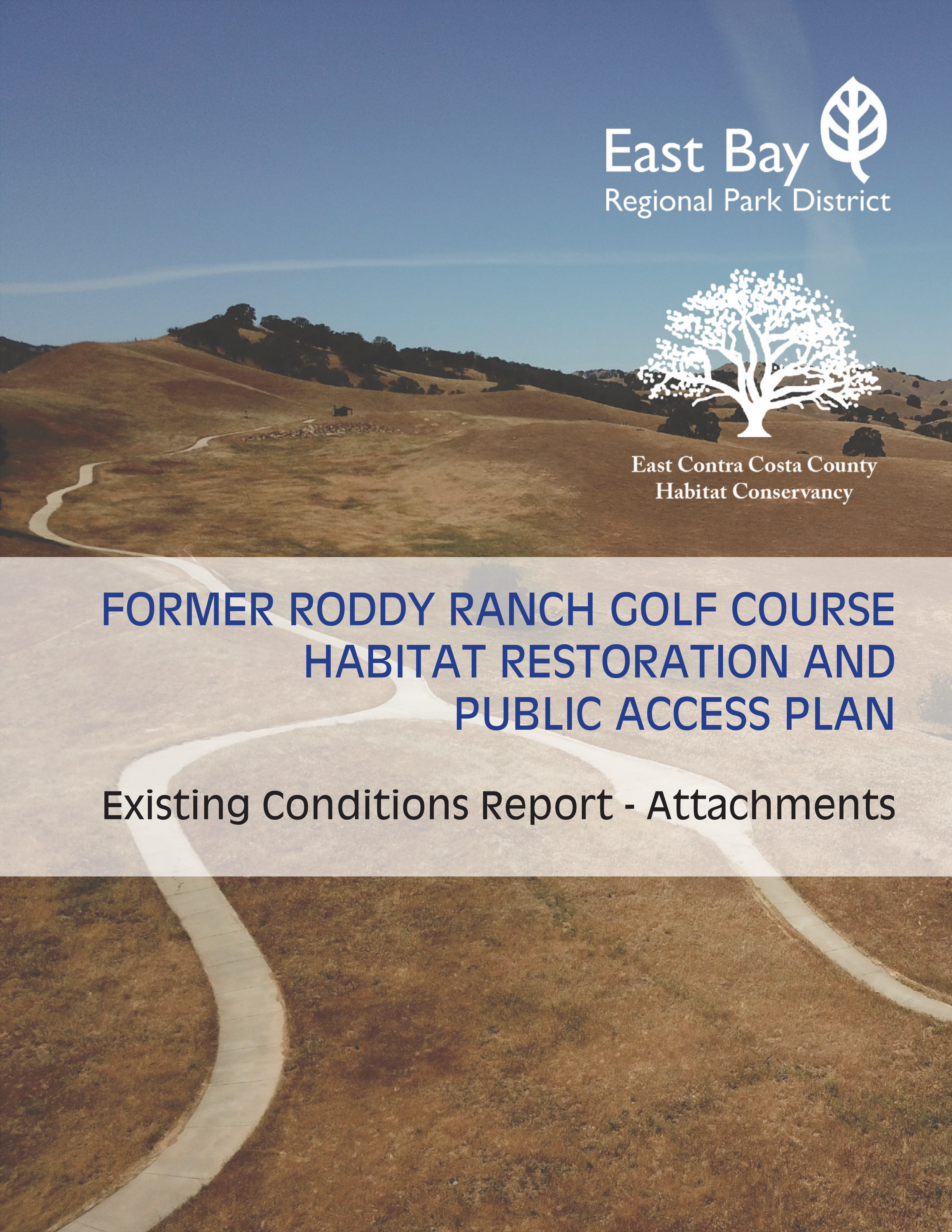

East Bay
Regional Park District

East Contra Costa County
Habitat Conservancy

FORMER RODDY RANCH GOLF COURSE HABITAT RESTORATION AND PUBLIC ACCESS PLAN

Existing Conditions Report - Attachments

East Bay
Regional Park District

East Contra Costa County
Habitat Conservancy

FORMER RODDY RANCH GOLF COURSE HABITAT RESTORATION AND PUBLIC ACCESS PLAN

Existing Conditions Report - Attachments

March 8, 2021

Prepared by:

RDG
Restoration Design Group

In association with:
BKF Engineers
ENGEO
Fehr & Peers
Vic Claassen, PhD
Impact Sciences
Nomad Ecology
PaleoWest

ATTACHMENTS

1. ENGEO. 2020. Summary of Geotechnical Constraints. Roddy Ranch Golf Course – Antioch, CA. July. San Ramon, CA.

2. Claassen, V. 2021. Preliminary assessment of existing and disturbed soils at Roddy Ranch as potential revegetation substrates. August. Davis, CA.

3. Restoration Design Group. 2020. The Former Roddy Ranch Golf Course Habitat Restoration and Public Access Project - Drainage Network Inventory and Assessment. August. Berkeley, CA.

4. Nomad Ecology. 2020. Biological Resources Assessment – The Former Roddy Ranch Golf Course Habitat Restoration and Public Access Project - Contra Costa County, California. November. Martinez, CA.

5. Restoration Design Group. 2021. The Former Roddy Ranch Golf Course Habitat Restoration and Public Access Project - Recreational and Environmental Education Opportunities. February. Berkeley, CA.

6. PaleoWest. 2021. Fieldwork Closure Memorandum for the Roddy Ranch Project in Antioch, Contra Costa County, California. February. Walnut Creek, CA.

7. BKF. 2021. Civil Engineering Utility Review - Roddy Ranch – Antioch, CA. January. Walnut Creek, CA.

8. Fehr & Peers. 2020. Former Roddy Ranch Golf Course Restoration and Public Access – Transportation Assessment. October. Walnut Creek, CA.

1

ENGEO. 2020. SUMMARY OF GEOTECHNICAL CONSTRAINTS. RODDY RANCH GOLF COURSE – ANTIOCH, CA.

RODDY RANCH GOLF COURSE
ANTIOCH, CALIFORNIA

SUMMARY OF GEOTECHNICAL CONSTRAINTS

SUBMITTED TO
Ms. Angela Pan
Impact Sciences, Inc.
811 W. 7th Street, Suite 200
Los Angeles, CA 90017

PREPARED BY
ENGEO Incorporated

July 10, 2020
Revised August 10, 2020

PROJECT NO.
17306.000.000

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GEOTECHNICAL
ENVIRONMENTAL
WATER RESOURCES
CONSTRUCTION SERVICES

Project No.
17306.000.000

July 10, 2020
Revised August 10, 2020

Ms. Angela Pan
Impact Sciences, Inc.
811 W. 7th Street, Suite 200
Los Angeles, CA 90017

Subject: Roddy Ranch Golf Course
Antioch, California

SUMMARY OF GEOTECHNICAL CONSTRAINTS

Dear Ms. Pan:

At your request, we are providing a geotechnical constraints analysis for the Roddy Ranch Golf Course Project located in Antioch, California. The purpose of the analysis is to discuss the suitability of the geotechnical and geologic site conditions for a second use of the existing golf course as parklands to be managed by the East Bay Regional Park District.

Please contact us if you have any questions regarding the site conditions and geotechnical recommendations presented in this report.

Sincerely,

ENGEO Incorporated

JONATHAN BUCK
No. 2958

Jonathan D. Buck, GE
jdb/ps/cjn

PHILIP STUECHELI
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TABLE OF CONTENTS

1.0 INTRODUCTION

1.1 PROJECT LOCATION AND SETTING

The Roddy Ranch Golf Course property is located approximately 5 miles south of central Antioch and 7 miles east of Mount Diablo. The 230-acre portion of the property to be redeveloped by the East Bay Regional Park District (EBRPD) is located on the northern slopes of the ridge separating Deer and Horse Valleys, which drain southeast to Marsh Creek. The valleys lie below northwest-trending ridge lines that are progressively higher to the south. North of Horse Valley, the ridge crest is at approximately 400 feet; north of Deer Valley, the ridge crest is over 600 feet; and south of Deer Valley, the ridges rise to elevations of over 1,000 feet. The floors of Deer and Horse Valleys lie at elevations of approximately 250 to 350 feet.

Most of the surrounding Roddy Ranch area is open grassland with scattered oak trees and brush. The higher portions of the ridge areas are covered by a heavier growth of brush and trees. The property has historically been used for cattle grazing.

The existing approximately 230-acre Roddy Ranch Golf Club was constructed on the northern slopes of the ridge separating Deer and Horse Valleys (Figure 1) in the year 2000. The golf course consists of lakes, sandtraps, a driving range, concrete pathways, landscaped areas, a clubhouse building, a pro shop building, and a parking lot. We understand the East Bay Regional Park District (EBRPD) would like to redevelop the parcel as part of the greater acquisition of the Roddy Ranch properties. Potential future uses may include seasonal wetlands, trails, staging areas, and small structures associated with future park facilities.

2.0 GEOTECHNICAL SETTING

2.1 SITE SOILS AND BEDROCK GEOLOGY

According to published geologic maps (Dibblee, 1980, Graymer, 1994), the bedrock formation underlying the proposed development area is the Meganos Formation. The Meganos Formation consists of interbedded marine siltstone, sandstone and shale (Graymer, 1994).

The bedrock formations are inclined to the north at angles of between 15 to 35 degrees according to mapping by Dibblee (1980) and Graymer, et al. (1994). The regional geologic map published by Dibblee is shown on Figure 2.

Horse Valley and low-lying valley areas extending into the site are underlain by alluvial deposits generally consisting of interbedded sandy clays and silty clays (Helley and Graymer, 1997). According to Knudsen, et al. (2000), the valley floor sediments can be expected to have a “low to moderate” liquefaction susceptibility. The California Geological Survey Seismic Hazard Zone map for the Antioch South quadrangle identifies a liquefaction hazard zone in Horse Valley north of the site as shown on Figure 4. A small portion of the site is within the zone. However, soil samples obtained during the ENGEO field exploration on the adjacent site did not display any characteristics that are typically associated with liquefiable material.

Regional landslide mapping by Nilsen (1975) does not identify any mappable landslide features on the site, as shown on Figure 3. Based on our review of aerial images, we identified a recently active surficial landslide as depicted on Figure 7. The swale areas on the site contain deposits of colluvium and alluvium, which have accumulated by downslope transport of surficial soils.

Figure 7 depicts the approximate limits of mappable deposits of colluvium and alluvium as they existed prior to development.

The surficial soils are described in the National Resource Conservation Service (NRCS) soil survey for the areas as clays, loamy clays, and loamy sands as shown on Figure 5. Clays and loamy clays are identified on the valley floor and the lower ridge slopes. The soils on the upper ridge areas north and south of the valley floor are mapped as loamy sands. In general, the site surface soils can be expected to have a moderate to high shrink-swell potential. Nativesoils within the Roddy Ranch Golf Course property are categorized as hydrologic soil group (HSG) 'C' or 'A'. Soils in the 'C' group have moderately high runoff potential when thoroughly wet. Water transmission and infiltration potential through the soil is somewhat restricted. 'A' soils have high infiltration potential. (NRCS, 2007).

2.2 GOLF COURSE GRADING

Approximately 170 acres of the site were graded as part of the golf course construction. The approximate limit of the graded area is shown on Figure 7. We were not provided with grading plans for the golf course project. However, examination of the original and existing topography shows that the grading completed in 2000 generally consisted of making excavations in ridge areas to depth of 20 to 30 feet, and placing the excavated material as fills in valley floor areas. The grading altered the existing surface soil conditions identified on Figures 5 and 7, and within the identified grading limits, the surface soil conditions consist of artificially created cuts and fills.

2.3 REGIONAL FAULTING, SEISMICITY, AND RELATED SEISMIC HAZARDS

No active faults are known to pass directly through or near the property, based on the most recent compilations by the California Geological Survey (CGS) (Jennings et al., 2010). Mapping by Graymer (1994) shows the Davis Fault located approximately ¾ mile west of the western project boundary. The Davis Fault is part of the Antioch/Davis Fault Zone and is mapped by the CGS as a Quaternary fault, which is not currently considered to be active by the State of California. An active fault is defined by the State Mining and Geology Board as one that has had surface displacement within Holocene time (about the last 11,000 years) (Bryant and Hart, 2007).

Numerous small earthquakes occur every year in the San Francisco Bay Region and larger earthquakes have been recorded and can be expected to occur in the future. Figure 6 shows the approximate locations of these faults and significant historic earthquakes recorded within the San Francisco Bay Area Region. The most common nearby active faults within 30 miles of the site and their estimated maximum earthquake magnitudes are provided in the following table based on United States Geologic Survey (USGS) 2008 National Seismic Hazard Maps.

TABLE 2.3-1: Nearby Active Faults; Latitude = 37.9284°; Longitude = -121.794°

FAULT NAME	APPROXIMATE DISTANCE (MILES)	DIRECTION FROM SITE	ESTIMATE OF MAXIMUM MAGNITUDE (ELLSWORTH)
Greenville Connected	3.8	West	7.0
Great Valley	6.7	East	6.9
Green Valley Connected	10.9	Northwest	6.8
Mount Diablo Thrust	11.4	South	6.7
Calaveras	14.1	West	7.0
Hayward-Rodgers Creek	22.9	West	7.2

FAULT NAME	APPROXIMATE DISTANCE (MILES)	DIRECTION FROM SITE	ESTIMATE OF MAXIMUM MAGNITUDE (ELLSWORTH)
West Napa	29.5	Northwest	6.7

The United States Geologic Survey evaluated the Bay Area seismicity through a study by the 2014 Working Group on California Earthquake Probabilities (WGCEP) (Field, 2014). The 2014 WGCEP calculated probability of 72 percent for a moment magnitude (M_W) 6.7 or greater earthquake occurring in the San Francisco Region in the next 30 years.

2.3.1 2019 CBC Seismic Design Parameters

To mitigate ground-shaking effects, all structures should be designed using sound engineering judgment and the latest California Building Code (CBC) requirements as a minimum. We provide the 2019 CBC design parameters in Table 2.3.1-1 below, which include design spectral response acceleration parameters based on the mapped Risk-Targeted Maximum Considered Earthquake (MCE) spectral response acceleration parameters. The 2019 CBC utilized criteria set forth in the 2016 ASCE 7-16 Standard. Based on the soil conditions on site, we select a Site Class D for the site soil.

TABLE 2.3.1-1: 2019 CBC Seismic Design Parameters

PARAMETER	DESIGN VALUE
Site Class	D
Mapped MCE_R spectral response accelerations for short periods, S_S (g)	1.669
Mapped MCE_R spectral response accelerations for 1-second periods, S_1 (g)	0.579
Site Coefficient, F_a	1.2
Site Coefficient, F_v	Null*
MCE spectral response accelerations for short periods, S_{MS} (g)	2.003
MCE spectral response accelerations for 1-second periods, S_{M1} (g)	Null*
Design spectral response acceleration at short periods, S_{DS} (g)	1.335
Design spectral response acceleration at 1-second periods, S_{D1} (g)	Null*
Site Coefficient, F_{PGA}	1.2
MCE Geometric Mean Peak Ground Acceleration, PGA_M (g)	0.826
Long period transition-period, T_L	8 sec

*Requires site-specific ground motion hazard analysis per ASCE 7-16 Section 11.4.8

Considering the potential for future low-rise development, we estimate the fundamental periods of the proposed structures to be less than $1.5T_s$ (where T_s is 1.433 seconds for this project). Therefore, the structural engineer may consider exception(s) of Section 11.4.8 of ASCE 7-16 as follows:

> "A ground motion hazard analysis is not required for structures… where, structures on Site Class D sites with S_1 greater than or equal to 0.2, provided the value of the seismic response coefficient C_s is determined by Eq. (12.8-2) of ASCE 7-16 for values of $T \leq 1.5T_S$ and taken as equal to 1.5 times the value computed in accordance with Eq. (12.8-3) of ASCE 7-16 for $1.5T_s < T \leq T_L$."

We recommend that we collaborate with the structural engineer of record to further evaluate the effects of taking the exceptions on the structural design and identify the need for performing a site-specific seismic hazard analysis. We can provide a scope for site-specific seismic hazard analysis and ground motion study separately, if needed.

2.4 ADJACENT FIELD EXPLORATION

In January 2005, ENGEO performed a preliminary geotechnical exploration on the adjacent property to the north. The exploration included the excavation of 17 test pits at locations nearby the project site. As shown on Figure 7, we have included logs of the test pits closest to the site, nine total, in this report as a general indication of site conditions.

Additional exploration would be required to documents subsurface conditions within the golf course. The logs of the test pits are presented in Appendix A.

2.5 EXPANSIVE SOIL

Laboratory testing of material obtained from the adjacent site measured Plasticity Indexes (PI) ranging from 18 to 50. This indicates that the materials at the site are expected to be moderately to highly expansive. Expansive materials shrink and swell as a result of moisture changes. This can cause heaving and cracking of slabs-on-grade, pavements, and structures founded on shallow foundations. Building damage due to volume changes associated with expansive foundation materials and bedrock can be reduced by deepening the foundations to below the zone of moisture fluctuation with deep foundations.

3.0 SUMMARY OF GEOTECHNICAL CONSTRAINTS

Geotechnical constraints at the site are typical of the Antioch area and include seismic ground shaking, possible soil settlement in existing filled valley areas, expansive soils, and surficial landslides on steep slope areas. The site re-use plans are not well defined at this time but may consider creating wetland areas to enhance biological habitats on-site

At the time of report preparation, geotechnical documentation of the 2000 golf course grading was not available, but review of pre-grading topography and existing ground elevations suggests the cuts and fills were generally 20 to 30 feet above or below existing grade, which is consistent with the grading plans At the time the golf course was constructed, projects of this scale would have required grading permits, geotechnical reports, and geotechnical observation and testing during grading and fill placement. As project plans evolve, efforts should be made to obtain documentation for the golf course construction either from previous owners or from City or County representatives. We recommend a project-specific geotechnical report be prepared which includes additional site characterization or review of existing documentation, and provides appropriate recommendations for the proposed second use.

3.1 SURFACE FAULT RUPTURE

The site is not located within a State Earthquake Fault Zone and there are no active faults mapped through or very near to the site. The risk of surface fault rupture is therefore considered to be low.

3.2 SEISMIC SHAKING

There is potential for considerable ground shaking at the project site resulting from an earthquake of moderate to high magnitude generated within the San Francisco Bay Region. This represents a potentially significant impact related to future structures.

As stated above, ground-shaking effects can be mitigated through implementation of CBC requirements and sound engineering judgement as set forth in a project-specific geotechnical exploration report.

3.3 SUBSIDENCE, LIQUEFACTION, AND LOOSE OR COMPRESSIBLE SOILS

As described above, site grading included placing fills in valleys on the site. It is likely that the fills were compacted with geotechnical oversight, but specific documentation was not reviewed for this study. As depicted on Figure 7, valley areas on the site contained deposits of alluvium and colluvium prior to site grading. Therefore, it should be expected that filled valley areas could be subject to long-term settlement from fill compression or consolidation of native soils. Project re-use should consider possible settlement hazards. If settlement-sensitive second uses are considered, filled valley areas should be characterized by a geotechnical exploration. Potential settlement hazards could be mitigated if necessary by remedial grading design of project improvements to accommodate settlement or avoidance.

Previous geotechnical explorations on the adjacent property encountered fine-grained soils that would not be subject to liquefaction. Published liquefaction maps do not identify high levels of liquefaction hazards on the site. We therefore conclude that the risk of liquefaction is low.

3.4 EXPANSIVE ON-SITE SOILS

As discussed above, soil materials at the site are expected to be moderately to critically expansive. The effects of expansive soils can be mitigated by proper design of foundations, pavements, and other improvements based on the recommendations of the geotechnical report.

3.5 LANDSLIDES

Landslide hazards at the site are generally low and confined to localized steep slopes. Landslide hazards should be assessed by a site-specific geotechnical exploration when site re-use plans are more finalized. If necessary, landslide hazards can be mitigated by remedial grading, or avoidance of potential unstable slope areas.

4.0 LIMITATIONS AND UNIFORMITY OF CONDITIONS

This report is issued with the understanding that it is the responsibility of the owner to transmit the information and recommendations of this report to developers, contractors, buyers, architects, engineers and designers for the project so that the necessary steps can be taken by the contractors and subcontractors to carry out such recommendations in the field. The conclusions and recommendations contained in this report are solely professional opinions.

The professional staff of ENGEO Incorporated strives to perform its services in a proper and professional manner with reasonable care and competence but is not infallible. There are risks of earth movement and property damages inherent in land development. We are unable to eliminate all risks; therefore, we are unable to guarantee or warrant the results of our work.

