DRAFT

Wetland Mitigation and Monitoring Plan

For

Rio Del Oro

Sacramento County, California

11 September 2007

Prepared for:
Elliott Homes, Inc.
and
GenCorp Real Estate

ECORP Consulting, Inc.
ENVIRONMENTAL CONSULTANTS

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SUMMARY

This mitigation and monitoring plan has been prepared for the Rio del Oro project as required by the U.S. Army Corps of Engineers (Corps) and provides information supporting consultation under Section 7.

The project is located in Sacramento County, California. There are a total of 56.632 acres of waters of the U.S. on-site, including 35.485 acres of vernal pools, 6.044 acres of seasonal wetland swale, 6.418 acres of seasonal wetland, 3.540 acres of ponds, and 5.145 acre of ephemeral drainage. Of these 56.632 acres, 27.903 acres will be impacted. A total of 12.946 acres of non-jurisdictional (isolated) aquatic features also occur on the project site, including 2.414 acres of vernal pool, 0.653 acre of seasonal wetland swale, 9.158 acres of seasonal wetland, and a 0.721 acre of pond. These features occur primarily within the dredge tailings that cover much of the project site. Activities associated with project implementation will result in the grading and filling of wetlands to establish construction grade and the installation of infrastructure for mixed land use on the 3829± acre site.

As part of project implementation, a 507-acre area located in the southern portion of the project that contains the highest quality and density of vernal pools will be set aside as a Wetland Preserve. In addition to the 20.413 acres of preserved vernal pools and 8.316 acres of other wetland habitat, 17.867 acres of vernal pools will be restored/created in the Preserve. Wetland habitat will also be created within the major drainage corridors and the large detention basin that will be established on the site. These corridors will contain 20.785 acres of seasonal wetland habitat and 8.402 acres of low-flow channel. On-site compensatory vernal pool habitat will be monitored for 10 years and seasonal wetland habitat within the drainage corridor will be monitored for a 5-year period. Specific success criteria have been set forth in this document. The wetland preserve area will be permanently fenced and will be protected by Deed Restrictions and Conservation Easements and managed as wetland/wildlife habitat in perpetuity. Long-term monitoring and maintenance funding will be provided through an endowment, a Community Facilities District, or other similar mechanism such as a Mello-Roos District as approved by the Corps and the U.S. Fish and Wildlife Service (Service).

To offset any temporal losses, the applicants propose a phased impact and mitigation plan that will establish the entire on-site vernal pool preserve in Phase One as well as the majority of compensatory vernal pool habitat in early phases, prior to the majority of impacts. In addition, 13 acres of seasonal wetland habitat at the Clay Station Mitigation Bank was constructed in 1994 and is already fully functioning.

The 160-acre± Cook property, located south of Highway 16 in Sacramento County, is proposed as additional mitigation (preservation of existing vernal pool and wetland habitat) for the Rio del Oro project. The Cook property is bordered to the north and west by existing conservation properties, to the east by Eagles Nest Road, and to the South by Florin Road. A preliminary wetland assessment conducted by ECORP Consulting, Inc. (ECORP) identified the following wetland habitats on the property; 2.67 acres of vernal pools, 9.90 acres of seasonal marsh, 2.63 acres of seasonal wetland swales, as well as other waters including a 6.51 acre pond and 0.58 acre intermittent drainage (Frye Creek). The remainder of the property includes associated uplands and approximately 21 acres of irrigated pasture.

The likelihood of the presence of listed vernal pool invertebrates, as well as the property's proximity to other regional conservation areas, makes the Cook Property an ideal location to mitigate impacts to biological resources resulting from the Rio del Oro project. While protocol-level branchiopod surveys have not been conducted on the Cook Property to date, it is likely that vernal pools on the property support vernal pool branchiopod crustaceans. The site is situated in an area of Sacramento County that is known to support several branchiopod species, including those that are federally-listed as threatened or endangered. Surveys conducted by ECORP and other investigators in the immediate vicinity of the Cook Property have identified vernal pool fairy shrimp (*Branchinecta lynchi*) (federal listed threatened), mid-valley fairy shrimp (*Branchinecta mesovallensis*), vernal pool tadpole shrimp (*Lepidurus packardi*) (federal listed endangered) and California fairy shrimp (*Linderiella occidentalis*).

PROJECT DESCRIPTION

Responsible Parties

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Parties Having Financial Responsibility:

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<u>On-Site Vernal Pool Preserve</u>

Present owner: Elliott Homes, Inc. and GenCorp Real Estate

Expected long-term owner: Sacramento Valley Open Space Conservancy, Wildlife Heritage Foundation, or other conservation-oriented third party

Parties responsible for long-term maintenance: Sacramento Valley Open Space Conservancy, Wildlife Heritage Foundation, or other conservation-oriented third party

On-Site Drainage Corridor

Present owner: Elliott Homes, Inc. and GenCorp Real Estate
Expected long-term owner: City of Rancho Cordova or other public entity
Parties responsible for long-term maintenance: City of Rancho Cordova, Sacramento Valley Open Space Conservancy, Wildlife Heritage Foundation, or other public entity

Off-Site Mitigation (Cook Property)

Present owner: Elliott Homes
Expected long-term owner: Sacramento Valley Conservancy
Parties responsible for long-term maintenance: Sacramento Valley Open Space Conservancy , Wildlife Heritage Foundation, or other public entity.

Off-Site Mitigation (Clay Station Mitigation Bank)

Present owner: Elliott Homes
Expected long-term owner: Elliott Homes
Parties responsible for long-term maintenance: Elliott Conservancy

Location of Project

The 3829± acre project site (Assessor's Parcel No. 072-0370-036,043,045-048,066,067,070,071, 072-0440-003,005-016, and 072-0540-023) is located south of White Rock Road, north of Douglas Road, and east of Sunrise Boulevard in the City of Rancho Cordova, California. The site corresponds to portions of Sections 5, 6, 7, 8, 9, and 10 of Township 8 North, Range 7 East, on the "Carmichael, California" U.S. Geological Survey 7.5-minute quadrangle and portions of Sections 31 and 32 of Township 9 North, Range 7 East, on the "Buffalo Creek, California" U.S. Geological Survey 7.5-minute quadrangle (Figure 1. *Project Site and Vicinity*).

Brief Description of Overall Project

The proposed project consists of grading and filling to establish construction grade and installation of infrastructure for a master-planned community on the 3829± acre parcel (Figure 2. *Land Use Plan*). The proposed land use plan would include high, medium, and low-density residential, retail/commercial, office, park, schools, wetland preserve and open space.

Jurisdictional Areas to be Filled

The project will permanently impact approximately 27.903 acres of waters of the U.S., composed of vernal pool (15.072 acres), seasonal wetland swale (3.587 acres), seasonal wetland (3.064 acres), pond (2.924 acres), and ephemeral drainage (3.256 acres) to be filled during construction grading.

Non-Jurisdictional Aquatic Resources to be Filled

The project will permanently impact 12.946 acres of isolated wetlands, composed of 2.414 acres of vernal pool, 0.653 acre of seasonal wetland swale, 9.158 acres of seasonal wetland, and 0.721 acre of pond. Seasonal wetland habitat to be considered within the drainage corridors is proposed as mitigation for the majority of impacts to isolated waters. Isolated vernal pool habitat mitigation will occur within the on-site preserve.

Types, Functions and Values of the Jurisdictional Areas on the Project Site To Be Directly and Indirectly Impacted

Types

The following table (Table 1 – *Waters/Wetlands Existing, Preserve, and Impact*) provides acreage of the wetlands and other waters of the U.S. that would be impacted by the proposed project. Descriptions of wetland categories follow. Please note that this plan includes mitigation for jurisdictional and non-jurisdictional waters.

Table 1 – Waters/Wetlands Existing, Preserve, and Impact			
Wetland Type	**Existing**	**Preserve**	**Impact**
Wetlands			
Vernal pool	35.485	20.413	15.072
Seasonal wetland swale	6.044	2.457	3.587
Seasonal wetland	6.418	3.354	3.064
Pond	3.540	0.616	2.924
Other Waters of the U.S.			
Ephemeral drainage	5.145	1.889	3.256
Total:	**56.632**	**28.729**	**27.903**

Functions, Values, and Baseline Information

A delineation of the project site was first conducted by Gibson and Skordal in 1999 and revised by ECORP on October 21, 2004 (Figure 3. *Wetland Delineation*). The delineation was verified by the Corps on January 10, 2005. A total of 56.632 acres of waters of the U.S. are located within the project site. In addition, 12.946 acres of non-jurisdictional wetlands were identified on the site. Determinate-level late season field surveys of special status plant species were conducted on June 9 ,12, 13, 14, 15, and July 3, 7, 10 of 2006. Rare plant surveys were also conducted on May 14, 19, 21, and 26 of 2003.

At the request of the Corps, ECORP conducted an assessment of the various wetland resources located within the Rio del Oro Project Area (Project Area) in 2004 (ECORP 2004). Data collected were used to support the on-site alternatives analysis component of the project's Environmental Impact Statement/Environmental Impact Report (EIS/EIR). The assessment compared the relative biological values of wetlands located within the project's on-site preserve with those wetlands to be filled as a result of project implementation. Most wetlands designated for fill are located in the northern and central portions of the Project Area, much of which is a historically manipulated landscape, largely the result of historical mining activities.

The 'relative value' of wetlands within preserve and impact areas was assessed by evaluating various ecological and biological conditions observed within the Project Area. Several characteristics were used to assess relative conservation value, including: 1) level of disturbance; 2) uniqueness of habitat; 3) wetland size, density, and connectivity; 4) hydrology;

5) occurrence of native and/or specialized plant species; and 6) occurrence of special-status species. Studies associated with the South Sacramento County Habitat Conservation Plan (HCP) have recognized many of these parameters as being important in assessing conservation value of vernal pool resources in the County. Data were collected during several survey efforts including a redelineation of wetlands on the property, an amphibian survey, and rare plant surveys conducted by ECORP during 2003, 2004, and 2006. The assessment investigation made the following fisndings.

The preserve area was found to be relatively undisturbed with the exception of minor disturbances resulting from cattle grazing practices. Vernal pool densities were found to vary, as several scattered clusters of vernal pools are present. Vernal pools range in size from small (0.002 acre) to large (1.3 acres), and occur in localized clumps that are often connected by linear seasonal wetland swales and drainages including the upper reaches of Morrison Creek. This continuity among wetlands serves to provide dispersal opportunities for wetland-dependant species including various aquatic invertebrates (including branchiopod crustaceans), amphibians, and a high diversity of plant species. In general, the variability in vernal pool sizes, depths, and degree of continuity increases the likelihood that favorable wetland conditions for plant and animal species will persist regardless of variable annual conditions, and that dispersal to suitable habitat is achievable. Studies associated with the South Sacramento County Habitat Conservation Plan HCP have, similarly, correlated increased vernal pool density and pool size with conservation value.

Generally, the inundation periods of the wetlands in the on-site preserve tend to be longer for the southern grassland vernal pools (preserve) than for seasonal wetlands to the north (impact area). Consequently, unique plant species adapted to the hydrological regime characteristic of vernal pools occur more frequently in the preserve area. These plants include several native, obligate hydrophytes such as coyote thistle (Eryngium vaseyi), slender popcorn flower (Plagiobothrys stipitatus), Carter's buttercup (Ranunculus bonariensis), and creeping spikerush (Eleocharis macrostachya). Rare plant surveys conducted by ECORP in May 2003 identified Greene's legenere (Legenere limosa - USFWS species of concern and CNPS List 1B species) in two wetlands in the planned preserve area. Additionally, several of the wetlands within the preserve have been found to support the federally threatened vernal pool fairy shrimp

(Branchinecta lynchi) and the federally endangered vernal pool tadpole shrimp (Lepidurus packardi).

In contrast, much of the northern two-thirds of the Project Area is highly disturbed, primarily due to gold dredging operations during the 1920s and 1950s. As a result of past dredging operations, long rows of cobble tailings, as high as 60 feet tall, were deposited throughout the site. The soils in these areas have been highly altered and consist primarily of Xerorthents with smaller patches of slickens deposits. The overall density of seasonal wetlands within the rock tailing areas was found to be much less than that of the proposed wetland preserve area, which accommodates a significant fraction of the property's vernal pools and seasonal wetlands. The wetlands in the dredger lands are much more scattered in their distribution. Many of these wetland features tend to be smaller and less interconnected, as evidenced by fewer seasonal wetland swales and drainages. The majority of these features are isolated between dredger tailings.

The dredger seasonal wetlands were found to be typically dominated by facultative, non-native wetland plants, including Mediterranean barley (Hordeum marinum), Italian ryegrass (Lolium multiflorum), and curly dock (Rumex crispus). Several of the seasonal wetlands also contain woody species such as willow (Salix sp) and Fremont cottonwood (Populus fremontii); however, these species appear to be deep-rooted remnants established when the area received more water, due to past Aerojet operations. The dredger wetlands typically support a lower diversity of plant species than the grassland wetlands in the proposed wetland preserve area.

Wet season branchiopod surveys of the dredger tailings in the upper portion of the Project Area were conducted by Gibson and Skordal in 2000 and 2001. Gibson and Skordal documented that the dredger tailings were unsuitable habitat for fairy shrimp, as no shrimp were found within the dredger wetlands. These surveys identified only a few Branchinecta lynchi and Lepidurus packardi in open grassland wetlands located along the outer edge of the survey area, adjacent to, but not within, the dredger tailings areas.

The relative biological and conservation value of wetlands located within the on-site wetland preserve were found to be higher than those for wetlands planned for fill. In general,

preserved wetlands are situated on lands that have experienced considerably less disturbance. The preserve accommodates an assemblage of vernal pools and other wetlands, situated on the Laguna Formation, that support a more diverse vegetation community than that present in mined portions of the property (i.e., the proposed development area). Additionally, wetland densities and connectivity are greater in the proposed preserve area, whereas most of the wetlands being impacted are either scattered in their distribution and/or are typically small, isolated features. The preserve encompasses vernal pools and wetlands of various sizes and depths that support several native plant species including special-status species.

ECORP's 2004 assessment of the relative conservation values of Rio del Oro's wetland resources is consistent with findings of previous studies associated with development of the South Sacramento County Habitat Conservation Plan (HCP), which have correlated increased vernal pool density and pool size with increased conservation value.

Descriptions of the wetland types follow.

Vernal Pools

Vernal pools are poorly drained, isolated depressions that occur within the annual grassland landscape. Vernal pools are fed by direct rainfall or surface run-off. Water ponds for several weeks at a time during the rainy season and may dry completely between storm events.

In the Mediterranean climate of California's Central Valley, fall rains initiate the "wetting" stage, during which seeds germinate and dormant perennials re-sprout. As soils saturate and standing water accumulates, the pool enters the "aquatic" phase. Inundation may be periodic or continuous, and this variability supports a diverse plant and animal community. As water levels recede, primarily through evaporation, the "drying" phase begins during which pool basins begin drying and plant flowering reaches its peak, followed by the setting of seeds. The final phase is the "drought" phase, which is characterized by dry soils and dead or dormant vegetation. Since vernal pools hold ponded water and have emergent vegetation, they are responsible for some nutrient uptake/transformation. However, because of the brief period of inundation of the vernal pools on the site, it is unlikely that the pools provides any significant

contribution to overall regional water quality (i.e., minimal effects on groundwater recharge, flood flows, or sediment stabilization).

There are numerous vernal pools throughout the annual grassland habitat portions of the project site, particularly in the non-mined areas. Vernal pools are types of shallow seasonal wetland depression that are typically dominated by annual native wetland plant species adapted to an annual wet/dry cycle. Vernal pools are flooded in the winter and spring but completely dry by summer. On-site vernal pools vary in maximum water depth from a couple of inches to 18 inches deep, and they range from 0.002 to 1.3 acres in size. Due to the timing of this wetland delineation, many of the species that ordinarily occupy the vernal pools during the wet season were lacking or their remains were not identifiable to species. Plant species observed within vernal pools include Carter's buttercup (*Ranunculus bonariensis*), Vasey's coyote-thistle (*Eryngium vaseyi*), creeping spikerush (*Eleocharis macrostachya*), and slender popcorn-flower (*Plagiobothrys stipitatus*). Typical wildlife associated with vernal pools includes various aquatic invertebrates and amphibians such as the pacific chorus frog.

The vernal pool fairy shrimp (*Branchinecta lynchi*) and vernal pool tadpole shrimp (*Lepidurus packardi*), listed as threatened and endangered (respectively), pursuant to the federal Endangered Species Act, are known to occur within several vernal pools in project area. Two years of wet season surveys have been performed on the site, and vernal pool tadpole and fairy shrimp were located in the open grassland habitat along the outer edges of the project site.

Seasonal Wetland and Seasonal Wetland Swale

Seasonal wetlands are scattered throughout both the mined and non-mined areas of the project site. These seasonal wetlands are ephemerally wet areas that are usually underlain by clay or a heavy clay loam that act to suspend runoff within low-lying areas. They become inundated during the winter and fall but dry completely during the summer months. Unlike vernal pool wetlands, vegetation inhabiting on-site seasonal wetlands are predominately non-native wetland generalist plants such as Italian ryegrass (*Lolium multiflorum*), barley (*Hordeum murinum*), dock (*Rumex* spp.) rabbits-foot grass (*Polypogon monspeliensis*). Less common are native species such as Baltic rush (*Juncus balticus*) and creeping spikerush (*Eleocharis macrostachya*).

Many of the seasonal wetlands that occur within the cobble tailings low areas also contain woody species such as willow and cottonwood. The vegetation in seasonal wetlands can function to remove/transform nutrients, as well as help with sediment stabilization. However, due to the size of these wetlands and the relatively low amount of water conveyed through this habitat, contribution to overall regional water quality is relatively low (i.e., minimal effects on groundwater recharge or flood flows).

Various seasonal wetland swales are located on the project site and consist of shallow, ephemerally wet areas that convey water between larger drainages or other wetland/water features during storm events. They occur as linear wetland features but lack bed-and-bank, and are lined with vegetation. Portions of a swale remain saturated into the growing season, support some hydrophytic vegetation, and exhibit hydric soil characteristics. The vegetation community of on-site swales consists primarily of non-native wetland generalist plants such as Italian ryegrass and Mediterranean barley, dock, as well as native annual species including coyote thistle.

When inundated, these seasonal wetlands potentially provide habitat for aquatic invertebrates and amphibians. For most of the remainder of the year, wildlife usage is similar to that of typical Central Valley non-native annual grassland habitat.

The isolated seasonal wetlands can provide habitat for vernal pool fairy and/or tadpole shrimp (*Branchinecta lynchi* and/or *Lepidurus packardi*, respectively). Some of the seasonal wetland depressions on the site have been considered potential habitat for listed crustaceans.

Pond

Several wetland features identified as ponds are present within the project site and consist primarily of modified or excavated basins or impounded drainages. They currently provide water for cattle grazing. For the most part, the ponds are seasonally inundated yet they hold water significantly longer than other seasonal wetland types. Several may even remain inundated throughout the year. The ponds largely lack emergent vegetation except for scarce individuals that exist around the high water mark.

Ponds can contribute to water quality through nutrient removal/transformation, collections of flood waters during local storm events, and reduction in sediment loads and turbidity. Many wildlife species are likely to use the stock ponds throughout the year and these may include great egret (*Ardea alba*), great blue heron (*A. nerodias*), belted kingfisher (*Ceryle alcyone*), bullfrog (*Rana catesbeiana*), and Pacific chorus frog. These ponds can be particularly important to wildlife seeking water during summer months, when other features have dried down.

Ephemeral Drainage

Ephemeral drainages are linear features that provide a conduit to flow during storm events. In general, they exhibit bed-and-bank characteristics and are largely un-vegetated due to the depth and scouring effects of flowing water. Occasionally however, some hydrophytic vegetation is present along the upper edges, and in areas where sediment accumulation provides suitable substrate for plant establishment. The dominant ephemeral drainage located on-site is Morrison Creek which runs from east to west through the southern section of the site and is identified on the U.S.G.S topographic map as a blue line feature. Ultimately, this feature drains into Mather Lake, located southwest from the Rio del Oro Project Area. Several other smaller sections of ephemeral drainages were mapped in the Project Area. They consist originally of seasonal wetland swale features that have eroded and developed bed-and-bank characteristics.

The channels are important to water quality in that they collect sheet flows and water from local storm events into larger drainages and tributaries. Depending on the flow capacity, the channels may also contribute to overall regional water quality in terms of nutrient transformation and sediment stabilization.

Soils

There are eleven different soils types mapped for the project area. Soil series mapped by the Natural Resource Conservation Service for the site include (145) Fiddyment fine sandy loam, 1-8% slopes; (158) Hicksville loam, occasionally flooded, 0-2% slopes; (159) Hicksville gravelly loam, 0-2% slopes; (181) Natomas loam, 0-2% slopes; (191) Red Bluff loam, 0-2% slopes;

(192) Red Bluff loam, 2-5% slopes; (193) Red Bluff Loam, 0-5% slopes; (196) Red Bluff-Xerorthents, dredge tailing complex, 2-5% slopes; (198) Redding gravelly loam, 0-8% slopes; (223) Slickens; and (245) Xerorthent, dredge tailings, 2-50% slopes (Figure 4. *Natural Resources Conservation Service Soil Types*). The Fiddyment, Hicksville, Natomas, Red Bluff, and Redding soils occur in the grasslands within areas which have not been disturbed by historic mining activities. The Slickens and Xerorthent dredge tailings soils occur with areas that have been substantially disturbed by historic mining activities.

GOALS OF MITIGATION

The overall goal of the proposed mitigation for the Rio del Oro project is to achieve no net loss of wetland functions and values and to preserve and enhance existing species habitat. This goal will be accomplished through a combination of on-site preservation/creation, off-site preservation, and purchase of off-site compensatory mitigation. On-site mitigation planned for the site includes creation of 17.867 acres of vernal pools, 20.785 acres of seasonal wetland and 8.402 acres of low-flow channel (Figure 5. *Wetland Preserve, Impact, and Compensation Plan* and Attachment A – *Wetland Preserve, Impact and Compensation Plan*). Vernal pool creation will occur within the proposed 507-acre Wetland Preserve, where a total of 20.413 acres of existing vernal pools will also be preserved. The preserve has been designed to protect Morrison Creek as well as the highest quality of vernal pools on the project site. The majority of the remainder of the site has been historically mined, and is currently dredger tailings.

Preservation and restoration/creation habitat proposed for the Rio del Oro project is located within the same recovery area for the listed branchiopods and plant species that may occur at the Rio del Oro site. Additional habitat at the Clay Station Mitigation Bank has also been documented to support vernal pool fairy shrimp and vernal pool tadpole shrimp.

Types

The following table (Table 2) presents acreages of wetlands and other Waters of the United States that would be impacted, preserved and created by the proposed project. Mitigation for non-jurisdictional features is also proposed. Descriptions of the mitigation components follow.

Table 2 - Waters/Wetlands, Existing, Avoidance, Impact, and Compensation Acreage							
		Impacts		Mitigation			
Wetland Type	**Existing**	**Jurisdictional**	**Isolated**	**On-site Preservation**	**On-Site Creation**	**Off-Site Preservation**	**Off-Site Creation**
Vernal Pool	35.485	15.072	2.414	20.413	17.867	2.67	---
Seasonal wetland swale	6.044	3.587	0.653	2.457	---	---	---
Seasonal wetland	6.418	3.064	9.158	3.354	20.785	12.53	13
Pond	3.54	2.924	0.721	0.616	---	6.51	---
Ephemeral drainages	5.145	3.256	---	1.889	---	0.58	---
Channel	---	---	---	---	8.402	---	---
Total	**56.632**	**27.903**	**12.946**	**28.729**	**47.057**	**22.29**	**13**
		Total Impact:	**40.849**				

[1] A total of 22.29 wetland acres will be preserved at the Cook Property
[2] 13 acres of seasonal wetland habitat will be purchased at the Clay Station Mitigation Bank
[3] There is an additional 2.179 acres of indirect impacts to vernal pools

Characteristics, Functions and Values of Habitat to be Created/Enhanced

On-Site Mitigation

The functions and values of the habitat to be created or enhanced on-site will be designed to mimic those of the impacted habitats on the project site and successfully integrate with existing wetlands in the preserve (see Functions, Values, and Baseline Infrastructure, page 6). On-site mitigation will provide preservation and compensatory mitigation habitat for listed branchiopod and plant species within their core-recovery area.

A 507-acre vernal pool preserve area will be designated in the southern portion of the project site (Figure 6. *Conceptual Vernal Pool Preserve*). This area contains the highest concentration of high-value, undisturbed vernal pools on the project site. A total of 20.413 acres of vernal pools are located within the proposed preserve. Vernal pool creation totaling 17.867 acres (maintaining approximately 250' buffers from existing vernal pool features) will occur within this preserve area also. Other existing wetland features within the preserve include: 2.457 acre of seasonal wetland swale, 3.354 acres of seasonal wetland, 0.616 acre of pond, and 1.889 acres of ephemeral drainage. The portion of Morrison Creek located within this area will be preserved.

The proposed Rio del Oro Vernal Pool Preserve surface morphology has been analyzed using hydrologic modeling tools in ESRI's ArcGIS software. It was used to determine if the naturally-

occurring vernal pool and seasonal wetland (depressional wetlands) habitat is likely to function appropriately in a post-development setting and with the restoration and construction of additional vernal pools within the adjacent uplands. Specifically, the purpose of the investigation was to determine if the development of the surrounding property, the construction of Rancho Cordova Parkway, and the restoration and construction of additional vernal pool habitat would lead to a reduction of watershed area necessary to sustain the naturally-occurring depressional wetlands and proposed vernal pools. To accomplish this, the preserve area was mapped in May 2007, with LIDAR (Light Detection and Ranging) to develop a fine scale topographic model. Using the LIDAR-derived topographic model, the watershed boundaries of each depressional wetland were established. Using these data, ECORP staff determined the ratio of each existing depressional wetland to its corresponding watershed size.