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Date	Flight Line + Frame Number	Scale
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5-15-1957	AV 253-31-9,10, and 11	1:12,000
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FIGURES

BASEMAP SOURCE: ESRI MAPPING SERVICE 2017 AND 2018

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VICINITY MAP
RODDY RANCH GOLF COURSE
ANTIOCH, CALIFORNIA

PROJECT NO. : 17306.000.000		FIGURE NO.
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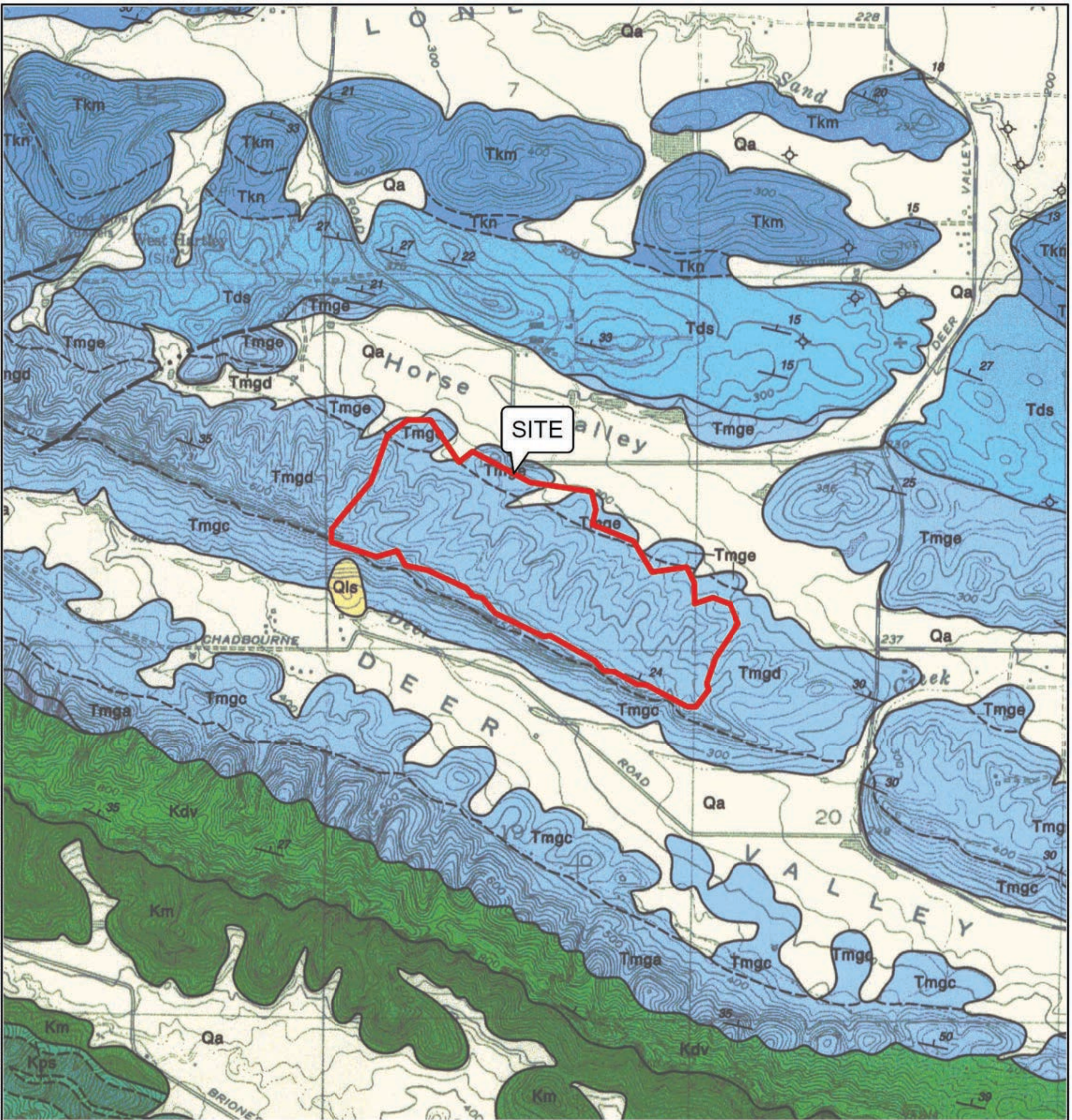

BASEMAP SOURCE: DIBBLEE, 2006

EXPLANATION

ALL LOCATIONS ARE APPROXIMATE

Qls	LANDSLIDE RUBBLE	Tds	DOMENGINE SANDSTONE
Tmge	MEGANOS FORMATION - UPPER	Qa	ALLUVIAL PEBBLE GRAVEL
Tmgd	MEGANOS FORMATION SANDSTONE	Kdv	DEER VALLEY SANDSTONE
Tmgc	MEGANOS FORMATION - SHALE	Km	CLAY SHALE OR CLAYSTONE
Tkn	NORTON SHALE MEMBER	Kps	PANOCHE FORMATION - SANDSTONE

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REGIONAL GEOLOGIC MAP
RODDY RANCH GOLF COURSE
ANTIOCH, CALIFORNIA

PROJECT NO. : 17306.000.000
SCALE: AS SHOWN
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FIGURE NO.
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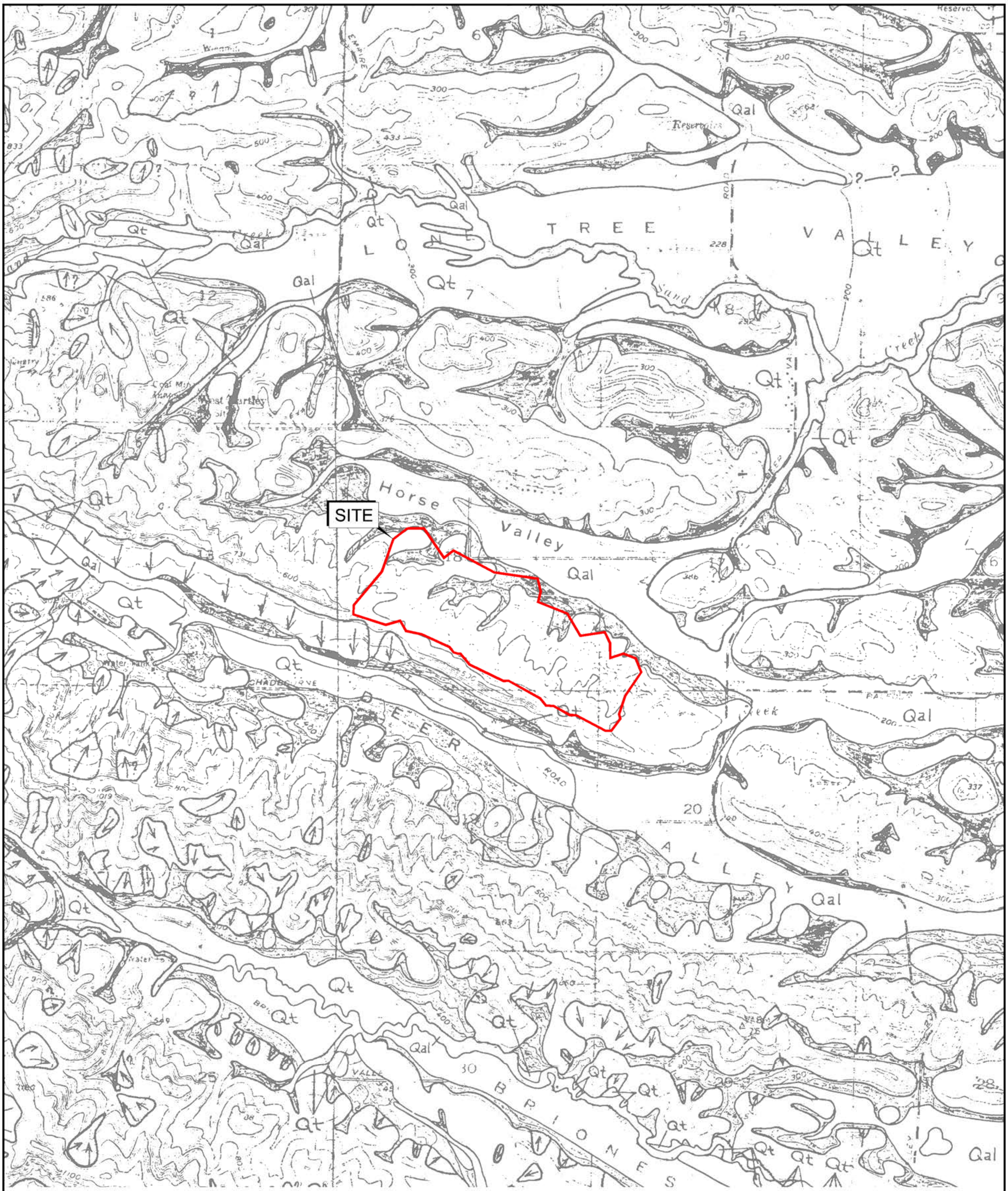

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EXPLANATION

ALL LOCATIONS ARE APPROXIMATE

	LANDSLIDE DEPOSIT. ARROWS INDICATE GENERAL DIRECTION OF DOWNSLOPE MOVEMENT. QUERIED WHERE UNCERTAIN
Qal	ALLUVIAL DEPOSIT
Qt	ALLUVIAL TERRACE DEPOSIT. QUERIED WHERE UNCERTAIN
■	COLLUVIAL DEPOSIT AND/OR SMALL ALLUVIAL FAN DEPOSIT
Qaf	ARTIFICIAL FILL
☐	BEDROCK. QUERIED WHERE IDENTIFICATION UNCERTAIN
⚒	QUARRY OR GRAVEL PIT

BASE MAP SOURCE: NILSEN, 1975

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REGIONAL LANDSLIDE MAP
RODDY RANCH GOLF COURSE
ANTIOCH, CALIFORNIA

PROJECT NO.: 17306.000.000
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FIGURE NO.
3

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EXPLANATION

ALL LOCATIONS ARE APPROXIMATE

🟦 **EARTHQUAKE-INDUCED LANDSLIDE ZONES**
AREAS WHERE PREVIOUS OCCURENCE OF LANDSLIDE MOVEMENT, OR LOCAL TOPOGRAPHIC, GEOLOGICAL, GEOTECHNICAL AND SUBSURFACE WATER CONDITIONS INDICATE A POTENTIAL FOR PERMANENT GROUND DISPLACEMENTS SUCH THAT MITIGATION AS DEFINED IN PUBLIC RESOURCES CODE SECTION 2693(C) WOULD BE REQUIRED.

🟩 **LIQUEFACTION ZONE**
AREAS WHERE HISTORICAL OCCURENCE OF LIQUEFACTION, OR LOCAL GEOLOGICAL, GEOTEHNICAL AND GROUND WATER CONDITIONS INDICATE A POTENTIAL L FOR PERMANENT GROUND DISPLACEMENTS SUCH THAT MITIGATION AS DEFINED IN PUBLIC RESOURCES CODE SECTION 2693(C) WOULD BE REQUIRED

BASEMAP SOURCE: ESRI MAPPING SERVICE
CALIFORNIA DEPARTMENT OF CONSERVATION, CALIFORNIA GEOLOGICAL SURVEY

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SEISMIC HAZARDS ZONE MAP
RODDY RANCH GOLF COURSE
ANTIOCH, CALIFORNIA

PROJECT NO. : 17306.000.000
SCALE: AS SHOWN
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FIGURE NO.
4

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LAYOUT: SEISMIC HAZARD USER: JVERGARA

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EXPLANATION

ALL LOCATIONS ARE APPROXIMATE

— — SOIL LINE

SOIL TYPES

AbD	ALTAMONT CLAY, 9-15% SLOPES, MLRA 15, CLASS C SOIL
BdE	BRIONES LOAMY SAND, 5-30% SLOPES, CLASS A SOIL
RbA	RINCON CLAY LOAM, 0-2% SLOPES MLRA 14, CLASS C SOIL
RbC	RINCON CLAY LOAM, 2-9% SLOPES MLRA 14, CLASS C SOIL

BASE MAP SOURCE: GOOGLE EARTH MAPPING SERVICE (2020)

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SOIL MAP
RODDY RANCH GOLF COURSE
ANTIOCH, CALIFORNIA

PROJECT NO.: 17306.000.000
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FIGURE NO.
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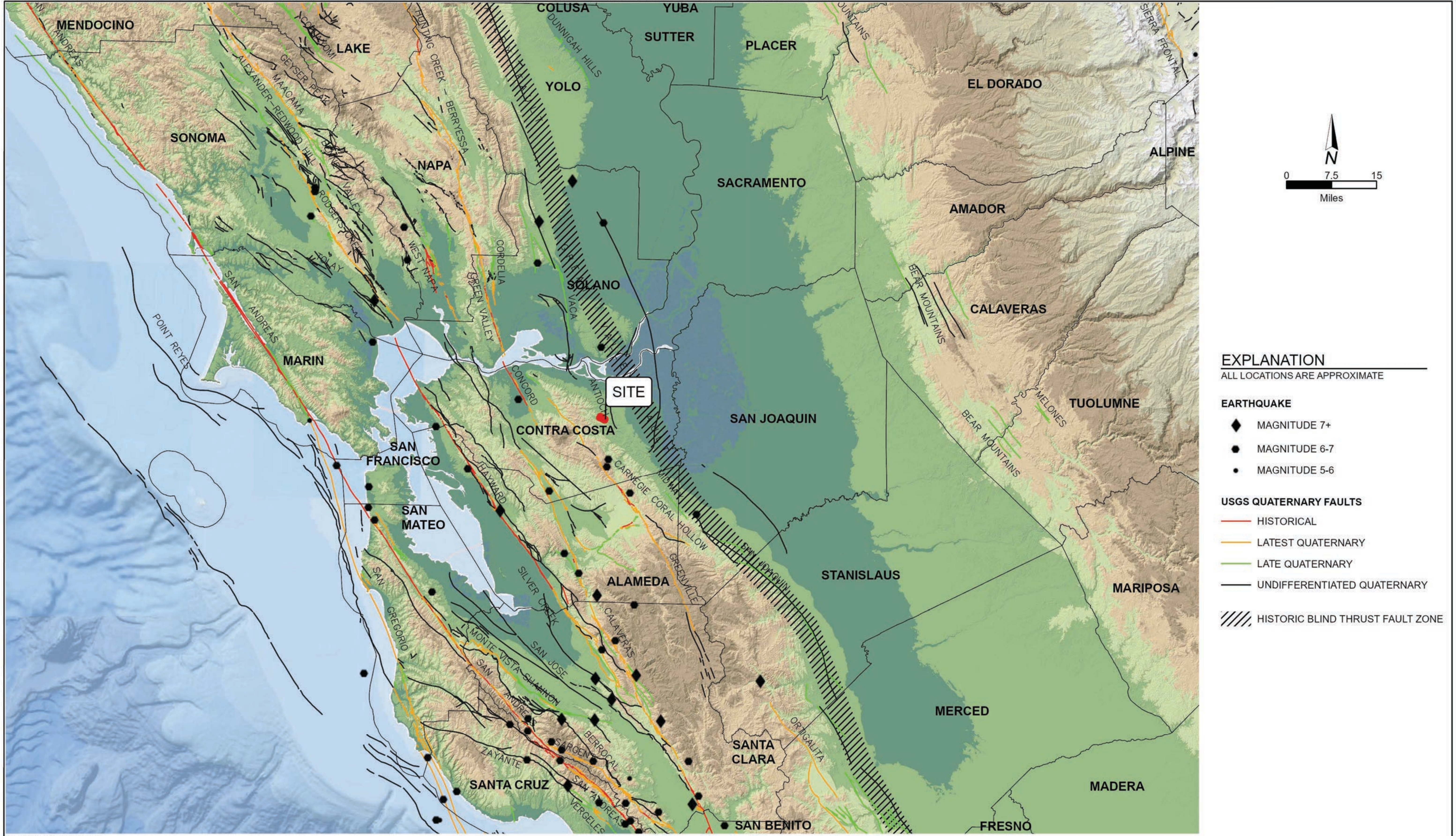

BASE MAP SOURCE
ESRI, GARMIN, GEBCO, NOAA NGDC, AND OTHER CONTRIBUTORS
COLOR HILLSHADE IMAGE BASED ON THE NATIONAL ELEVATION DATA SET (NED) AT 30 METER RESOLUTION
U.S.G.S. QUATERNARY FAULT DATABASE, 2018
U.S.G.S. HISTORIC EARTHQUAKE DATABASE (1800-PRESENT)

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REGIONAL FAULTING AND SEISMICITY
RODDY RANCH GOLF COURSE
ANTIOCH, CALIFORNIA

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FIGURE NO. 6

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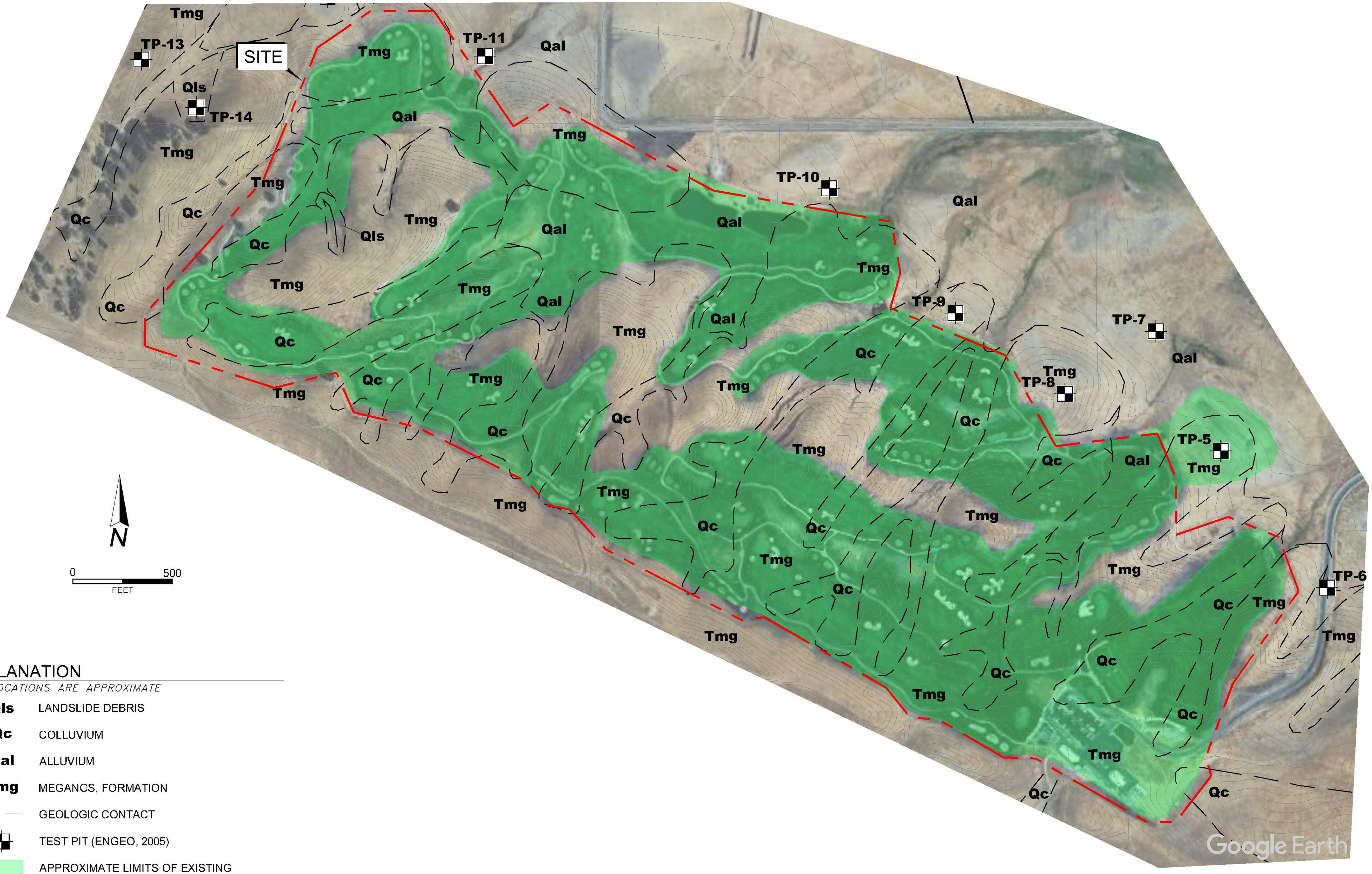


EXPLANATION

ALL LOCATIONS ARE APPROXIMATE

Qls	LANDSLIDE DEBRIS
Qc	COLLUVIUM
Qal	ALLUVIUM
Tmg	MEGANOS, FORMATION
— —	GEOLOGIC CONTACT
TP-14 ▣	TEST PIT (ENGEO, 2005)
🟩	APPROXIMATE LIMITS OF EXISTING GRADED AREAS

BASE MAP SOURCE: GOOGLE EARTH MAPPING SERVICE

ENGEO
Expect Excellence

SITE GEOLOGIC MAP
RODDY RANCH GOLF COURSE
ANTIOCH, CALIFORNIA

PROJECT NO.: 17306.000.000
SCALE: AS SHOWN
DRAWN BY: JV
CHECKED BY: PJS
FIGURE NO.
7

ORIGINAL FIGURE PRINTED IN COLOR

APPENDIX A

TEST PIT LOGS

TEST PIT LOGS

Test Pit Number	Depth (Feet)	Description
TP-5	0 – 0.5	Silty CLAY (CL), dark brown, moist to wet, disturbed (disked), some organics.
	0.5 - 2.5	Interbedded SILTSTONE with clay, light brown and orange, moist, very closely fractured, weathered, friable, $CaCO_3$ filaments, trace rootlets.
	2.5 - 6	Interbedded SILTSTONE, olive gray, closely to very closely fractured, highly weathered, friable, with iron oxide staining.
		Bottom of test pit at approximately 6 feet. No free groundwater encountered.
TP-6	0 – 1	Silty CLAY (CL), dark brown, soft, wet, highly compressible disturbed (disked), some organics.
	1 – 9	Silty CLAY (CL), red-brown, soft to medium stiff, wet.
	9 - 13	SILTSTONE, olive, closely fractured, completely weathered, friable, with iron oxide staining throughout.
		Test pit too unstable to enter.
		Bottom of test pit at approximately 13 feet. Groundwater encountered at approximately 9 feet.
TP-7	0 – 1	Silty CLAY (CL), gray-brown, soft, wet, highly compressible, disturbed (disked), some organics.
	1 – 2	Silty CLAY (CL), gray-brown, soft, wet, highly compressible, some organics.
	2 – 4.5	Silty CLAY (CL), light brown, stiff, moist, some poor blocky soil structure.
	4.5 – 18	SILT with clay (ML), yellow-brown, very stiff to hard, moist, some fine-medium grained sand, silt and sand increase with depth.
	18 - 19	SILTSTONE, olive gray, moist to wet, very closely fractured, completely weathered, friable.
		Bottom of test pit at approximately 19 feet. Groundwater encountered at approximately 10 feet.