This analysis suggests that the implementation of the Rio del Oro project will not decrease the watershed ratios below the levels necessary to sustain the existing depressional wetlands or the 17.87 acres of vernal pool restoration and construction proposed within the 507-acre Preserve. Further GIS analysis, in addition to a review of historic topography, historic aerial photography, and the results from a soils investigation, will be used to further refine the restoration and construction of this habitat such that each wetland feature is supported by a watershed of adequate size. The results of this analysis will dictate the optimal location of the proposed vernal pools such that they do not replace more upland watershed area than is required to sustain the existing depressional wetlands.

The GIS analysis of the LIDAR based topography was also used to analyze the affects of the proposed Rancho Cordova Parkway on existing depressional wetlands and proposed vernal pools within the Preserve. During the initial project design, the road was aligned such that it avoided direct impacts to the depressional wetlands within the Preserve. Further, the GIS analysis indicates that the proposed road alignment maintains sufficient watershed ratios for the depressional wetlands within the vicinity of the road. Therefore, the road construction should not reduce the watershed area necessary to sustain the existing depressional wetlands. Finally, the design of the vernal pool restoration and construction will incorporate the proposed Jaeger Road alignment. Attachment B provides a summary of the Watershed Analysis.

The wetland preserve is being designed to maximize protection of existing and compensatory vernal pool habitat. Drainage will be designed so that summer nuisance flows are directed to low-flow channels to be constructed along the perimeter of the preserve that will parallel a proposed trail system. The preserve configuration was also designed to maintain existing hydrology to preserve and compensatory vernal pool habitat. Areas adjacent to the preserve generally flow away from the preserve and as such, development of these areas will not compromise the hydrology of the protected resources.

In addition to the 507-acre wetland preserve area, 197 acres of drainage corridors and open space will be established on the project site. The 197 acres will be a re-creation of drainages that were previously on the site prior to dredging activities. The corridors will range from 200 to 300 feet wide and will consist of a meandering low-flow channel, adjacent wetlands, riparian plantings and a bike trail. A total of 25.342-acres of wetlands will be created within the corridors, including 8.402-acres of channel/low-flow habitat and 16.345-acres of seasonal wetlands (Figure 7. *Conceptual Corridor Plan*). These corridors will reestablish defined drainageways for the site which have not been present since the dredging operations completely altered the character and topography of the majority of the site. It is anticipated that riparian habitat to be established within the reestablished corridors will offset mitigation requirements that may be required by the California Department of Fish and Game.
Three detention basins (7, 6, and 26 acres in size) will be constructed as part of the project for flood protection. A total of 3.84-acres of seasonal wetlands will be constructed within the 26-acre detention basin that is located in the southwest corner of the project area and is contiguous with the proposed drainage corridors.

Off-Site Mitigation

The 160-acre± Cook property, located south of Highway 16 in Sacramento County, is proposed as additional mitigation for the Rio del Oro project (Figure 8. *Project Site and Vicinity – Cook Property*). The Cook property is bordered to the north and west by existing conservation properties, to the east by Eagles Nest Road, and to the South by Florin Road. A preliminary wetland assessment conducted by ECORP identified the following wetland habitats on the property; 2.67 acres of vernal pools, 9.90 acres of seasonal marsh, 2.63 acres of seasonal

wetland swales, as well as other waters including a 6.51 acre pond and 0.58 acre intermittent drainage (Frye Creek) (Figure 9. *Preliminary Wetland Assessment – Cooks Property*). The remainder of the property includes associated uplands and approximately 21 acres of irrigated pasture. A homestead is also present in the north-eastern portion of the property.

The Cook property is within the same core-recovery as Rio del Oro and has been identified by the Service staff as a important component in establishing a large-contiguous preserve area in the region.

The likelihood of the presence of listed vernal pool invertebrates, as well as the property's proximity to other regional conservation areas, makes the Cook Property an ideal location to mitigate impacts to biological resources resulting from the Rio del Oro project. While protocol-level branchiopod surveys have not been conducted on the Cook Property to date, it is likely that vernal pools on the property support vernal pool branchiopod crustaceans. The site is situated in an area of Sacramento County that is known to support several branchiopod species, including those that are federally-listed as threatened or endangered. Surveys conducted by ECORP and other investigators in the immediate vicinity of the Cook Property have identified vernal pool fairy shrimp (*Branchinecta lynchi*) (federal listed threatened), mid-valley fairy shrimp (*Branchinecta mesovallensis*), vernal pool tadpole shrimp (*Lepidurus packardi*) (federal listed endangered) and California fairy shrimp (*Linderiella occidentalis*). According to the California Natural Diversity Database vernal pool fairy shrimp and vernal pool tadpole shrimp have been documented 800 feet to the west of the property.

The project will also purchase 13-acres of seasonal wetland habitat at the Clay Station Mitigation Bank located on Clay Station Road in southern Sacramento County, approximately 15 miles south of the Rio del Oro project. The Clay Station Mitigation Bank site is bounded by Clay Station Road to the east, Laguna Creek and associated riparian habitat to the west, farmland to the north, and Brown's Creek to the south and is adjacent to other large preserves, such as Gill Ranch to the east. The Clay Station Mitigation Bank was established in 1994 and all wetland habitat has been monitored for 10 years. In addition to the site supporting fairy shrimp and tadpole shrimp, the Rio del Oro is well within the bank established service area. Wetland

habitat at Clay Station Mitigation Bank exhibits functions and values that are similar to those to be filled at the Rio del Oro site.

Evaluation of Temporal Losses

The created and restored habitat within the preserve area should begin functioning hydrologically during the first rainy season after completion of the excavation and countouring of the compensation wetlands. Substantial vegetative cover within the wetland features is expected to be established within two years after construction. It is also expected to increase annually and reach the established performance standards within three to five years. The project has developed a phased impact/compensation plan that will offset any temporal losses. The 507-acre vernal pool preserve will be established concurrent with Phase One and all of the compensatory vernal pool habitat will be constructed within the first two phases of the project (Figure 10. *Preserve Phasing*).

Although Phase One impacts total only 6.339 acres, 9.718 acres of vernal pool habitat and 4.09 acres of seasonal wetland constructed and approximately 51 acres of existing vernal pool and wetland habitat will be permanently protected and managed (on-site and off-site) concurrent with Phase One impacts. Subsequent project phases and associated mitigation acreages are presented in the table below (Table 3 – *Impact and Mitigation Phasing*) and on Figure 11. Mitigation habitat within the corridors will be constructed concurrent with build-out of those areas. This approach, providing excess mitigation in the early phases of the project, is proposed to eliminate potential temporal losses of wetland functions and values.

Additionally, the thirteen (13) acres of seasonal wetland habitat at the Clay Station Mitigation Bank was created approximately 10 years ago and is fully-functioning.

Table 3 – Impact and Mitigation Phasing

PHASE	AREA	IMPACTS	ON-SITE MITIGATION Preservation Vernal Pool	Preservation Other	Creation Vernal Pool	Creation Low-Flow Channel	Creation Seasonal Wetlands	OFF-SITE MITIGATION Preservation	OFF-SITE MITIGATION Creation	TOTAL IMPACT	TOTAL MITIGATION
PHASE 1	Area 1a Area 2	2.350 3.989	20.413	8.316	9.718	0.250	3.840	22.290	13.000	6.339	78.827
PHASE 2	Area 1b	4.050	0	0	8.149	0	0	0	0	10.389	85.476
PHASE 3	Area 1c	7.920	0	0	0	2.000	0.140	0	0	18.309	88.116
PHASE 4	Area 1d	1.560	0	0	0	4.230	10.490	0	0	19.869	102.836
PHASE 5	Area 3	3.850	0	0	0	0.640	3.990	0	0	23.719	107.466
PHASE 6	Area 4	4.510	0	0	0	0	0	0	0	28.229	107.466
PHASE 7	Area 5	3.710	0	0	0	1.282	2.325	0	0	31.939	111.073
PHASE 8	Area 6	8.910	0	0	0	0	0	0	0	40.849	111.073
Totals:		40.849	20.413	8.316	17.867	8.402	20.785	22.290	13.000		

PROPOSED (ON-SITE) MITIGATION SITES

Mitigation Site

A 507-acre Wetland Preserve will be located in the southern portion of the project protection the majority of high-value, undisturbed vernal pool habitat on the Rio del Oro site. Several large drainage corridors, 200′ – 300′ feet in width, totaling 25,000 feet (4.7 miles) in length will also be established throughout the project. Theses corridors will be established drainages in areas where gold dredging activities have destroyed the naturals drainages years ago. A 26-acre detention basin in the southwest portion of the site will contain 3.84 acres of seasonal wetland habitat.

Ownership Status

<u>507-acre Vernal Pool Preserve</u>

Present owner of the mitigation site:

Elliott Homes, Inc. and GenCorp Real Estate

Expected long-term owner of the mitigation site:
Sacramento Valley Open Space Conservancy, Wildlife Heritage Foundation, or other conservation-oriented third party

Parties responsible for long-term maintenance of the mitigation site:
Sacramento Valley Open Space Conservancy, Wildlife Heritage Foundation, or other conservation-oriented third party

Point of Contact for Corps Access to the Site:
During construction and 5-year monitoring: Elliott Homes, Inc. and GenCorp Real Estate
Following Corps Sign-off: Sacramento Valley Open Space Conservancy, Wildlife Heritage Foundation, or other conservation-oriented third party

Deed Restrictions, Conservation Easements and Operations and Management:
Deed restrictions/conservation easements will be recorded and will require that the on-site constructed wetland and open space areas are maintained as wetland and wildlife habitat in perpetuity. A detailed Operations and Management (O&M) Plan has bee drafted for the long-term monitoring at the 507-acre preserve by ECORP. Copies of proposed language will be submitted to the Corps for approval prior to recordation and copies of the recorded documents will be provided to the Corps no later than 30 days subsequent to recordation. In addition, recordation will occur prior to the start of project construction.

<u>Drainage Corridors</u>
Present owner of the mitigation site:
Elliott Homes, Inc. and GenCorp Real Estate

Expected long-term owner of the mitigation site:
City of Rancho Cordova or other public entity

Parties responsible for long-term maintenance of the mitigation site:
City of Rancho Cordova or other public agency

Point of Contact for Corps Access to the Site:

During construction and 5-year monitoring: Elliott Homes, Inc. and GenCorp Real Estate

Following Corps Sign-off: City of Rancho Cordova, Sacramento Valley Open space Conservancy, Wildlife Heritage Foundation, or other public agency

Deed Restrictions, Conservation Easements and Operations and Management:

Deed restrictions and conservation easements will be recorded and will require that the on-site constructed wetland and open space areas are maintained as wetland and wildlife habitat in perpetuity. A detailed Operations and Management (O&M) Plan has bee drafted for the long-term monitoring at the drainage corridors by ECORP. Copies of proposed language will be submitted to the Corps for approval prior to recordation and copies of the recorded documents will be provided to the Corps no later than 30 days subsequent to recordation. In addition, recordation will occur prior to the start of project construction.

Existing Functions, Values, Baseline Information of Mitigation Sites

507-acre Vernal Pool Preserve

The existing functions and values of the 507-acre preserve site are similar to those for the un-mined habitats to be impacted, as the mitigation site within the same watershed and compensatory habitat will be designed to mimic those affect by project implementation. The functions and values of the proposed mitigation exceeds those of the marginal wetland features found in the mining tailings (see Functions, Values and Baseline Information, page 6).

Drainage Corridors

Currently, the locations where the drainage corridors will be constructed consist of dredger tailings – large linear cobble piles. There is very little connectivity between the limited amount of wetlands that occur between the tailings. These features were determined to be isolated and non-jurisdictional by the Corps.

Present Use of Mitigation Area

507-acre Vernal Pool Preserve

The proposed mitigation area (within the project site) is currently a fallow undeveloped property and is used for cattle grazing. The proposed mitigation area has existing wetland features including 20.413 acres of vernal pools, 2.457 acres of seasonal wetland swale, 3.354 acres of seasonal wetland, 0.616 acre of pond, and 1.889 acres of ephemeral drainage.

Two areas (Kappa/Gamm complex is the "Metal-Lived Hole" area) within the preserve will undergo further clean-up activies prior to being preserved in perpetuity.

The Kappa/Gamma Complex is located within the eastern side of the preserve and is approximately 30 acres in size. The Kappa/Gamma Complex facilities were used for several activities including the testing of the Thor rocket, the development and testing of hydrogen components, for evaluation of the use of self-igniting propellant, and testing of engines and supply systems. Testing activities generated wastewater that was channeled to concrete-lined burn basins where the wastewater would be burned off and the remaining fluids were pumped to an unlined percolation pond that contained several deep, dry wells to enhance the percolation of wastewater into the soil. The Kappa/Gamma Complex currently contains volatile organic compounds within shallow surrounding soils and in January 2006 a Remedial Action Plan for institutional control (land use restrictions) was approved by the California Department of Toxic Substances Control.

The Metal-Lined Hole area is located within the western portion of the preserve and occupies approximately a 1- to 2-acre location. The area contains two 80-foot circular concrete curbs and a 1.8-foot-diameter by 9-foot-deep vertical steel pipe surrounded by a 6-foot-square concrete pad (36 square feet), which is approximately 1 foot thick. Originally the Metal-Lined Hole was full of an unknown oily fluid that was pumped into three drums by the Mcdonnell Aircraft Corporation for appropriate off-site disposal. The Metal-Lined Hole was later filled with bentonite and capped with a layer of cement. In 1978 Metal-Lined Hole the site was leased to Cetec Antenna Company where the Metal-Lined Hole was used for a vertical antenna array and

the concrete curbs were used for horizontal antenna arrays until the late 1980s when it was decommissioned. The Final Remedial Action Plan for this site indicated that the trace volatile organic compounds concentrations of limited extent near the site did not warrant further remedial actions. In December 2000 the Final Remedial Action Plan was approved by the California Department of Toxic Substances Control.

Groundwater-water monitoring wells are also located within the project preserve.

Drainage Corridors

There are a few areas that cattle are able to use for grazing, but overall there are no current active uses for the dredger tailing areas. These areas were previously used as buffers for testing facilities that are no longer active, with exception of some surface mining of the exposed aggregate.

Jurisdictional Delineation

The jurisdictional delineation for the on-site mitigation sites are included in the delineation for the entire project site.

Present and Proposed Uses of All Adjacent Areas

Adjacent land use in areas surrounding the mitigation site is at present agricultural to the west, north and south, and light industrial to the east. The permit for which this mitigation plan has been developed authorizes mixed-use development to north and west. Residential development is being developed south of the proejct (across Douglas Road) as part of the Sunridge Specific Plan Area. The Rio del Oro project has designed it's preserve area to be consistent with the agency-proposed preserve configuration to the east, allowing for contiguous continuation of the open space in the future.

Zoning

The Mitigation Area is currently zoned as industrial with aggregate resource overlay. The mitigation area will be rezoned as open space.

Implementation Plan

Rationale for Expecting Implementation Success

ECORP has successfully designed and overseen the construction of numerous other compensation wetlands in Sacramento County – including many vernal pool mitigation banks and projects. This experience will be used in the design and construction of the compensation habitat for the Rio del Oro project. In addition, the mitigation will be constructed in proximity to existing, functioning features within an established watershed. An extensive watershed analysis has been conducted for the proposed compensatory vernal pool habitat within the 507-acre preserve (see on-site mitigation, page 14). In addition, Davis[2] Soil Scientists have conducted soil testing of the site and has concluded the soils are appropriate for vernal pool restoration/creation. The Clay Station Mitigation Bank was designed and construction oversight was conducted by ECORP. The site is regularly visited by resource agency staff during bank tours and considered an exammple of a successful creation/restoration project.

Responsible Parties

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AGENT:

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Schedule

Grading is expected to begin immediately after all requirements for commencement of construction have been fulfilled. Although Phase One impacts total only 6.11 acres, a total of 9.718 acres of vernal pool habitat will be constructed and approximately 51 acres of vernal pool and wetland habitat will be permanently protected and managed (on-site and off-site) concurrent with Phase One impacts. Mitigation habitat within the corridors will be constructed concurrent with build-out of those areas. This approach, providing excess mitigation in the early phases of the project, is proposed to eliminate potential temporal losses of wetland functions and values. Figure 10 presents anticipated phasing of the project.

As-Built Conditions

An aerial photo will be taken in the first winter after the wetlands have been constructed. The wetland areas will be digitized and wetland acreage will be calculated. This wetland "as-built" will be included in the annual monitoring reports and will verify that the mitigation acreages specified in the permit have been constructed. If there are significant changes from the original plans, these will be indicated in indelible red ink.

Maintenance During Monitoring Period

Maintenance Activities

In order to ensure that the constructed wetlands and preserved wetlands are adequately protected during construction, the following actions will be taken. First, the boundaries of the entire area to be preserved will be temporarily fenced to ensure that the area is not disturbed during the construction of the rest of the project. After project completion, permanent fencing will be installed along the perimeter of the entire preserve area. Fencing should be sufficient to prevent vehicle access into the area. Permanent signs identifying the open space area will be placed along the perimeter of the fence.

On-going maintenance activities will include trash removal, inspections for erosion control problems, inspections for invasion of exotic species, repair/replacement of fencing and signage, and inspections for vandalism. If necessary, for reasons such as obstruction of outfalls, flood protection, removal of exotic species, or thatch buildup, the removal of vegetation may be needed within the upland perimeter areas. If vegetation removal is required it will be conducted by hand. This action will be appropriately timed, and will be consistent with the Deed Restrictions and Conservation Easements governing the preserve. The condition of the channel will be evaluated during monitoring visits. The Corps will be notified if any action beyond this is required during the monitoring period. If thatch removal or extensive erosion control work is deemed necessary, the Corps will be provided with a plan for review, and Corps approval will be required prior to implementation. The deed restrictions and conservation easement outlining the permitted and prohibited activities, will be submitted to the appropriate agencies for review and approval.

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Schedule

Annual maintenance inspections of the channel will occur concurrently with other monitoring activities for the first five years after construction, or until mitigation success obligations have been met. Compensatory Vernal Pool habitat will be monitored seven years over a ten-year

period. Annually, biologists will evaluate the need for vegetation removal, including the removal of thatch, erosion control measures, trash removal, vandalism, and other maintenance activities. Inspections will be an ongoing activity and trash removal will occur as needed.

Monitoring Plan

Vernal Pools

Final Success Criteria

The overall goal of mitigation is no net loss of wetland functions and values. This goal will be met through the creation of 17.867 acres of vernal pool and the preservation of 20.413 acres of vernal pool. Compensatory vernal pool habitat will be monitored seven years over a ten-year period.

In order to judge whether or not the goal of no net loss of function and values has been met for the on-site compensation vernal pools, a set of final success criteria have been developed. These success criteria are based on the final goal of mitigation as creation of vernal pools with functions and values similar to the preserved vernal pool habitat. By comparing the preserved to the compensation habitat, we can ensure the functions and values of the impacted portion of the project are replaced. For the constructed vernal pool habitat, at the end of the monitoring period, it must meet specific success criteria, after three years of no human intervention, as listed in Table 4.

Table 4 – Success Criteria Compensation Vernal Pool		
Hydrology:	1)	The maximum depth of the created vernal pools will not be greater than 18 inches.
Vegetation:	1)	The aerial coverage of vegetation for 90% of the created vernal pools must be equal to or greater than 85%, and the aerial coverage of vegetation for the remaining 10% of the created vernal pools must be 50-80%.
	2)	Species richness will equal or exceed 10 species.
	3)	The percentage of the total relative cover (as calculated by the sum of all the cover class mid-points) attributable to "vernal pool indicators" or "vernal pool associates"[1] must be as follows: 25% of the pools shall attain ≥90% total relative cover, 50% shall attain 75-90%, and 25% shall attain a value of ≥50%.
	4)	All dominant species (those with a Braun-Blanquet cover scale of 3 or greater) will be "vernal pool indicators" or "vernal pool associates."[1]

[1] As defined in the California Department of Fish and Game's list: *Catalog of Plant Species Known to be Associated with Vernal Pools* (CDFG 1997) or other vernal pool literature.

Monitoring will be conducted for ten years. The monitoring period will begin with the first rainy season following the construction activities. See Constructed Vernal Pool Monitoring Schedule - Years 1-10 Table 5 below for an outline of the monitoring schedule by monitoring year. Monitoring will be extended beyond the ten-year period only for those wetlands that are not meeting success criteria.

Target Jurisdictional Acreage to be Created/Enhanced

An aerial photo will be taken in the first winter after the wetlands have been constructed. The ponded wetland areas will be digitized and a wetland acreage will be calculated. This wetland "as-built" will be included in the annual monitoring reports and will verify that the mitigation acreages specified in the permit have been constructed.

Monitoring Methods

In order to determine if the constructed wetlands are functioning properly, the following hydrology, vegetation, and wildlife monitoring program will be adopted.

Table 5 - Constructed Vernal Pool Monitoring Schedule - Years 1-10

Constructed and Reference Vernal Pools	Hydrology	Invertebrates	Vegetation	Photo Documentation	General Preserve Monitoring
First Year	Yes - All of the Constructed Pools and all of the Reference Pools	Yes - 20*% of the Constructed Pools and all of the Reference Pools	Yes - All Constructed Pools informally monitored by an experienced biologist/botanist.	Yes	Yes - Meet with grazing contractor
Second Year	Yes - All of the Constructed Pools and all of the Reference Pools	Yes - 20*% of the Constructed Pools and all of the Reference Pools	Yes - All Constructed Pools informally monitored by an experienced biologist/botanist.	Yes	Yes - Meet with grazing contractor
Third Year	None	Yes - 20*% of the Constructed Pools and all of the Reference Pools	Yes - All Constructed Pools informally monitored by an experienced biologist/botanist. Pools that appear to be functioning poorly will be considered for remediation. Remediation, if implemented, will occur during Summer of the third year.	Yes	Yes - Meet with grazing contractor
Fourth Year	None	Yes - 20*% of the Constructed Pools and all of the Reference Pools	Yes - 50% of the Constructed Pools and Reference Pools will be floristically monitored.	Yes	Yes - Meet with grazing contractor
Fifth Year	None	Yes - 20*% of the Constructed Pools and all of the Reference Pools	Yes - 50% of the Constructed Pools and Reference Pools will be floristically monitored.	Yes	Yes - Meet with grazing contractor
Sixth Year	None**	Yes - 20*% of the Constructed Pools and all of the Reference Pools	None**	Yes	Yes - Meet with grazing contractor
Seventh Year	None**	Yes - 20*% of the Constructed Pools and all of the Reference Pools	None**	Yes	Yes - Meet with grazing contractor
Eighth Year	Yes - All of the Constructed Pools and all of the Reference Pools**	Yes - 20*% of the Constructed Pools and all of the Reference Pools	Yes - All Constructed Pools that do not meet the hydrology and vegetation success criteria in the fifth year will be monitored. All Reference Pools will be monitored.	Yes	Yes - Meet with grazing contractor
Ninth Year	None	Yes - 20*% of the Constructed Pools and all of the Reference Pools	Yes - All Constructed Pools that do not meet the hydrology and vegetation success criteria in the eighth year will be monitored. All Reference Pools will be monitored.	Yes	Yes - Meet with grazing contractor
Tenth Year	Yes - All of the Constructed Pools and all of the Reference Pools	Yes - 20*% of the Constructed Pools and all of the Reference Pools	Yes - All Constructed Pools and Reference Pools will be monitored.	Yes	Yes - Meet with grazing contractor

* The 20% of Constructed Pools that monitor listed vernal pool invertebrates will be the same in each individual year, however in the first through fifth years a different 20% will be chosen, such that in the fifth year all pools will have been monitored once.

** Any remediated pools will be monitored in these years.

***Monitoring will be conducted for ten years. The monitoring period will begin with the first rainy season following the construction activities. Monitoring will be extended beyond the ten-year period only for those wetlands that are not meeting success criteria.

Hydrology

The purpose of hydrologic monitoring is to determine if the constructed vernal pools are inundated for periods sufficient to support appropriate wetland biota. Staff gauges will be placed in 10% of the created vernal pools. Staff gauges will reflect a variety of created habitat depths. The exact placement of the gauges cannot be anticipated prior to creation, but the first monitoring report will include a map indicating actual locations. For comparison, staff gauges will also be placed in 5% of the on-site preserved vernal pools. Staff gauges will be read a minimum of three times between December 15th and June 15th of each monitoring season, with at least one reading occurring during the estimated period of maximum inundation (usually during January or February). In addition, a minimum of 50% of the created vernal pools will be randomly selected and biologists will record the maximum depth. During the final monitoring year, maximum depth will be recorded for 100% of the created vernal pools.

Aerial photographs will also be used for hydrologic monitoring. Two aerial photographs will be taken during each monitoring year. Photographs will be taken once during the peak period of inundation, typically during January or February and once when the vernal pool plants are flowering, typically April or May. Such aerial photographs give an excellent overview of the mitigation area and its micro-watershed. Aerial photographs can help identify areas that warrant additional attention during subsequent field visits. In particular, aerial photographs will be used to help identify: 1) areas that do not pond water, 2) areas that are ponding late in the season, and 3) off-site activities that may be affecting hydrologic function within the mitigation area. These aerial photos can also be used to estimate actual pool area for the constructed wetlands.