TEST PIT LOGS

Test Pit Number	Depth (Feet)	Description
TP-8	0 -1	Silty CLAY (CL), brown, soft, wet, disturbed (disked), some organics.
	1 – 3	Silty CLAY (CL), brown, medium stiff, moist, some fine-medium grained sand, trace poor blocky soil structure.
	3 – 6	SILTSTONE with clay, olive mottled orange (FeO), moist, very closely fractured, completely weathered, friable.
	6 - 8.5	Interbedded SILTSTONE, olive-gray alternating orange-brown, closely fractured, highly weathered, friable, trace fine grained sand in orange-brown layers, some clay in olive-gray layer, $CaCO_3$ in upper section.
		Bedding N35W33NE
		Bottom of test pit at approximately 8.5 feet. No free groundwater encountered.
TP-9	0 – 1	Silty CLAY (CL), olive brown, soft, wet, highly compressible, disturbed (disked), some organics.
	1– 3	Silty CLAY (CL), olive-brown, medium stiff, dry to moist, poor to moderate blocky soil structure, some angular siltstone clasts at bottom.
	3 – 4.5	SILTSTONE with clay, olive mottled orange (FeO), moist, some $CaCO_3$, very closely fractured, completely weathered, friable.
	4.5 – 9	Interbedded SILTSTONE, orange-brown and olive gray, closely fractured, highly weathered, friable, trace fine grained sand in orange-brown layers, some clay in olive-gray layer, $CaCO_3$ in upper section.
		Bedding N15W18NE
		Bottom of test pit at approximately 9 feet. No free groundwater encountered.

TEST PIT LOGS

Test Pit Number	Depth (Feet)	Description
TP-10	0 – 1	Silty CLAY (CL), red-brown, soft, wet, highly compressible, disturbed (disked), some organics.
	1 – 17	Silty CLAY with SAND (CL), red-brown, medium stiff to stiff, moist. PI = 18 Water soluble sulfate in soil = 191 mg/kg
	17 – 20	Silty CLAY (CL), yellow-brown, medium stiff to stiff, saturated, trace fine grained sand.
	20	Clayey SILTSTONE, olive-gray, wet, very closely fractured, completely weathered, friable, very little structure preserved.
		Bedrock encountered at 20 feet.
		Bottom of test pit at approximately 20 feet. Groundwater encountered at approximately 11.5 feet
TP-11	0 – 1	Silty CLAY (CL), brown, soft, wet, highly compressible, disturbed (disked), some organics.
	1 – 20	Silty CLAY (CL), red-brown, medium stiff, moist, trace fine-grained sand, trace rootlets.
		Grades to a SILT with Clay (ML), at 16 feet.
		Bottom of test pit at approximately 20 feet. Groundwater encountered at approximately 10 feet

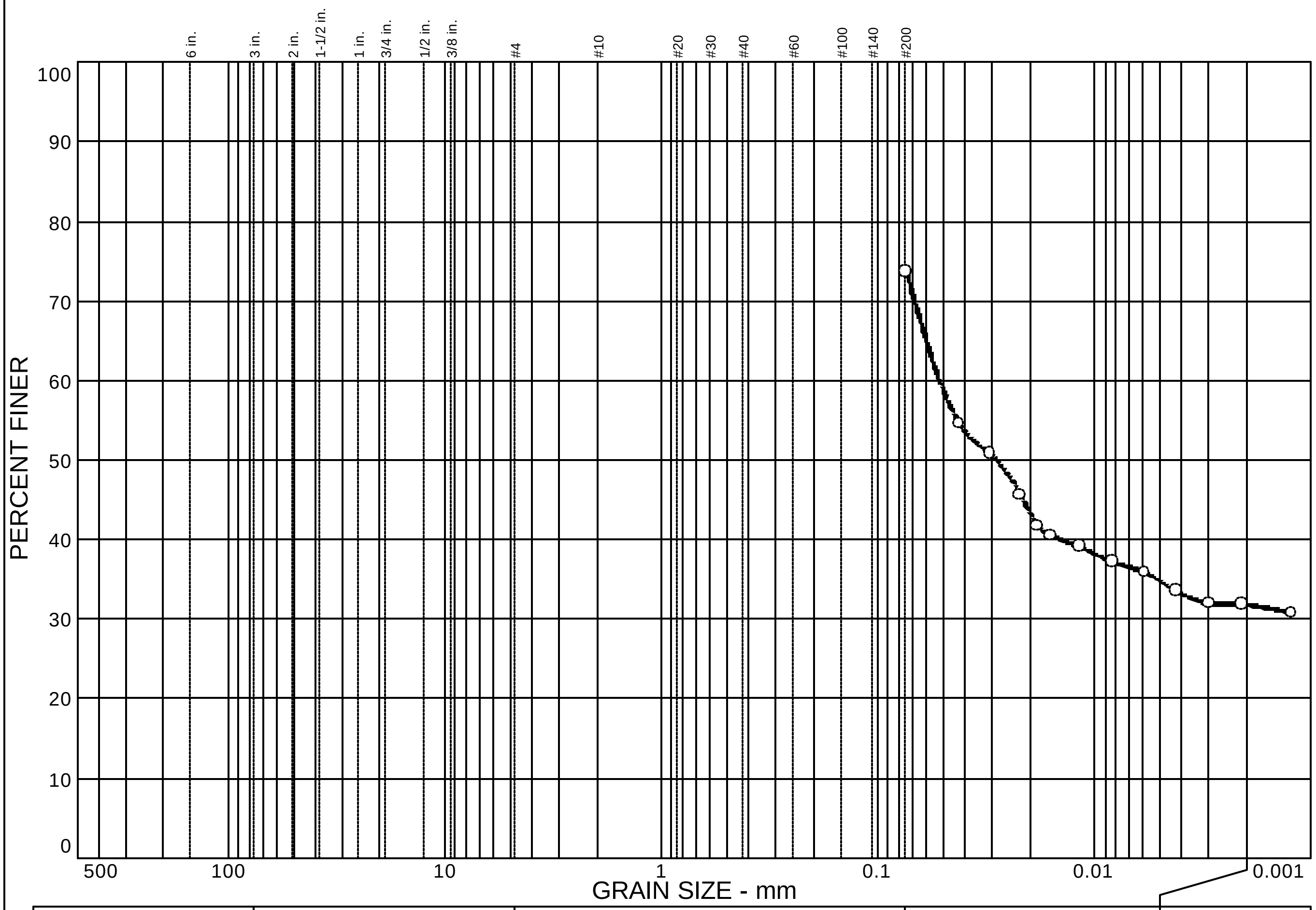
TEST PIT LOGS

Test Pit Number	Depth (Feet)	Description
TP-13	0 – 1	Silty CLAY to clayey SILT (CL-ML), light brown, soft, wet, disturbed (disked), some organics.
	1 – 4	Interbedded SILTSTONE, gray and tan, dry, very closely fractured, highly weathered, friable, trace FeO staining, trace $CaCO_3$, trace red siltstone concretions (<3” diameter).
	4 – 9	Becomes weak. Bedding N85W32N Bottom of test pit at approximately 9 feet. No free groundwater encountered.
TP-14	1 – 1.5	Silty CLAY to clayey SILT (CL – ML), red-brown, soft, moist, poor blocky soil structure continuous, trace organics.
	1.5 – 7.5	Becomes stiff to very stiff.
	7.5 - 12	Interbedded SILTSTONE, brown and olive brown, very closely fractured, highly weathered, friable. Bottom of test pit at approximately 12 feet. No free groundwater encountered.

APPENDIX B

LABORATORY TEST DATA

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
			41.9	31.8

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#200	73.7		

* (no specification provided)

Soil Description

Very dark brown silty CLAY with sand.

Atterberg Limits

PL= 14 LL= 32 PI= 18

Coefficients

D_{85}= D_{60}= 0.0524 D_{50}= 0.0285
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO=

Remarks

Sample No.: TP10 @ 2' **Source of Sample:** **Date:** 01/03/06
Location: **Elev./Depth:** 2.0 feet

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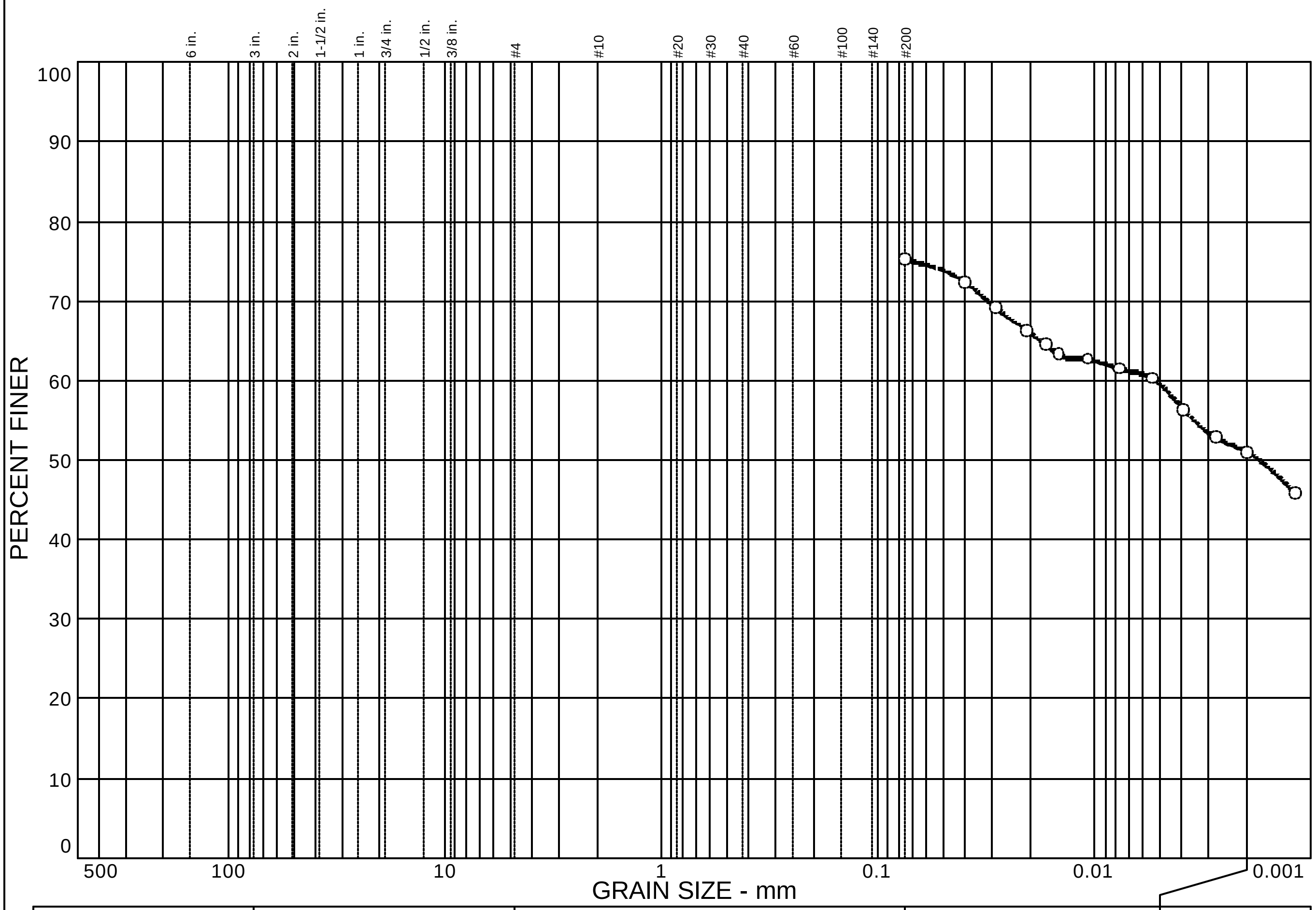
MATERIALS TESTING

Client:
Project: Roddy Ranch @ Hiddenbrooke

Project No: 7044.1.001.01

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
			24.1	51.0

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#200	75.1		

* (no specification provided)

Soil Description

Dark grayish brown silty CLAY with sand.

Atterberg Limits

PL= 14 LL= 40 PI= 26

Coefficients

D_{85}= D_{60}= 0.0053 D_{50}= 0.0017
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO=

Remarks

Sample No.: TP16 @ 2' **Source of Sample:** **Date:** 01/03/06
Location: **Elev./Depth:** 2.0 feet

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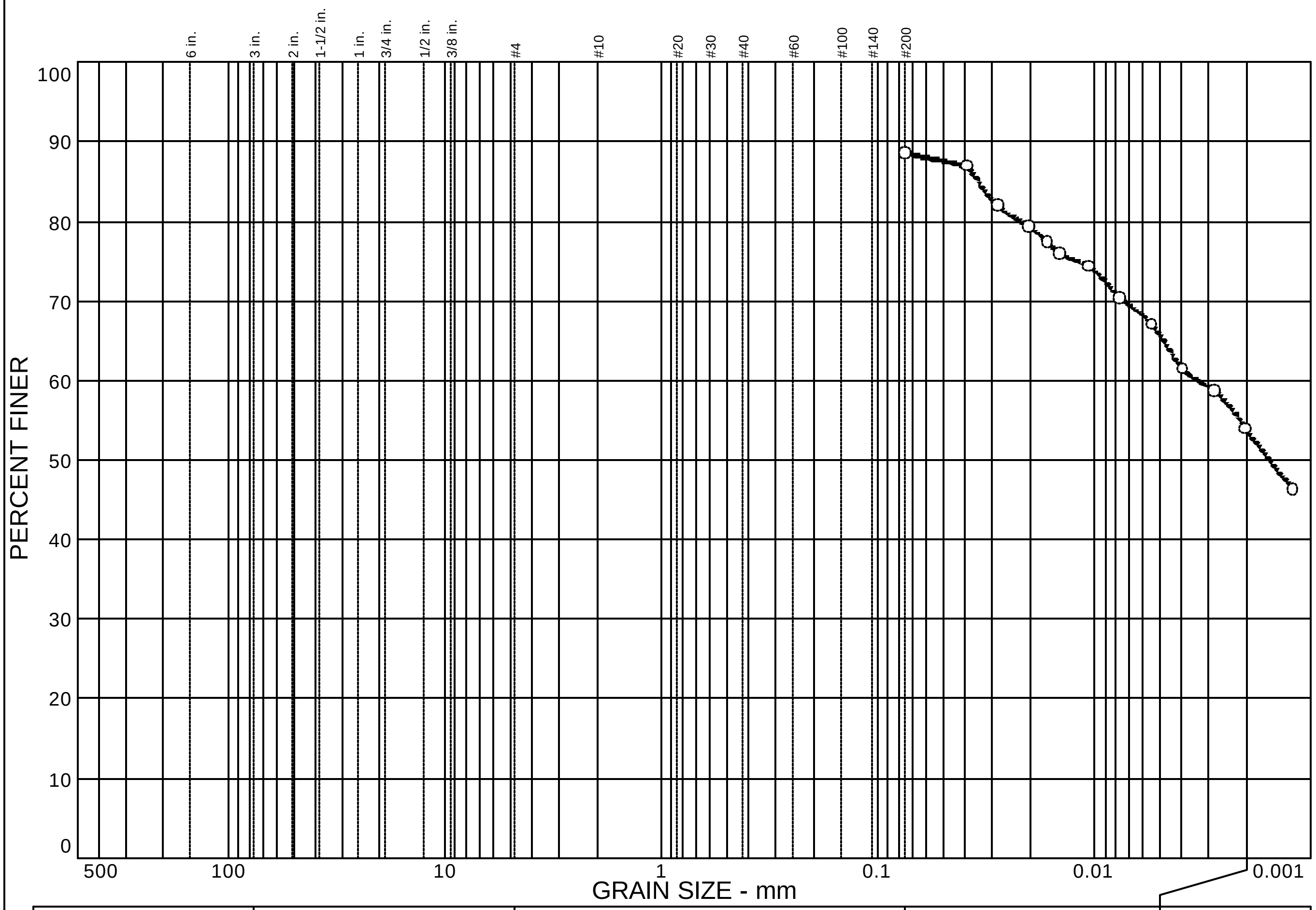
ENVIRONMENTAL CONSULTANTS
MATERIALS TESTING

Client:
Project: Roddy Ranch @ Hiddenbrooke

Project No: 7044.1.001.01

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
			34.7	53.9

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#200	88.6		

* (no specification provided)

Soil Description

Very dark grayish brown CLAY with claystone fragments and some sand.

Atterberg Limits

PL= 20 LL= 70 PI= 50

Coefficients

D_{85}= 0.0346 D_{60}= 0.0034 D_{50}= 0.0016
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CH AASHTO=

Remarks

Sample No.: TP16 @ 6' **Source of Sample:** **Date:** 01/03/06
Location: **Elev./Depth:** 6.0 feet

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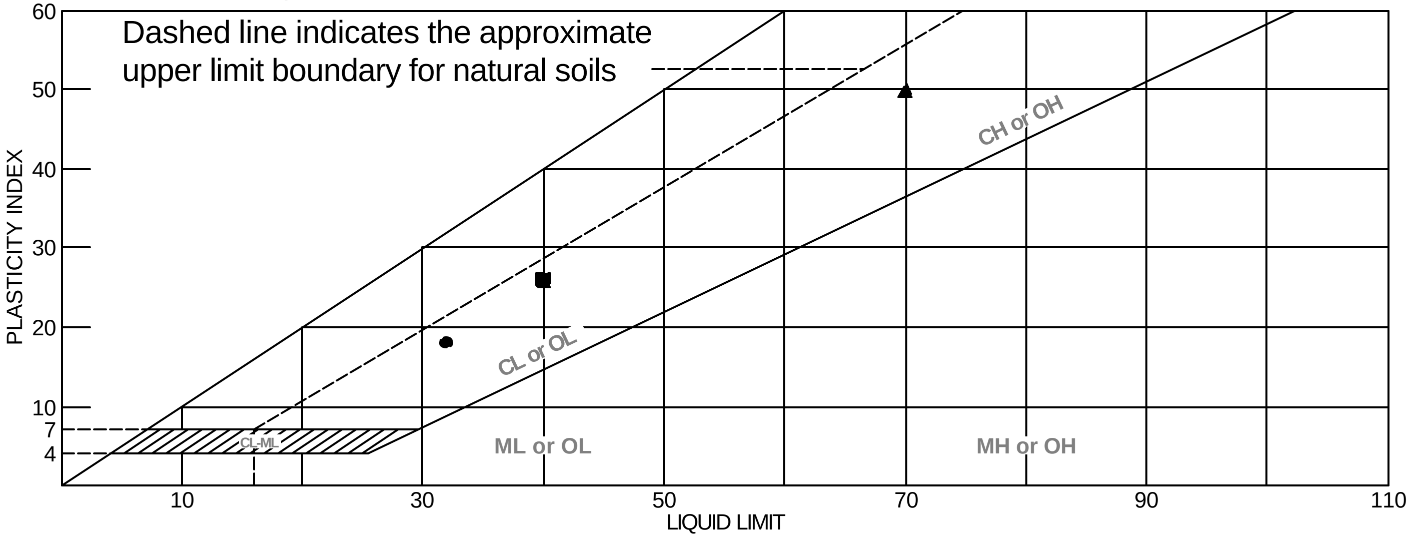
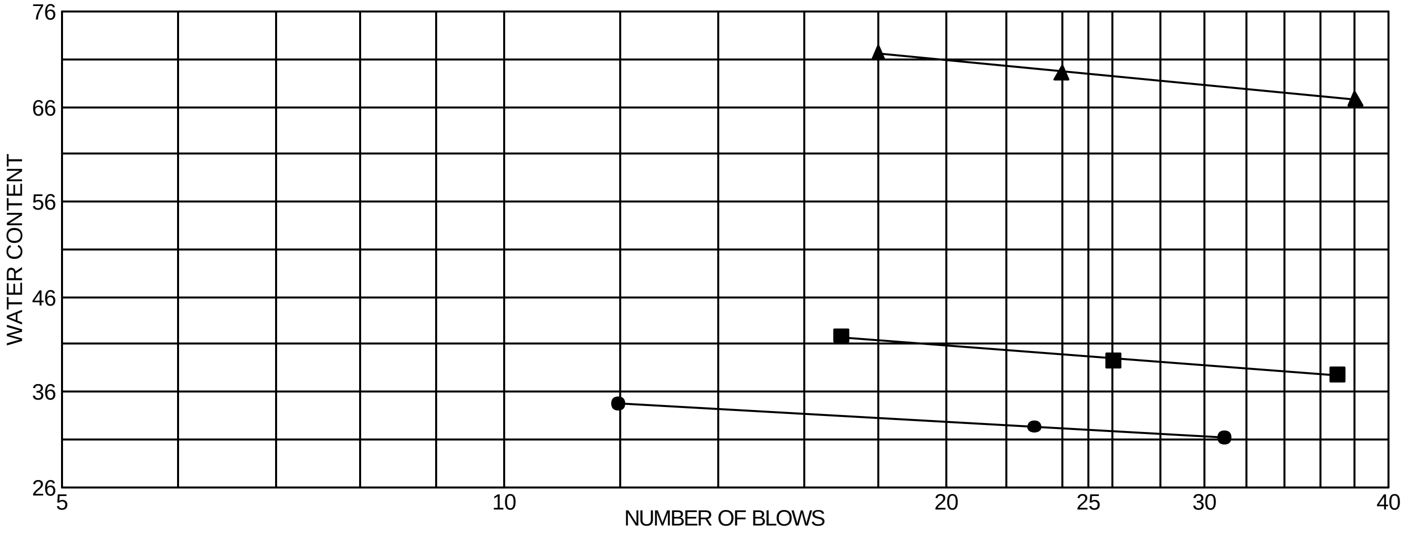
MATERIALS TESTING

Client:
Project: Roddy Ranch @ Hiddenbrooke

Project No: 7044.1.001.01

LIQUID AND PLASTIC LIMITS TEST REPORT





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Very dark brown silty CLAY with sand.	32	14	18		73.7	CL
■	Dark grayish brown silty CLAY with sand.	40	14	26		75.1	CL
▲	Very dark grayish brown CLAY with claystone fragments and some sand.	70	20	50		88.6	CH

Project No. 7044.1.001.01 **Client:**

Project: Roddy Ranch @ Hiddenbrooke

● **Source:** **Sample No.:** TP10 @ 2'

■ **Source:** **Sample No.:** TP16 @ 2'

▲ **Source:** **Sample No.:** TP16 @ 6'

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MATERIALS TESTING

Remarks:
- ● TP10 @ 2.0 feet
- ■ TP16 @ 2.0 feet
- ▲ TP16 @ 6.0 feet

EN GEO Incorporated

SULFATE TEST RESULTS

CALTRANS Test Method 417

Project Name: Roddy Ranch

Project Number: 7044.1.001.01

Tested By: GC

Date: January 3, 2006

Measurements less than 15 mg/kg are reported as Not Detectable (ND)

Sample Number	Sample Location	Matrix	Water Soluble Sulfate (SO_4) in Soil	
			mg/kg	% by Weight
1	TP10 @ 2'	soil	191	0.019
2	TP16 @2'	soil	270	0.027
3	TP16 @ 6'	soil	210	0.021

2

CLAASSEN, V. 2021. PRELIMINARY ASSESSMENT OF EXISTING AND DISTURBED SOILS AT RODDY RANCH AS POTENTIAL REVEGETATION SUBSTRATES.