Floristics

Floristic surveys of created and preserved on-site vernal pools will be conducted each spring during peak flowering period.. Timing of floristic surveys will be adjusted according to site specific conditions. Data collected from each monitored wetland will include an estimate of percent aerial vegetative cover, a cumulative species list, and an estimate of the relative cover of each species using the modified Braun-Blanquet cover estimate scale (0=<1%, 1=1-5%,

2=6-25%, 3=26-50%, 4=51-75%, and 5=76-100%). A cumulative plant species list will then be generated for each wetland.

Data from each monitored wetland will be entered into a database. From this database, the following will be calculated for each monitored wetland: number of species, number of wetland species, number of native species, number of dominant species (species with a Braun-Blanquet cover class of 3 or greater), the Prevalence Index, the number of "vernal pool indicators" and "vernal pool associates" with a Braun-Blanquet cover class of 2 or greater, the sum of all of the cover class mid-points, the sum of all of the native vernal pool species cover class mid-points, and the percentage of the overall relative native vernal pool species cover (as calculated by the sum of the cover class mid-points) attributable to native species.

Prior to the first season of monitoring, 25% of the created wetlands will be randomly selected. Each of these wetlands will be floristically monitored during each of the five monitoring years. During the second and fourth monitoring season, another 25% will be randomly selected for floristic monitoring. In addition, monitoring biologists will visit each created wetland every monitoring season and will monitor any additional wetlands that, by a subjective assessment, do not appear to be functioning properly (e.g., very low vegetative cover, dominance by non-native generalist species, etc.). For comparison, a random selection of existing vernal pools at the mitigation site will be monitored each year. During the final year of monitoring, 100% of the created vernal pools will be monitored.

Finally, in the first few monitoring years, the revegetation of the disturbed upland areas will be assessed, with particular attention given to assessing the spread of exotic non-native species such as yellow star-thistle (Centaurea solstitialis).

The Prevalence Index (PI) is a standard method used to determine whether a floristic data set can be categorized as being that of a wetland or an upland community. Plant species categories used to calculate the PI will be based upon those described by Reed (1997) and weighted according to Table 6.

Table 6 – Plant Species Category Weighting

Wetland Status	Weighting
Obligate Wetland (OBL)	1
Facultative Wetland (FACW)	2
Facultative (FAC)	3
Facultative Upland (FACU)	4
Obligate Upland (UPL)	5

The Prevalence Index for each wetland is calculated using the following formula:

$$PI = \frac{1*f(OBL) + 2*f(FACW) + 3*f(FAC) + 4*f(FACU) + 5*f(UPL)}{f(OBL) + f(FACW) + f(FAC) + f(FACU) + f(UPL)}$$

Where: f(OBL) = a measure of abundance for OBL species,
f(FACW)= a measure of abundance for FACW species, etc.

The Prevalence Index is a standard method of determining whether a wetland data set is categorized as a wetland or upland plant community. To be considered a wetland, the area must have a PI value less than 3.0 (Federal Interagency Committee for Wetland Delineation, 1989). However, PI values within disturbed areas can range higher, depending on plant species.

Several supplemental summary statistics and indices will be calculated for the vernal pools, which are described below.

Relative Wetland Cover

Relative cover of wetland species is defined as the percentage of the total vegetative cover that is made up of wetland plant species within an individual wetland. Wetland species include

those categorized as obligate (OBL), facultative wetland (FACW), or facultative (FAC) (Reed 1988).[1]

Species Richness

Species richness is defined as the total number of plant species recorded within an individual wetland.

Wetland Species Richness

Wetland species richness is defined as the total number of wetland plant species recorded within an individual wetland. Wetland plants include those that are categorized as obligate (OBL), facultative wetland (FACW), or facultative (FAC) (Reed 1988).

Native Species Richness

Native species richness is defined as the number of native plant species found in an individual wetland.

Vascular Plant Species Frequency of Occurrence

Frequency of occurrence is defined as the number of pools in which a species is observed within a given preserve, divided by the number of pools sampled. For example, if 100 pools were surveyed and Species A was recorded in 37 of them, the frequency of occurrence of Species A would be 0.37.

---

[1] Categories found in the *National List of Plant Species That Occur in Wetlands: California (Region 0)* (Reed 1988):

Obligate Wetland (OBL)	= occur almost always in wetlands (>99% probability).
Facultative Wetland (FACW)	= usually occur in wetlands (67%-99% probability).
Facultative (FAC)	= equally likely to occur in wetlands and non-wetlands (34%-66% probability).
Facultative Upland (FACU)	= usually occur in non-wetlands (67%-99% probability).
Obligate Upland (UPL)	= occur almost always in non-wetlands (>99% probability).

Wildlife

Wildlife surveys will occur in conjunction with hydrologic and floristic monitoring visits. A biologist will walk a meandering transect through the compensation wetland area and generate a cumulative list of the type and number of all species observed utilizing the compensation wetland area. Wildlife signs, such as scat, pellets, or bones, will also be noted. In addition, any wildlife observed during hydrologic or vegetation monitoring surveys will be noted and included in an annual cumulative list of wildlife found within the Wetland Preserve.

Seasonal Wetlands

Final Success Criteria

The overall goal of mitigation is no net loss of wetland functions and values. This goal will be met through the creation of 3.84 acres of seasonal wetland are proposed within the large detention basin located in the southwest corner of the site. The wetlands will be monitored over a period of 5 years or until success criteria have been met. At the end of the monitoring period, the constructed seasonal wetland must exhibit the range of functions and values described below Table 7. Once established criteria have been met and approved by the Corps, no further monitoring of the mitigation wetland will be required.

Table 7 – Success Criteria Compensation Seasonal Wetland

Performance Standard:	1) Wetland will be inundated or saturated for sufficient periods to support a predominance of wetland plant species (those listed as FAC, FACW, or OBL in *The National List of Plant Species that Occur in Wetlands: California (Region 0)* (Reed 1997).
Success Criteria:	1) 95% of the wetland acreage must be inundated or saturated for period of sufficient duration to support wetland vascular plants as the most prevalent and dominant component; 2) Prevalence Index will be less than 3.0; 3) The following annual minimum vegetative cover values will be met: Year 1: Minimum 10% relative cover Year 2: Minimum 30% relative cover Year 3: Minimum 50% relative cover Year 4: Minimum 60% relative cover Year 5: Greater than or equal to 70% relative cover

Target Jurisdictional Acreage to be Created/Enhanced

An aerial photo will be taken in the first winter after the wetlands have been constructed. The ponded wetland areas will be digitized and a wetland acreage will be calculated. This wetland "as-built" will be included in the annual monitoring reports and will verify that the mitigation acreages specified in the permit have been constructed.

Monitoring Methods

In order to determine if the constructed wetland are functioning properly, the following hydrology, vegetation, and wildlife monitoring program will be adopted.

Hydrology

The purpose of hydrologic monitoring is to determine if the constructed seasonal wetlands are inundated for periods sufficient to support appropriate wetland biota.

Aerial photographs will also be used for hydrologic monitoring. Two aerial photographs will be taken during each monitoring year. Photographs will be taken once during the peak period of inundation, typically during January or February and once when the vernal pool plants are flowering, typically April or May. Such aerial photographs give an excellent overview of the mitigation area and its micro-watershed. Aerial photographs can help identify areas that warrant additional attention during subsequent field visits. In particular, aerial photographs will be used to help identify: 1) areas that do not pond water, 2) areas that are ponding late in the season, and 3) off-site activities that may be affecting hydrologic function within the mitigation area. These aerial photos can also be used to estimate actual pool area for the constructed wetlands.

Floristics

To collect vegetation data from the constructed seasonal wetland, a point-intercept sampling procedure will be used (Federal Interagency Committee for Wetland Delineation 1989). During

the first monitoring season, baseline transects will be established that run the length of the constructed feature. To create a potential starting point along this baseline, the start of each one-foot interval will be considered our baseline grid. After determining the length (in feet) of the baseline transect, a random number table will be used to select three starting points for data collection. Beginning at each randomly selected starting point, a pen or pencil will be spun in the air and, when it falls, the direction it is pointing will be the direction of that data collection transect. For each of these data collection transects, all of the plants present at points located at two-foot intervals along that transect will be recorded. If there is more than one plant vertically, both should be recorded. If there are no plants present, the point will be noted as bare ground but excluded from subsequent calculations.

Once the data has been collected, each species will be assigned the appropriate indicator status (i.e., OBL, FACW, FAC, FACU, and UPL). Then, for each transect, the frequency of occurrence of plants in each of the indicator status categories will be calculated. These data will be plugged in the standard Prevalence Index calculation:

$$PI = \frac{(1.0*F1) + (2.0*F2) + (3.0*F3) + (4.0*F4) + (5.0*F5)}{\sum (F1 + F2 + F3 + F4 + F5)}$$

Where: F1 = Frequency of occurrence for OBL species

F2 = Frequency of occurrence for FACW species

F3 = Frequency of occurrence for FAC species

F4 = Frequency of occurrence for FACU

F5 = Frequency of occurrence for UPL and other species not meeting above categories

Using the resulting three PI values, the standard error will be calculated. If the standard error is greater than 0.20, then additional randomly selected transects (up to a maximum of three) will be sampled. Once the standard error is 0.20 or less or a total of six transects have been sampled, a mean PI will be calculated for the constructed wetland.

In addition to the PI data collection, an estimate of total vegetative cover will be made by visual assessment. This value is based upon aerial coverage of the total vegetative aggregate and excludes the cover of non-vegetative components such as bare ground, rocks, and algal matting.

Wildlife

Wildlife surveys will occur in conjunction with hydrologic and floristic monitoring visits. A biologist will walk a meandering transect through the compensation wetland area and generate a cumulative list of the type and number of all species observed utilizing the compensation wetland area. Wildlife signs, such as scat, pellets, or bones, will also be noted. In addition, any wildlife observed during hydrologic or vegetation monitoring surveys will be noted and included in an annual cumulative list of wildlife found within the Wetland Preserve.

Low-Flow Channel and Adjacent Seasonal Wetlands

A set of final success criteria have been developed for the constructed channel and associated seasonal wetland basins.

At the end of the monitoring period, the constructed channel must exhibit the range of functions and values described below. In addition, the channel habitat must meet specific success criteria, after three years of no human intervention, as listed in Table 8.

Table 8 – Success Criteria: Compensation Channel

Hydrology:	1)	Flows will be appropriate to support the establishment and dominance of hydrophytic vegetation.
Vegetation:	1)	Each wetland bench area will be dominated by hydrophytic vegetation.
	2)	Each wetland bench area will have a Prevalence Index of less than 3.0; and 90% of the realigned channel will be covered with hydrophytic vegetation or
	3)	open water.

Target Jurisdictional Acreage to be Created/Enhanced

An aerial photo will be taken in the first winter after the channel has been constructed. The ponded wetland areas will be digitized and a wetland acreage will be calculated. This wetland "as-built" will be included in the annual monitoring reports and will verify that the mitigation acreages specified in the permit have been constructed.

Monitoring Methods

In order to determine if the constructed wetlands are functioning properly, the following hydrology, vegetation, and wildlife monitoring program will be adopted.

Hydrology

Hydrology will be assessed twice annually, once during the peak period of inundation, typically during January or February and then again later in the season. Aerial photographs of the constructed wetland may be used to estimate the extent of inundation. Using the aerial photo, the channel will be ranked according to its approximate percent of inundation: 4 = channel is 100% inundated, 3 = channel $\geq$ 80% inundated, 2 = channel <80% and $\geq$ 50% inundated, 1 = channel <50% inundated, and 0 = channel not inundated. These aerial photos can also be used to estimate actual area for the constructed channel habitat. Hydrology may also be assessed by direct observation during appropriately timed site visits.

Vegetation

In order to accurately evaluate the performance of the compensation channel as well as the wetland benches, two methods of monitoring will be used, the point-intercept method (for the channel) and the species list/percent cover method (for the seasonal wetland benches). Floristic surveys of created and preserved on-site vernal pools will be conducted each spring during peak flowering period. Timing of floristic surveys will be adjusted according to site specific conditions.

Three transects will be randomly selected within the constructed wetland channel. Plant species data will be collected by the point-intercept sampling method at one-foot intervals along each transect. All plant species (or bare ground where no plants are present) at the one-foot interval will be recorded. The prevalence index and the percent vegetative cover will be calculated.

Floristic data will also be collected for the created seasonal wetland benches within the channel. A species list and an estimate of the cover of each species present will be collected. The cover estimate will be based upon the Braun-Blanquet scale. In addition, an estimate of total vegetative cover will be made by visual assessment. This value will be based upon aerial coverage of the total vegetative aggregate, excluding non-vegetative cover such as bare ground, rocks and algal matting. Data from each monitored bench will be entered into a database. From this database, the following will be calculated for each monitored wetland: relative wetland cover, species richness, native species richness, Prevalence Index (PI), and vascular plant species frequency of occurrence.

Completion of Mitigation

Notification of Completion

When the initial monitoring period is complete, and if the applicant believes that the final success criteria have been met, the applicant shall notify the Corps when submitting the final annual report that documents this completion. If appropriate, a current delineation of the created wetland area will be submitted with the report, along with copies of field data sheets.

Corps Confirmation

Following receipt of the report, the Corps may require a site visit to confirm the completion of the mitigation effort.

Contingency Measures

Initiating Procedures

If any annual performance criterion is not met for all or any portion of the mitigation project in any year, or if the final success criteria are not met, the applicant shall prepare an analysis of the cause or causes of failure, and if deemed necessary by the Corps, propose remedial action for approval. If the mitigation site has not met the performance criterion, the responsible party's maintenance and monitoring obligations continue until the Corps gives final project confirmation. Any required remediation measures will presume that all the functions and values of the implemented wetlands have been adequately mitigation, including providing habitat for listed special-status species that potentially occur at the Rio del Oro site.

Alternative Locations for Contingency Mitigation

A feasibility study will be done prior to the construction of the compensation tributary on-site. If results of this study indicate that the proposed wetland construction site will not support the desired habitat, then another Corps approved site and/or a Corps approved mitigation bank or off-site mitigation facility will be used for the remaining mitigation requirements.

Funding Mechanism

To be determined.

PROPOSED OFF-SITE MITIGATION

Cook Property

The proposed off-site 160-acre± Cook Property is bordered to the north and west by conservation properties, to the east by Eagles Nest Road, and to the South by Florin Road, in Sacramento County (Figure 12. *Cook Property Location*). A wetland assessment conducted by

ECORP revealed that the following wetland types are present at the property; 2.67 acres of vernal pools, 9.90 acres of seasonal marsh, 2.63 acres of seasonal wetland swales, as well as other waters including a 6.51 acre pond and 0.58 acre intermittent drainage (Frye creek) (see Figure 9).

The likelihood of the presence of listed vernal pool invertebrates, as well as the property's proximity to other regional conservation areas, makes the Cook Property an ideal location to mitigate impacts to biological resources resulting from the Rio del Oro project. While protocol-level branchiopod surveys have not been conducted on the Cook Property to date, it is likely that vernal pools on the property support vernal pool branchiopod crustaceans. The site is situated in an area of Sacramento County that is known to support several branchiopod species, including those that are federally-listed as threatened or endangered. Surveys conducted by ECORP and other investigators in the immediate vicinity of the Cook Property have identified vernal pool fairy shrimp (*Branchinecta lynchi*) (federal listed threatened), mid-valley fairy shrimp (*Branchinecta mesovallensis*), vernal pool tadpole shrimp (*Lepidurus packardi*) (federal listed endangered) and California fairy shrimp (*Linderiella occidentalis*).
According to the California Natural Diversity Database vernal pool fairy shrimp and vernal pool tadpole shrimp have been documented 800 feet to the west of the property (Figure 13).

Ownership Status

Present owner of the Off-Site mitigation site:
Elliott Homes, Inc.

Expected long-term owner of the Off-Site mitigation site:
Sacramento Valley Open Space Conservancy, Wildlife Heritage Foundation, or other conservation-oriented third party

Parties responsible for long-term maintenance of the Off-Site mitigation site:
Sacramento Valley Open Space Conservancy, Wildlife Heritage Foundation, or other conservation-oriented third party

Point of Contact for Corps Access to the Site:
Elliott Homes, Inc.
Following Corps Sign-off: Sacramento Valley Open Space Conservancy, Wildlife Heritage Foundation or other conservation-oriented third party

Deed Restrictions, Conservation Easements, and Operations and Management:
Deed restrictions and/or conservation easements will be recorded and will require that the site be maintained as wetland and wildlife habitat in perpetuity. A detailed O&M Plan will be developed for the Cook Property and funded by an endowment. Copies of proposed language will be submitted to the Service for approval prior to recordation and copies of the recorded documents will be provided to the Service no later than 30 days subsequent to recordation. In addition, recordation will occur prior to or concurrent with the start of project construction.

Existing Functions, Values, Baseline Information – Cook Property

The 160-acre± Cook property, located south of Highway 16 in Sacramento County, is proposed as additional mitigation for the Rio del Oro project (Figure 8. *Project Site and Vicinity – Cook Property*). The Cook property is bordered to the north and west by existing conservation properties, to the east by Eagles Nest Road, and to the South by Florin Road. A preliminary wetland assessment conducted by ECORP identified the following wetland habitats on the property; 2.67 acres of vernal pools, 9.90 acres of seasonal marsh, 2.63 acres of seasonal wetland swales, as well as other waters including a 6.51 acre pond and 0.58 acre intermittent drainage (Frye Creek) (Figure 9. *Preliminary Wetland Assessment – Cooks Property*). The remainder of the property includes associated uplands and approximately 21 acres of irrigated pasture. A homestead is also present in the north-eastern portion of the property.

The Cook property is within the same core-recovery as Rio del Oro and has been identified by the Service staff as a important component in establishing a large-contiguous preserve area in the region.

The likelihood of the presence of listed vernal pool invertebrates, as well as the property's proximity to other regional conservation areas, makes the Cook Property an ideal location to

mitigate impacts to biological resources resulting from the Rio del Oro project. While protocol-level branchiopod surveys have not been conducted on the Cook Property to date, it is likely that vernal pools on the property support vernal pool branchiopod crustaceans. The site is situated in an area of Sacramento County that is known to support several branchiopod species, including those that are federally-listed as threatened or endangered. Surveys conducted by ECORP and other investigators in the immediate vicinity of the Cook Property have identified vernal pool fairy shrimp (*Branchinecta lynchi*) (federal listed threatened), mid-valley fairy shrimp (*Branchinecta mesovallensis*), vernal pool tadpole shrimp (*Lepidurus packardi*) (federal listed endangered) and California fairy shrimp (*Linderiella occidentalis*).

Present Use of Mitigation Area

A preliminary wetland assessment conducted by ECORP revealed that the following wetland types are present at the property; 2.67 acres of vernal pools, 9.90 acres of seasonal marsh, 2.63 acres of seasonal wetland swales, as well as other waters including a 6.51 acre pond and 0.58 acre intermittent drainage (Frye creek). The property also includes associated uplands and 21.27 acres of irrigated pasture. Homesteads are also present in the north-eastern portion of the property. In addition to wetland preservation, the property has the option of gaining additional income from grazing, as well as the continued use of crop production within the two irrigated pastures.

Clay Station Mitigation Bank

Ownership Status

Present owner of the Off-Site mitigation site:
Elliott Homes, Inc.

Expected long-term owner of the Off-Site mitigation site:
Elliott Homes, Inc.

Parties responsible for long-term maintenance of the Off-Site mitigation site:

The Elliott Conservancy

Point of Contact for Corps Access to the Site:

ECORP Consulting, Inc.
Contact: Bjorn Gregersen
2525 Warren Drive
Rocklin, California 95677
Phone: (916) 782-9100
Fax: (916) 782-9134

Following Corps Sign-off:

ECORP Consulting, Inc.
Contact: Bjorn Gregersen
2525 Warren Drive
Rocklin, California 95677
Phone: (916) 782-9100
Fax: (916) 782-9134

Deed Restrictions and Conservation Easements:

Deed restrictions and conservation easements have been recorded for the Clay Station Mitigation Bank.

Existing Functions, Values, Baseline Information – Clay Station Mitigation Bank

The Clay Station Mitigation Bank site is bounded by Clay Station Road to the east, Laguna Creek and associated riparian habitat to the west, farmland to the north, and Brown's Creek to the south and is adjacent to other large preserves, such as Gill Ranch to the east. The Clay Station Mitigation Bank was established in 1994 and all wetland habitat has been monitored for 10 years. In addition to the site supporting fairy shrimp and tadpole shrimp, the Rio del Oro is well within the bank established service area. Wetland habitat at Clay Station Mitigation Bank exhibits functions and values that are similar to those to be filled at the Rio del Oro site.
The Mitigation Banking Review Team has authorized CSMB to sell credits to offset impacts in a service area that includes Rio del Oro.

Present Use of Mitigation Area

The site is managed as wetland and endangered species habitat in perpetuity, which includes limited grazing to prevent thatch build-up.

Present and Proposed Uses of All Adjacent Areas

The CSMB is surrounded by agricultural uses and is also adjacent to other established conservation parcels, including the 10,000-acres Gill Ranch property.

Zoning

The CSMB area is zoned as open space.

REFERENCES

Consulting Earth Scientist, Inc. 2007. Soil of Inventory of Rio del Oro Wetland Preserve. Prepared for ECORP Environmental Consultants. Dated August 20, 2007.

ECORP Consulting, Inc. Clay Station Mitigation Bank, Bank Enabling Instrument. Prepared for U.S. Army Corps of Engineers, U.S. Fish and Wildlife Service, California Department of Fish and Game, U.S. Environmental Protection Agency, Natural Resources Conservation Service, and Elliott Homes, Inc.

ECORP Consulting, Inc. 2002. Section 404 Individual Permit Application for Rio del Oro, Sacramento County, California. Prepared for Elliott Homes, Inc. Dated November 26, 2002.

ECORP Consulting, Inc. 2003. Section 404 Individual Permit Application for Rio del Oro Project Boundary Revisions. Prepared for U.S. Army Corps of Engineers. Dated June 2, 2003.

ECORP Consulting, Inc. 2003. Rio del Oro, Rancho Cordova, California – Rare Plant Survey. Prepared for Elliott Homes, Inc.. Dated August 1, 2003.

ECORP Consulting, Inc. 2003. Biological Assessment for Rio Del Oro, Sacramento County, California. Prepared for Elliott Homes, Inc. Dated September 18, 2003.

ECORP Consulting, Inc. 2003. Rio del Oro, Rancho Cordova, California – Rare Plant Survey. Prepared for Elliott Homes, Inc. Dated November 11, 2003.

ECORP Consulting, Inc. 2004. Response to Request for Additional Information Proposed Rio Del Oro Project, Section 7 Consultation (Corps Regulatory #199900590) (USFWS #1-1-04-I-0143). Prepared for United States Fish and Wildlife Service. Dated 12 February 2004.

ECORP Consulting, Inc. 2004. Wetland Delineation for Rio del Oro, Sacramento County, California. Prepared for Elliott Homes, Inc. Dated July 12, 2004.

ECORP Consulting, Inc. 2004. Draft Valley Elderberry Longhorn Beetle Habitat Survey for Rio del Oro White Rock Road Widening, Sacramento County, California. Prepared for Elliott Homes. Dated August 31, 2004.

ECORP Consulting, Inc. 2004. Draft Wetland Delineation for Rio Del Oro White Rock Road Widening, Sacramento County, California. Prepared for Elliott Homes. Dated August 31, 2004.

ECORP Consulting, Inc. 2004. Wetland Resources Assessment for Rio Del Oro, Sacramento County, California. Prepared for Elliott Homes. Dated November 15, 2004.

ECORP Consulting, Inc. 2006. Late Season Special-Status Plant Survey for Rio del Oro, Sacramento County, California. Prepared for Elliott Homes, Inc. Dated August 16, 2006.

Gibson & Skordal. 2000. Listed Branchiopods Wet Season Survey Rio Del Oro Property, Sacramento County, California. Prepared for The Brewer Law Firm. Dated August 2000.

Gibson & Skordal. 2001. Listed Vernal Pool Branchiopods 2001 Wetland Season Survey Rio del Oro Property. Prepared for The Brewer Law Firm. Dated July 2001.