February 16, 2021

Preliminary assessment of existing and disturbed soils at Roddy Ranch as potential revegetation substrates.

Vic Claassen, soil scientist vpclaassen@gmail.com 530-902-4622

Section 1. Preliminary soil assessment of general site.

Summary

Existing soils at Roddy Ranch have adequate chemical and fertility characteristics to grow annual grasses for an open-space management objective. Erosion is a risk on the upland Briones soils because they are single grain sands and because soil depths in some areas have been reduced by grading and compaction during use as a golf course. If summer active forbs are desired for nectary plantings, these should probably be restricted to lower landforms or fill areas and to Altamont and Rincon soils.

Negative effects of coarse sand lenses from the sand traps can be ameliorated by spreading the sand out over the adjacent berms that were sculpted during golf course development. Then, as the mounds are pushed back into the sand trap basins, the sand will mix into the soils, dispersing thick buried layers.

Altamont and Rincon soils on the lower reaches of the site have high clay and could be compacted to reduce percolation losses and retain water for wetland features. On slopes of the low hills above the wetland areas, these soils will need to provide moderate to deep rooting. They should not be worked when wet and may need to be ripped if they have been compacted by previous construction or grading.

Introduction

The site was previously developed as a golf course but is now being evaluated for use as open-space with naturalized annual grasses and forbs or potential wetland habitat. During development as a golf course, numerous areas were sculpted into localized mounds and sand-filled depressions. Areas of natural-appearing landforms remain (non-graded areas), but shallow surface grading is extensive, especially along the numerous paved paths. Soil disturbance is of concern for the effect it has on degrading weak soil aggregation, leading to low soil infiltration and surface erosion. Areas that were 'improved' as golf greens have more gentle topography than the mounds and sand traps, but these soils have been heavily amended with sand and fibrous organic materials (peat or compost materials). Localized drainage basins and drain pipe have been installed, further altering natural soil hydrology. These grading and amendment impacts, along with the naturally occurring environmental conditions that influence plant growth are evaluated for their influences on growth of an annual grass cover or for potential wetlands sites.

Soils were sampled on July 16, 2020 as a set of 0 to 6 inch horizon samples with the surface plant litter and duff removed. These were composites of five local soils from with a 30 ft area. Two samples were gathered from what appeared to be undisturbed Briones and Altamont soils and two were taken from adjacent constructed putting greens. Soils were sieved to < 2 mm and submitted for chemical and fertility analysis at a commercial soil testing lab. Two samples were also taken from sand traps for particle size analysis.

The soil resources and growth potential for annual grasses are evaluated below from the perspective of geology and landform, soil hydrology, soil chemistry and fertility. Finally, recommendations are listed for practical treatments for re-naturalization.

Geology and landform

The site is on a north-northeast facing ridge of soft sandstone that slopes down from a ridge on the south-west side of the project area to a series of low hills and toe slopes on the north-northeast side. Soils on the higher sandstone areas are mapped (Contra Costa soil survey, 1977) as Briones loamy sand (mapping unit BdE, Figure 1, Google Earth). A narrow area along the north boundary of the project is underlain by shale and soft, fine-grained sandstones. Soils at these low hill and toe slope positions are mapped as Altamont clay (AbD) on the lower smooth rolling hills or Rincon clay loam (RbC) soils in small drainageways. The lowest landforms are benches on alluvial fill above local drainages (Horse Creek) and are mapped as Rincon clay loam (RbC) (Figure 1. Soils of Roddy Ranch).

Figure 1. Soils of Roddy Ranch (Google Earth image from 10/30/2015).

Soil hydrology

Uplands:

The Briones loamy sand soil is mapped as having medium to rapid runoff (Soil Survey of Contra Costa county, California, 1977). The surface soil itself has rapid permeability, but the underlying soft sandstone has slow permeability. If heavy or extended rains saturate the surface soil horizons, the low infiltration rate into the sandstone generates a moderate to high erosion potential. Areas of Briones soil that have been graded off and have even shallower depths to the underlying sandstone will more rapidly saturate and sheet excess rainfall overland as surface flows. This type of outcome is shown in Figure 2 for this soil type and more locally in Figures 3 and 4. These figures are a matched pair of images from 1993 (prior to construction) and from 2003 (after regrading). Accelerated gully erosion is visible at several drainage locations from 2003. Some local gullies may in fact exist in the low resolution image from 1993, but they seem to be smaller and partially recovered by regrowth of grasses.

The Briones soil has weak to no soil aggregation. Several of the horizons have single grain sands, which are very susceptible to surface erosion. Infiltration is rated as low through the underlying sandstone. The high sand content also means low levels of plant-available moisture. The soil depth above the sandstone will determine the density of plant growth on this soil. Plant available moisture is listed at 7 to 10 % by volume. Rooting depth varies from 20 to 40 inches. Plant available moisture is listed as 1.5 to 4.5 inches. This is low, but suited to annual grass growth which occurs in the wetter late winter and spring.

Lower hills and drainages along north boundary:
The Altamont clay occurs on lower hills and toe slopes. This soil has medium to very high runoff. These are expansive clays, meaning they swell shut with winter rains and crack open several feet deep in summer drought. Permeability is slow after the soils have re-wetted and cracks have swelled shut. Altamont soils have high clay content (35-60 %). Rooting depth is listed at 40 to 60 inches. Available moisture is indicated to be 16-18%, or approximately 6.5 to 10 inches of plant-available moisture. These soils are strongly expansive, with cracks that open from the surface to several feet deep when dry. When wetted, they have low permeability, listed at between 0.06 and 0.20 inches of infiltration per hour. The low infiltration rates mean medium to very high runoff, depending on antecedent moisture content and crack closure. But because of the high clay and well aggregated soil structure, erosion and sediment production is slight to moderate.

Small areas of Altamont soils are mapped southeast of the two ponds and between the ponds and WQ basin 5. Remaining areas are smaller still or are likely to have been graded for the paved paths. A larger area of approximately 20 acres of Altamont soils exists in the northwest corner of the project, west of the Empire Mine corner. Still, about half of this has been disturbed by grading during golf course construction. This soil is strongly structured, so mixing or removal of various horizons will influence plant establishment growth, as described later.

The Rincon clay loam occurs in low drainages at the north boundary of the property. This soil is rated as having medium runoff but only a slight susceptibility to erosion since soils are less than 9 % in this mapping unit. These soils are mapped as having over 60 inches of rooting depth and available moisture 9 to 10 inches.

Although the Rincon clay loam is mapped within the project area, only three locations occur. The east two locations have both been disturbed (excavated, graded) for a lake near WQ basin 2 and the central one near WQ basin 3. It is unlikely that a natural soil profile remains at these sites. Subsurface horizons may be exposed. If so, these would be sandy clay loam and clay loam textures. Linear Extensibility is about 7.5 % from 18 to 48 inches depth and 5.8 % above and below this band. This is in contrast to Altamont soils with 10 % Linear Extensibility in the surface foot. Cracking will be more strongly expressed in Altamont than Rincon soils. If worked wet and compacted, these soils will have very low infiltration rates after they have re-wetted.

The third location of Rincon soil is in a band under and approximately 125 ft south of the west pond near the corner of Empire Mine Rd and then extending approximately 600 ft WSW. This area is nearly all included within areas marked within the ‘limit of grading.’ Therefore, the surface horizonation of this area is not known. These soils naturally have strong aggregation (blocky or prismatic) so some soil structure should survive grading and allow rooting, although permeability is listed as low. These soils should not be moved or graded when moist or wet as they will compact densely.

Figure 3.—**Erosion in this area of unprotected Briones soils during construction contributes to sedimentation of the streams and reservoir downslope.**

Figure 2. Historical example of erosion on disturbed Briones soils. Contra Costa Soil Survey, 1977. pg 14.

Mechanical excavation or grading of Altamont or Rincon soils when they are wet is likely to create compaction that dries to hard, unrootable clods. These soils should only be excavated or graded when dry. The soil series description notes that permeability is slow when cracks swell shut. On upland sites that require deeper rooting for moisture acquisition, it will be important to not compact the residual aggregate structure when reworking these soils.

Conversely, intentional compaction to reduce infiltration may be desired to retain standing water on low lying catchment areas intended for wetlands. Vernal Pools are reported on Altamont soils in Southern California (Bauder et al, 2011, pg 25). They list the pools as having a low permeability layer (0.06-0.20 inch/hr) between 0 and 36 inches deep, which matches the soils mapped at the Roddy Ranch project site. Local sites should be individually evaluated because sandy overlays from up-slope erosion was observed over the mapped clayey soils during initial assessment. These substrates will not hold water.

Comparison images of the central portion of the golf course to contrast erosion after grading impacts.

Figure 3. Overhead view of golf course soon after construction showing multiple gullies from increased runoff following grading and soil impacts. Image date: 12/13/2003.

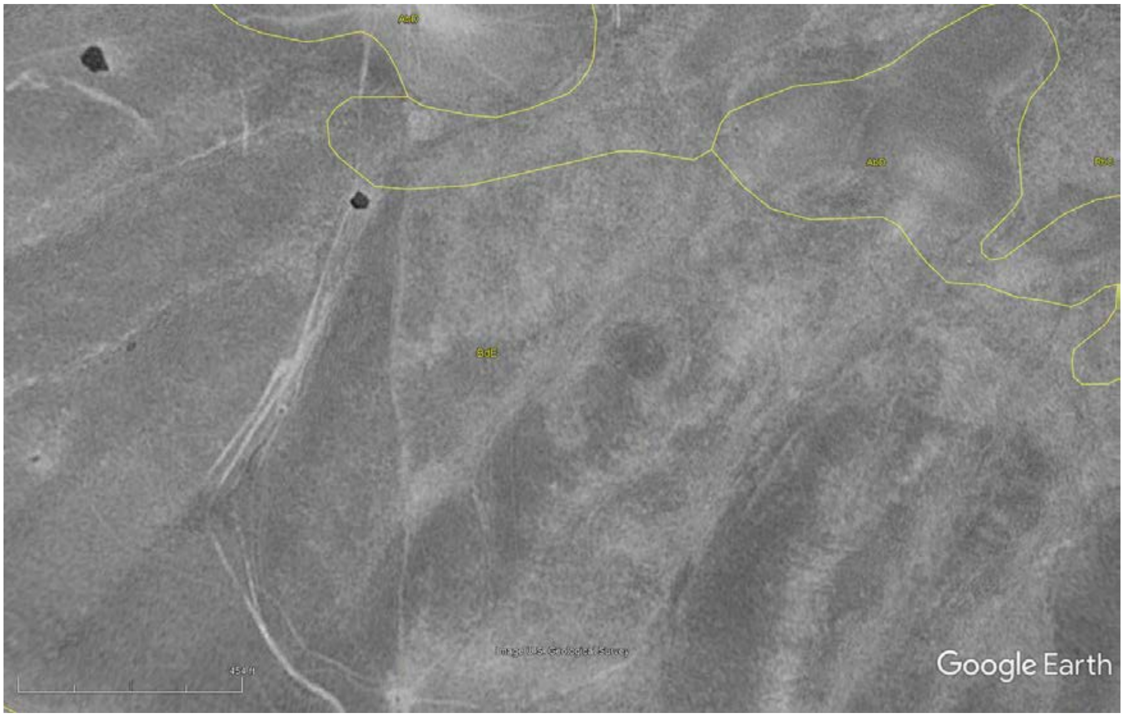

Figure 4. Overhead view of same site as Figure 3 but before golf course grading and construction. Gullies are smaller or have grassed over. Image date: 6/11/1993.

Soil soil chemical and fertility characteristics

Comparison of relatively undisturbed Briones or Altamont soils to soils taken from nearby constructed greens suggests that soil chemical and fertility conditions are little altered from the pre-existing soils and are generally adequate for annual grass growth. Soil acidity is generally moderate to neutral (pH 6.0 to 6.9). The more acid soils are in topsoil positions but are not limiting to plant growth. Buffer pH indicates that soils will readily be neutralized, if needed. The Briones loamy sand samples have about half the cation exchange capacity (CEC) so their ability to ionically attract and retain cation nutrients is low. Salt (EC) levels are low and acceptable in all samples. Soil textures are loams and sands on the Briones mapped unit, and clay loam on the Altamont soil. Greens have elevated sand content, which I assume was added for drainage. Greens have far less clay than their reference topsoils. Organic matter was observed to be fibrous and peat-like. Soil organic matter (OM) varied between sites and was also visually heterogeneous, with variable amounts of the fibrous material rather than typical organic matter from local plant litter.

Soil fertility was generally adequate for annual grass growth. Organic matter was at least adequate, which promotes aggregation and continued, slow nutrient release. Samples with high fibrous organic (peat) content are not expected to have nitrogen draw-down from high rates of decomposition because the peat is fairly slowly decomposable. Therefore the estimated nitrogen release (a metric calibrated for agricultural soils) is probably not a good indicator in samples with high OM content due to the effects of residual peat fibers. The slight to moderate levels of acidity would be expected to reduce phosphorus (P) availability, but the indicated values are adequate for wildlands plant growth. Major nutrient cations (K, Mg, Ca) are all adequate for continued growth and relative proportion of the CEC sites.

Nitrate levels are higher than typical range land values. This is not a toxic condition, but would contribute to fast growth of annual weeds. Whether this results from extensive fertilization while the soil was managed as a golf course or whether this is an effect of atmospheric nitrogen deposition from heavy traffic in the Bay Area is not known (Fenn et al., 2010). This is not a growth limiting issue as much as an unintended input that contributes to rapid growth of ruderal weed species. Sulfur levels are not growth limiting. Micro-nutrients are all adequate for wildlands plant growth.

In general, while these soils have physical limitations for plant growth, they do not have fertility or chemical limitations for wildlands plant growth, especially for naturalized annual grasses. Some level of weed control or thatch removal may be necessary for fire control or to establish forbs within the grass sward.

Table 1. Soil chemical and fertility comparisions of relatively undisturbed soils and constructed greens.

Roddy Ranch soil samples			Report #	20-213-034														
sample	sample	notes	OM	ENR	P1	HCO3_P	pH	buf	CEC	K	Mg	Ca	Na	K	Mg	Ca	Na	Ca:Mg
code	pit name		%	lb/ac	ppm	ppm		pH	cmol/kg	ppm	ppm	ppm	ppm	%	%	%	%	olar ratio
RBRNT	Briones topsoil		3.0	89.4	8.9	7.2	6.0	6.8	9.8	272.4	270.2	1035.0	63.0	7.1	22.6	52.5	2.8	2.3
RBRGR	Briones green substr		1.8	66.2	25.0	12.0	6.6		5.0	52.4	150.3	647.8	12.6	2.7	24.9	65.2	1.1	2.6
RALNT	Altamont topsoil		3.3	95.8	13.2	11.3	6.0	6.7	15.7	252.8	487.9	1728.0	20.9	4.1	25.5	54.8	0.6	2.1
RALGR	Altamont green		19.3	416.6	38.7	36.2	6.9		25.4	487.3	671.8	3573.0	96.4	4.9	21.8	70.2	1.7	3.2
RBWET	Briones wetland (pla		6.8	165.8	21.6	21.0	6.7		17.2	323.7	564.8	2092.0	120.7	4.8	27.0	60.7	3.1	2.2
	average all		6.8	166.8	21.5	17.5	6.4	6.8	14.6	277.7	429.0	1815.2	62.7	4.7	24.4	60.7	1.9	2.5
			variable		adeq	adeq	adeq	adeq	Brion low	adeq	adeq	adeq	adeq	adeq		adeq	adeq	adeq
sample	sample	notes	NO3	S	Zn	Mn	Fe	Cu	B	ex lime	EC	sand	silt	clay	texture			
code	pit name		ppm	ppm	ppm	ppm	ppm	ppm	ppm		dS/m	%	%	%				
RBRNT	Briones topsoil		46.8	6.7	1.7	25.0	54.7	0.9	0.2	L	0.4	43.2	38.0	18.8	LOAM			
RBRGR	Briones green substr		48.8	8.3	4.8	8.3	26.4	1.1	0.5	L	0.4	93.2	4.0	2.8	SAND			
RALNT	Altamont topsoil		47.6	6.6	1.3	17.1	30.1	1.0	0.3	L	0.4	37.2	34.0	28.8	CLAY LOAM			
RALGR	Altamont green		49.7	41.7	5.1	31.1	31.7	1.1	6.8	L	1.0	67.2	22.0	10.8	SANDY LOAM			
RBWET	Briones wetland are		52.7	27.0	2.9	29.7	31.2	1.1	4.3	L	1.2	51.2	30.0	18.8	LOAM			
			49.1	18.1	3.2	22.2	34.8	1.0	2.4		0.7	58.4	25.6	16.0				
			high	low	adeq	adeq	adeq	adeq	adeq		adeq			adeq				
														except Brion green, with low CEC, low clay				

Preliminary recommendations from soil assessment

1. Confirm the general suitability of soils for continued annual grass growth.

Soil fertility

Soil chemical and fertility characteristics are suitable for annual grass growth. The nitrate-nitrogen and phosphorus components of soil fertility are excessive for range-land growth, but will not be limiting for growth of naturalized annual grasses. Excessive fertility may promote a thick thatch of standing biomass that may reduce growth of summer active forbs and may increase fire severity. Unless the source is atmospheric deposition, the high nitrate-nitrogen and phosphorus levels can be expected to decline within a few years.

Soil profiles

Plant growth in some soil profiles will require mechanical ripping treatment to provide deeper rooting and to be able to imbibe larger rain events without saturation and surface erosion. Examples are some Briones soils that have shallow depths to bedrock of soft sandstone where historic grading has removed surface soil volumes. Two outcomes of this condition are that shallow soil depths will reduce the already limited plant available moisture on these sites. Dry years, or extended dry periods during winter may result in low plant cover and exposed soil. These shallow soils also increase the likelihood of soil saturation during intensive storm events, resulting in overland flow and surface erosion. Visual examples are shown in Figures 2, 3 and 4 as described earlier.

Altamont soils have high clay content and are susceptible to compaction if worked when wet. Plant growth in upland areas needs infiltration to imbibe winter rains and avoid runoff and to allow adequate rooting. These soils should only be worked (graded, excavated) when dry to avoid compaction and clodding.

Altamont soils in their natural configuration have a 7 inch A horizon. Underlying B horizons have common slickensides (smear faces from cracking and re-sealing) that reduce rooting. If these A horizons remain to the present time, care should be taken to retain them for improved plant establishment over the clayey and high shrink-swell horizons (7 to 50 inch depths) that are less easily rooted into. If the soil profile has already been disturbed and are very dense, they should be mechanically decompacted before seeding to improve plant establishment avoid surface flows, especially in concave landforms. If current annual grass growth is adequate (as through previous tillage or natural breakdown of aggregates) then they can be left in place.

Rincon soils also have high clay content but they are typically able to be rooted to greater depths, with 16 inches of A horizon described. These soils are also more productive if left in their original horizons, although their subsoils are not as limiting to root growth as the Altamont. However, the only significant area of the project site with Rincon is south and southwest from the west pond. Only a small part of this area remains outside of previous grading activity. If annual grass is adequate, they can be left in place, as long as overland flow is not occurring, as indicated by lodged plant litter, rills or gullies and headcutting of local drainages.

2. Note impacts from golf course construction and management, including fertility levels, imported materials.

Sand amendment

A concern was that drainage from the surface horizons may be interrupted if fine-textured soil horizons occur over coarse-textured horizons such as the sand trap substrates. This can perch water tables, saturate the upper horizons and prevent or reduce rooting into the coarse textured material. Preliminary analysis with Hydrus 1D soil hydrology modeling was done for the contrast of finer textured soils in the Briones loamy sands above a layer of coarser sand in the low-lying traps. Preliminary modeling suggests that this will probably not perch water tables in Briones loamy sand soils because the particle size is not sufficiently different. But it will definitely reduce plant-available moisture for early growth in years with low or sporadic rainfall. For this reason alone, my recommendation is still to disrupt thick lenses of sand under finer soil textures. This is described in a grading recommendations section below. Similar tests are in progress on sand layers buried within clayey Altamont soil materials for situations where mounds and sand traps are regraded on clayey soil types.

Peat or compost amendment

Peat is well known for holding lots of water when wet or near saturation, but it holds very little in drier conditions when plants most need moisture. Even though these amendment materials are still commonly visible when sampling soil, the effect will be relatively low after re-grading has occurred. These organic amendment materials will degrade and disappear with time. My recommendation is to regrade and blend in-place as described in # 3.

Fertility

Nitrogen (as nitrate, NO_3^-) fertility is high in most samples, either from turf grass fertilization or atmospheric deposition. Phosphorus (P) is generally present in medium levels, but in agriculturally ‘high’ levels in the low-lying Briones (potential) wetlands area.

The combination of highly available N and P is will promote growth of rapidly responding ruderal plants such as annual grasses or invasive forbs. Effects of excessive fertility can be reduced by crop or grass removal, grazing, or ameliorated by active weed control. Nitrate levels will draw down steadily if they were from fertilizer application but not if the source is from on-going atmospheric deposition. Phosphorus levels will also slowly decline. Fertility is most elevated in the Briones drainage site. If this is developed into a wetlands area, a pre-treatment catchment basin may help trap sediment and fertility inputs.

Compaction or shallow rooting depths

Altamont and Rincon soils that have been previously graded and are shown to have limited annual plant growth or high compaction levels should be ripped on contour to 12-14 inches depth when dry. This condition can be mapped by a quick walk-through on the next site visit, if it occurs.

Briones soils that are very shallow to bedrock (less than 10 inches depth) and are on slopes or concave slopes and are susceptible to generation of overland flow should be ripped on contour to 12 - 14 inches. These areas may be indicated by sparse annual plant growth (smaller plants or lower density and more open ground; sometimes a shift in plant species such as more Zorro fescue) or by measuring depth with a tile probe (wet or damp conditions are more indicative; summer dry soils can be hard if packed sands or clay, making the firmness of the bedrock layer hard to detect).

3. Soil-related issues resulting from potential actions to 'un-grade' berms and sand traps and leveled or sculpted areas and return to naturalistic landforms, if not the original grade.

Topography

The goal is to re-contour local mounds and swales (sand traps, cut portions of greens) to match natural landform or at least a more naturalized terrain.

If sand cannot be productively used elsewhere, the most expedient solution to the many sand traps is to blade the material out over the adjacent mounds that were sculpted out of the trap depressions, spreading it in a relatively thin layer. Then, from outside of the berm, push the soil and sand layers back into the depression, mixing the soil and sand materials while achieving a naturalized local topography. An anticipated outcome is that what is lost in increased sand content (therefore lower clay and reduced plant-available moisture) will be offset by deeper rooting depths.

Regrading of golf course berms and traps on Altamont and Rincon soils will more easily incorporate the additional sand fraction from emptying the traps. But, these soils must be graded when dry to avoid compaction and smearing.

4. Different management issues for clayey Altamont soils (lower portions of the site) vs sandy Briones soils (the majority of the upper areas of the site).

Water retention in potential wetlands areas can be enhanced by working these soils when wet. All other clayey soils must be worked when dry. Do not disturb soils that are not graded so far. Rip compacted areas to reintroduce void spaces to allow rooting. The extent of compacted soils has not been evaluated as part of this soil evaluation so far.

Briones soils are very erosive when disturbed. Minimize the area of disturbance and consider surface drainage when re-sculpting landforms to avoid concentrated flows. Reinforce flow paths in areas of concave slopes.

5. Potential to retain drainage in low-lying areas for wet-site features.

The basins for wet-site features should be mapped and numerous soil pits evaluated for clay content. Some proposed wetlands areas are on Briones loamy sand soils that will not hold water in the soil itself. Underlying low-permeability sandstone may retain moisture, but this would need to be confirm with a percolation test. A landform hydrology assessment to estimate inundation period would be instructive but is beyond the general soil assessment reported here.

Erik questions:
6. Discussion on the implications on wetland creation that result from soil disturbance and mixing.

Areas mapped as Briones soils have sandy textures and will rapidly percolate rainwater. To be able to pond rain water, any artificial vernal pools sculpted on areas of Briones soils need to be excavated down to the bedrock layer itself. The amount of fracturing in the sandstone is not known, but these geological materials, even if not fractured, can still have high percolation rates even if they are too tight for root growth. In general, these areas should be avoided for wetlands construction unless clay linings are used.

Soil profiles for potential wetlands construction sites were excavated in the west area of the site (Figure 1) including pits areas mapped as Altamont and Rincon series. Clayey subsoil materials occurred in all these pit locations except #4, which was located on a boundary with Briones series soils. The clay subsoil started deeper in Pit # 7, also near a Briones boundary, compared to all other pits except # 4. These subsoils are expected to have good moisture retention characteristics, but will require surface grading to pond water and to prevent lateral drainage off of the graded surface. Most pits showed some evidence of mixing and grading activities, at least on the surfaces. Presence of a suitable clayey subsoil should be re-confirmed for the footprint of potential excavation locations, especially on the edges of the mapped soils types adjacent to Briones soils. More details are included in the Section 2 below. Natural vernal pools have been described in areas of Altamont soils elsewhere (Bauder et al., 2009).

7. Relocation of various soil types around the site adds an additional level of uncertainty of current substrate characteristics.

Most of the grading and landscaping modifications involved localized transfers of soil materials. An exception may be the area around Hole 18 and the driving range where larger volumes were excavated and filled (Erik Stromberg information).

8. Impacts of mechanical disturbance and mixing of soil types on soil performance, both as a growing medium and for water retention.

The Briones soils are weakly aggregated on entirely non-aggregates. These areas will pack very densely when disturbed by previous or current grading. Dense areas in the uplands should be ripped 12 to 14 inches deep. These will tend to be flat areas and shallow catchment basins rather than slopes.

Water retention on Briones soils will depend on a competent, low-permeability layer of sandstone under the soils. If this can be utilized, water sufficient for adequate inundation periods may be able to be retained. Altamont and Rincon soils will be more easily sculpted and potentially compacted to reduce infiltration to very low levels and improve retention. The combination of hills and runoff cycles may make inundation patterns more variable than that of larger flatter areas that are typical of vernal pool topography.

Section 2. Evaluation of subsoil textures of Roddy west greens areas for wetlands construction.

Summary

Textures of all subsoils except pit #4 contained clay contents in excess of 20 %, which is a recommended clay content for sealing pond bottoms. Where clayey horizons occurred they were generally within two feet of the current ground surface, except for Pit # 6 in which clay started at 32 inches deep, and Pit #7 in which clay horizons started at 48 inches. With moderate depths of excavation, basins in the Roddy west greens area should be able to retain water for seasonal wetlands. Collection areas and conveyance of runoff water from uplands areas was not considered in this work.

Goal

The goal of this sampling was to check for presence of subsoil horizons that naturally retain surface moisture or that could be graded or treated to improve moisture retention for shallow seasonal water basins. Baseline soil fertility tests were also made to assess ability to support plant growth.

Results

Presence of suitable subsoil horizons

Depth to a subsoil horizon with high clay content was approximately 26 inches and ranged from 8 to 48 inches. Except for the sample from G4, all subsoil samples had clay content over 20%. This is generally considered adequate for water retention in farm and wildlife ponds. A variety of field-oriented references are cited in the Bibliography section below.

The observed subsoils empirically appear to be intergrades of Briones versus Rincon subsoils. They had reddish colors (7.5 YR) potentially related to environmental and chemical conditions typical of Briones subsoils, while having higher clay contents more similar to Rincon subsoils (sandy clay loams, sandy clay) that reflect different parent material sources. These subsoils appear to be disturbed or excavated and moved from other locations since they have little naturally occurring soil or geological structure.

One of the potential mapped soil types is classified as a vertisol, with expansive clay and deep subsoil cracking. These deep cracks would be a potential negative aspect for materials intended to retain standing water. However, none of the excavated pits showed any signs of deep cracking when excavated in late summer at the peak of the dry period. The subsoils appear to be suitable for use or modification as wetland basins.

Review of soil fertility

Selected soil samples were analyzed for a comprehensive plant nutrient availability. This evaluates whether the substrates of the wetland basin would sustainably support plant growth if construction occurs. The plant available nutrient assessment uses conventional soil fertility methods as for agricultural soils. But these availability tests are interpreted for wildlands plant communities that internally recycle nutrients rather than for agricultural systems that produce marketable biomass but require repeated external inputs.

Soils were collected on September 14, 2020. Soils were dried and sieved to < 2 mm to represent the fine soil fraction. Soils were submitted to A&L Western Agricultural Labs, Modesto, CA for the S3C complete suite of nutrient availability tests, plus textural analysis by hydrometer method. The complete set of soil fertility analyses is included at the end of this document.

Table 1. Soil pit horizonation summary

Pit #	depth (inches)	% clay	color	comments
				East green/wetlands area
G1	1-20			disturbed soils with common peat amendment organics visible
	20-72		10YR 6/4	uniform light colored; silty clay loam texture, approx 25 – 30 % clay (est by hand).
G2	0-25			coarse blocky texture with variable fibrous organic
	25-60	54	7.5YR 5/4	clay texture; strong very coarse subangular blocky texture;
G3	0- 20			weak blocky structure
	36-48	48	2.5YR 5/4	clay texture; strong coarse angular blocky with small mottles and faces of red clay films
	48-60			massive to weak blocky structure
G4	0-24			oak site pit, increased plant litter and amendment organics
	24-38	6	10YR 7/3	sandy loam texture; baseline fertility sample for sustained oak growth; common fragments of broken sandstone, some with calcareous precipitates on faces
G5	0-8			mixed organics including green amendment materials
	8-55	35	10YR 6/4	clay loam texture
				West green/wetlands area
G6	0-10			darker from organic accumulation or maybe imported clayey materials; moderate subangular blocky structure; organic amendments at surface two inches
	10-32			gravelly light colored soils; appears disturbed; angular fragments
	32-50	34	10YR 5/3	clay loam texture; few gravels; uniform horizon; composite sample
G7	0-5			darker weak granular aggregation
	5-25			weak subangular blocky; angular sandstone frags; Briones material
	25-48			Briones type material; compacted; massive breaking to single grain
	48-65	22	7.5YR 5/4	sandy clay loam texture; sample from 60-65 inches; texture similar to disturbed Rincon subsoil; no gravels
G8	0-12			weak angular blocky; slight darkening from natural organics
	12-20			lighter; disturbed fragments of compacted material and sandstone
	20-48	22	5YR 5/4	sandy clay loam texture; uniform reddish horizon; composited sample; no gravels
G9	0-5			higher organic matter content; blocky structure
	5-18			weak aggregation, lighter color
	18-48	24	5 YR 4/6	sandy clay loam texture; uniform C horizon material; composited sample; massive or weak blocky; no gravels

Soil chemical characteristics

Texture

The average clay content of these samples is 33.8 % and textures are clay, clay loam and sandy clay loam (except for the G4 sample). These textures have high moisture retention capacity (as opposed to the loamy sand textures of the Briones soil). They are also able to retain cation nutrients on clay surfaces. Finally, since this evaluation relates to the potential to retain surface water in basins for creation of seasonal wetlands, these clay materials are desired because they can have very low infiltration rates, especially if mechanically compacted. All subsoil materials are suitable for this purpose, with the exception of G4, which was sampled near an existing mature oak on the border of soils mapped as Briones loamy sands. This soil had only 6 percent clay and a loamy sand / sandy loam texture.

pH

Soil reaction (acidity or alkalinity and reported as pH) was high (8.3) in the oak sample (G4). However, all of the remaining soils tested were in an ideal range for plant growth (6.1 to 7.5). Annual grass plants in all sample locations appeared to not be growth-limited. Native species and mycorrhizal symbionts are additionally suited to growth in marginal pH conditions such as the area around the oak sample, so this is not a concern for growth. The buffer pH was near neutral, indicating that acidity or alkalninty was easily modified.

CEC

The CEC (cation exchange capacity, which holds cation nutrients on clay surfaces) is adequate at 11 or 12 cmol/kg. The more alkaline soil (pH 8.3) is tested at 16.1 cmol/kg but this is predominantly a pH effect, especially since the clay content is lower.

EC

Soil salinity is measured by electrical conductance (EC) and is reported as deciSiemens per meter (dS/m), or electrical flow over a defined distance. Sensitive plant species start to reduce growth at 2 dS/m. Only one of the soils tested had an EC of this level (G8 at 2.3). No indications of salt limited growth were observed in the field. All other EC levels were within acceptable ranges. Most native plants, and certainly central valley wetlands species, are expected to be tolerant of the existing low soil salinity conditions.

Soil fertility characteristics

Macronutrient availability

Macronutrients are those elements that a plant requires in relatively large amounts to complete its growth cycle and reproduce. These include nitrogen (N), phosphorus (P), potassium (K), sulfur (S), calcium (Ca) and magnesium (Mg). Nutrient elements have various chemical characteristics by which they are retained in soils and are extracted by plant roots. Therefore, many different extractant methods are used to estimate the ‘plant available’ levels of nutrients in soils. A target level for each extractant method is used to estimate sufficiency for plant growth. These levels are much higher for production agriculture than for wildlands systems. In this evaluation, target levels are used that are suitable for wildlands systems, with their lower nutrient concentrations but extensive internal recycling patterns.

Organic Matter (OM)

Organic matter is an estimate of the humified and decomposing organics from previous years of plant growth. Levels of 2 – 3 % are desirable, while these soils test at 1.0 to 1.2 %. These levels are relatively low for wildlands plant/soil communities, perhaps as a residual effect of grading, disturbance and golf course management. These can be expected to increase as the system readjusts to wildlands conditions. OM levels influence soil aggregation and nutrient retention, especially of nitrogen (N) and sulfur (S).

Phosphorus (P)

Phosphorus (P) levels in these soils are moderate to low, but are adequate for wildlands plant growth. Mycorrhizal fungal colonization will improve P availability to plants.

Potassium (K)

Potassium levels are low in the sandier soils but adequate in those with clayey textures. As organic matter levels increase, K availability (a common output of decomposing organic matter) will increase.

Calcium (Ca) and Magnesium (Mg)

Calcium and magnesium are two cations that interact together. Calcium must be high enough for uptake to occur in the presence of Mg interference. A high proportion of Mg relative to Ca increases the serpentinitic quality of a soil. This selects for adapted plant species and affects soil aggregation. Soils with Ca:Mg molar ratios less than one are generally considered to be serpentenitic. In these samples, the ratio is much greater than one (1.7 to 4.6), and so they are considered calcium dominated. Therefore, the amounts of these two cations and their relative proportions to each other are within an acceptable range and there will be no growth limiting effects of these two cations.

Sodium (Na)

Effects of sodium ions are primarily to cause salt stress in plants and to disperse soils in which the Na% is high. These soils do not have negative sodium impacts.

Nitrogen (as nitrate, $NO3^-$ and ammonium, $NH4^+$)

Both nitrate and ammonium are readily taken up by plants. Decomposition of soil organic matter (OM) releases both forms of nitrogen. Rapid plant growth depletes soil nitrogen reserves, while slower plant growth (during dry spells or cool, cloudy period or short days) reduces the amount taken up and allows soil reserves to increase. So, the absolute amount of nitrogen in the soil can fluctuate extensively from day to day. Because soil microbes steadily decompose soil organic compounds and release the nitrogen it contains, levels of organic matter in the system are a better indicator of overall nitrogen availability in a sustainable system than is the nitrate or ammonium in the soil. The OM levels in this system are relatively low. But, because native plants have low N uptake requirements, these soils are not expected to be N limited. Low N levels have the general effect of limiting annual plant growth, which is also influenced by external sources of additional N. Atmospheric deposition of N from urban development and highways can provide significant additional plant available nitrogen, up to 50 % of the annual growth requirement downwind from urbanized areas. While native plants utilize nitrogen readily, excess amounts have a greater effect on weed growth. The effect of atmospheric deposition down-wind of major metropolitan areas is unavoidable, so assertive weed control becomes even more important.

Sulfur (S)

Sulfur levels in these soils are adequate, although clear target levels of S are not well established. Sulfur is not expected to be growth-limiting.

Micronutrients (Zn, Mn, Fe, Cu)

Micronutrient elements are needed in much smaller amounts than macronutrients. Micronutrients include zinc (Zn), manganese (Mn), iron (Fe), and copper (Cu). These are all evaluated in soils using chelates (chemicals that specifically hold onto micronutrient ions) and extractant solutions. The short answer here is that none of the micronutrient elements are growth-limiting and plant productivity will not be reduced by micronutrient deficiency.

Boron (B)

Boron is another micronutrient, but it is extracted by hot water rather than by chelate solutions. It can increase in arid environments and leach in wet environments. Boron levels in these samples are adequate for plant growth and are not at toxic levels in high evaporation locations like seasonal wetlands.

Summary of soil chemical and fertility characteristics

In summary, although these soils are highly modified by grading and management as a golf facility, plant available nutrients are not limiting for plant growth. The main effect of historic golf course construction and management are changes in the soil profiles available for deep root growth by native species. Annual grasses are a default plant cover that will grow well in the wet winter and spring and become dormant in the dry summer. This life cycle avoids the need for deep rooting volumes and summer moisture availability. Use of these soils for winter seasonal wetlands is also not limiting.

Recommendations for wetland construction

The areas sampled generally follow a pattern of disturbed surface soil materials composed of Briones topsoils and subsoils imported from upland positions that overlay disturbed subsoil materials similar to Rincon soils. All subsoil horizons except one (G4 near the mature oak) have high clay contents.

Because of the consistently high clay content of these subsoil samples, they have high potential to pond and hold water during seasonal rains. Assuming an appropriate design that matches the size of the upland catchment area and drainage patterns with retention basin volumes and through-flow rates, these substrates are expected to function well to create seasonal wetlands. References for methods of sealing of farm and wildlife ponds (listed below) suggest clay contents of a minimum of 10 % and ideally 20 % or more. All of the soil samples except G4 fit the 20 % clay content characteristic.

Retention of ponded water may be improved by driving equipment over the exposed clayey subsoils when they are damp or wet. This compresses soil pores and further reduces infiltration. However, field guides often recommend a foot or so of suitable topsoil as a surface growth medium over the impermeable clay layer. This creates a problem for the phasing of construction in that soil is first removed and then must be reapplied, requiring multiple handling. A solution may be some type of 'direct-haul' sequence in that an area is sculpted out to desired elevations and compacted and then the surplus soil on an adjacent area is pushed over the finished clayey surface. This approach may be adapted to existing topography and drainage patterns in this project area, as described next.

The current landforms (as previous golfing greens) are graded so that water flows to local collection points and pipe drains, or it flows out through surface swales during rainy periods. Because of the porous nature of the surface soils, a constructed wetland basin may have a water-tight floor, but some edges may be bermed with existing porous surface soil materials. Ponded water in a constructed wetland could then seep laterally out through the existing berm even if the base of the wetland pool has low infiltration rates. Plugging of the current drainage piping and observing the level and duration of ponded water is a simple, field practical way to observe this possibility, as is planned for winter of 2020-2021. If rainfalls are low enough to not pond during the current season, an exploratory trench across the lower rims of planned wetlands would show whether the retaining berm has porous material versus a subsurface ridge of clay. This requires a general idea of location and relative elevation of potential wetland basins.

A design element that must be addressed as the plan develops is that the overflow areas should be reinforced sufficiently to withstand concentrated water flow during periods of high rainfall and pond overtopping. This is because the existing Briones surface soils are sandy weakly aggregated and very susceptible to surface erosion, as reviewed in the previous Roddy soil evaluation.

Soil fertility results

Roddy Ranch west basin samples

sample code	sample pit name	OM %	ENR lb/ac	P1 ppm	HCO3_P ppm	pH	buf pH	CEC cmol/kg	K ppm	Mg ppm	Ca ppm	Na ppm	K %	Mg %	Ca %	Na %	Ca:Mg molar ratio
RG2	G2						7.1										
RG3	G3						7.1										
RG4	G4	1.2	53	3.3	1.7	8.3		16.1	38.2	321.8	2447	274.8	0.6	16.4	75.6	7.4	4.6
RG5	G5						7.1										
RG6	G6						7.1										
RG7	G7	1.1	52.6	6.4	5.8	6.5	6.9	11.9	124.4	336.6	1493	102.8	2.7	23.3	62.7	3.8	2.7
RG8	G8	1	50.8	4.6	3.3	6.1	6.8	12.8	100.5	441.3	1253	204.6	2	28.3	48.8	6.9	1.7
RG9	G9	1	49.2	3.6	4.3	7.5		11.9	82.1	396.2	1516	209.3	1.8	27.3	63.3	7.6	2.3
yey subsoils average		1.0	50.9	4.9	4.5	6.7	6.9	12.2		391.4	1420.7	172.2	2.2				

sample code	sample pit name	NO3 ppm	S ppm	Zn ppm	Mn ppm	Fe ppm	Cu ppm	B ppm	ex lime	EC dS/m	sand %	silt %	clay %	texture
RG2											18	28	54	CLAY
RG3											28	24	48	CLAY
RG4		3.8	16.3	0.1	1	2.4	0.1	0.5	H	0.8	66	28	6	SANDY LOAM
RG5											29	36	35	CLAY LOAM
RG6											36	30	34	CLAY LOAM
RG7		3.7	32.8	4	51.1	21.6	1.5	0.4	L	1.5	58	20	22	SANDY CLAY LOAM
RG8		6.3	92.9	0.3	7.9	5.4	0.5	0.3	L	2.3	56	22	22	SANDY CLAY LOAM
RG9		1.6	5.2	0.4	2.6	3.5	0.5	1.5	L	0.3	54	22	24	SANDY CLAY LOAM
yey subsoils average		3.9	43.6	1.6	20.5	10.2	0.8	0.7		1.4	40.2	26.0	33.8	

Photos of soil pits showing clay subsoil horizons

Pit G6

Pit G7

Pit G8

Pit G9

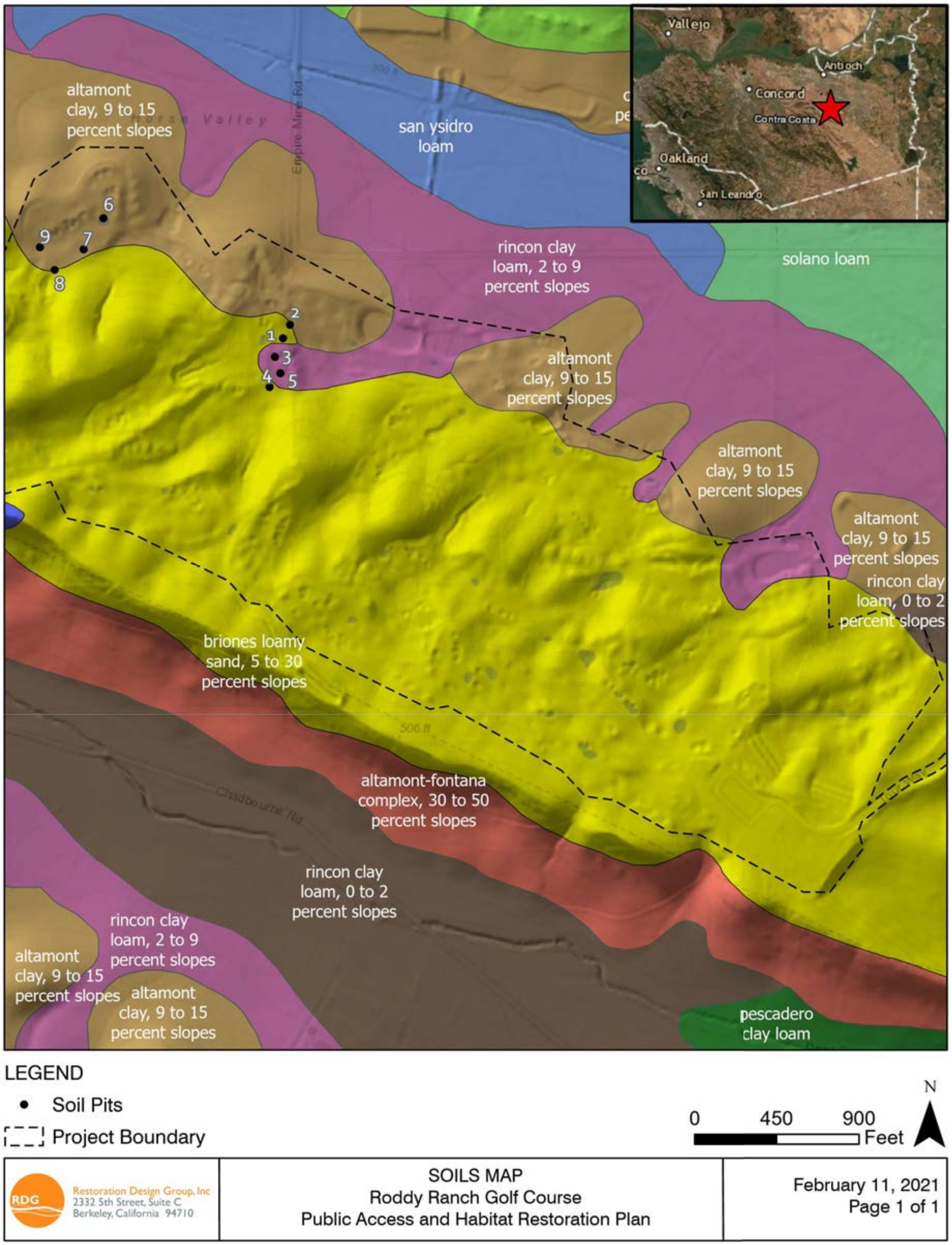

Figure 1. Locations of soil pits in potential wetlands construction areas (RDG graphic).