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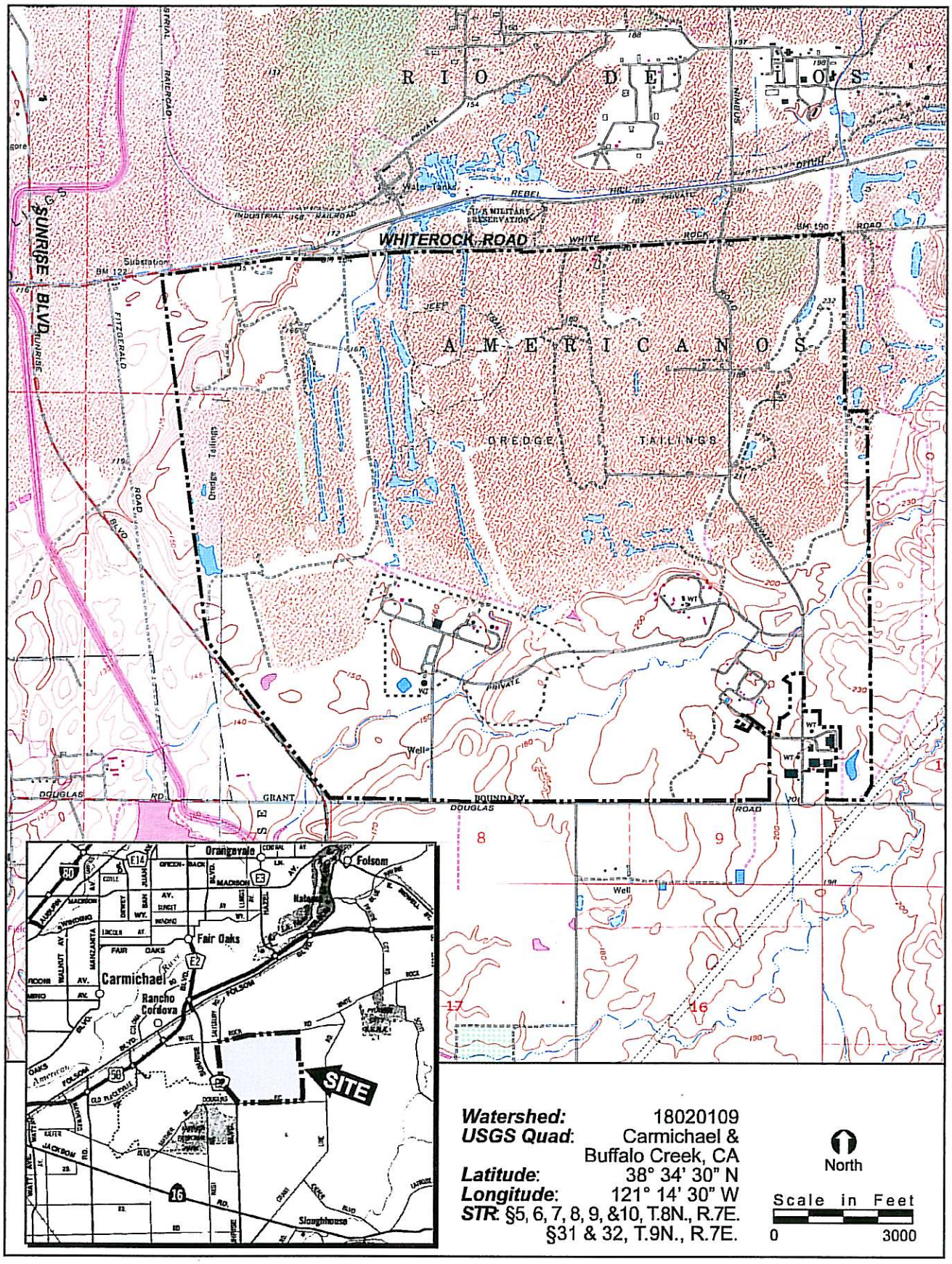

FIGURE 1. Project Site and Vicinity

2002-009 Rio del Oro

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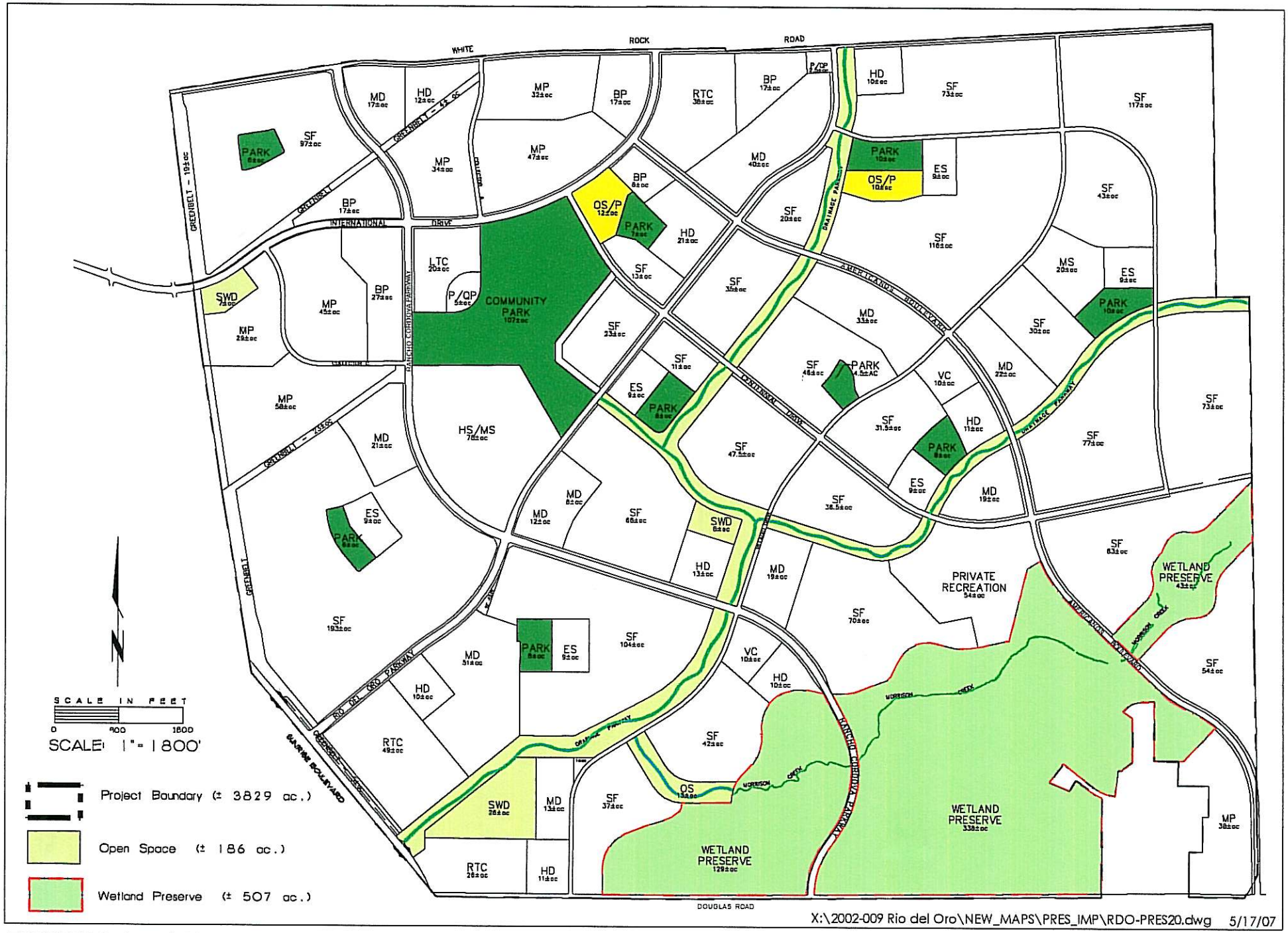

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FIGURE 2. Land Use Plan

2002-009 RIO DEL ORO

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CLASSIFICATION	JURISDICTIONAL ACREAGE	ISOLATED ACREAGE	EXISTING ACREAGE
Wetlands:			
Vernal Pool	35.485	2.414	37.899
Seasonal Wetland Swale	6.044	0.653	6.697
Seasonal Wetland	6.418	9.158	15.576
Other Waters:			
Ephemeral drainage	5.145	---	5.145
Pond	3.540	0.721	4.261
TOTAL:	56.632	12.946	69.578

Isolated wetlands

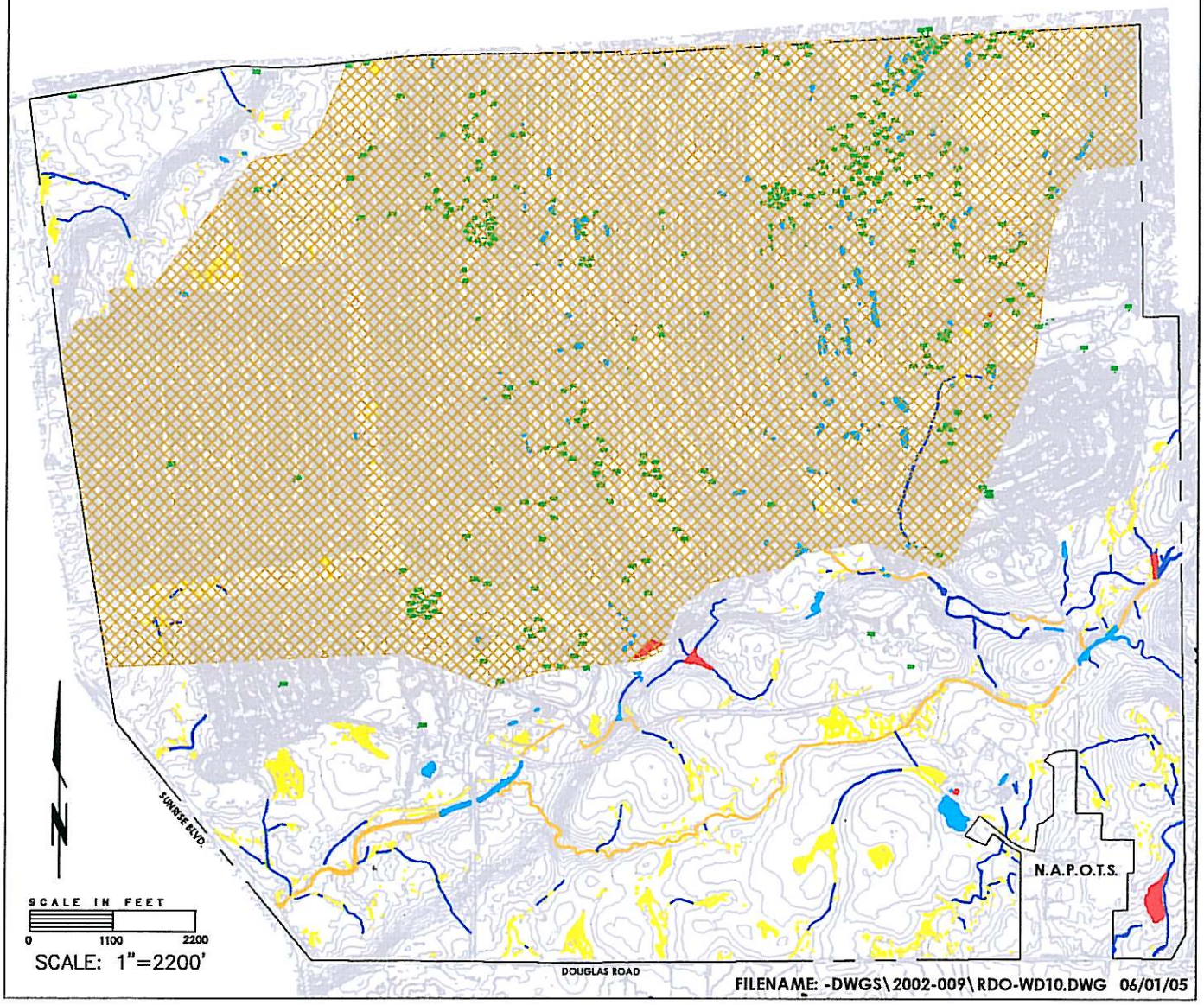

FIGURE 3. Wetland Delineation

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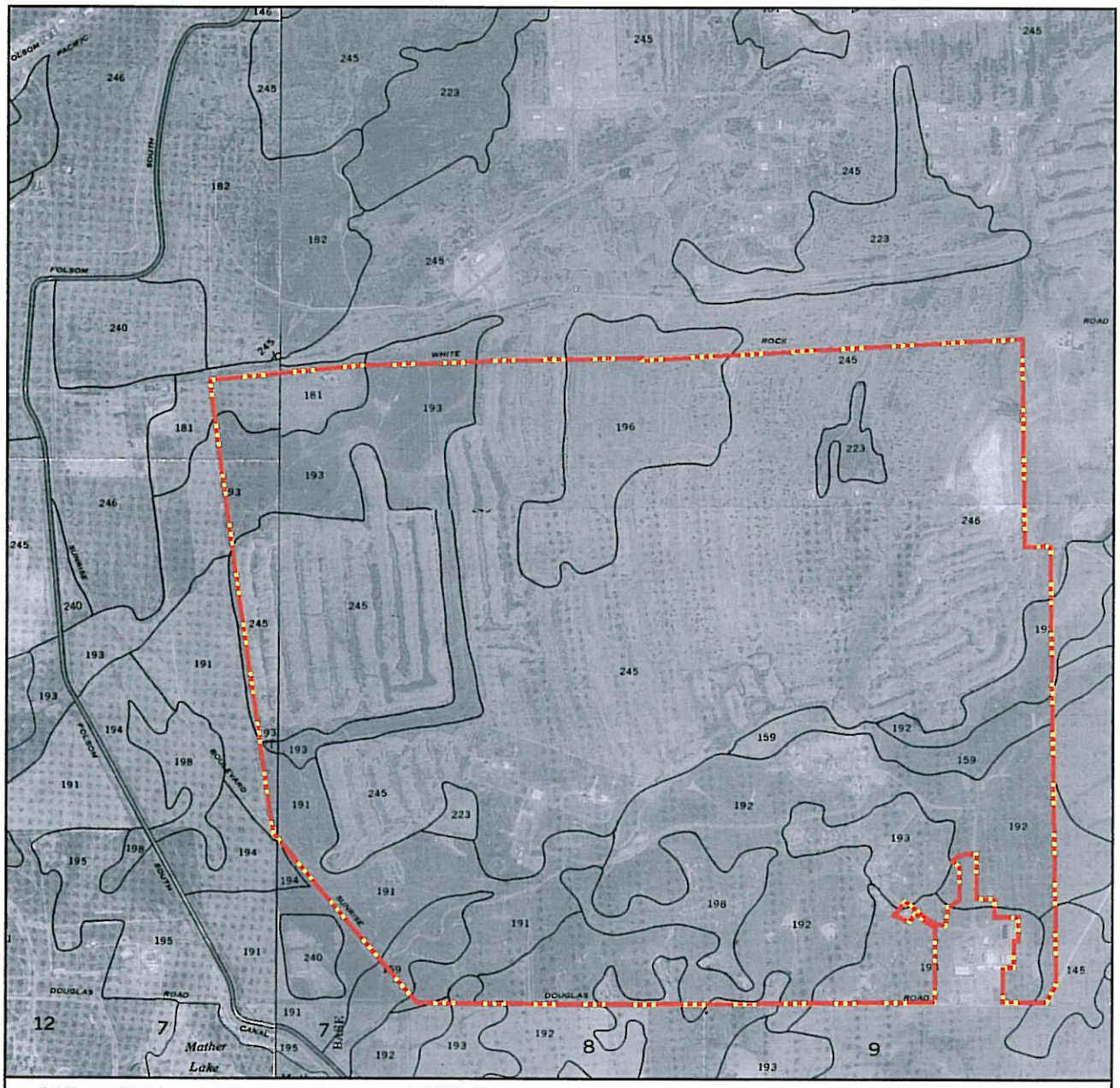
2002-009 Rio del Oro



145	Fiddyment fine sandy loam, 1-8% slopes
158*	Hicksville loam, occassionally flooded, 0-2% slopes
159*	Hicksville gravelly loam, occasionally flooded, 0-2% slopes
181	Natomas loam, 0-2% slopes
191*	Red Bluff loam, 0-2% slopes
192*	Red Bluff loam, 2-5% slopes
193*	Red Bluff - Redding complex, 0-5% slopes
196*	Red Bluff-Xerorthents, 2-50% slopes
198*	Redding gravelly loam, 0-8% slopes
223**	Slickens
245*	Xerorthents, dredge tailings, 2-50% slope

North

Scale in Feet

0 3000

* Soil unit contains listed hydric inclusions.
** Soil unit contists of listed hydric components.

NRCS Soil Survey, Sacramento County, California, 1993.

FIGURE 4. Natural Resources Conservation Service Soil Types

WATERS OF THE U.S. ACREAGE [1]

CLASSIFICATION	JURISDICTIONAL ACREAGE	IMPACTS* DIRECT	IMPACTS* INDIRECT	MITIGATION PRESERVE	MITIGATION CREATION
Wetlands:					
Vernal Pool	35.485	15.072	2.179	20.413	17.867
Pond	3.540	2.923		0.616	N/A 0.000
Seasonal Wetland Swale	6.044	3.587		2.457	N/A 0.000
Seasonal Wetland	6.418	3.064		3.354	N/A 0.000
Other Waters:					
Ephemeral Drainage	5.145	3.256		1.889	N/A 0.000
Riparian Wetland	---	---		---	20.785
Channel	---	---		---	8.402
TOTAL:	56.632	27.902	2.179	28.729	47.054

Project Boundary

Line of Indirect Impact

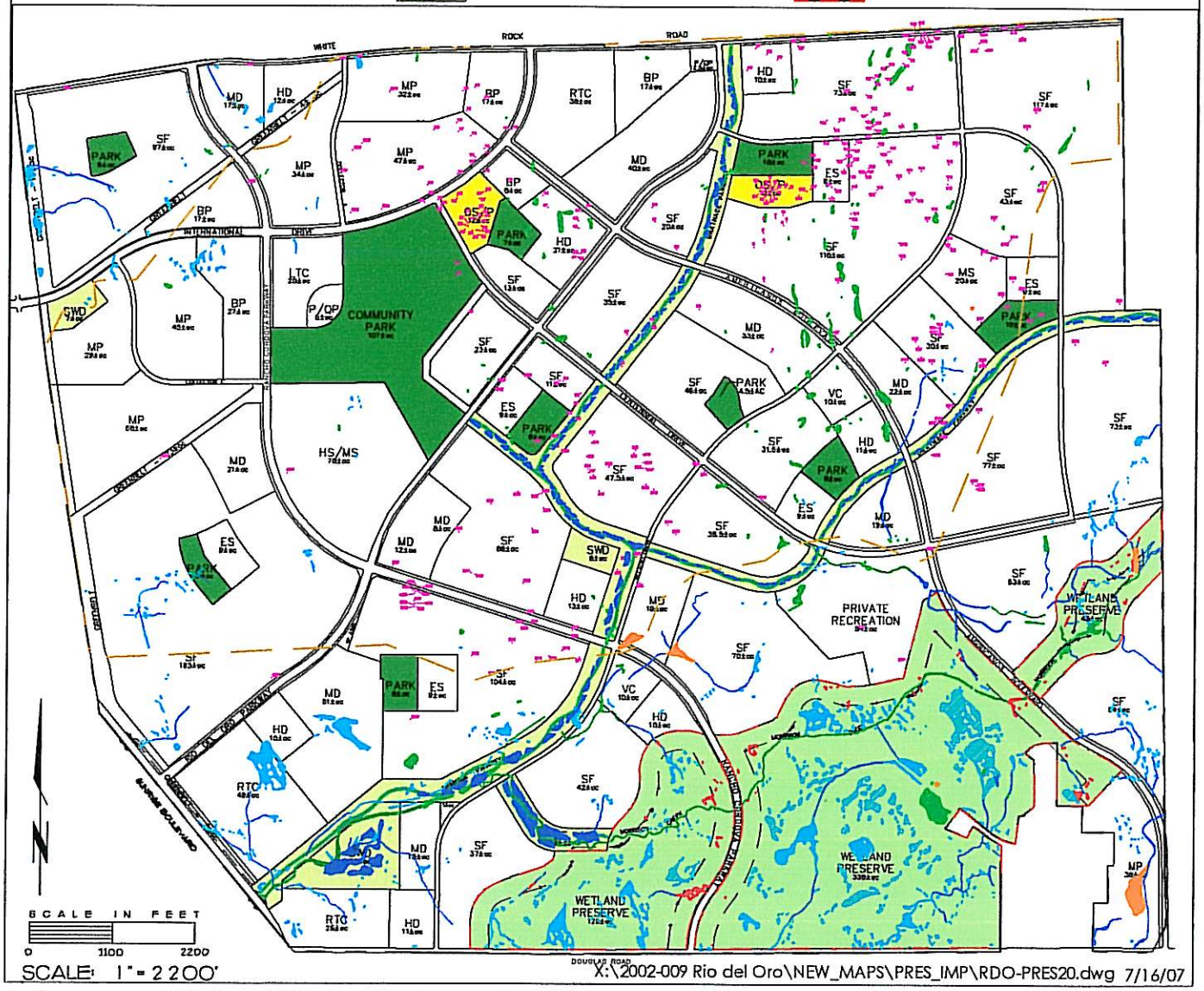
Elderberry Location

Open Space (+/- 187 ac.)

Isolated Wetlands

Wetland Preserve (+/- 507 ac.)

* In addition, 12.946 acres of isolated wetlands are located on the site, all of which will be impacted



SCALE: 1" = 2200'

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FIGURE 5. Wetland Preserve, Impact, and Compensation Plan

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2002-009 RIO DEL ORO

FIGURE 6. Conceptual Vernal Pool Preserve

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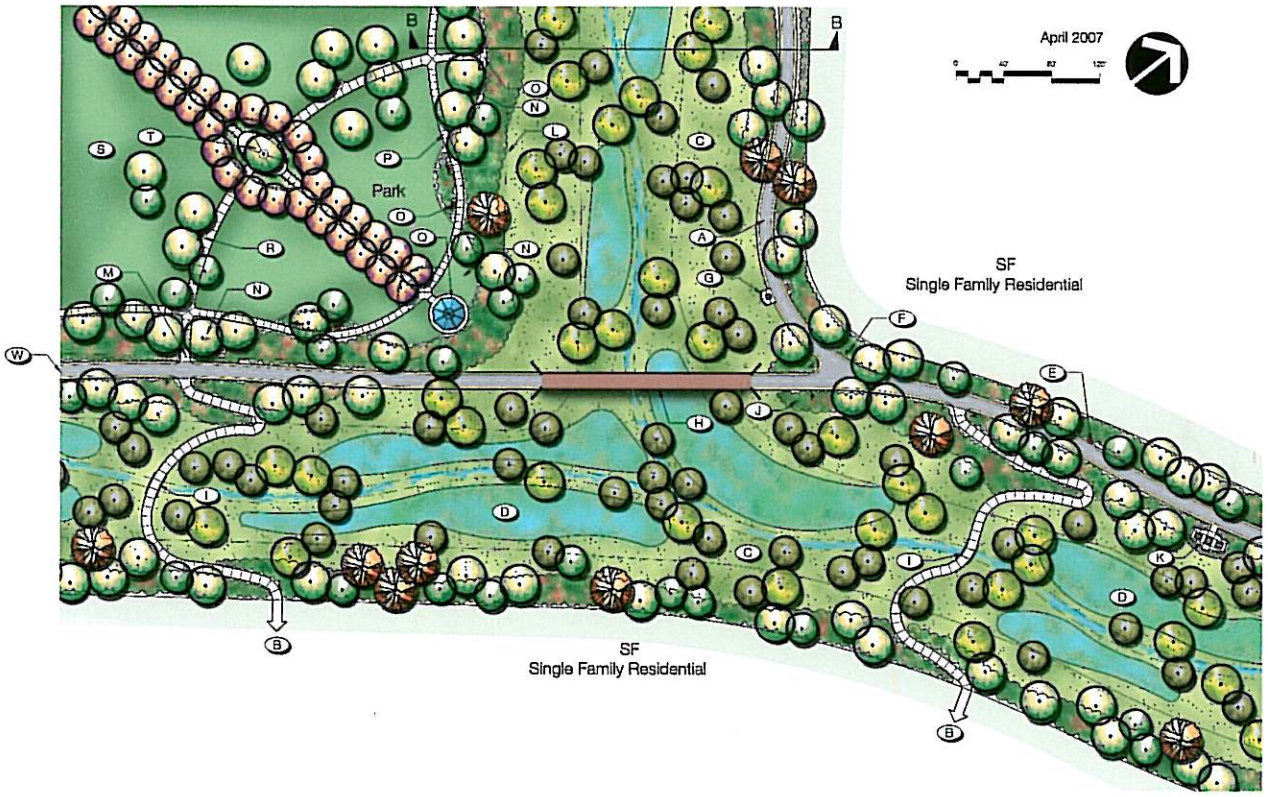
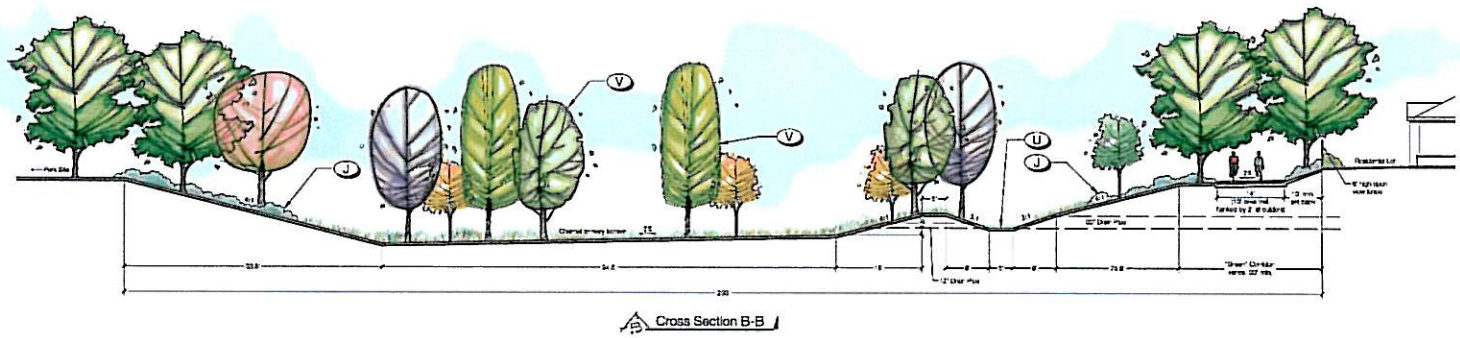


Plan Legend

- (A) Class I bike trail, with signage and striping
- (B) Bike trail connection to adjacent residential neighborhood
- (C) Grassy drainage channel area with supplemental riparian tree and dee pot plantings, slope varies.
- (D) Seasonal wetlands
- (E) Bench seating area for wildlife viewing, resting or reading.
- (F) Directional bike trail signage
- (G) Interpretive overlook with informational kiosk
- (H) Bike trail bridge crossing over drainage channel
- (I) Bike trail low flow connection through bottom of drainage channel.
- (J) Native and drought-tolerant meandering buffer planting area, slope varies.
- (K) Picnic area with tables and trash receptacles
- (L) Neighborhood park boundary
- (M) Park access walk from bike trail
- (N) Turf accent nodes along edges of drainage channel
- (O) Park bench seating area with views out across drainage channel
- (P) Perimeter park pathway
- (Q) Park gathering area with gazebo and group seating centered on axial view out to drainage channel
- (R) Bench seating
- (S) Open turf area
- (T) Formal passive seating area surrounded by rose garden.
- (U) Meandering low flow channel filtering runoff from adjacent neighborhoods prior to release into lower channel bottom and pools.
- (V) Supplemental riparian tree and dee pot plantings
- (W) Trail continues to Community Park



Source: HLA, *Drainage Parkway*, 040407.