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RESTORATION DESIGN GROUP. 2020. THE FORMER RODDY RANCH GOLF COURSE HABITAT RESTORATION AND PUBLIC ACCESS PROJECT - DRAINAGE NETWORK INVENTORY AND ASSESSMENT.

THE FORMER RODDY RANCH GOLF COURSE HABITAT RESTORATION AND PUBLIC ACCESS PROJECT

Drainage Network Inventory and Assessment

Introduction

This memorandum provides an overview of the past and current condition of drainages on the former Roddy Ranch Golf Course in Antioch. The purpose of this evaluation is to inform future site improvements as they relate to restoration opportunities and long-term sustainability of the drainage network on site.

Goals and Vision

The following goals, adapted and expanded from the project RFP, provide guidance for future work related to modifications to the existing drainage network while recognizing potential opportunities provided by decommissioning the former golf course.

1. Maximize the enhancement and restoration for sensitive species and habitat
    a. Enhance wildlife corridors by restoring drainages from top to bottom where feasible
    b. Evaluate hydrology to determine which species are appropriate to target for habitat restoration
2. Manage and enhance water resources on site to provide optimal habitat
    a. Determine which features provide habitat and/or manage stormwater
    b. Remove or modify pond and basin features as necessary
    c. Evaluate the site for opportunities to restore and create habitat and manage stormwater.
3. Support wetlands with stormwater drainage and installation of "green infrastructure"
    a. Restore natural hydrology to support downstream aquatic habitat
    b. Provide natural drainage features of equivalent stability to the pre-golf course drainage network
    c. Reduce long-term maintenance to the drainage network
    d. Restore natural sediment delivery and storage processes
    e. Improve water quality primarily through infiltration

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Figure 1: 2018 Aerial Photograph of the Former Roddy Ranch Golf Course

Methodology

RDG staff compiled and reviewed documents related to the existing and pre-golf drainage conditions on-site. These documents include a series of aerial photographs covering 1939 to the present, USGS topographic maps, golf course grading, and erosion control and irrigation plans. Existing condition drainage boundaries were delineated by hand using 2008 Contra Costa County LiDAR. The golf course storm drain network was digitized by hand from scans of the 2002 Drainage System As-Builts, (Mapmaking Systems, 2002), further, the limit of grading was digitized by hand from rough grading plans dating back to 1999 (JMP Golf Design Group, 1999). The LiDAR and the 1999 plans were also used to analyze the channel profiles in AutoCAD Civil 3D.

Limitations

The drainage network inventory and assessment provides a planning level analysis of the former Roddy Ranch Golf Course at the parcel scale (1"=200'). Design level work will require a finer scale analysis. A topographic survey is anticipated to be complete in the fall of 2020 that will aid with this analysis.

Pre-Golf Course Conditions

The project site drains a north facing slope that was historically grasslands (Figure 2). The hillslope is divided into a series of small drainages between 20.5 and 58.4 acres. Each drainage descends approximately 260-ft in elevation across approximately 2,100-ft. Most of the drainages occur as sheet flow at the top and bottom of the site, with a short portion of defined channel occurring at the base of the steeper hillslopes. Each drainage flows north off site in a network of grassy swales and shallow depressions that collect along the shoulder of Empire Mine Road north of the site.

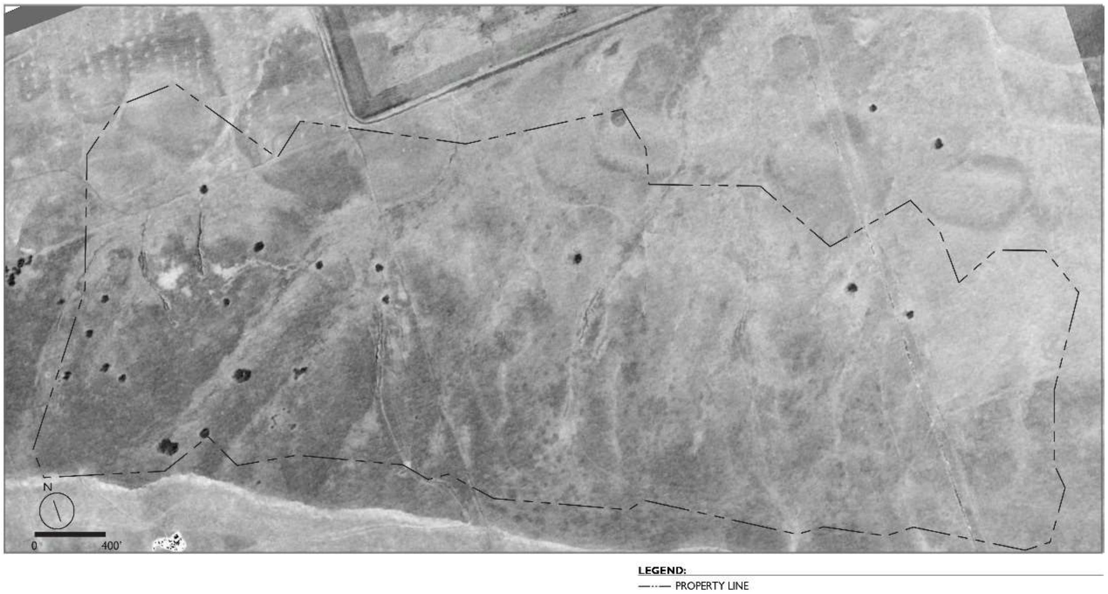


Figure 2: 1939 Aerial

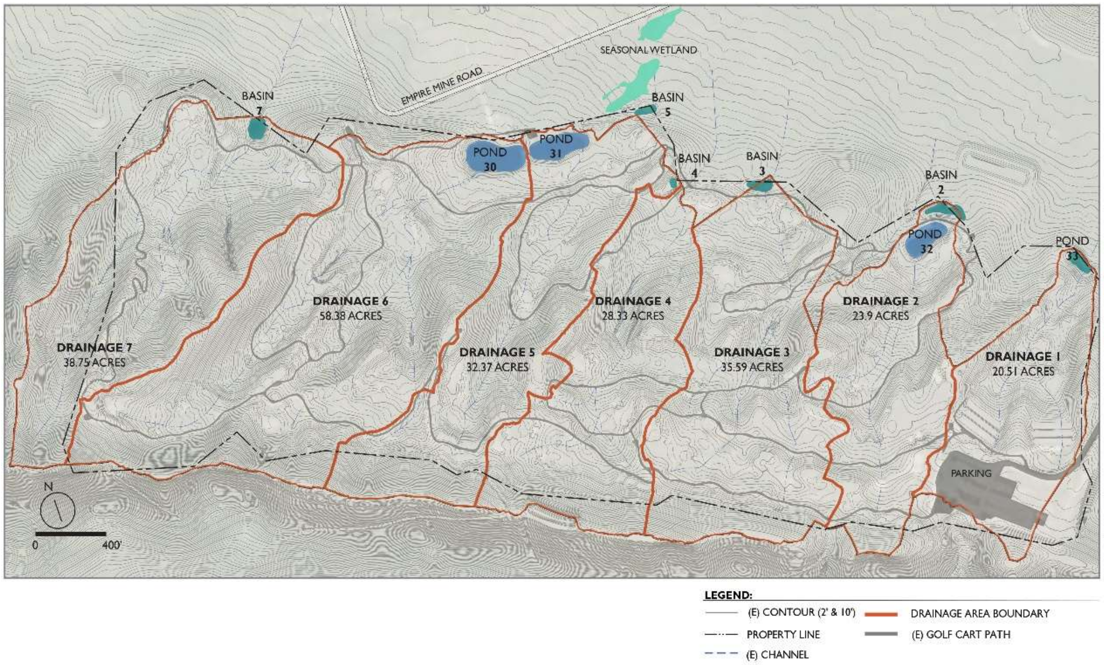


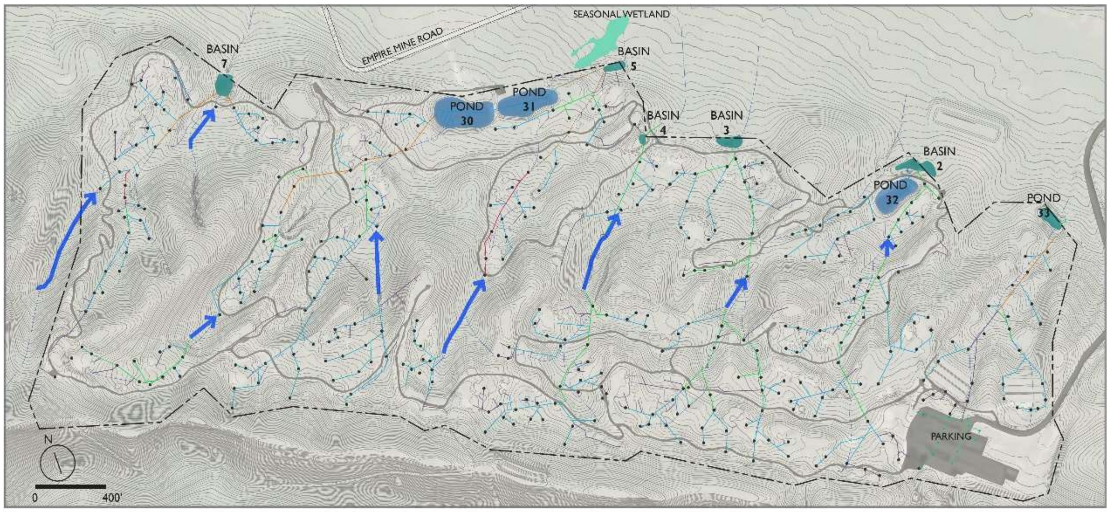
Figure 3: Drainage Network

Existing Conditions

During the creation of the golf course, approximately 600,000 cubic yards of soil was moved to provide suitable topography for golf. This resulted in the filling of many drainages and the creation of a series of ponds used for irrigation and water quality basins designed to capture and treat water before leaving the site.

While the golf course was operated, the site experienced an increase in runoff from the irrigation in the swales heading offsite towards Empire Mine Road. During this period, the drainage swale alongside Empire Mine road supported cattails and other wetland obligate species.

<u>Storm Drain Network</u>
To adequately convey stormwater for golf course operations, an extensive storm drain network was installed under the fairways to direct water downslope to a series of ponds and water quality basins. Nearly 10 miles of solid drainpipe and an unquantified length of perforated pipe below the sand traps transport stormwater. In addition to the array of perforated pipes installed at each sand trap there are a number of French drains installed on-site to alleviate any localized flooding (Mapmaking Systems, 2002). The following figure was based on information in the 2002 as-builts and shows the extensive storm drain network in addition to segments of surface flow that connected the upstream and downstream areas of the golf course.



LENGTH OF EXISTING DRAINAGE PIPES BY DIAMETER FROM EAST TO WEST:

	4"	6"	8"	10"	12"	15"
Drainage 1	1088	1684	1185			502
Drainage 2	1510	4367	1476			
Drainage 3	2656	3865	2642			
Drainage 4	1883	3619	1476			
Drainage 5	1164	2654	437	598	996	
Drainage 6	2202	6936	1540			1034
Drainage 7	1395	2757	137	192		540
Sum	11,897	25,882	8,893	790	996	2,076

Total **50,535 Feet**
10 Miles

Figure 4: Storm Drain Network

Hydrologically, the impact of the storm drain network is an increase in peak flows downstream and a reduction in infiltration. The lack of infiltration limits the subsurface movement of water downslope and the availability of water for uptake by vegetation.

It is common for subsurface water to express at the margins of hillslopes either as a prolonged growing season for perennial grasslands or to reemerge as surface flow and ponding during high precipitation years. This is especially true on this site where the base of the hillslope corresponds to a contact point between a more permeable Briones Loamy Sand upslope and the less permeable Altamont Clay and Rincon Clay Loam at the valley bottom.

In many instances there is an upper storm drain network that has an outfall into an existing channel in the middle of the project site. Stormwater is conveyed downslope on the surface for a few hundred feet before becoming recaptured by the storm drain network once again and conveyed under fairways at the bottom of the site. These open channel sections are typically areas that were preserved and protected during the grading of the golf course and some of the larger drainages have identifiable bed and banks.

The following figure below shows the golf course limits of grading and the NRCS Soil Survey with Briones Loamy Sand composing the majority of the site and Altamont Clay and Rincon Clay Loam occupying the lower margins (north edge) of the site.

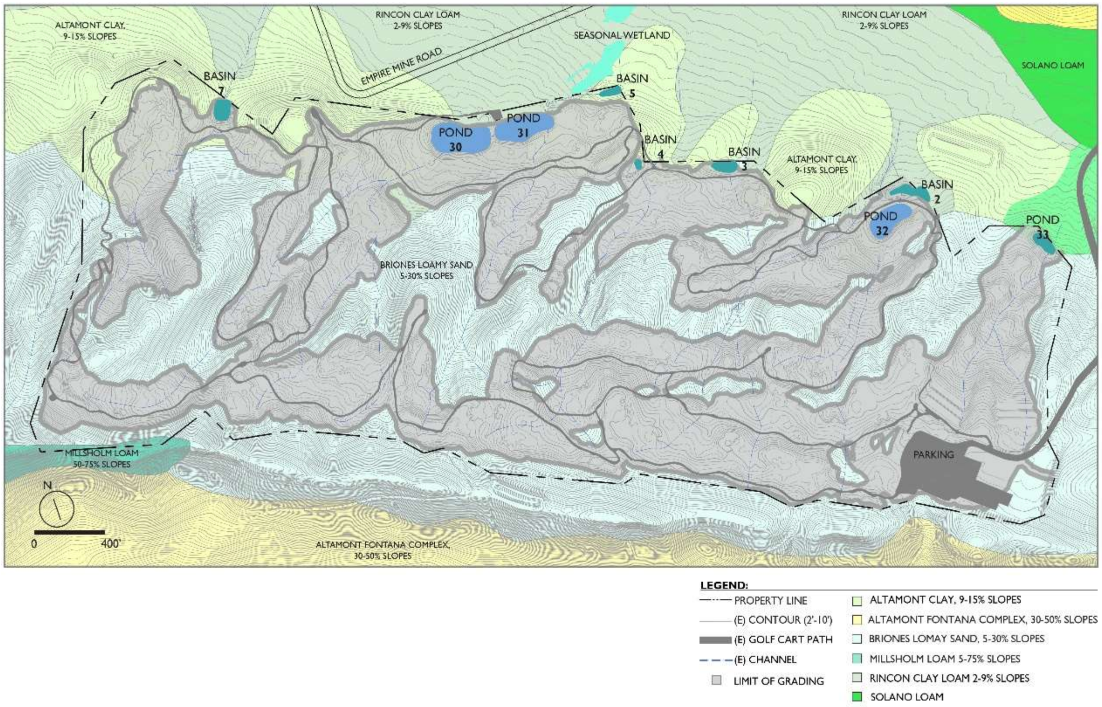


Figure 5: Soils and Grading Footprint

Ponds and Drainage Basins

The site has four ponds and six water quality basins located at bottom of the site. Three ponds (ponds 30, 31, 32) have pond liners and shotcrete shore. Pond 33 (also referred to as Basin #1) is not lined and functions like the other water quality basins.

The three lined ponds are connected to the non-potable water line and were used augment the water supply for the golf course irrigation. Pond 30 also receives stormwater from the storm drain network draining Drainage 6, which is the largest drainage at 58.38 acres. Pond 30 drains into Pond 31 before flowing off-site. Each pond and basin has drainage infrastructure to control outflow and water surface elevations. This infrastructure typically consists of drainpipes operated by gate valves the connect the pond/basin to existing drainage channels downstream. Each pond and water quality basin is equipped with an overflow structure lined with riprap. Many of these structures are in poor shape and show evidence of erosion and piping around the rock.

Grading

Earthwork operations moved approximately 600,000 cubic yards of soil to convert the site to a golf course. Review of the October 9, 1998 Fine Grading and Earthwork Plan show the general strategy for earthwork was to remove soil from lateral (north-south running) ridges and peaks and place it in drainages, many of which were converted to fairways. Cuts and fills of fifteen to twenty feet are common (JMP Golf Design Group, 1999).

Ponds and water quality basins were created by excavating into existing grade. Pond 31 and 30 were excavated up to 18 and 16-feet below existing grade respectively. Pond 32 was excavated 26-feet.

Because many of the existing drainages were converted to fairways, most drainages have been buried under fill or significantly altered through fine grading. Steep fill slopes often tie in the grading downslope of each graded fairway. These fills, created with highly erodible Briones Loamy Sand, create the potential for future instability, especially where the fills are placed over old or current flow paths and channels. Figure 6 maps where the drainages have been over-steepened (shown in red) and where the grading of benches for fairways has resulted in a channel sections less steep (shown in orange) than what existed prior to golf course grading.

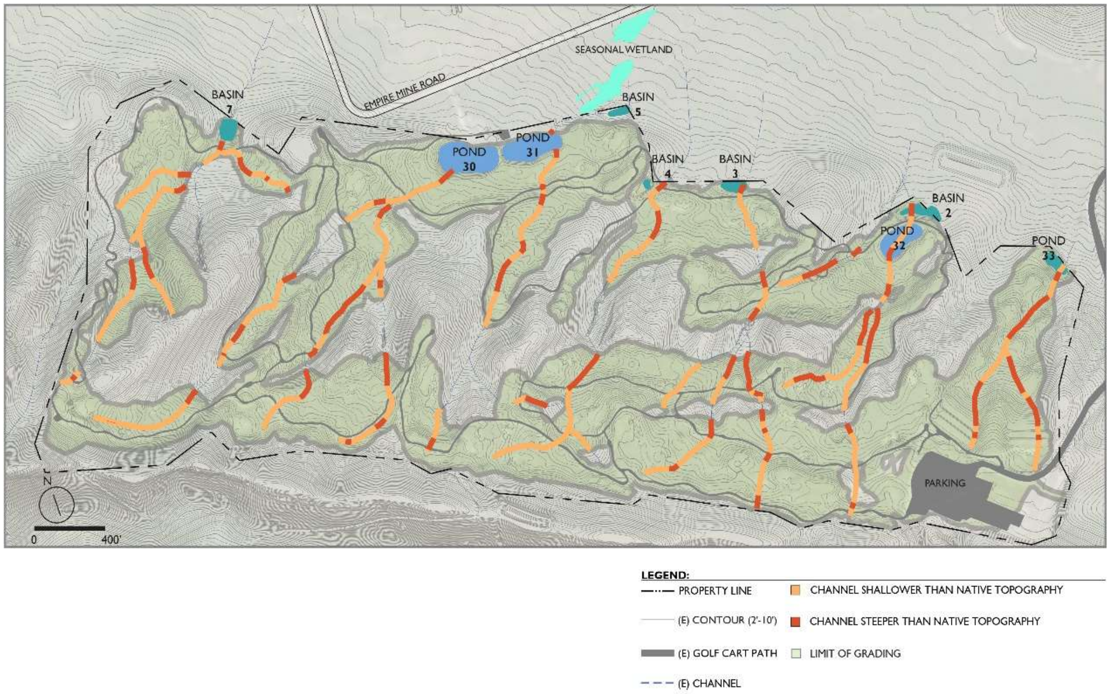
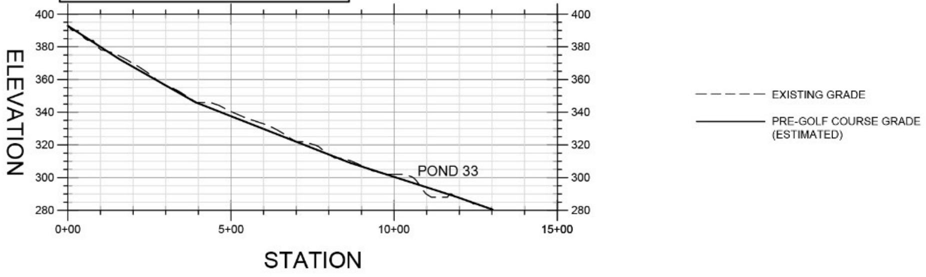


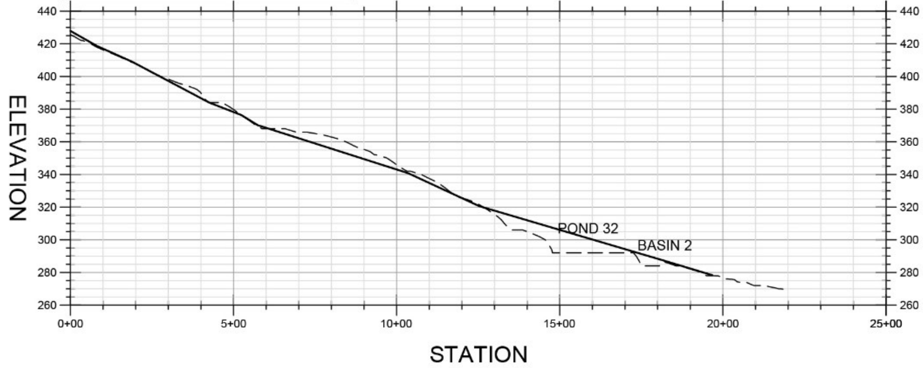
Figure 6: Drainage Analysis

The mapping of these drainages reveals how the site currently relies on the storm drain network to convey runoff and that the drainages will require significant alterations if the storm drain network were to be removed or abandoned.

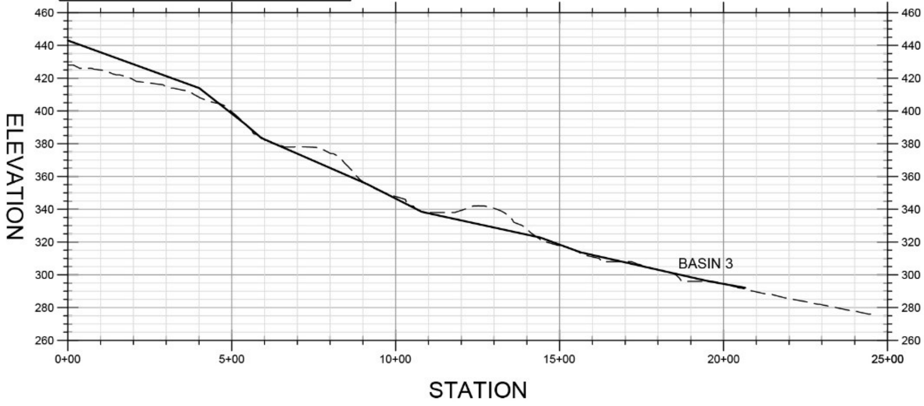
DRAINAGE E1.0 PROFILE



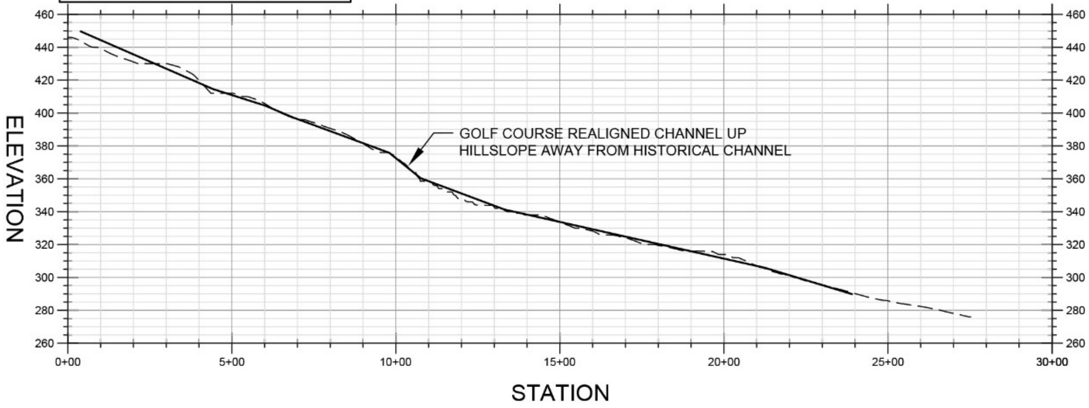
DRAINAGE E2.0 PROFILE



DRAINAGE E3.0 PROFILE



DRAINAGE E4.0 PROFILE



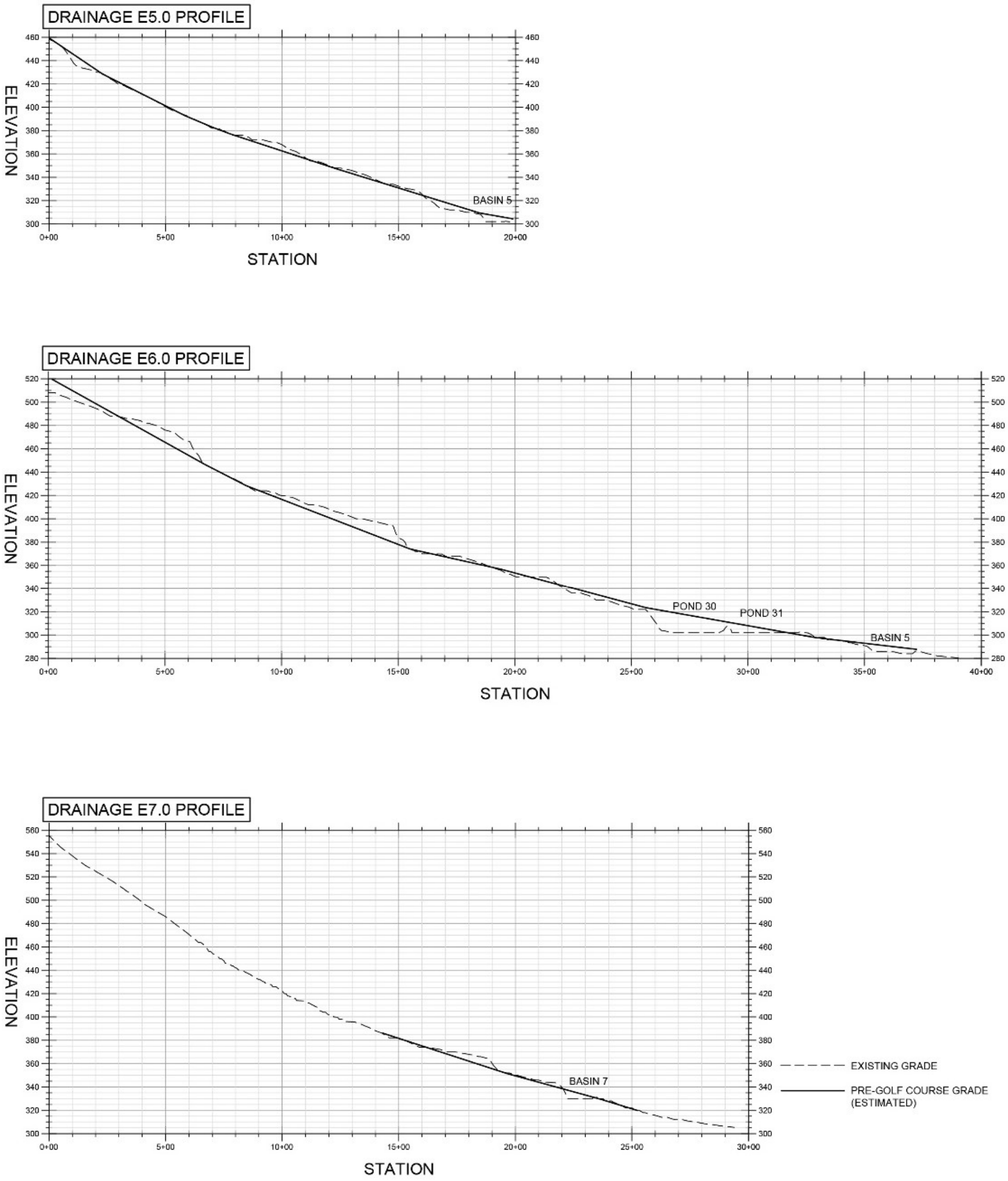


Figure 7: Channel Profiles

Considerations for Design

Existing Ponds and Water Quality Basins

The best way to achieve the project habitat goals is to modify the existing ponds and drainage basins to function more naturally. This removes the reliance on drainage features and rocked spillways that tend to fail over time and require significant maintenance to keep functional. The process of converting these features includes regrading to allow each feature to fill, spill and infiltrate as much as possible and removal of the outlet pipes and spillways. The result is a feature that has a more natural hydroperiod and hydrology typical of aquatic resources in the region.

Most of the pond and basin features were created by excavating into the native grade and building a low berm, typically 1 to 4 feet tall, to impound additional water. At a minimum removing the berm will allow for each feature to spill naturally over native grade. Additionally, each feature should be considered a candidate for regrading to naturalize the topography. This will allow each feature to blend into the landscape and not appear like drainage infrastructure. This changes will likely shrink the maximum ponded volume of water; however, this may not have an impact on the overall hydroperiod of each feature, especially when coupled with modifications to the drainage network which will work to retain runoff on site longer than the current piped configuration.

Designing stable and ecologically beneficial inlets into the existing features will require specific design strategies for each feature. Because each pond and basin was created by excavating into the existing grade, any overland flow that enters these features will descend a steep cut slope. To avoid this scenario each feature can be modified with a stabilized rock slope designed to convey this flow, or the existing storm drain system can continue to be relied on to intercept the water and convey it to the bottom of the feature. Alternately individual ponds or basins can be regraded to no longer be in-line with the drainage flow line. This will allow the drainages to convey flow alongside the wetlands and fill each feature by backwatering flow into the wetland.

Existing Storm Drains

The existing storm drain network must remain functional to avoid erosion along the existing channels. Even with the existing storm drain network preserved, existing channels that receive flow from the storm drain network may incise in the future as a result of the accelerated time of concentration caused by the more efficient conveyance of the storm drain network. This is particularly the case along the open channel sections of Drainage 6.

In addition, any storm drain infrastructure that is to remain will require frequent (multiple times a year) maintenance to keep the inlets clear of debris. Most drain inlets on-site are already buried with 1 - 2-inches of sediment after only a few years of the golf course closure.

Any removal of storm drain inlets will need to be coupled with deliberate interventions to ensure that the topography and soil can effectively convey the additional surface runoff. This will require reconstructing channels and grassy swales wherever flow paths are changed. The type and geometry of these flow paths depend on the contributing drainage area and local channel slope.

Restoring the entire drainage network to pre-golf conditions is one way to restore natural drainage on-site. This, in addition to vegetation management to encourage historical levels of cover and root mass, will provide naturally stable channels that would be less prone to excessive erosion overtime. The extent and volume of grading required to implement this type of effort is significant and not supported from a cost-benefit standpoint.

Channel Stability

If sections of existing altered channels are to remain on site, they will need to be evaluated to determine if they will be relatively stable over time. The following summarizes our preliminary assessment that will be used to determine whether future proposed alterations will remain stable.

For the work developing similar channels in the adjacent Horse Valley, RDG assessed the relationship between channel slope and vegetation cover on channel stability, among other metrics (Restoration Design Group, 2016). This work revealed the degree to which converting sparse vegetation to dense vegetation increased a given channels ability to withstand a greater flow, or alternatively, allowed a given flow to be suitably conveyed down a steeper channel.

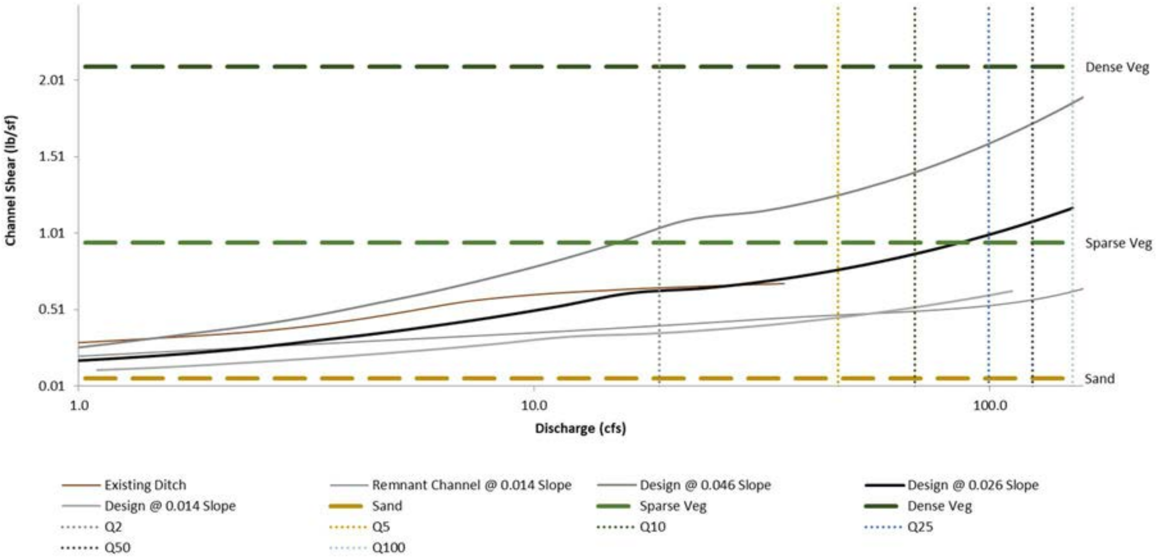


Figure 8: Channel Stability Investigation at Horse Valley. Channel stability thresholds were investigated for a wide range of channel geometries, discharges, slopes, and materials.

Our assessment of the existing drainages prior to the development of the former Roddy Ranch Golf Course noted that a few slopes on-site had evidence of relatively recent incision and erosion. The evaluation of vegetation on channel stability at Horse Valley confirms that grazing alone has the potential to reduce vegetation cover enough to be the primary cause of this instability. As a result, any future restoration or modifications to drainages should be associated with the creation and preservation of dense grassland along channel flowlines.

To further understand channel formation on site, we plotted drainage area and slope for twenty drainage points on site. Thirteen of these locations represented the point of incipient channel formation. Another seven locations were similar in slope and drainage area but did not have evidence of a channel. This plot (Figure 9) reveals where along drainages we would expect to see a channel versus a grassy swale or sheet flow. This will guide the type of channel we target for any areas intended to be restored or modified as part of the restoration. Locations that typically map as *no channel* are suitable to be designed as a grassy swale. Areas that map as *channel* are expected to have enough shear stress to erode and develop identifiable bed and banks over time. Areas that map in the middle will need to be evaluated more closely. Review of points that fall across the expected line represent channels that have additional unique characteristics that impact channel formation. For example, Point 9 has a longer watershed and is suspected to have a much slower time of concentration, greater infiltration, and potentially a lower peak flow than Point 1, which has a similar watershed size and a shallower slope.

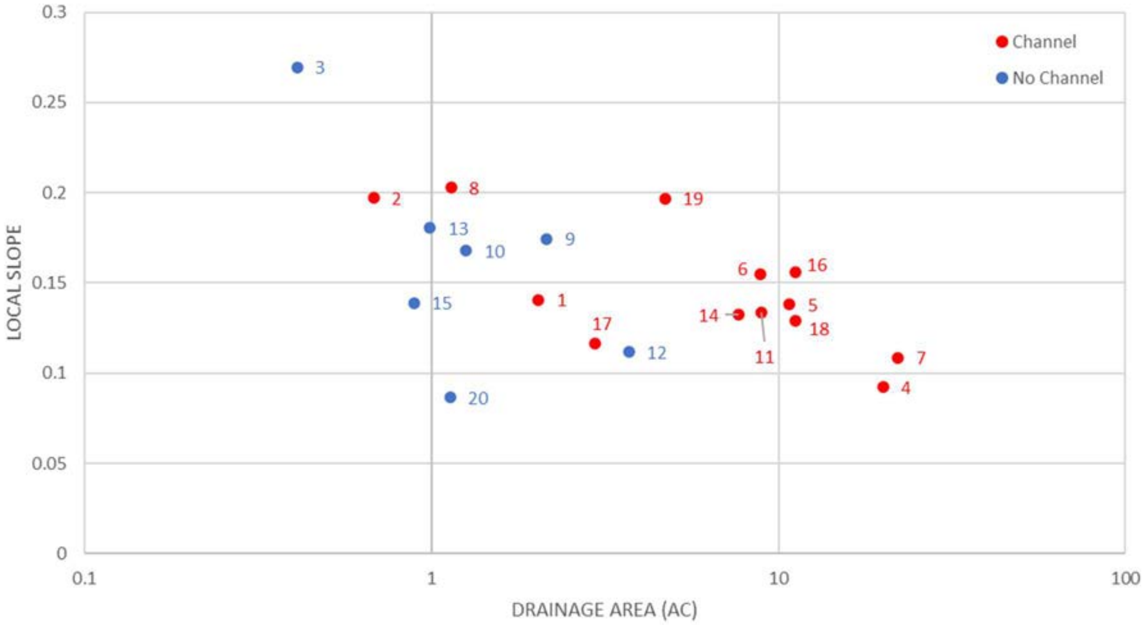


Figure 9: Slope and Drainage Area as a function of Channel Formation on Roddy Ranch Golf Course

Discussion

Two hundred thousand cubic yards of earthwork reconfigured the numerous drainages on site, moving earth from the ridges to the drainages. The golf course drainage network was designed to stabilize the new topography and remains in place today. Any modifications to this grading and storm drain network must consider the impacts these changes will have on channel stability.

Returning channels to surface flow will achieve habitat and water quality goals, however many drainages have experienced large alterations that make restoring surface flow a challenge. Returning the grading to pre-golf course conditions is not considered feasible from a cost-benefit standpoint.

Identifying portions of drainages or a subset of drainages to be converted to predominantly surface flow is likely feasible and will require an evaluation of channel stability. For areas that require modifications to provide a dynamically stable channel, the suite of options include regrading the channel to achieve a suitable slope, modifying the channel substrate to allow for channel stability (step-pools, woody debris, woody vegetation) and/or attenuating flow from the upper drainage basins to reduce the rate of runoff. For areas where the effort to regrade or create a channel becomes too great, the project team can consider leaving portions of the storm drain network in place. Any storm drain infrastructure to remain will require long-term maintenance typical of this type of infrastructure and includes frequent clearing of drain inlets and outlets and considerations of pipe maintenance and replacement costs.

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JMP Golf Design Group. (1999). *Roddy Ranch, L.L.C. FIne Grading / Earthwork Plan.* Saratoga, CA.

Mapmaking Systems. (2002). *Drainage System As-Builts.* Glen Ellen.

McGill MartinSelf, Inc. (1999). *Roddy Ranch Rough Grading.* Walnut Creek, Ca.

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NOMAD ECOLOGY. 2020. BIOLOGICAL RESOURCES ASSESSMENT – THE FORMER RODDY RANCH GOLF COURSE HABITAT RESTORATION AND PUBLIC ACCESS PROJECT - CONTRA COSTA COUNTY, CALIFORNIA. .

BIOLOGICAL RESOURCES ASSESSMENT

THE FORMER RODDY RANCH GOLF COURSE
HABITAT RESTORATION AND PUBLIC ACCESS PROJECT
CONTRA COSTA COUNTY, CALIFORNIA

Prepared for

East Bay Regional Park District
2950 Peralta Oaks Court
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and

East Contra Costa County Habitat Conservancy
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NOVEMBER 2020

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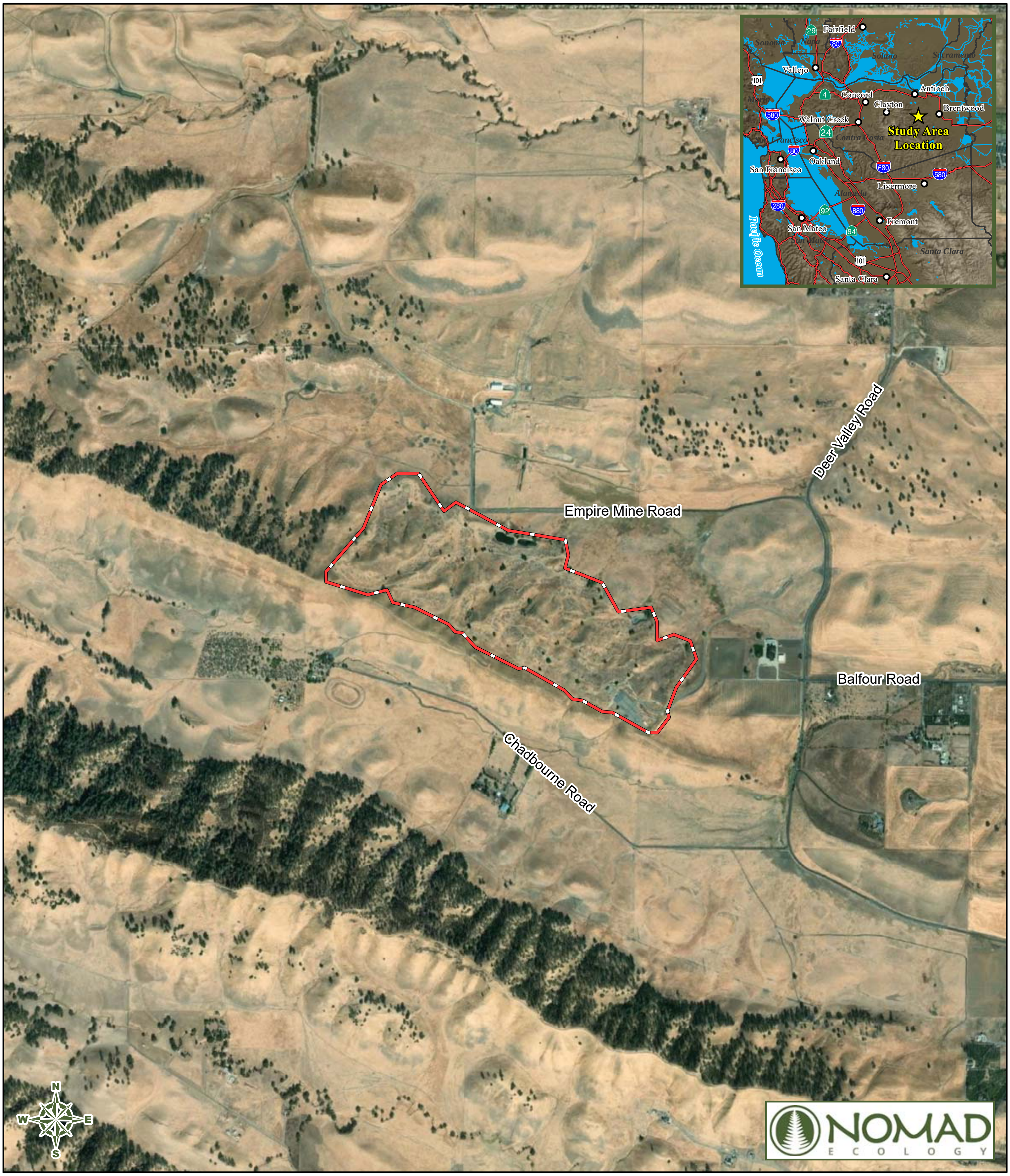
Section 1. INTRODUCTION

Nomad Ecology, LLC (Nomad) prepared this Biological Resources Assessment for the Former Roddy Ranch Golf Course Habitat Restoration and Public Access Project (project). The project is on the 230-acre former Roddy Ranch Golf Course property in unincorporated east Contra Costa County, approximately two miles south of Antioch (Figure 1). The golf course ceased operations in August 2016 and the property was incorporated into Preserve System of the East Contra Costa County Habitat Conservation Plan and Natural Community Conservation Plan (HCP/NCCP) (Jones & Stokes 2006) in April 2018.