FIGURE 7. Conceptual Corridor Plan

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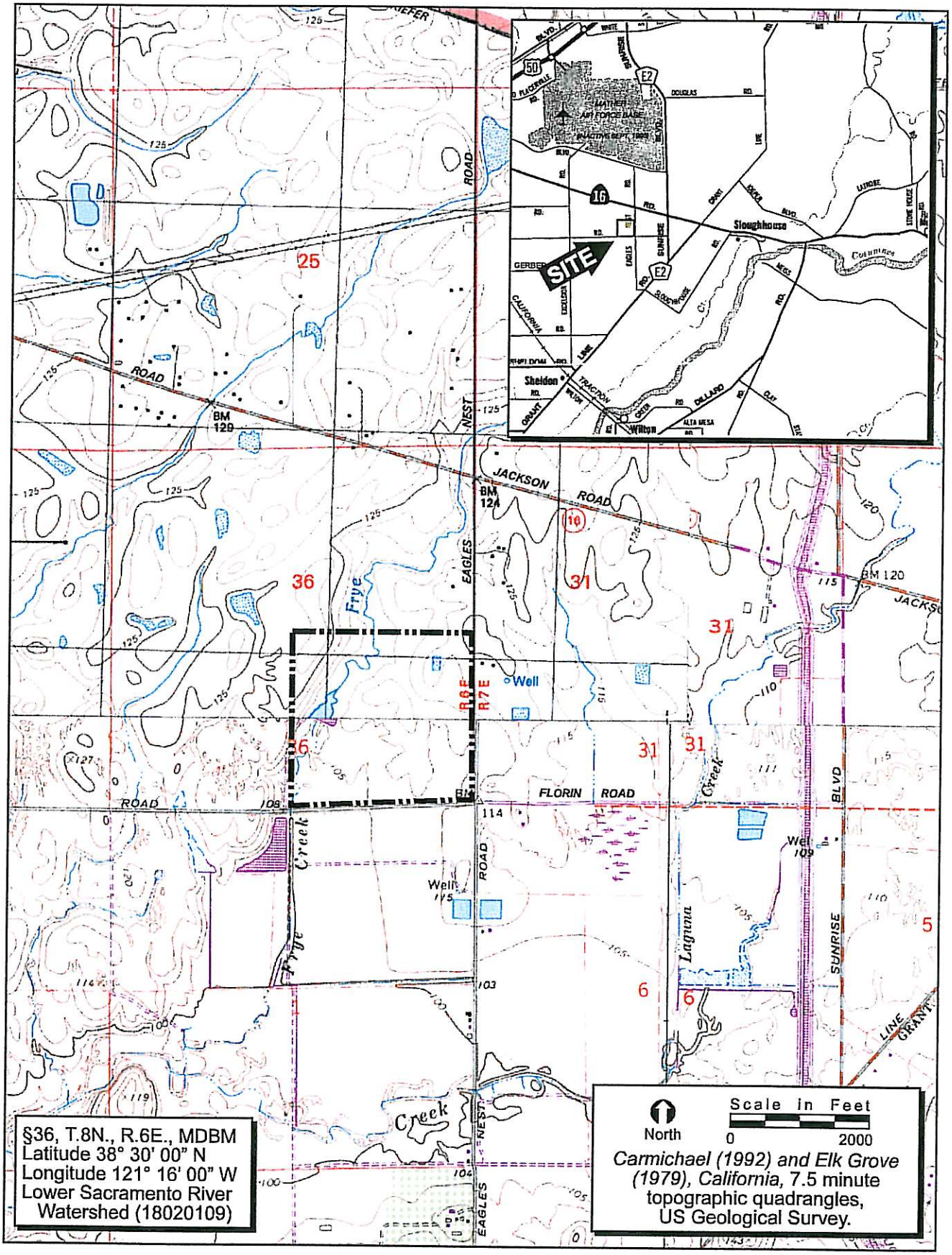

FIGURE 8. Project Site and Vicinity - Cook Property

2002-009 Rio del Oro - Cook Property

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APPROXIMATE WATERS OF THE U.S. ACREAGE[1]

CLASSIFICATION	APPROXIMATE ACREAGE
WETLANDS:	
Vernal Pool	2.67
Seasonal Marsh	9.90
Seasonal Wetland Swale	2.63
OTHER WATERS:	
Pond	6.51
Intermitent Drainage	0.58
TOTAL:	22.29

OTHER FEATURES[2]

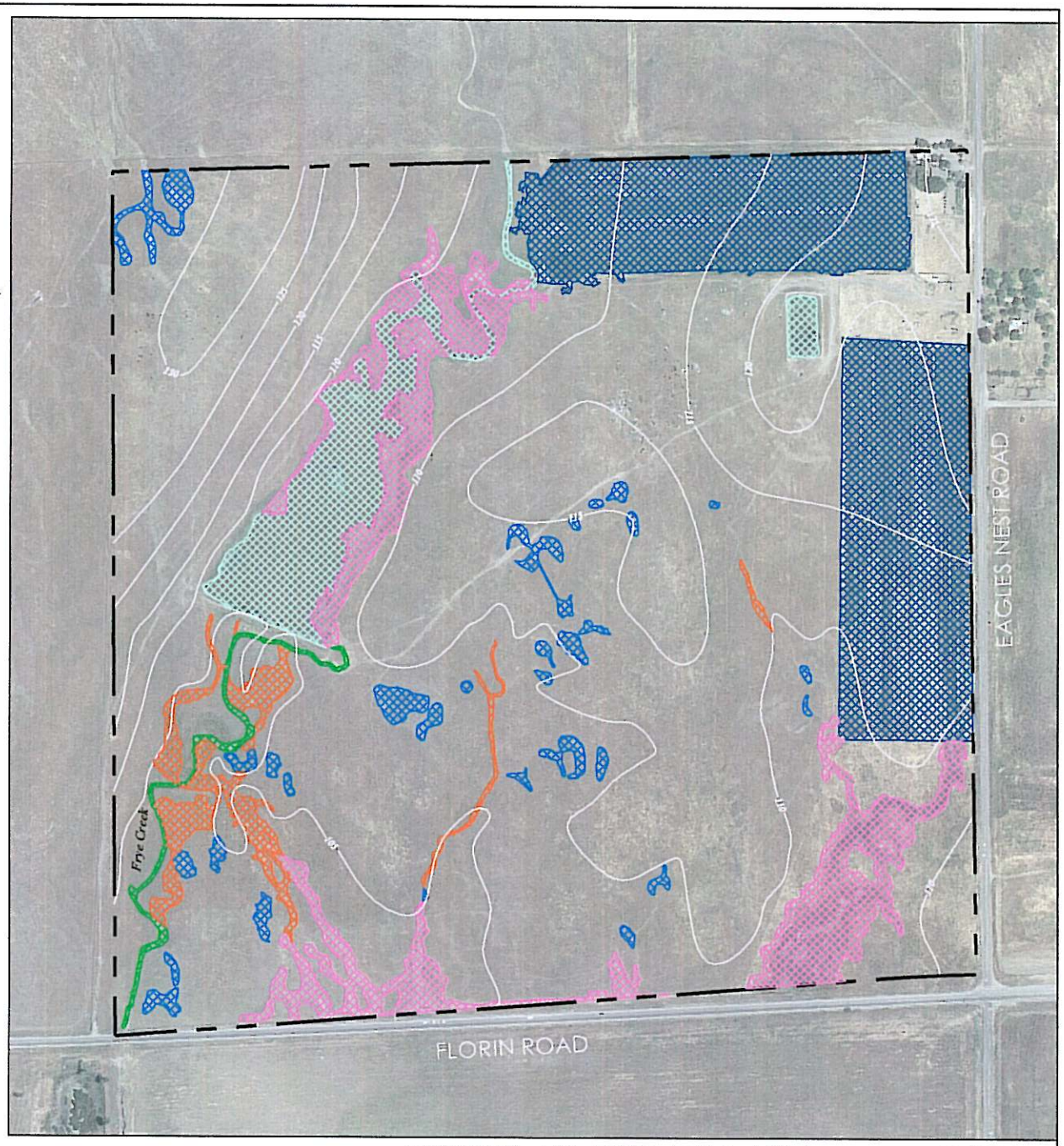
Project Boundary	±160
Irrigated Pastures	21.27

N

SCALE IN FEET

0 500 1000

SCALE: 1" = 500'



X:\2002-009 Rio del Oro\WA\Cook Mit\Cook-WA.dwg 28 JULY 2006

FIGURE 9. Preliminary Wetland Assessment - Cook Property

2002-009 Rio Del Oro

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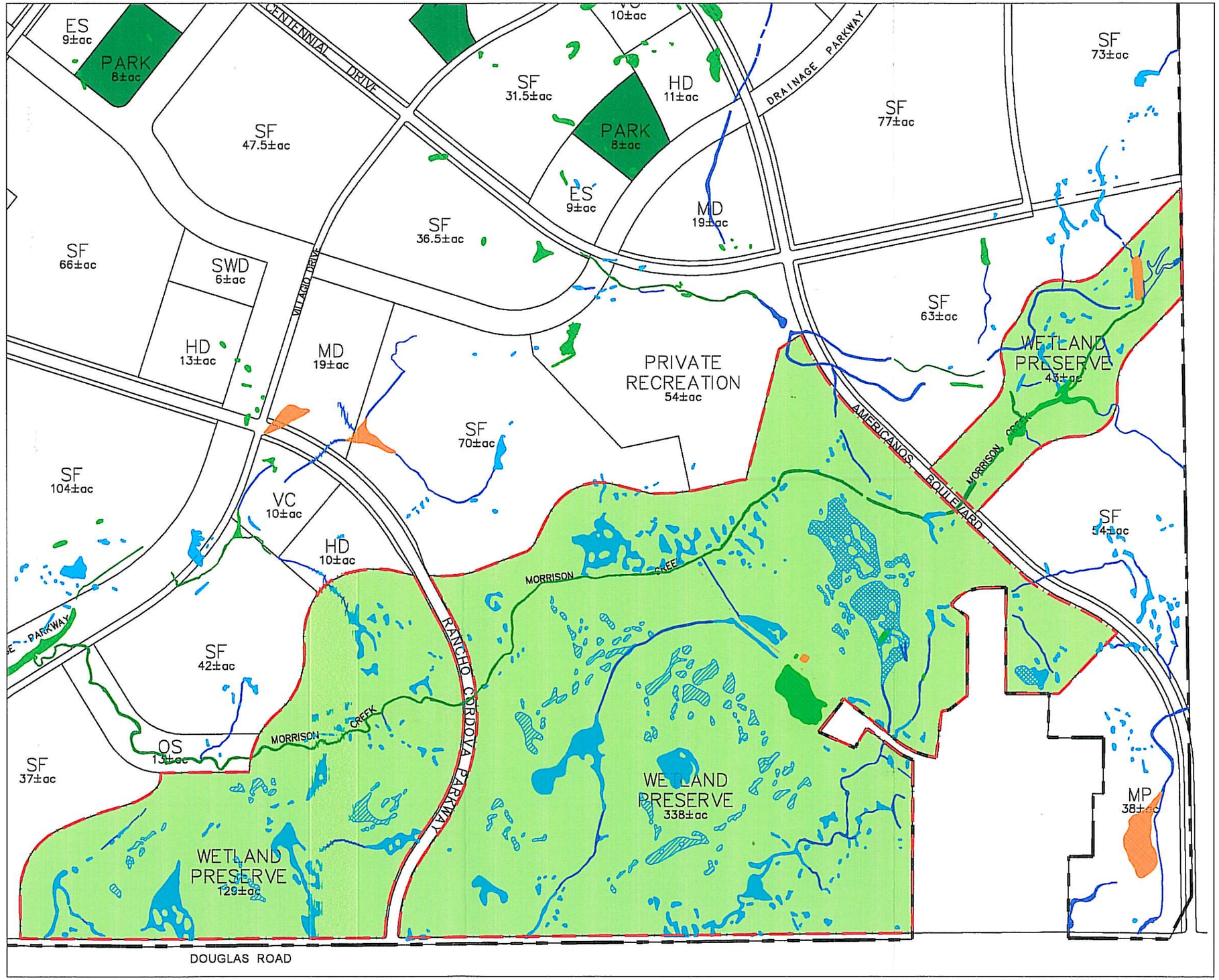
WETLAND PRESERVE & CREATION TOTAL

CLASSIFICATION	PHASE 1 ACREAGE	PHASE 2 ACREAGE
Vernal Pool	20.413	0.000
Pond	0.617	0.000
Seasonal Wetland Swale	2.457	0.000
Seasonal Wetland	3.354	0.000
Ephemeral Drainage	1.889	0.000
Created Wetlands	9.718	8.149
TOTAL:	38.873	8.149



Project Boundary

Wetland Preserve (+/- 507 ac.)

N

SCALE IN FEET
0 400 800
SCALE: 1"=800'

X:\2002-009 Rio del Oro\NEW_MAPS\MISC\RDO-PresPhase.dwg 6/26/07

FIGURE 10. Preserve Phasing

2002-009 RIO DEL ORO

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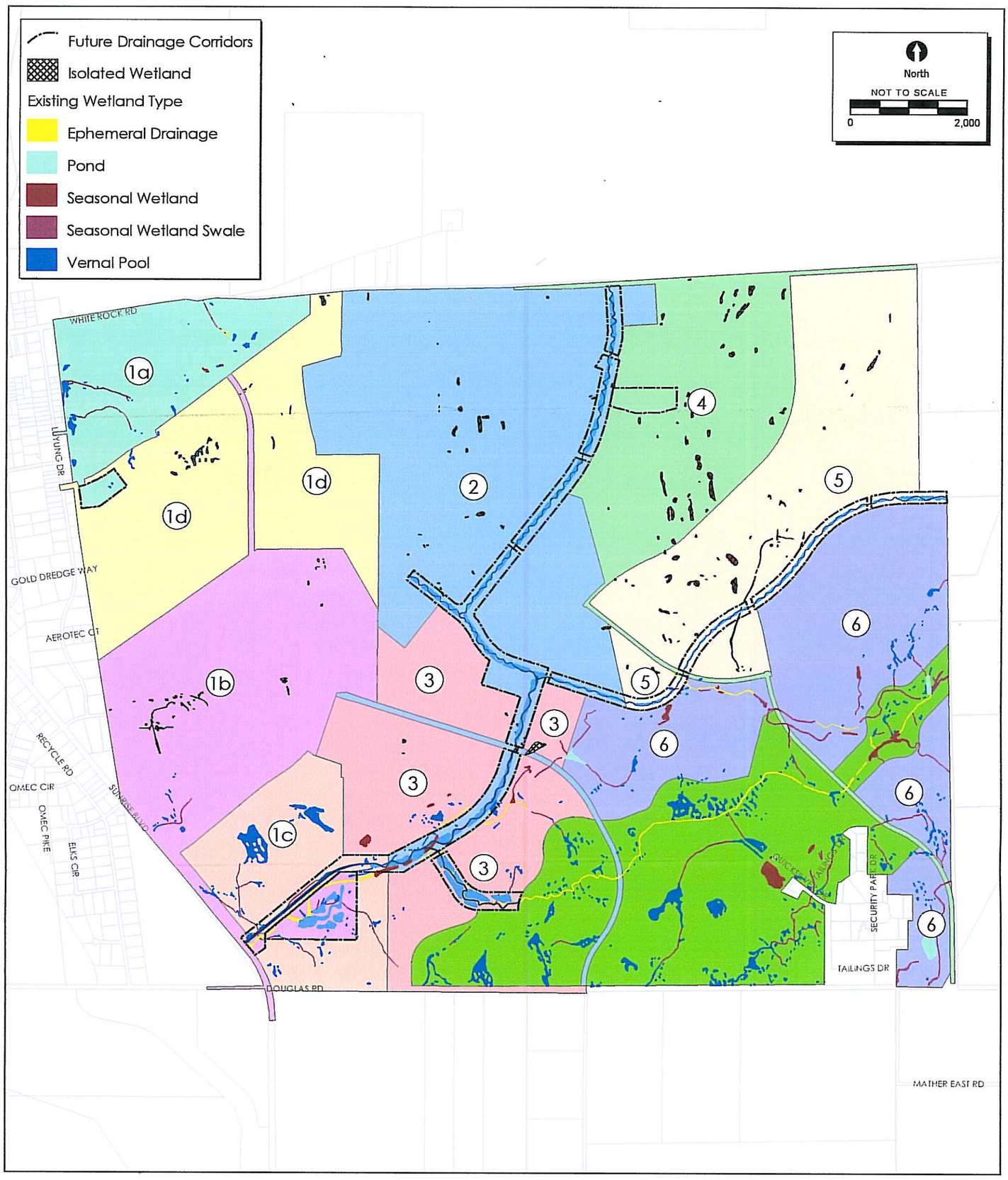

		Construction										Preserve	Total
		PHASE1a	PHASE1b	PHASE1c	PHASE1d	PHASE2	PHASE3	PHASE4	PHASE5	PHASE6	Construction Total		
Constructed Drainage Feature	Channel Upland	0.00	24.21	12.04	0.00	79.07	7.92	0.00	27.25	0.01	150.51	0.00	150.51
	Drainage Feature	0.00	0.25	2.00	0.00	4.23	0.64	0.00	1.26	0.00	8.38	0.00	8.38
	Wetland Feature	0.00	3.84	0.14	0.00	10.49	3.99	0.00	2.31	0.00	20.79	0.00	20.79
	Total	0.00	28.30	14.19	0.00	93.79	12.56	0.00	30.82	0.01	179.68	0.00	179.68

		Impact										Preserve	Total
		PHASE1a	PHASE1b	PHASE1c	PHASE1d	PHASE2	PHASE3	PHASE4	PHASE5	PHASE6	Impact Total		
Isolated	Pond					0.11	0.58		0.03		0.72		0.72
	Seasonal Wetland		0.04		0.11	1.90	0.09	4.25	2.77		9.16		9.16
	Seasonal Wetland Swale		0.07						0.58		0.65		0.65
	Vernal Pool		0.98		1.20		0.01		0.22		2.41		2.41
Isolated Total			1.08		1.31	2.01	0.69	4.25	3.60		12.95		12.95
Non-Isolated	Ephermal Drainage	0.02	1.41	0.50		0.12	0.83	0.03	0.04	0.28	3.23	1.91	5.15
	Pond						0.02			2.90	2.92	0.62	3.54
	Seasonal Wetland	0.08		0.31		1.07	0.79			0.81	3.06	3.35	6.42
	Seasonal Wetland Swale	0.36	0.26	0.36		0.02	0.36	0.11	0.02	2.08	3.57	2.47	6.04
	Vernal Pool	1.89	1.29	6.74	0.25	0.54	1.15	0.12	0.05	2.84	14.87	20.61	35.49
Non-Isolated Total		2.35	2.96	7.92	0.25	1.75	3.16	0.26	0.11	8.91	27.67	28.96	56.63
Wetland Total		2.35	4.05	7.92	1.56	3.76	3.85	4.51	3.71	8.91	40.62	28.96	69.58
Upland		176.52	413.39	173.45	345.07	685.03	342.35	317.67	404.13	436.54	3294.21	481.52	3775.73
Property Total		178.87	417.43	181.37	346.63	688.79	346.20	322.18	407.84	445.45	3334.83	510.48	3845.31

Location: J:\GIS_Maps\2002-009_Rio_Del_Oro\Phased_Impacts\PhasedImpacts_v2(2007-06-21)\PhasedImpacts_v2.mxd

FIGURE 11. Phase Impact Analysis

2002-009 Rio del Oro

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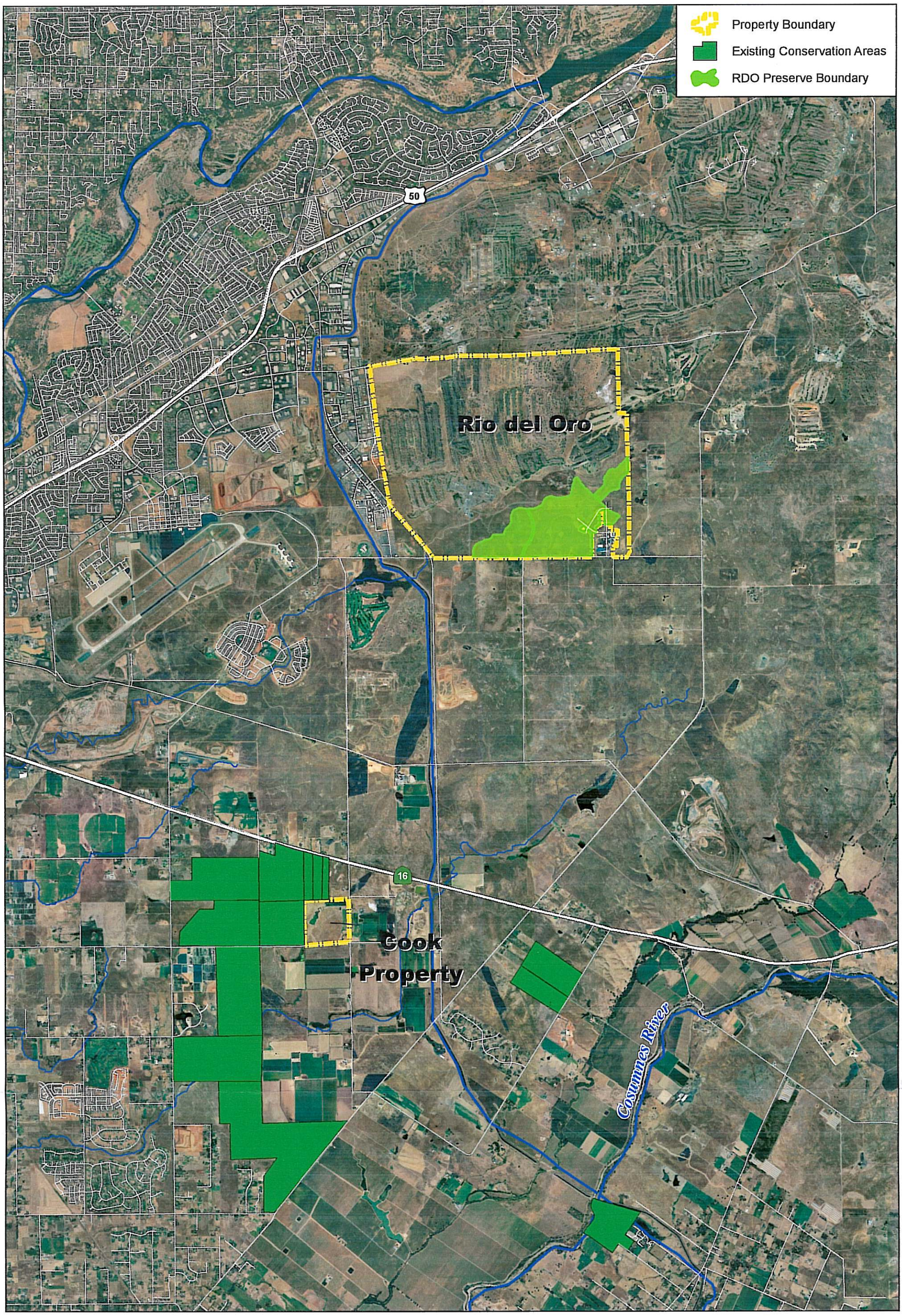

Location: J:\GIS_Maps\2002-009_Rio_Del_Oro\Cook_Property_Location(Tabloid).mxd

FIGURE 12. Cook Property Location

1 inch equals 1 miles

0 0.5 1 2 Miles

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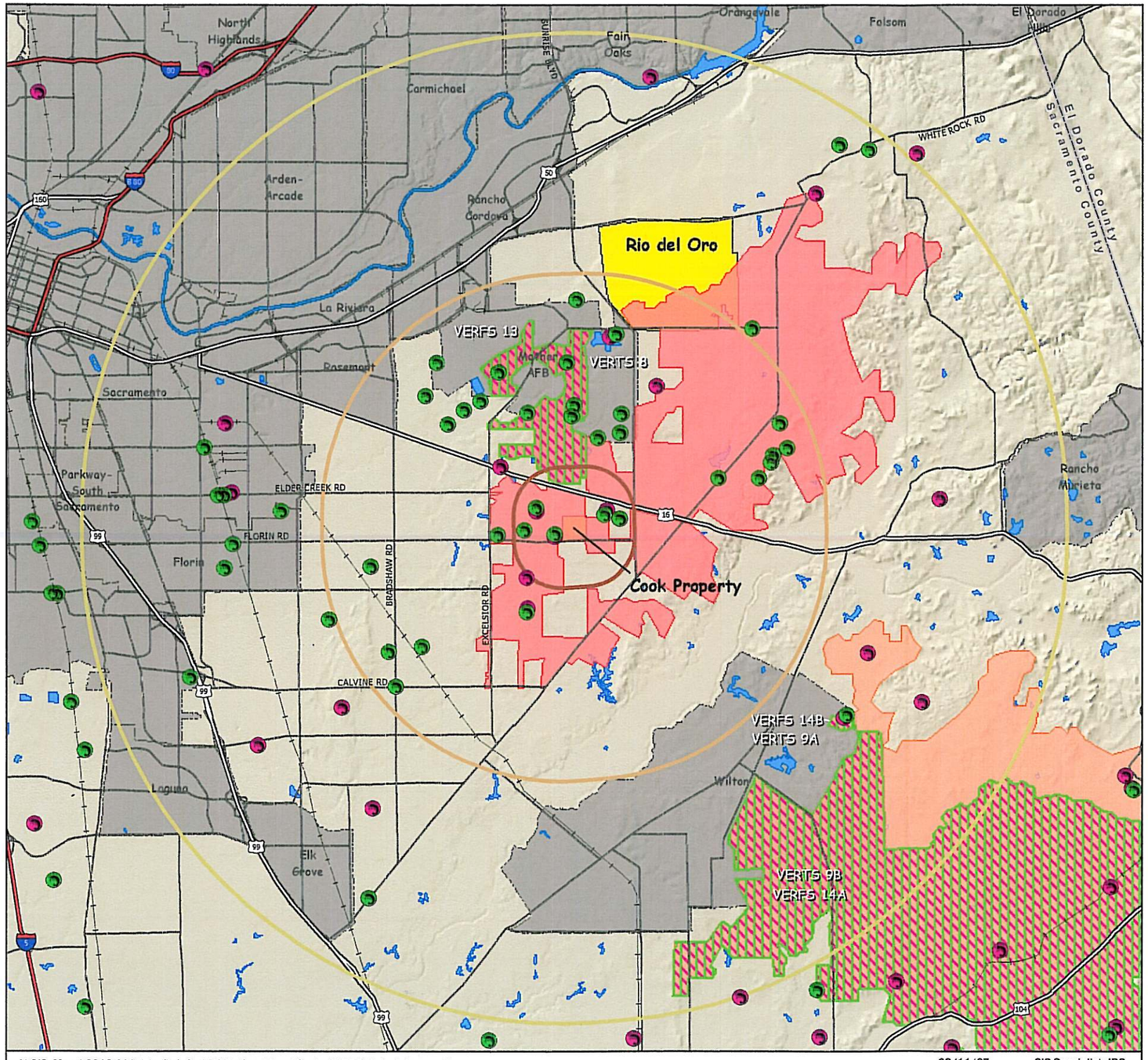
2002-009 Rio Del Oro



J:\GIS_Maps\2002-009_Rio_Del_Oro\Mitigation_Maps\Cook_CNDDB_fed_shrimp.mxd 09/11/07 GIS Specialist: JDS

FIGURE 13. CNDDB Occurrences of Federally Listed Shrimp Species

2002-009 Rio del Oro - Cook Property

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Map Features

Administrative Boundaries
- [1] Project Boundary
- City Boundary
- County Boundary

Distance From Project
- 1 mile
- 5 mile
- 10 mile

Transportation
- Interstate
- State Highway
- Roads
- Railroads

Aquatic Features
- Lakes and Reservoirs
- Rivers

[2] CNDDB Occurrences of Federally Listed Shrimp

Endangered
- Vernal Pool Tadpole Shrimp

Threatened
- Vernal Pool Fairy Shrimp

Critical Habitat
- [3] Vernal Pool Fairy Shrimp
- [3] Vernal Pool Tadpole Shrimp

Southeastern Sacramento Valley Core Areas
- [4] Cosumnes/Rancho Seco
- [4] Mather

This map may include multiple species' occurrences at each location, some of which may not be visible on this graphic. The CNDDB occurrences shown may not reflect the actual location of the occurrence.

N

1 " equals 13,000 '

SCALE IN FEET
0 6,500 13,000

NOTES

[1] Project Boundary: Sacramento County GIS Parcel Database (Boundary Approximate)

[2] CDFG California Natural Diversity Database (CNDDB), September 2007 Update (GIS Shapefile)

[3] USFWS Vernal Pool Species Final Critical Habitat, February 2006.

[4] USFWS Vernal Pool Recovery Core Areas, April 2006.

Map Extents Located on USGS 7.5' Quadrangles: Rio Linda, Citrus Heights, Folsom, Clarksville, Sacramento East, Carmichael, Buffalo Creek, Folsom SE, Florin, Elk Grove, Sloughhouse, Carbondale, Bruceville, Galt, Clay and Goose Creek, CA

LIST OF ATTACHMENTS

Attachment A – Wetland Preserve, Impact and Compensation Plan

Attachment B – Watershed Analysis of the Hydrologic Function of the Rio Del Oro Preserve for Preservation for Existing Wetlands and Construction of Mitigation Wetlands

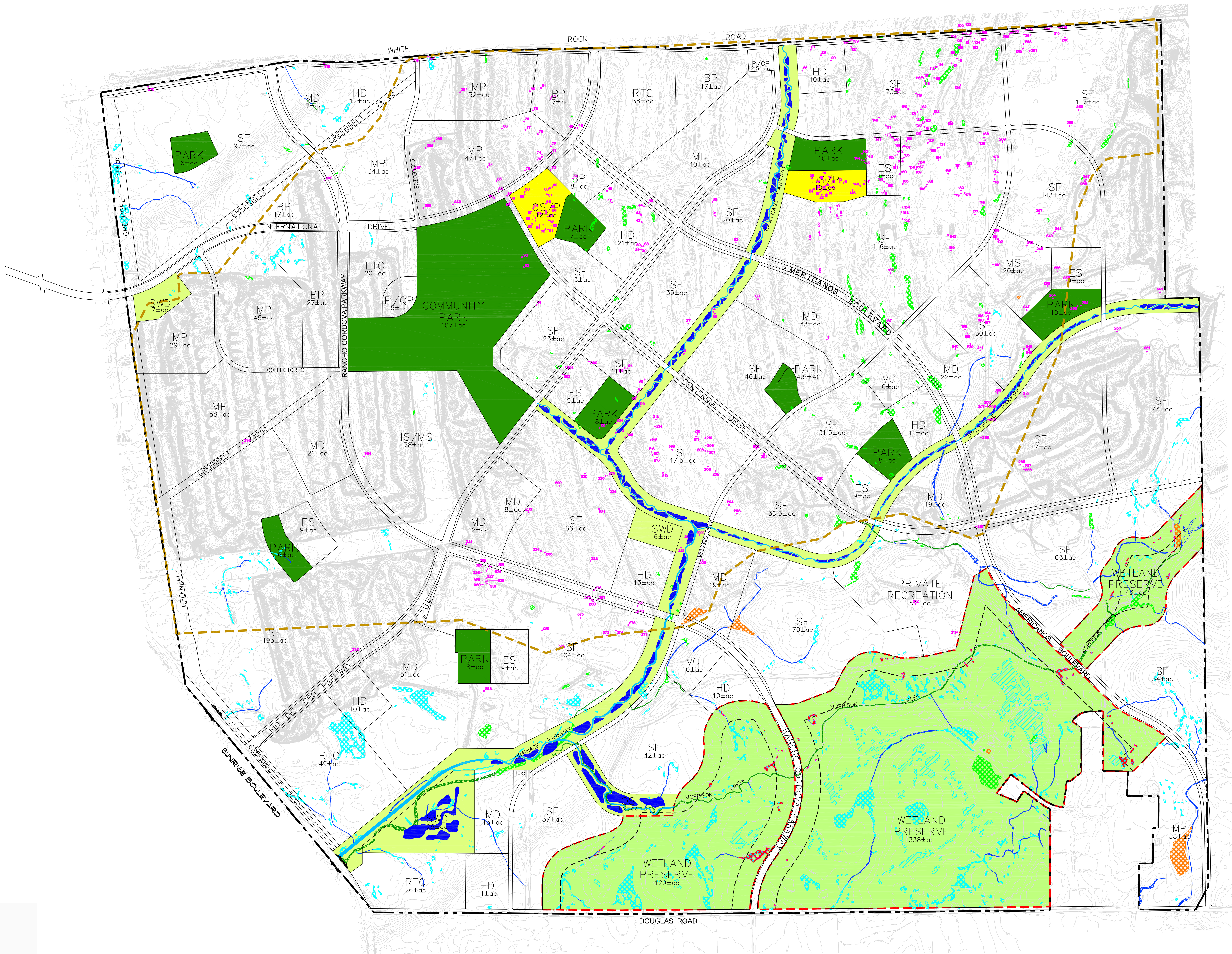
Attachment C – Preliminary Wetland Assessment Cook Property

ATTACHMENT A

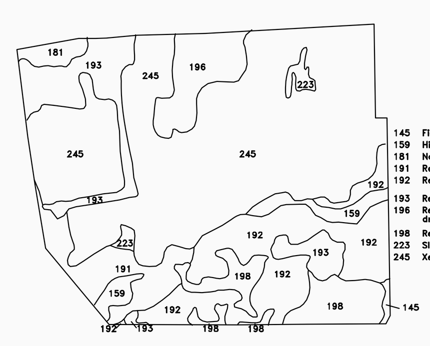
Wetland Preserve, Impact and Compensation Plan

PROJECT NAME: RIO DEL ORO - PRES/IMP

Kameron Meyer 12/3/07 3:30 PM



NRCS SOIL TYPES



- 145 Fiddyment fine sand loam, 1–8% slopes
- 159 Hicksville gravelly loam, 0–2% slopes
- 181 Natomas loam, 0–2% slopes
- 191 Red Bluff loam, 0–2% slopes
- 192 Red Bluff loam, 2–5% slopes
- 193 Red Bluff loam, 0–5% slopes
- 196 Red Bluff–Xerorthents, dredge tailing complex, 2–5% slopes
- 198 Redding gravelly loam, 0–8% slopes
- 223 Slickens
- 245 Xerorthent, dredge tailings, 2–50% slopes

JOB NAME: RIO DEL ORO - PRES/IMP
PROJECT NO: 2002-009
MAP SCALE: 1"=500'
DATE: 18 OCTOBER 2006
REVISION: 08/27/07
FILE NAME: RDO-PRES20.dwg

WATERS OF THE U.S. ACREAGE

CLASSIFICATION	Existing: Jurisdictional Acreage	Existing: Isolated Acreage	Impacts Direct: Jurisdictional Acreage	Impacts Direct: Isolated Acreage	Impacts Indirect: Jurisdictional Acreage	Impacts Indirect: Isolated Acreage	Mitigation: Preserve	Mitigation: Creation
Wetlands:								
Vernal Pool	35.485	2.414	15.072	2.414	2.179	–	20.413[1]	17.867
Pond	3.540	0.721	2.924	0.721	–	–	0.616	N/A 0.000
Seasonal Wetland Swale	6.044	0.653	3.587	0.653	–	–	2.457	N/A 0.000
Seasonal Wetland	6.418	9.158	3.064	9.158	–	–	3.354	N/A 0.000
Other Waters:								
Ephemeral Drainage	5.145	–	3.256	–	–	–	1.889	N/A 0.000
Riparian Wetland	–	–	–	–	–	–	–	20.785
Channel	–	–	–	–	–	–	–	8.402
TOTAL:	56.632	12.946	27.903	12.946	2.179	–	28.729	47.054

[1] In addition, 12.946 acres of isolated wetlands are located on the site, all of which will be impacted

- Project Boundary
- Line of Indirect Impact
- ●100 Elderberry Location and ID#
- Wetland Preserve (+/- 507 ac.)
- Open Space (+/- 187 ac.)
- VELB Preserve (+/- 44 ac.)
- Park (+/- 179 ac.)
- Isolated Wetlands

NOTES

Gross Project Acreage: ± 3829

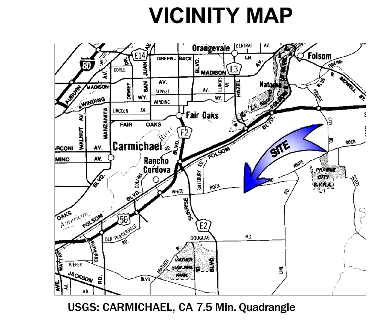
Base data source: G.C. Wallace

This exhibit depicts information and data produced in strict accord with the U.S. Army Corps of Engineers wetland delineation methods described in the 1987 Corps of Engineers Wetland Delineation Manual and conforms to specifications per the Corps Sacramento District. However, wetland boundaries have not been legally surveyed and may be subject to minor adjustments if exact locations are required.

N

SCALE IN FEET
0 250 500 1000
SCALE: 1"=500'

VICINITY MAP



USGS: CARMICHAEL, CA 7.5 Min. Quadrangle

RIO DEL ORO

PROPOSED PRESERVE/IMPACT MAP

DATE: 18 OCTOBER 2006	REVISION DATE: 08/27/07	PROJECT NUMBER: 2002-009
CAD SPECIALIST: CN/MC/KO/JH	SCALE: 1"=500'	MAP NAME: RDO-PRES20.dwg
MAP LOCATION: X:\2002-009 Rio del Oro\NEW_MAPS\PRES_IMP		
WETLAND VERIFICATION LETTER DATE:		PM: BG

ECORP Consulting, Inc.
ENVIRONMENTAL CONSULTANTS

Northern California: 2525 Warren Drive, Rocklin, CA. 95677, Ph: 916.782.9100 • Bay Area: 2100 Embarcadero, Ste. 202, Oakland, CA. 94606, Ph: 510.434.0150 • Orange County: 1801 Park Court Place Bldg B. Ste. 103, Santa Ana, CA. 92701, Ph: 714.648.0630 • Inland Empire: 412 East State St., Redlands, CA. 92373, Ph: 909.307.0046

ATTACHMENT B

Watershed Analysis of the Hydrologic Function of the Rio Del Oro Preserve for Preservation for Existing Wetlands and Construction of Mitigation Wetlands

DRAFT

Watershed Analysis of the Hydrologic Function of the Rio del Oro Preserve for Preservation of Existing Wetlands and Construction of Mitigation Wetlands

Sacramento County, California

11 September 2007

Prepared for:
Elliott Homes, Inc.
and
GenCorp Real Estate

ECORP Consulting, Inc.
ENVIRONMENTAL CONSULTANTS

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Attachment B – Rancho Cordova Parkway – Affects on Watersheds
Attachment C – Proposed Mitigation Preserve with Existing and Proposed Compensatory Wetlands and Watersheds

INTRODUCTION

ECORP Consulting, Inc. (ECORP) has conducted a model-based hydrologic analysis of the existing vernal pools and other wetlands within the proposed Rio del Oro preserve to address comments provided on the project Draft EIR/EIS, specifically regarding potential adverse hydrologic effects to existing wetlands or proposed compensatory wetlands within the designated preserve.

The analysis evaluated the verified wetland delineation of the Rio del Oro preserve and adjacent watersheds. A total of 295 vernal pools were located within the preserve. Vernal pools are topographic basins within the grassland community and are typically underlain with an impermeable or semi-permeable hardpan or duripan layer. Vernal pools are inundated through the wet season and are dry by late spring through the following wet season. Sixteen (16) seasonal wetlands were also mapped within the Rio del Oro project site. Seasonal wetlands are ephemerally wet areas where runoff accumulates within low-lying depressions and/or adjacent to watercourses. These areas may remain inundated for extended periods into the spring and summer. Additionally, there are three stock ponds present on the site. These man-made features have historically been used to support cattle grazing operations.

The Rio del Oro Project proposes to establish a 507-acre vernal pool and wetland preserve in the southern portion of the project. This preserve contains 227 vernal pools totaling 20.413 acres and 48 other wetlands totaling 8.316 acres. The overall preserve configuration was established by assessing the watersheds of existing vernal pools and wetlands to be preserved as well as maintaining 250′ buffers wherever possible.

Rancho Cordova Parkway, a proposed major thoroughfare to highway 50, will connect to a previously established location south of Douglas Road. Due to this connection the Parkway must transect the proposed preserve. The alignment of the Parkway was designed to avoid and buffer as many wetlands as possible.

In addition to preservation, compensatory vernal pool mitigation will also occur within the 507-acre preserve. A total of 17.867 acres of vernal pool habitat will be constructed to satisfy mitigation requirements of the project. The preliminary compensatory wetland plan was designed to minimize indirect impacts to existing habitat by maintaining 200' to 250′ buffers to existing vernal pools.

OBJECTIVES

The objectives of the investigation were to determine:

1. If the proposed Rio del Oro preserve configuration will negatively impact any existing vernal pools or seasonal wetlands within the preserve,
2. If the proposed Rio del Oro preserve will support the construction of mitigation vernal pools without indirectly impacting existing vernal pools and seasonal wetlands, and
3. If the proposed construction of Rancho Cordova Parkway through the Rio del Oro preserve will indirectly impact any existing or proposed mitigation wetlands.

METHODS

ECORP took a six (6) step approach to assess potential direct and indirect impacts to the seasonal wetlands and vernal pools within the preserve. These include:

1. Acquiring a high resolution Light-Imaging Detection And Ranging (LIDAR) based topographic survey;
2. Creating a grid model of the preserve;
3. Utilizing industry standard hydrologic assessment tools to determine the physical characteristics of the site;
4. Establishing a method for assessing the hydrologic boundaries between individual seasonal wetlands and vernal pools and their watershed areas;
5. Establishing a baseline for typical wetland to watershed ratios, and;
6. Modeling potential future watershed characteristics based on the construction of 17.867 acres of mitigation vernal pools and the construction of Rancho Cordova Parkway.

This approach provides a comprehensive quantitative assessment of current preserve characteristics, models the change in the topography of the preserve based on the proposed mitigation wetland design and the Rancho Cordova Parkway alignment, and evaluates how the changes to the preserve characteristics will modify hydrologic characteristics of each individual seasonal wetland and vernal pool and its corresponding watershed.

ESTABLISHING THE GROUND MODEL

Traditional Ground Models

The first step in establishing a high quality hydrologic model of any project site is to develop an elevation model of the study area. Large scale projects require high quality topographic ("topo") information, traditionally generated using photogrametric methods. Traditional topo is created through the analysis of stereoscopic orthophoto pairs, coupled with a site survey. This topographic data is supplied as contour lines placed at 1-foot, 2-foot, or greater intervals and spot elevations, with the focus of the data being on the contour lines to generate the description of the ground surface. These topographic contour lines are generated through a combination of computer based, automation processes and the effort of a photogramatic technician, who provides quality control and assurance that the contours created are readable, logical and aesthetically pleasing. This type of topographic model provides an easy to read, topographically exact method for site evaluation; however, it has some limitations.

There are three limitations of traditionally derived topography important to this study:

1. The ratio of the contour interval to the physical characteristics of the features of interest;
2. The deficiency of information describing the ground elevations between contours, and;
3. The aesthetically pleasing nature of the contours.

The first limitation of traditional topographic mapping is the contour interval spacing. This is important to this study because the depressional wetland features of interest are vernal pools

and seasonal wetlands, which can be very shallow in depth (<1ft deep.) Only the largest and deepest wetlands have physical characteristics that exceed the threshold that allow them to be mapped using traditional topographic methods. Many sites in the Sacramento Valley Area with depressional wetland features are unable to be properly depicted due to the limitations of traditional photogrametric methods. This threshold also affects the mapping of the site micro-topography. Small ridges and hummocks determine micro-scale surface water flow across the site and are unable to be properly mapped with this method.

The second limitation of using traditionally derived topography for this study is the deficiency of elevation information between contours. Most topographic datasets provide spot elevations spaced at regular or irregular intervals across a site. They tend to be spaced in intervals much larger than the size of the depressional features and micro-topography of interest. Like the aforementioned vertical feature tolerance for contours, not all features of interest are depicted in the topographic model of the site.

The final limitation of traditionally derived topographic contours concerns their aesthetically pleasing nature. Because traditional topo is developed with the intent of being read by surveyors, engineers and architects, many topographic features are omitted from the contours in an effort to keep them simple to read and pleasing to use. For example, a traditional photogrametric approach to mapping a drainage feature creates smooth and regular contours, providing an easy to read and straightforward to visualize depiction of the drainage. In contrast, the actual drainage may contain topography greater than one foot in elevation (e.g., rocks, ponds, and other features). Small topographic features may be omitted from the final topographic data to make it more usable, but the removal of these features decreases the utility of the contours for micro-scale hydrologic modeling. The limitations of traditionally derived topo do not allow for the detailed evaluation of seasonal wetlands, vernal pools, and their micro-watersheds.

The LIDAR Based Model

Due to the limitations of traditionally derived topographic contours, an alternative higher density source of topography was required for the present analysis. Airborne LIDAR was selected as the topographic data collection method of choice for this study. LIDAR, an acronym for Light-Imaging Detection And Ranging, also known as ALSM (Airborne Laser Swath Mapping) or Laser Altimetry or LADAR (Laser Detection and Ranging) is an optical remote sensing technology that measures properties of scattered light to find range and/or other information of a distant target. LIDAR system components include a high precision survey GPS (Global Positioning System) unit, an IMS (Inertial Measurement System), and a laser (usually in the 600-1500 nanometer range.)

The LIDAR system is mounted in an aircraft which flies transects across a project site. While in flight, the laser sweeps across the site sending pulses of light to the ground, and records the time it takes for those pulses to return to the aircraft. Meanwhile, the GPS unit records the precise location of the laser and the IMS measures the pitch, roll and yaw of the aircraft. At the hanger, this information is loaded into a computer and the data are processed to provide locations and elevations for all spots from which the laser received reflected pulses. These locations, or returns, are then filtered to remove x,y,z values depicting trees, buildings and other non-ground features. This 'Bare Earth' dataset is then distributed for use. An example of

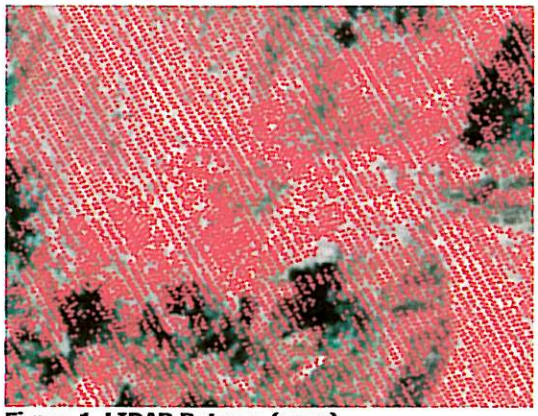


Figure 1. LIDAR Returns (x,y,z)

these filtered spot elevations (in red) can be seen in Figure 1, where pulses reflected from tree canopy (dark green) have been removed.

The LIDAR derived Bare Earth measurements represent a different method for depicting the ground surface than traditional topographic contours. Depending on the sensor and the altitude of the flight, LIDAR returns can achieve vertical precision of up to +/-3 inches relative to each other. This allows LIDAR data to accurately represent the physical characteristics of depressional wetland features. The data primarily rely on the massive number of spot elevations recorded by the sensor to depict topography. The data represents a nearly continuous field of elevation values across the site, allowing for the mapping of mirco-scale features which otherwise are not detected by traditional topo. Figure 2 depicts the density of point elevations around vernal pools. Contour lines can be generated from the Bare Earth dataset, and because the LIDAR sensor captures all ground features, contour lines resulting from LIDAR represent a more precise model of the earth for the purposes of micro-scale modeling.

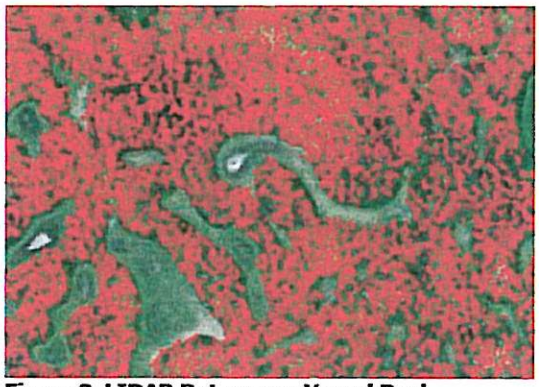


Figure 2. LIDAR Returns on Vernal Pool Grassland Landscape

Project LIDAR Topographic Model

The LIDAR based aerial survey of the preserve was conducted by Airborne1 in April 2007 using a Partnavia fixed wing aircraft equipped with an Optech 2050 LIDAR system. Transects of the site were flown at an altitude of 4500 feet with the sensor operating 50,000 pulses/second at a scan angle of 18º and a scan frequency of 30 Hz. The resulting recoded data have an average point spacing of 2ft, and a vertical RMSE of 7 inches, well within the accuracy and parameters required for mapping depressional wetland features.

Once the Bare Earth LIDAR topography was delivered to ECORP it was loaded into a GIS (Geographic Information System), so that the 15 million data points (x,y,z spot heights with an average ground distance of two feet,) could be analyzed, interpreted and checked for quality. All spot heights were loaded into an ESRI (Environmental Science Research Institute) File Geodatabase, and converted into a continuous field raster based DEM (Digital Elevation Model) in the ESRI GRID format. The GRID format is the standard structure used for most topographic modeling within a GIS. Converting the data to a GRID normalizes the data point spacing and greatly increases the speed at which the data can be interpreted and analyzed. Creating a DEM allows for the use of file based modeling tools that have been developed, peer reviewed, and are considered industry standard for many applications.

The resultant dataset depicts the sites physical characteristics and allows for a visual assessment of the site, as well as the measurement of quantitative parameters. Figure 3 depicts a shaded relief model of the DEM, where purple line represents the preserve boundary.

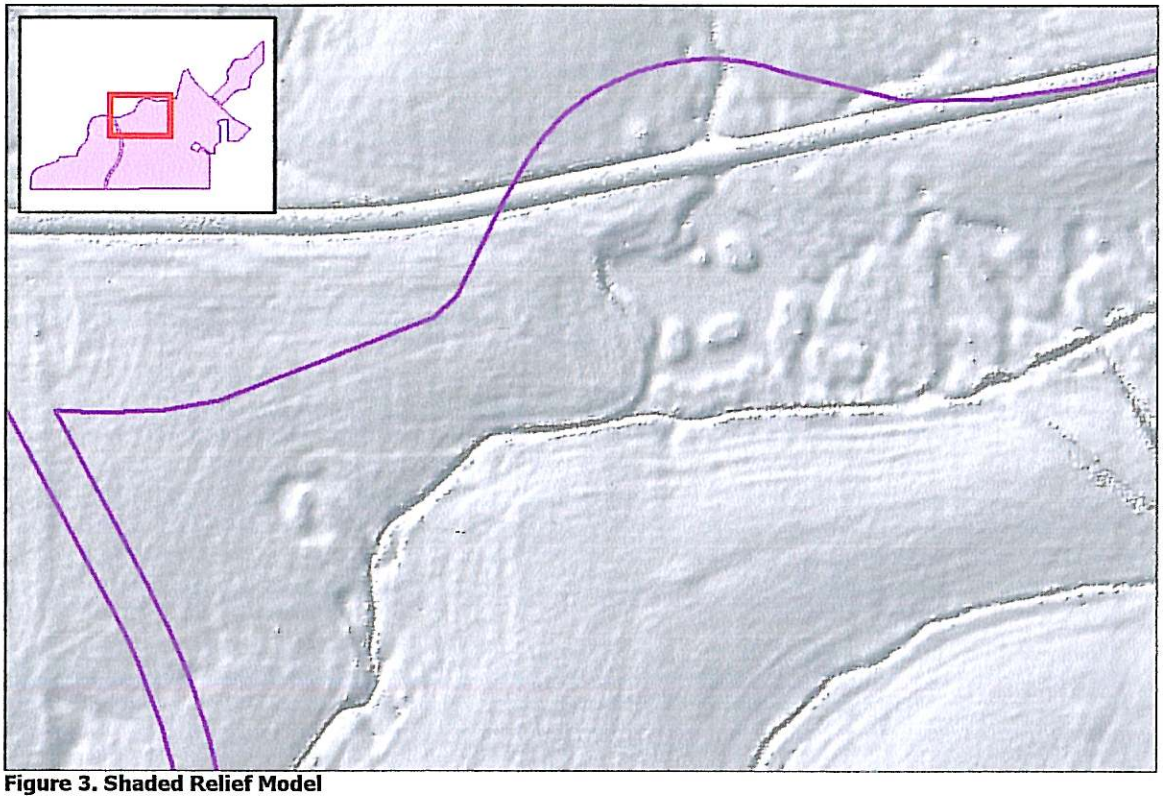


Figure 3. Shaded Relief Model

This representation of the topographic model clearly shows the location of various topographic features within the preserve boundary, including an existing road running east-west along the northern boundary of the preserve. Remnant features created by past farming can be seen in the form of striations paralleling the drainages, indicating that this area was once used for active farming.

After the shaded model of the DEM was computed, a curvature model of the preserve was created. The curvature model, shown in Figure 4, quantitatively measures the convexity or concavity of each cell within the DEM, establishing the relief of the terrain and quickly identifying depressions on the landscape. The model represents a combination of the slope and aspect values for the site, and provides a visual representation of the site that can be quickly checked against field collected data.

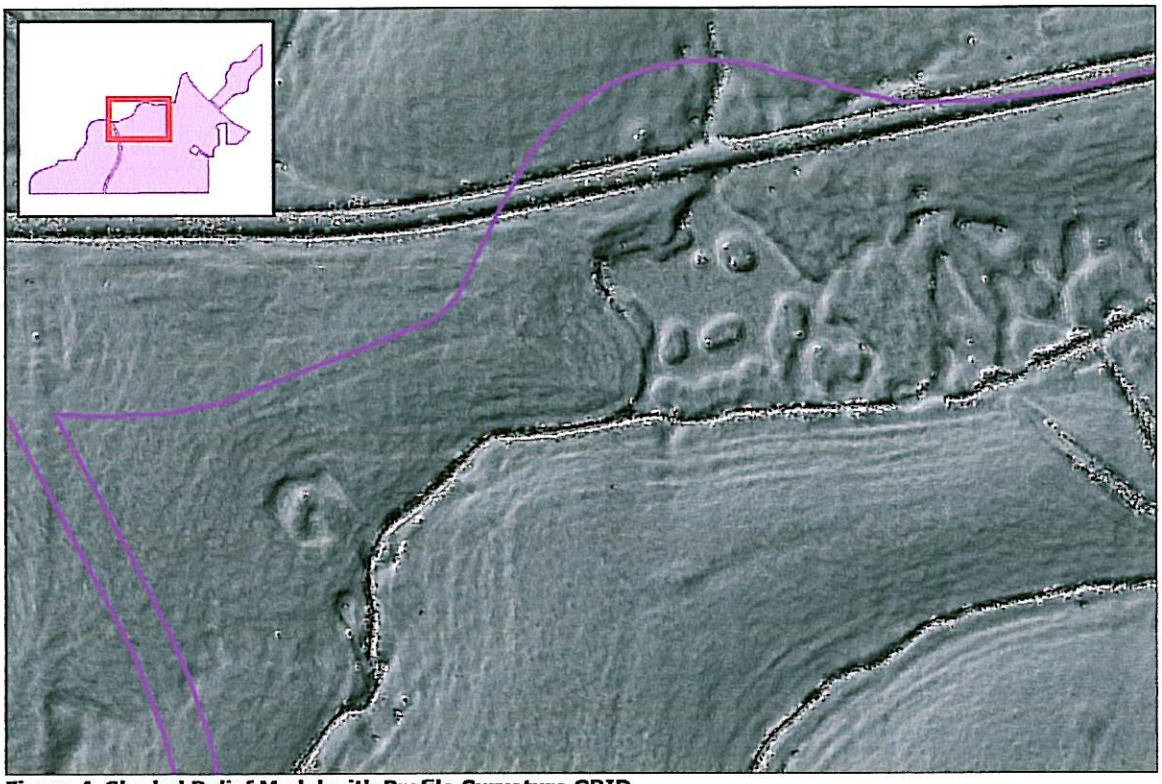


Figure 4. Shaded Relief Model with Profile Curvature GRID

Overlaying the depressional wetlands from the wetland delineation on top of the shaded elevation curvature model provides additional indication of the accuracy of the LIDAR topographic survey. A graphic depiction of this overlay can be seen in Figure 5. The boundaries of the depressional wetlands match the locations computed by the model, suggesting that the LIDAR survey is sufficient for mapping the micro topography of the site. Once the LIDAR survey was checked against the field collected data, the hydrologic model could be created.

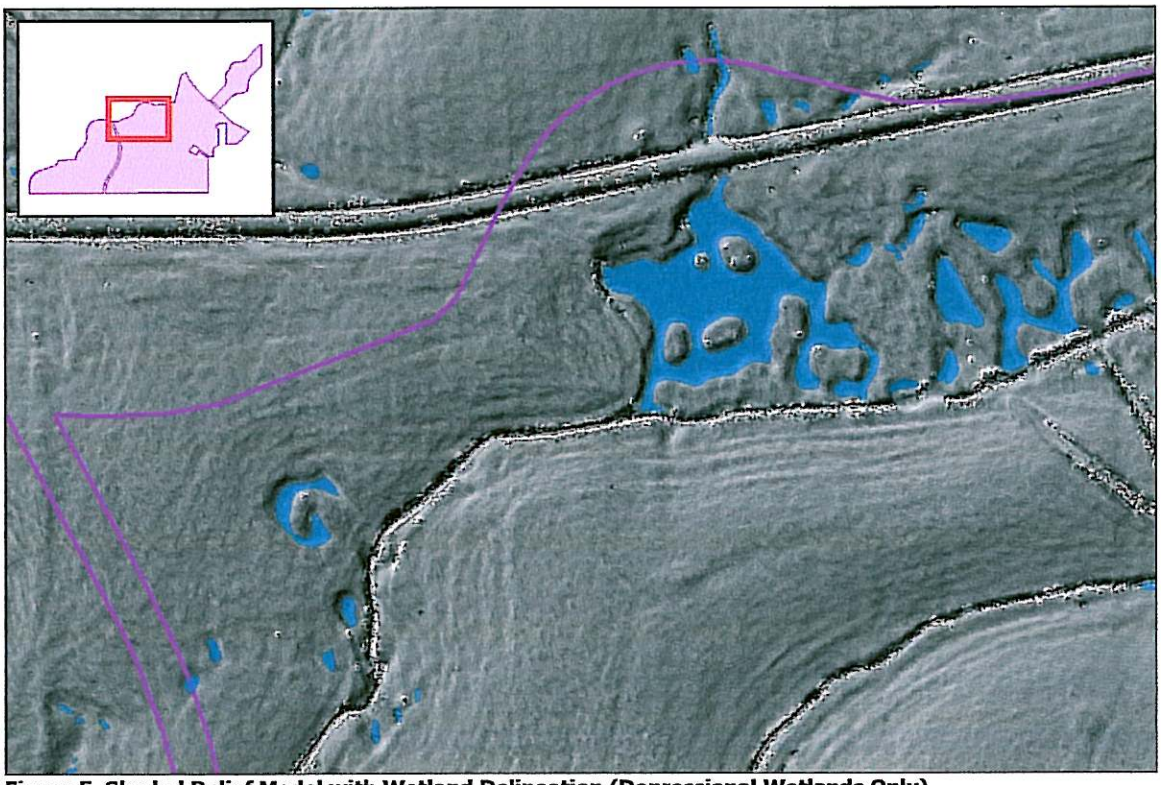


Figure 5. Shaded Relief Model with Wetland Delineation (Depressional Wetlands Only)

HYDROLOGIC MODEL

The preserve's surface hydrology was evaluated and characterized using the hydrology tool package available in ESRI's ArcInfo. The tool set allows for the preparation of a hydrologically correct DEM that can be used to define the characteristics of a project site, including potential surface water conveyance pathways, watershed boundaries, and water feature connectivity. The process involves creating a DEM, measuring the change in elevation to determine the flow direction of water that falls onto any cell within the elevation grid, and determining the accumulated upstream watershed for any depressional water feature within the model.

The primary challenge of modeling a site containing depressional wetland features is that the majority of hydrologic modeling tools have been designed for flow-through hydraulic systems. The models require the water which enters the system must eventually exit the system in order to evaluate site characteristics. In order to model a vernal pool grassland landscape, it is necessary to be able to describe the site with existing depressions. It is then imperative to evaluate the process that allows depressional wetlands to fill before reaching their maximum volume, and finally to be able to model the site as a flow through system once the pools have reached their maximum capacity. Before the depressional wetlands fill for the season they act as sinks on the landscape, storing surface water and keeping it from flowing out of the system. Once they are full the network of wetlands and swales becomes a flow through system, where water falling within the watershed makes its way down through the system via a flowpath nework that includes both riverine and depressional wetlands.

The description of the depressional hydrologic system is achieved by using a flow masking technique. The flow masking technique allows the modeler to treat the edges of the depressional wetlands like a hydrologic sink. This method assumes that water that enters the wetland never exits the wetland. By defining the limits of the wetlands as a sink, the hydrologic tools used to identify the upper limits of a drainage's watershed can be applied. This allows the automation of the calculation of the watershed for each individual depressional wetland. This method for establishing the watersheds of each depressional wetland works well because it establishes the outer boundary of the area that drains into each wetland and tabulates the total water contribution of both surface sheet flow and flow from swales or other riverine features. It also allows the storage of the wetlands and their corresponding watersheds' physical characteristics within a database for later analysis. Once the watersheds have been computed for each wetland, the sink-based, masked flow model can be reevaluated and run as a flow through model. The flow through model can then be used to create a flowpath network, which allows for additional parameterizing and characterizing of the system.

Preserve Specific Hydrologic Model

The hydrologic model for the preserve was computed from a combination of field collected wetland data and the DEM created from the LIDAR based topography. The model was generated by creating a hydrologically correct DEM using the field collected depressional wetland boundaries as a mask. Flow direction was computed allowing the creation of an accumulated flow GRID. Each cell in this dataset contains the value of the total aggregated upstream area. Cells with higher values have larger watersheds and are more likely to represent drainage features, while cells with lower values have smaller watershed areas. Most importantly, cells with a value of 0 represent the upper hydrologic boundary of at least one depressional wetland feature. These values for the preserve were aggregated and converted to the flow paths and watershed boundaries, depicted in yellow and red in Figure 6. Once the watershed boundaries were created, the spatial statistics were computed for each wetland feature and its corresponding micro-watershed.

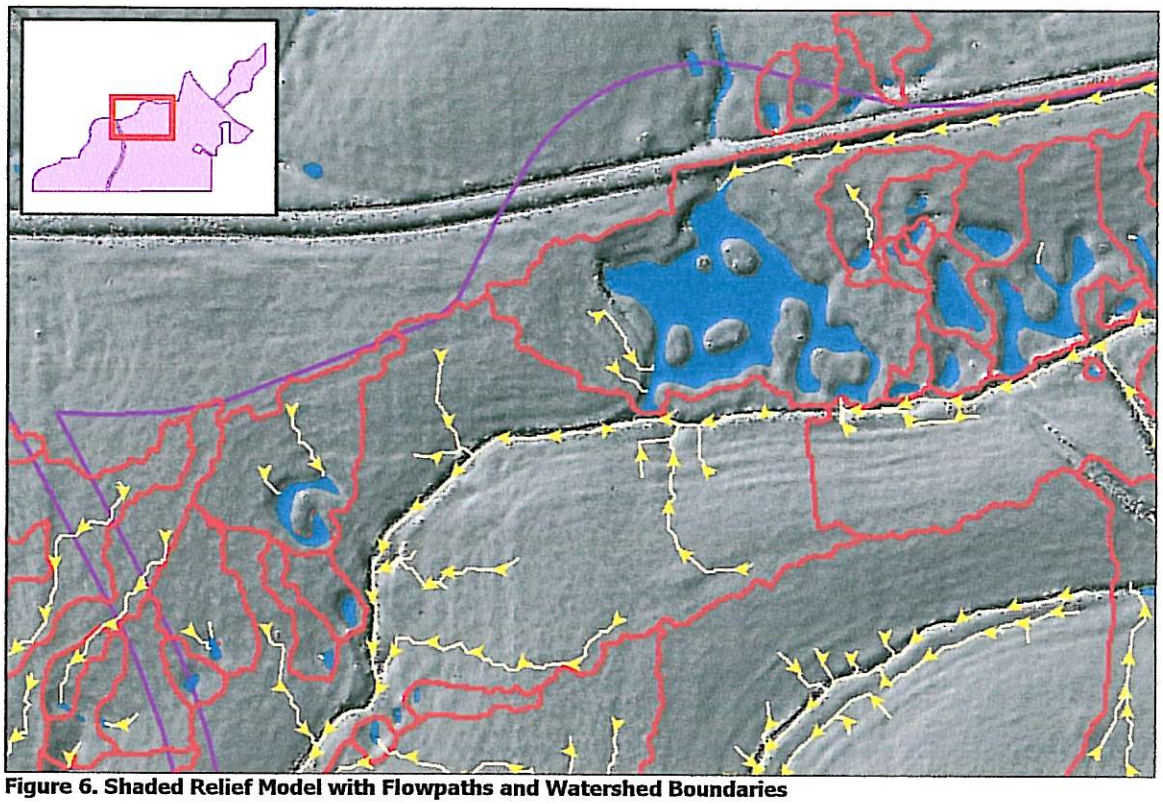


Figure 6. Shaded Relief Model with Flowpaths and Watershed Boundaries

Spatial Statistics

A sub-data set was generated that compiled the area (size) of each depressional wetland feature and the area of its corresponding micro-watershed. ECORP's fluvial geomorphologist then evaluated the distribution of the data to determine appropriate depressional wetland size classes for subsequent evaluation. Each depressional wetland size class was then analyzed to determine the minimum watershed area necessary to sustain current runoff inundation levels. Each depressional wetland size class was further evaluated to determine the WWR. The WWRs were then statistically analyzed to determine the minimum WWR for each depressional wetland size class. The overall analysis consisted of the following steps.

1. Sort the existing depressional wetland data set based on wetland area
   - Using hydrologic flow network analysis tools within GIS the LIDAR data were coupled with the wetland delineation to determine the number, type, and acreage of each wetland feature and its corresponding watershed area.

2. Determine the appropriate depressional wetland size classes
   - The wetland data set was stratified based on discrete size classes. Fourteen (14) size classes (12 vernal pool, 2 seasonal wetland) were defined for the Rio del Oro preserve based on depressional wetland acreages.

3. Determine the minimum watershed area for each wetland size class
   - The smallest watershed area within each depressional wetland size class represents the minimum watershed area require to sustain wetlands within the size class.

4. Determine the WWR for each depressional wetland within each wetland size class based on the minimum watershed acreage.
   - The WWR was determined for each depressional wetland within each wetland size class by dividing the minimum watershed acreage for each wetland size class by the acreage of each individual depressional wetland.

5. Determine the mean WWR for each depressional wetland size class.
   - WWR results from individual wetland size classes were statistically analyzed to determine the minimum, maximum, mean, variance, standard deviation, and 95 % confidence interval (CI).

6. Determine the watershed area required for each depressional wetland within each wetland size class based on the mean WWR for each wetland size class.
   - The watershed area for each wetland within each wetland size class was determined by multiplying the wetland area by the mean WWR.

7. Determine potential indirect impacts to existing depressional wetlands due to preserve configuration.
   - Potential impacts to each depressional wetland were determined utilizing the WWR value for each wetland size class.

8. Determine the total watershed area required for existing depressional wetlands within the Rio del Oro preserve.
   - The calculated wetland watershed sizes were summed to determine the total area within the Rio del Oro preserve necessary to sustain the current hydrologic functions of the depressionalwetlands within the preserve.

9. Determine the potential indirect impacts due to the construction of the proposed Rancho Cordova Parkway through the Rio del Oro preserve.

RESULTS AND DISCUSSION

In order to evaluate the long-term viability of the Rio del Oro preserve, a series of analyses were conducted. These analyses assessed the size of the proposed preserve, the amount of watershed area required to support the existing wetlands within the preserve, the potential impacts due to the construction of Rancho Cordova Parkway through the preserve, the required mitigation wetlands to be constructed within the preserve, and the watershed area necessary to support the hydrologic function of each mitigation wetland. The process and justification for each step will be discussed individually.

Watershed Area Required to Support Existing Depressional Wetlands

The analysis combined data collected from the wetland delineation with the LIDAR data. The wetland delineation provided the aerial extent of the existing wetlands in accordance with the verified wetland delineation. LIDAR data allowed for the development of high resolution topography as described above.

GIS tools tabulated the number of depressional wetlands within the site, type of each wetland, size of each wetland, and the size of the corresponding micro-watershed for each wetland. Wetland data were sorted by type and then size (area). The data were further stratified based on wetland size classes. Size classes were based on appropriate size classes and natural breaks in the data. Analysis of the data yielded fourteen (14) wetland size classes, 12 for vernal pools and 2 for seasonal wetlands (Table 1.0).

Wetlands within each wetland size class were sorted based on the size of the wetland watershed (micro-watershed). The smallest watershed within each wetland size class represents the minimum watershed area required to support hydrologic function of wetlands within the size class. The minimum watershed size was then used to determine the amount of watershed area needed to support each wetland within the size class. This was accomplished by dividing the minimum watershed value for each wetland size class by the size of the wetland to determine the watershed-to-wetland ratio (WWR). The WWR values for each wetland size class were then statistically analyzed to determine the mean watershed size required to sustain wetlands within each size class. This analysis was determined at the 95% confidence interval (CI).

Table 1.0 – Wetland size class distribution for Rio del Oro project site with associated mean watershed/wetland ratio (WWR) at the 95 % CI.

Wetland Type	Wetland Size Class (acres)	Minimum Watershed Size Required per Acre of Wetland	Sample Size
Vernal Pool	0.004 – 0.01	1.829, +/- 0.201	19
	0.011 - 0.02	2.855, +/- 0.142	68
	0.021 - 0.03	1.829, +/- 0.059	54
	0.031 - 0.04	3.557, +/- 0.085	38
	0.041 - 0.05	2.173, +/- 0.056	28
	0.051 - 0.06	2.270, +/- 0.064	15
	0.061 - 0.07	4.387, +/- 0.100	16
	0.08 – 0.10	2.911, +/- 0.164	17
	0.11 – 0.20	3.781, +/- 0.487	14
	0.21 – 0.37	2.016, +/- 0.261	12
	0.47 – 0.81	3.172, +/- 0.482	8
	1.40 – 2.60	5.598, +/- 1.408	6
Seasonal Wetland	0.01 – 0.05	2.194, +/- 1.020	8
	0.10 – 0.55	5.147, +/- 2.463	6

Impacts to Existing Wetlands Due to Preserve Configuration

All wetlands directly impacted by the proposed Rio del Oro development are included in the mitigation wetland total and were not analyzed. The location of the proposed preserve boundary results in indirect impact to the watersheds of sixty (60) wetlands[1]. The preliminary results indicate the loss of watershed area due to the preserve's configuration will impact the hydrologic functions of one existing vernal pool wetland, VP-317 (Figure 7.) Upon further investigation, the proposed preserve configuration conserves almost 100% of the original watershed area (Table 2.0). VP-317 falls into the largest vernal pool wetland size class (1.40 – 2.60). This vernal pool wetland size class has a WWR of 5.598 +/- 1.408. VP-317 has a wetland area of 2.05 acres with an actual WWR of 4.74. This actual WWR value of 4.74 falls within the 95 % confidence interval of the WWR for this vernal pool wetland size class (WWR 95 % CI = 4.19 – 5.60). The WWRs for the remaining fifty-nine (59) vernal pools are greater than their required WWRs, indicating the proposed Rio del Oro preserve configuration will not negatively impact the hydrologic function of these vernal pools.

Table 2.0 – Impact totals for wetland VP-317.

Wetland ID	Wetland Acreage	Original Watershed Acreage	Post Construction Watershed Acreage	Percent Watershed Preserved
VP-317	2.047	9.698	9.625	99.25 %

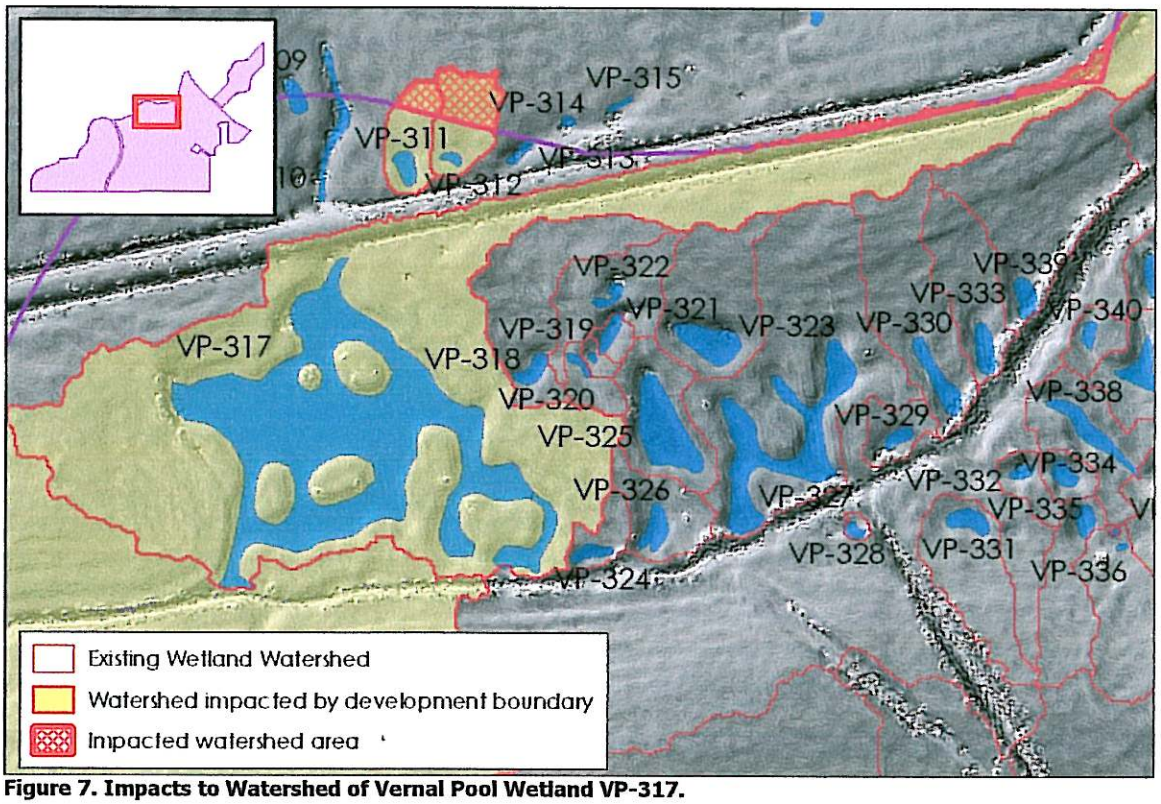


Figure 7. Impacts to Watershed of Vernal Pool Wetland VP-317.

[1] See Attachment A for a full-site image of all impacts resulting from the preserve's configuration.

Impacts Due to Rancho Cordova Parkway

The proposed road (Rancho Cordova Parkway) through the Rio del Oro preserve affects the watersheds of twelve (12) vernal pools. Because the proposed road follows a local ridge (topographic high) through the preserve, direct impacts are limited to one vernal pool (VP-287). This impact has been accounted for in the project impacts and wetland mitigation plan. Potential indirect impacts to the watersheds of the remaining eleven (11) vernal pools are minimal and do not negatively impact the hydrologic functions of these vernal pools. The eleven indirectly impacted vernal pools all have WWRs greater than their required WWRs for each vernal pool size class (Table 3.0).

Table 3.0 – Change in watershed/wetland ratio (WWR) to wetlands with watersheds indirectly impacted by Rancho Cordova Parkway.

Wetland ID #	Wetland Acreage	Original WWR	Final WWR[1]	Required WWR
VP-332	1.3285	8.66	7.65	5.598
VP-334	0.0039	130.77	128.77	1.829
VP-268	0.0051	172.52	70.56	1.829
VP-269	0.0052	120.24	108.07	1.829
VP-259	0.0200	137.95	88.36	1.829
VP-251	0.0306	133.53	46.35	3.557
VP-288	0.0193	55.58	52.37	2.855
VP-257	0.0188	82.00	77.44	2.844
VP-254	0.1677	15.40	8.90	3.781
VP-237	0.0692	63.71	42.91	4.387
VP-240	0.5770	20.01	9.48	3.172

[1]. "Final" represents the WWR after the road is constructed.

For example, Figure 8 illustrates how wetlands VP-251 and VP-240 are impacted by the proposed Rancho Cordova Parkway[2]. VP-251 has a vernal pool area of 0.0306 acres with an original watershed size of 4.08 acres (WWR = 133.53). VP-251 will lose 2.63 total acres from its watershed, 1.66 acres directly impacted by the footprint of the road and 0.97 acres from the upland area separated by the construction of the road, resulting in a final watershed area of 1.45 acres (WWR = 46.35). VP-240 has a vernal pool area of 0.5770 acres with an original watershed size of 10.80 acres (WWR = 20.01). VP-240 will lose 5.50 total acres from its watershed, 3.44 acres directly impacted by the footprint of the road and 2.06 acres from the upland area separated by the construction of the road, resulting in a final watershed area of 5.30 acres (WWR = 9.48).

Total watershed area removed from VP-251: [1.66 ac + 0.97 ac] = 2.63 ac
Total watershed area removed from VP-240: [3.44 ac + 2.06 ac] = 5.50 ac

VP-251 is in vernal pool size class 0.031 – 0.04 acre with a WWR of 3.557. Each vernal pool in this size class requires 3.557 acres of watershed for every 1.000 acre of vernal pool wetland. This indicates that 0.0306 acres of vernal pool require 0.109 acres of watershed area. VP-240

[2] See Attachment B for a full-site image of all vernal pool wetlands impacted by Racnho Cordova Parkway.

is in wetland size class 0.47 – 0.81 acre with a WWR of 3.172. This indicates that 0.5770 acre of vernal pool require 1.830 acres of watershed area.

Watershed area required for:
VP-251, [0.0306 ac wetland x 3.557 WWR] = 0.109 ac. watershed
VP-240, [0.5770 ac wetland x 3.172 WWR] = 1.830 ac. watershed

The remaining watershed area for wetlands VP-251 and VP-240 are 1.45 acres and 5.30 acres respectively. These are 1.34 and 3.47 acres greater than the required watershed size (Table 4.0) for their respective wetlands. This illustrates that the proposed Rancho Cordova Parkway through the Rio del Oro preserve will not negatively impact the watersheds of these vernal pools or their hydrologic function.

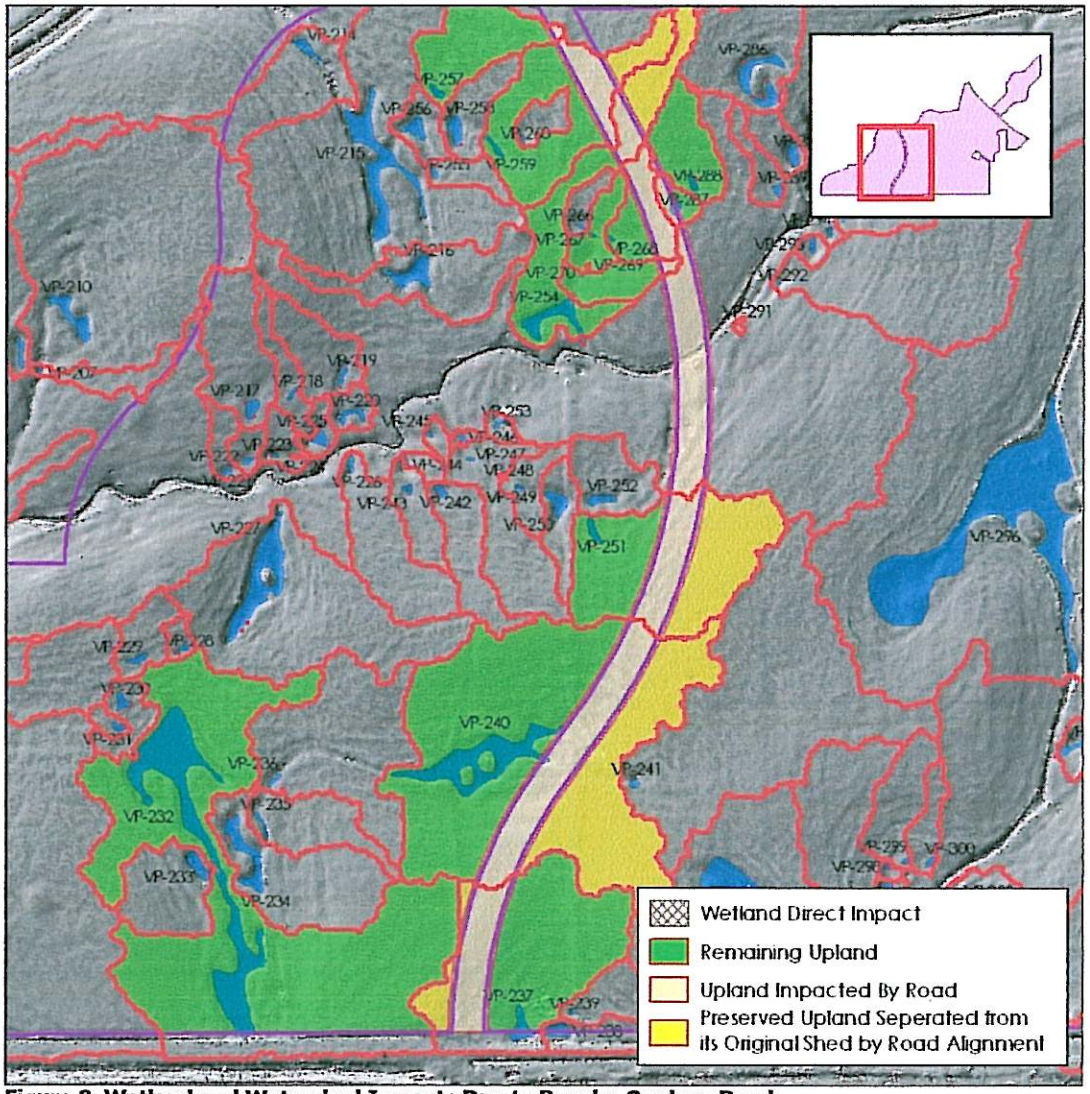


Figure 8. Wetland and Watershed Impacts Due to Rancho Cordova Road

Table 4.0. Impacts to vernal pools VP-251 and VP-240 due to Rancho Cordova Parkway.

Wetland ID	Original Wetland Size (ac.)	Truncated Watershed Size (ac.)	Watershed/ Wetland Ratio	Required Watershed Size (ac.)	Watershed Size Difference (ac.)
VP-251	0.03	1.45	3.557	0.109	+ 1.34
VP-240	0.58	5.30	3.172	1.830	+ 3.47

Suitability of Preserve for Construction of Mitigation Wetlands

To determine the feasibility of constructing mitigation wetlands within the Rio del Oro preserve, the WWRs for the current wetlands within the preserve were calculated. The current mitigation preserve area is 507 acres with 28.85 acres of vernal pools and waters of the U.S. The greatest WWR calculated for the existing wetland size classes within the Rio del Oro project site is 5.598 (+/- 1.408). This indicates that 5.598 acres of watershed are required for every 1.000 acres of wetland. Using the conservative WWR value of 7.01 (5.598 + 1.408) acres with the present wetland total within the preserve of 28.85 yields a total required watershed size of 202.24 acres.

[28.85 wetlands acres x 7.01 WWR] = 202.24 ac. of watershed

The Rio del Oro preserve is 507 acres in area. Removing the 28.85 acres of wetlands and waters of the US from the total preserve area results in 481.15 acres of watershed area. The construction of Rancho Cordova Parkway within the proposed Rio del Oro preserve will eliminate an additional 30.33 acres leaving 450.82 acres. Existing wetlands within the preserve require 202.24 acres of watershed, leaving a total of 248.58 acres available for the construction of mitigation wetlands and their required watersheds within the preserve. The project proposes to build 17.867 acres of mitigation wetlands within the Rio del Oro preserve[3]. Using the conservative WWR of 7.01 indicates a total of 125.25 acres of watershed are required to support the hydrologic function of 17.867 acres of mitigation wetlands preserve. This is 123.33 acres less than the available 248.58 acres and represents only half (50.39%) of the area within the proposed preserve available for the construction of mitigation wetlands.

Acres of watershed required to support the construction of 17.867 acres of mitigation wetlands: [17.867 wetland acres x 7.01 WWR] = 125.25 ac of watershed

CONCLUSIONS

The hydrologic analysis of the proposed Rio del Oro preserve allows us to make the following conclusions:

Overall Preserve Configuration

The size and configuration of the 507-acre proposed preserve located in the southern portion of the Rio Del Oro project adequately preserves and protects the watersheds of the existing vernal

[3] See attachment C for a full-site layout of the proposed mitigation wetlands within the preserve.

pools and seasonal wetlands. No additional indirect impacts, not already identified and accounted for in the mitigation plan, are expected to occur. The watersheds of the preserved wetlands meet or exceed the minimum required watershed needed to sustain them.

Compensatory Vernal Pool Habitat

Based on our analysis, the construction of the proposed compensatory vernal pool habitat within the preserve will not adversely affect the hydrology of the existing vernal pools and wetlands. Compensatory vernal pools will have sufficient watershed area while also maintaining seasonal watersheds for existing wetland features so that wetland functions and values are established and maintained, respectively.

Rancho Cordova Parkway

The construction of Rancho Cordova Parkway will not directly or indirectly impact wetlands not already considered impacted pursuant to the mitigation plan. Construction of the Parkway will remove and truncate portions of watersheds of some wetlands, but all wetlands will retain watersheds that meet or exceed their calculated needs.

LIST OF ATTACHMENTS

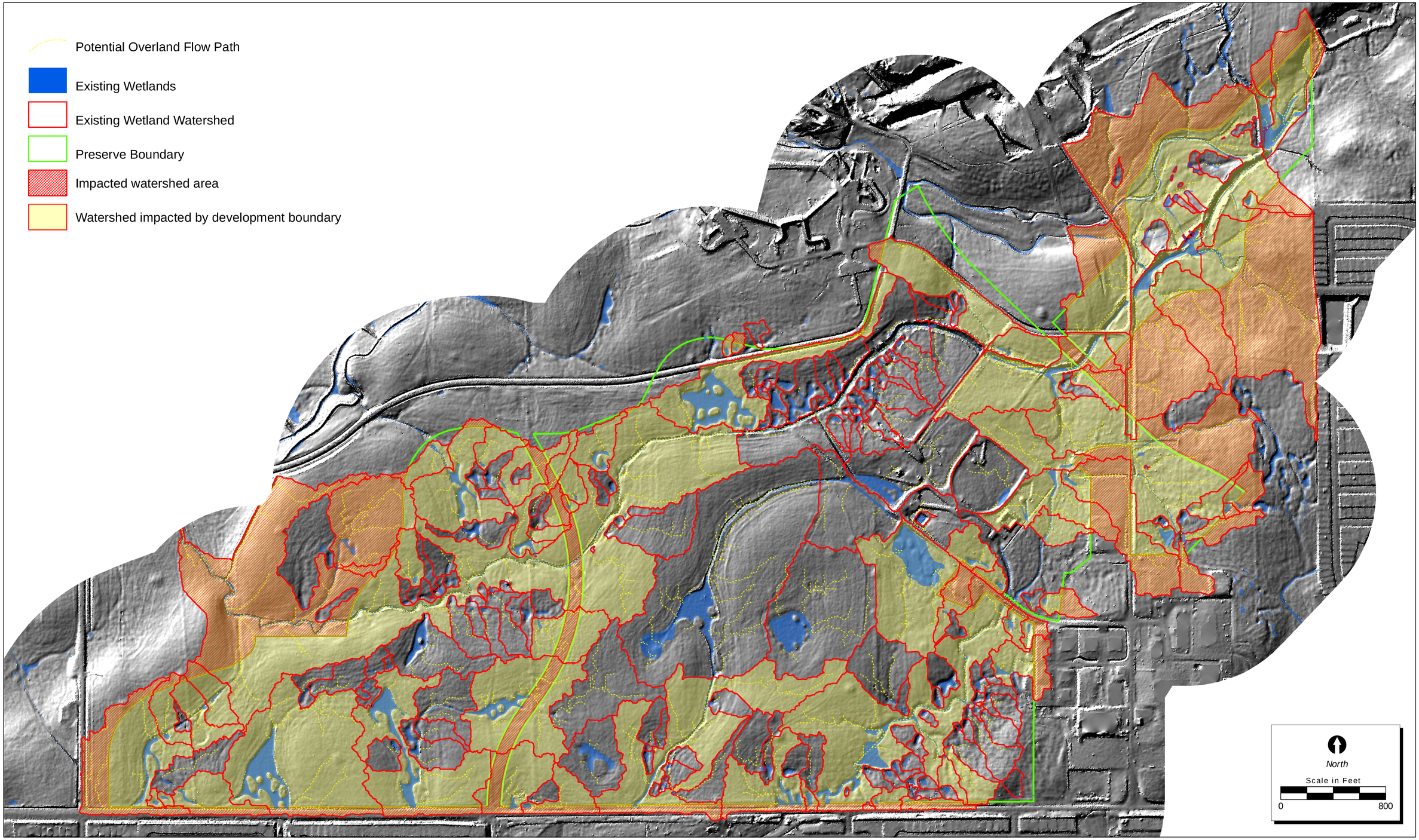
Attachment A – Proposed Mitigation Preserve with Existing Wetlands, Watersheds and Flow Paths

Attachment B – Rancho Cordova Parkway – Affects on Watersheds

Attachment C – Proposed Mitigation Preserve with Existing and Proposed Compensatory Wetlands and Watersheds

ATTACHMENT A

Proposed Mitigation Preserve with Existing Wetlands, Watersheds and Flow Paths



Location: J:\GIS_Maps\2002-009_Rio_Del_Oro\H20_MODEL\LIDAR\EIR_Inset_Graphics\SubshedBoundaries.mxd

Attachment A. Proposed Mitigation Preserve with Existing Wetlands, Watersheds and Flow Paths

2002-009 Rio del Oro

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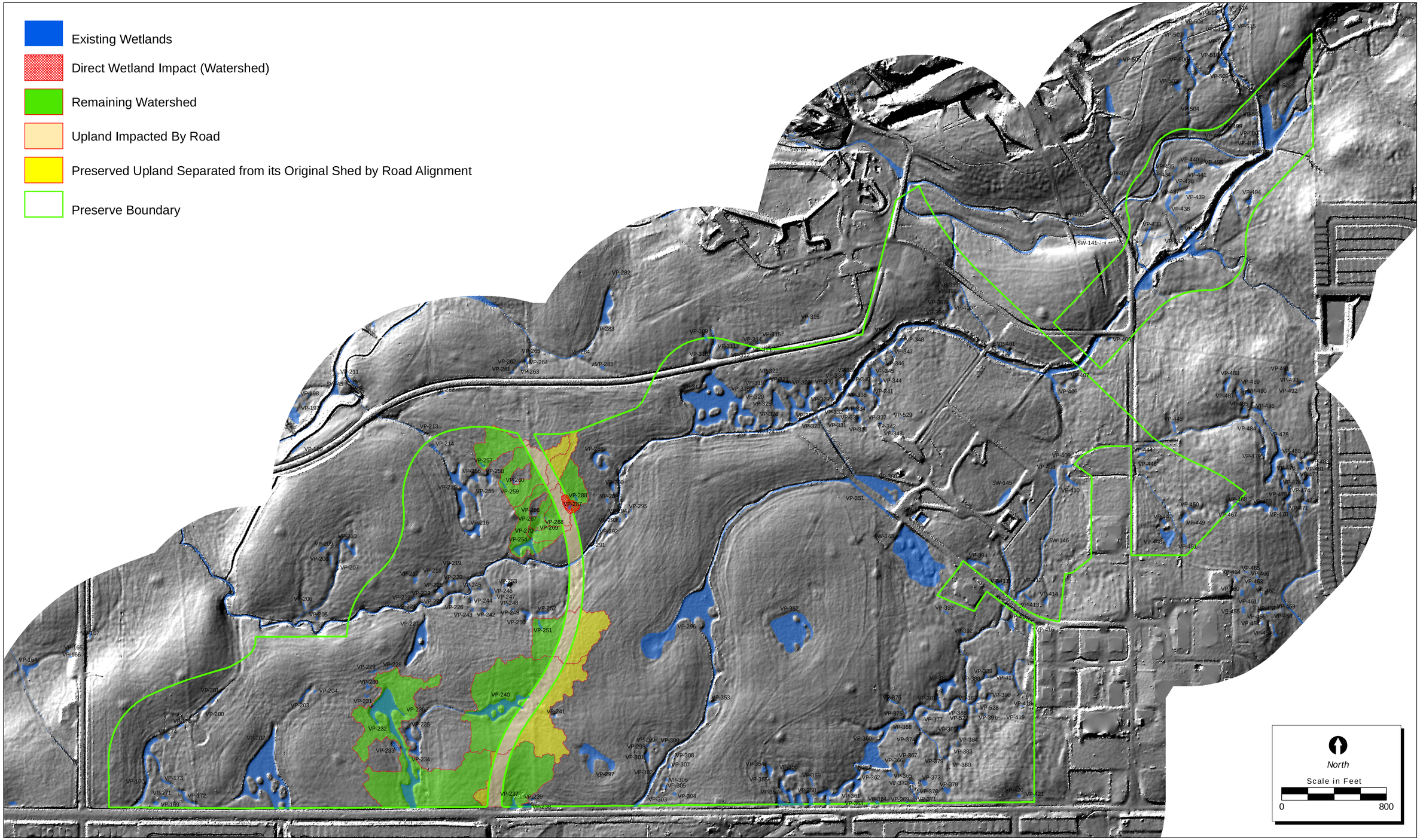
ENVIRONMENTAL CONSULTANTS

ATTACHMENT B

Rancho Cordova Parkway – Affects on Watersheds



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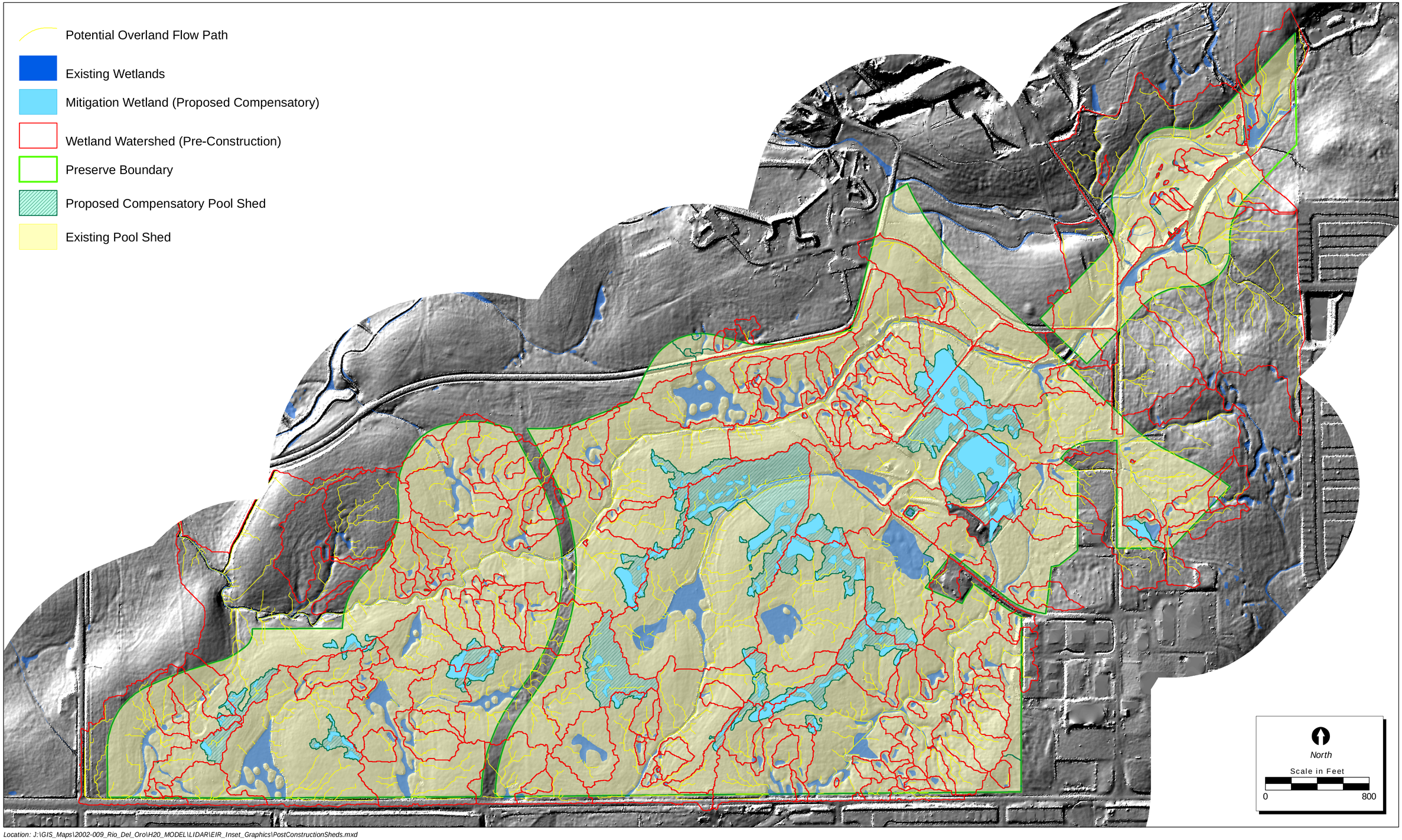
Attachment B. Rancho Cordova Parkway - Affects on Watersheds

2002-009 Rio del Oro

ECORP Consulting, Inc.
ENVIRONMENTAL CONSULTANTS

ATTACHMENT C

Proposed Mitigation Preserve with Existing Wetlands, Watersheds and Flow Paths



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Attachment C. Proposed Mitigation Preserve with Existing and Proposed Compensatory Wetlands and Watersheds

2002-009 Rio del Oro

ECORP Consulting, Inc.
ENVIRONMENTAL CONSULTANTS

ATTACHMENT C

Preliminary Wetland Assessment Cook Property

PROJECT NAME: Rio Del Oro - WETLAND ASSESSMENT

JOB NAME:	Rio Del Oro - WA
PROJECT NO:	2002-009
MAP SCALE:	1"=200'
DATE:	28 JULY 2006
REVISION:	—
FILE NAME:	Cook-WA.dwg

APPROXIMATE WATERS OF THE U.S. ACREAGE [1]

CLASSIFICATION	APPROXIMATE ACREAGE
WETLANDS:	
Vernal Pool	2.67
Seasonal Marsh	9.90
Seasonal Wetland Swale	2.63
OTHER WATERS:	
Pond	6.51
Intermitent Drainage	0.58
TOTAL:	22.29

OTHER FEATURES

Project Boundary [2]	±160
Irrigated Pastures	21.27

NOTES

Gross project acreage: ±160

Aerial photo source: Globe Explorer, October 1999.

Topographic data source: Digitized from U.S.G.S. Quadrangle

[1] *The information depicted on this graphic represents a preliminary wetland assessment. The assessment was not conducted in accordance with the Corps of Engineers Wetland Delineation Manual and Sacramento District Minimum Standards. The project boundaries, wetland boundaries, and acreage values are approximate.*

[2] Boundary source:
The project boundary extents depicted on this graphic have been extracted from the GIS parcel database provided by the assessor of Sacramento County and have not been ground surveyed. ECORP holds no liability to the accuracy of the boundary and recommends a future formal property survey.

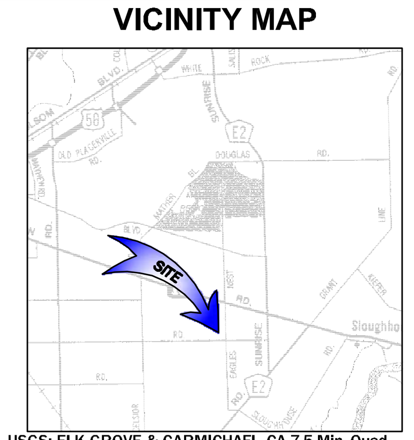
N

SCALE IN FEET

0 100 200 400

SCALE: 1"=200'

VICINITY MAP



USGS: ELK GROVE & CARMICHAEL, CA 7.5 Min. Quad

RIO DEL ORO

PRELIMINARY WETLAND ASSESSMENT
COOK PROPERTY

DATE: 28 JULY 2006	REVISION DATE: —	PROJECT NUMBER: 2002-009
CAD SPECIALIST: JLH	SCALE: 1"=200'	MAP NAME: Cook-WA.dwg
MAP LOCATION: X:\2002-009 Rio del Oro\WA\Cook Mit		QA/QC:
WETLAND VERIFICATION LETTER DATE:		PM: BG

ECORP Consulting, Inc.
ENVIRONMENTAL CONSULTANTS

Northern California 2525 Warren Drive Rocklin, CA. 95677 Ph: (916) 782-9100 • **Bay Area** 2100 Embarcadero, Ste. 202 Oakland, CA. 94606 Ph: 510.434.0150 • **Orange County** 1801 Park Court Place Bldg B. Ste. 103 Santa Ana, CA. 92701 Ph: 714.648.0630 • **Inland Empire** 412 East State St. Redlands, CA. 92373 Ph: 909.307.0046