East Bay Regional Park District (District) and the East Contra Costa County Habitat Conservancy (Conservancy) are partnering to implement a restoration project to enhance habitat and improve public access at the former Roddy Ranch Golf Course. The public access goals are consistent with the HCP/NCCP and include providing passive recreation opportunities and acting as the primary staging area for the future 3,600-acre Deer Valley Regional Park.

The study area for this report comprises the entire 230-acre property which includes one parcel, APN 057-060-017. The location of the project footprint within the study area has not been determined as the project is still in the conceptual design phase.

This report provides an assessment of existing conditions, evaluates habitat suitability for special status plant and wildlife species, analyzes potential project impacts to biological resources, and provides recommendations for impact avoidance and minimization. This report complies with all requirements of the HCP/NCCP. This report also addresses biological resources subject to the California Environmental Quality Act (CEQA).



December 2020

Legend

🟥 Study Area Boundary

Figure 1

Study Area Location

Former Roddy Ranch Golf Course Habitat Restoration
and Public Access Project
East Bay Regional Park District and
East Contra Costa County Habitat Conservancy

1:24,000
0 1,000 2,000
Feet

Sources: ESRI Aerial Imagery Basemap

Contra Costa County, California

Section 2. STUDY METHODS

2.1. DEFINITIONS

The following terms were used to evaluate the sensitivity of on-site biological resources and potential impacts of the proposed project. Terms and definitions are derived from the CEQA Guidelines and regulatory agencies, where applicable.

Study Area	The study area for this report comprises the entire 230-acre property which includes one parcel, APN 057-060-017. The analysis for this report extends beyond the immediate study area to address potential impacts to special status wildlife species that could result from construction of the project.
Project Area	The location of the project area (same as project footprint) within the study area has not been determined as the project is still in the conceptual design phase. The exact project area will be based on construction plans and will be smaller than the study area.
Direct Impact	Impacts (or primary effects) which are caused by the project and occur at the same time and place [CEQA Guidelines, Title 14 CCR, Section 15358(a)(1)].
Indirect Impact	Impacts (or secondary effects) which are caused by the project and are later in time or farther removed in distance, but are still reasonably foreseeable. These may include growth-inducing effects and other effects related to induced changes in the pattern of land use, population density, or growth rate, and related effects on air and water and other natural systems, including ecosystems [CEQA Guidelines, Title 14 CCR, Section 15358(a)(2)].
Critical Habitat	Defined by the Endangered Species Act (ESA), as amended (Code of Federal Regulations, Title 50, Section 17), as “a specific geographic area(s) that is essential for the conservation of a threatened or endangered species and that may require special management and protection. Critical habitat may include an area that is not currently occupied by the species but that will be needed for its recovery.” Critical habitat designations are published in the Federal Register. The final boundaries of the critical habitat area are also published in the Federal Register for federally listed species by USFWS and NOAA Fisheries.
DPS	A distinct population segment (DPS) is a vertebrate population or group of populations that are distinct from other populations of the species and significant in relation to the entire species. The ESA provides for listing species, subspecies, or distinct population segments of vertebrate species.

2.2. SIGNIFICANCE CRITERIA

The significance criteria are based in part on the Environmental Checklist (CEQA Guidelines Appendix G [Title 14 CCR, Section 15000-15387]). These criteria are used to determine the extent to which the proposed project would impact sensitive biological resources. The threshold of significance may vary for each species or habitat, and is determined by the lead agency. Using these guidelines, the project would result in a significant impact if it would:

- Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Wildlife (CDFW) or U.S. Fish and Wildlife Service (USFWS).
- Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations, or by CDFW or USFWS.
- Have a substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act (including, but not limited to, marsh, vernal pool, coastal, *etc*.) through direct removal, filling, hydrological interruption, or other means.
- Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites.
- Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance.
- Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan.

2.3. DATA RESOURCES

Background information for listed and special status plant and wildlife species, and sensitive natural communities was compiled through a review of the following resources:

U.S. Fish and Wildlife Service (USFWS):

- List of Threatened and Endangered Species that May Occur in the Roddy Ranch Golf Course Restoration Project Study Area. Retrieved from the USFWS Information for Planning and Consultation (IPaC) online system (USFWS 2020a) (Appendix E)
- National Wetland Inventory for the Antioch South Quadrangle (USFWS 2020b)

National Oceanographic and Atmospheric Administration Fisheries – West Coast Region – California (NOAA Fisheries):

- Intersection of USGS 7.5’ Topographic Quadrangles with NOAA Fisheries ESA Listed Species, Critical Habitat, Essential Fish Habitat, and MMPA Species Data within California for the Antioch South Quadrangle (NOAA Fisheries 2016)

California Department of Fish and Wildlife (CDFW):

- California Natural Communities List (CDFW 2020a)
- California Natural Diversity Database (CNDDB) Query for the Antioch South, Antioch North, Brentwood, Byron Hot Springs, Diablo, Jersey Island, Tassajara, Honker Bay, and Clayton USGS 7 ½ Minute Quads (CDFW 2020b) (Appendix F)
- Special Animal List (CDFW 2020c)
- Special Vascular Plants, Bryophytes, Lichens List (CDFW 2020d)
- State and Federally Listed Endangered and Threatened Animals of California (CDFW 2020e)
- State and Federally Listed Endangered, Threatened and Rare Plants of California (CDFW 2020f)

Other Sources:

- Annotated Checklist of the East Bay Flora (CNPS 2013)
- Biological Resources of the Proposed Golf Course at the Roddy Ranch, Contra Costa County, California (Sycamore Associates LLC 1998a)
- Botanical Assessment of the Roddy Ranch, Contra Costa County, California (Sycamore Associates LLC 1998b)
- The California Native Plant Society's Inventory of Rare and Endangered Plants of California (CNPS 2020)
- Consortium of California Herbaria (CCH 2020)
- Contra Costa County Breeding Bird Atlas (Glover 2009)
- Contra Costa County Watershed Atlas (CCCCDD 2003)
- East Contra Costa County Habitat Conservation Plan and Natural Community Conservation Plan (Jones & Stokes 2006)
- East Contra Costa County Historical Ecology Study (Stanford et al. 2011)
- The Jepson eFlora (JFP 2020)
- The Jepson Manual, 2nd Edition (Baldwin et al. 2012)
- A Manual of California Vegetation (Sawyer et al. 2009)
- Preliminary Wetlands Delineation and Jurisdictional Determination for the Roddy Ranch (Sycamore Associates LLC 1998c)
- Roddy Ranch Jurisdictional Wetland Delineation (Zentner and Zentner 2006)
- Unusual and Significant Plants of Alameda and Contra Costa Counties. Eighth Edition (Lake 2010)
- 2013 Covered Plant Species Inventory of Preserve System Acquisitions, East Contra Costa County Habitat Conservancy, Contra Costa County, California (Nomad Ecology LLC 2013a)
- 2014 Covered Plant Species Inventory of Preserve System Acquisitions, East Contra Costa County Habitat Conservancy, Contra Costa County, California (Nomad Ecology LLC 2014)

Botanical taxonomy and nomenclature conforms to *The Jepson Manual* (Baldwin et al. 2012) with the exception of recent updates posted on the Jepson eFlora (JFP 2020) website. Common names of plant species are derived from The Calflora Database (Calflora 2020). Land cover types and vegetation described herein conform to the HCP/NCCP (Jones & Stokes 2006), *Preliminary Descriptions of the Terrestrial Natural Communities of California* (Holland 1986) and/or *A Manual of California Vegetation* (Sawyer et al. 2009); wetland and deepwater habitat classifications conform to *Classification of Wetlands and Deepwater Habitats of the United States* (Cowardin et al. 1979), where appropriate.

Nomenclature for special status plant species conform to the *Inventory of Rare and Endangered Plants of California* (CNPS 2020) and *Special Vascular Plants, Bryophytes and Lichens List* (CDFW 2020d). Nomenclature for common and special status wildlife species conforms to the nomenclature used in the *Complete List of Amphibian, Reptile, Bird and Mammal Species in California* (CDFW 2016), and in the CNDDB (CDFW 2020b).

2.4. REGULATORY FRAMEWORK

Habitat Conservation Plan/Natural Community Conservation Plan

The primary goal of the (HCP/NCCP is to "*provide an effective framework to protect natural resources in eastern Contra Costa County, while improving and streamlining the environmental permitting process for* *impacts on endangered species*." The HCP/NCCP provides comprehensive species, wetlands, and ecosystem conservation and contributes to the recovery of endangered species in northern California. The HCP/NCCP avoids project-by-project permitting that is generally costly and time consuming for applicants and often results in uncoordinated and biologically ineffective mitigation. The Conservancy is the implementing entity for the HCP/NCCP.

The HCP/NCCP obtains authorization for take of covered species under the Federal Endangered Species Act (FESA) and California Endangered Species Act (CESA) for the reasonable expansion of urban development and specific rural infrastructure projects outside these urban boundaries that will support urban growth, as well as project on Conservancy preserves. The HCP/NCCP inventory area is located in the eastern portion of Contra Costa County and is identified as the area in which impacts are evaluated and conservation will occur.

Covered species are those species fully addressed in the HCP/NCCP and are included in the ESA and NCCP incidental take permits by evaluating and complying with avoidance and minimization requirements at a regional scale (Table 1). In addition, the HCP/NCCP includes "no-take" species, which are species for which take is not authorized under the Natural Community Conservation Plan Act (Table 2). In order to comply with the terms of the HCP/NCCP, the applicant must avoid all direct and indirect impacts on no-take species.

Table 1. Covered Species in the HCP/NCCP

COVERED SPECIES (28 SPECIES)	
PLANTS	**AMPHIBIANS**
Mount Diablo manzanita	California tiger salamander
brittlescale	California red-legged frog
San Joaquin spearscale	foothill yellow-legged frog
big tarplant	**REPTILES**
Mount Diablo fairy lantern	northern California legless lizard
recurved larkspur	Alameda whipsnake
round-leaved filaree	giant garter snake
Diablo helianthella	western pond turtle
Brewer's dwarf flax	**BIRDS**
showy madia	tricolored blackbird
adobe navarretia[1] / shining navarretia	western burrowing owl
INVERTEBRATES	Swainson's hawk
longhorn fairy shrimp	golden eagle
vernal pool fairy shrimp	**MAMMALS**
midvalley fairy shrimp	Townsend's big-eared bat
vernal pool tadpole shrimp	San Joaquin kit fox

[1] The species *Navarretia nigelliformis* subsp. *nigelliformis* is no longer considered to occur within Contra Costa County based on specimen annotations at the UC and Jepson Herbaria at the University of California Berkeley as well as the opinions of experts in the genus. This taxon is now recognized as *Navarretia nigelliformis* subsp. *radians*.

Table 2. No-Take Species in the HCP/NCCP

No-Take Species (10 Species)	
Plants	**Wildlife**
large-flowered fiddleneck	American peregrine falcon
alkali milk-vetch	golden eagle
Mount Diablo buckwheat	ringtail
diamond-petaled poppy	white-tailed kite
Contra Costa goldfields	-
caper-fruited tropidocarpum	-

Per the HCP/NCCP, planning surveys are conducted to identify biological resources on site. The first step in planning surveys is mapping the land cover types. Based on the land cover types and associated habitat elements identified in the study area, species-specific planning survey requirements may be triggered. Species-specific planning survey requirements include identifying and mapping habitat for covered wildlife and conducting botanical surveys for plants.

Sensitive Natural Communities

Sensitive natural communities are characterized as plant assemblages that are unique in constituent components, restricted in distribution, supported by distinctive edaphic conditions, considered locally rare, potentially support special status plant or wildlife species and/or receive regulatory protection from municipal, county, state and/or federal entities. The regulatory framework that protects sensitive natural communities is derived from local, state and federal laws and regulations including Section 10 of the federal Rivers and Harbors Act, Sections 401 and 404 of the federal Clean Water Act, Section 1600 *et seq.* of the California Fish and Game Code, Section 15065 of the CEQA guidelines, and various other city or county codes. Implementation and enforcement of these regulations are conducted by their respective regulatory entities such as the U.S. Army Corps of Engineers, California Regional Water Quality Control Board, CDFW, lead agency, and/or various cities or counties. Natural Communities with ranks of S1, S2, and S3 are considered sensitive natural communities to be addressed in the environmental review processes of CEQA and its equivalents (CDFW 2020a).

The HCP/NCCP also identifies eight Uncommon Vegetation Types and eight Uncommon Landscape Features, which are a subset of land cover types. Uncommon Vegetation Types and Uncommon Landscape Features identified in the HCP/NCCP are depicted below in Table 3 and discussed in Section 4 under sensitive natural communities. For a summary of the laws and regulations regarding sensitive natural communities please refer to Appendix A.

Table 3. Uncommon Vegetation Types and Uncommon Landscape Features in the HCP/NCCP

Uncommon Vegetation Types and Landscape Features
Uncommon Vegetation Types
purple needlegrass grassland
wildrye grassland
wildflower fields
squirreltail grassland
one-sided bluegrass grassland

serpentine grassland
saltgrass grassland (= alkali grassland)
alkali sacaton bunchgrass grassland
UNCOMMON LANDSCAPE FEATURES
rock outcrops
caves
springs and seeps
scalds
sand deposits
mines
buildings (bat roosts)
potential nest sites (trees or cliffs)

Special Status Species

Special status plant species are defined as those species listed as endangered or threatened, are proposed or candidates for listing, or are designated as fully protected species under one or more of the following regulatory statues: ESA, as amended (Code of Federal Regulations, Title 50, Section 17), California Endangered Species Act (CESA) (California Code of Regulations Title 14, Section 670.5), California Fish and Game Code (Sections 1901, 2062, 2067) and the Native Plant Protection Act (NPPA) of 1977. Special status species may also include locally rare species defined by CEQA guidelines 15125(c) and 15380, which may include species that are designated as sensitive, declining, rare, locally endemic or as having limited or restricted distribution by various federal, state, and local agencies, organizations, and watchlists. Their status is based on their rarity and endangerment throughout all or portions of their range. Such species are referred to as special status species or "target species" herein. For a summary of the laws and regulations regarding special status species please refer to Appendix A.

The California Native Plant Society (CNPS) has developed and maintains an inventory of rare, threatened and endangered plants of California. This information is published in the *Inventory of Rare and Endangered Vascular Plants of California* (CNPS 2020). The rarity ranking contained in the CNPS inventory is endorsed by the CDFW and effectively serves as its list of "candidate" plant species. The following identifies the definitions of the CNPS California Rare Plant Ranks:

- Rank 1A: Plants presumed to be extinct in California;
- Rank 1B: Plants that are rare, threatened, or endangered in California and elsewhere;
- Rank 2A: Plants presumed extirpated in California, but more common elsewhere
- Rank 2B: Plants rare, threatened, or endangered in California, but more common elsewhere
- Rank 3: Plants about which more information is needed (a review list); and
- Rank 4: Plants of limited distribution (a watch list).

California Rare Plant Rank 1B and 2B species are considered eligible for state listing as endangered or threatened pursuant to the California Fish and Game Code. As part of the CEQA process, such species should be fully considered, as they meet the definition of threatened or endangered under the NPPA and Sections 2062 and 2067 of the California Fish and Game Code. California Rare Plant Rank 3 and 4 species are considered to be either plants about which more information is needed or are uncommon enough that their status should be regularly monitored. Such plants may be eligible or may become eligible for state listing, and CNPS and CDFW recommend that these species be evaluated for consideration during the preparation of CEQA documents (CNPS 2001), as some of these species may meet NPPA and CESA criteria as threatened or endangered.

Locally Rare, Unusual, and Significant Plant Species

As consistent with CEQA's Article 9 and Guidelines §15125(a) and §15380 which state that "special emphasis should be placed on environmental resources that are rare or unique to that region" and CNPS's goal of preserving plant biodiversity on a regional and local scale, this study also assessed the occurrence of locally significant plant species. Locally significant plant species, also known as "peripheral populations" are those considered to be at the outer limits of their known distribution, a range extension, a rediscovery, or rare or uncommon in a local context. These species are not regarded as special-status species by the USFWS or CDFG. However, the East Bay Chapter of CNPS has a program, started in 1991, that tracks rare, unusual, and significant plants that occur within Contra Costa and Alameda counties. East Bay CNPS has three ranked designations for these species: A (which includes A1, A1x, and A2); B; and C. The criteria of each ranking are presented in Table 4. This determination is partially based on the number of botanical regions the subject taxon occurs in.

Table 4. Ranking Criteria for Rare, Unusual, and Significant Plants of the East Bay

RANKING	DEFINITION
A1	Species from 2 or less botanical regions in Alameda and Contra Costa counties, either currently or historically.
A1x	Species is previously known from Alameda or Contra Costa counties, but now believed to have been extirpated and no longer occurring here.
A2	Species is currently known from 3 to 5 regions in the two counties, or if more, meeting other important criteria such as small populations, stressed or declining populations, small geographical range, limited or threatened habitat, etc.
B	A high-priority watch list: Species currently known from 6 to 9 regions in the two counties, or if more, meeting other important criteria as described for A2.
C	A second-priority watch list: Species is currently known from 10 or more regions in the two counties, but potentially threatened if certain conditions persist such as over-development, water diversions, excessive grazing, weed or insect invasions, etc.

\

The East Bay Chapter has been divided into 40 botanical regions based on vegetation, geology, habitats, soil types, and other factors. The East Bay Chapter's botanical regions only include Contra Costa and Alameda counties.

2.5. PERSONNEL AND FIELD INVESTIGATION

Nomad Ecology biologists conducted site visits in the study area in 2013, 2018, 2019, and 2020. Site visits were conducted by Nomad senior botanist Heath Bartosh, Nomad senior restoration ecologist Erin McDermott, botanist Adam Chasey, botanist Cody Ender, botanist Jaclyn Inkster, botanist Brian Peterson, and senior wildlife biologist Dana Terry (Table 5).

Table 5. Site Visits

DATE	NOMAD PERSONNEL	GOAL OF SITE VISIT
July 11, 2013	Heath Bartosh, Erin McDermott	Rare Plant Survey
September 6, 2013	Heath Bartosh, Erin McDermott	Rare Plant Survey

DATE	NOMAD PERSONNEL	GOAL OF SITE VISIT
March 31, 2014	Heath Bartosh, Erin McDermott	Rare Plant Survey
April 7, 2014	Heath Bartosh, Erin McDermott	Rare Plant Survey
May 14, 2014	Heath Bartosh, Erin McDermott	Rare Plant Survey
May 10, 2018	Erin McDermott, Adam Chasey	Site Reconnaissance, Invasive Weed Mapping
March 29, 2019	Erin McDermott, Cody Ender	Wetland Assessment
May 2, 2019	Erin McDermott	Invasive Weed Mapping, Rare Plant Survey
January 24, 2020	Erin McDermott, Adam Chasey	Invasive Weed Mapping
May 5, 2020	Erin McDermott	Site Reconnaissance
June 12, 2020	Jaclyn Inkster	Invasive Weed Mapping
July 16, 2020	Erin McDermott, Dana Terry	Site Reconnaissance
July 27, 2020	Erin McDermott	Wetland Delineation
September 22, 2020	Adam Chasey, Brian Peterson	Rare Plant Survey

2.5.1 SITE RECONNAISSANCE VISITS

During site reconnaissance visits, all vegetation communities within the study area were visited and evaluated for their potential to support sensitive biological resources. Protocol-level surveys for special status animals were not conducted as part of this assessment. However, all wildlife species observed or recognized by diagnostic sign (e.g., audible call, tracks, scat, carcasses, burrows) were identified and recorded. Land cover types on site were mapped following the HCP/NCCP.

2.5.2 WETLAND DELINEATION

The field studies were conducted in accordance with the U.S. Army Corps of Engineers' (Corps) *Wetlands Delineation Manual* (Environmental Laboratory 1987) and the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Arid West Region* (U.S. Army Corps of Engineers 2008). Based on this protocol, topography and field characteristics including evidence of inundated or saturated soil conditions resulting from permanent or periodic inundation by ground water or surface water, the prevalence of hydrophytic vegetation (e.g. plant species typically adapted for life in saturated soil conditions), and the presence of hydric soils were evaluated to determine the wetland boundaries in the study area. The HCP/NCCP also defines wetland features.

The methodology and results of the wetland delineation are detailed in the wetland delineation for the project (Nomad Ecology 2020).

2.5.3 RARE PLANT SURVEYS

Rare plant surveys were conducted in 2013, 2014, 2019, and 2020. The purpose of the surveys was to conduct an inventory of vascular plants of the study area to document occurrences of rare, threatened, or endangered species, and other special status plants and sensitive natural communities. For more details about how the potentially occurring target special status species were selected, please see Section 4.2.

Botanical surveys were conducted in accordance with the California Native Plant Society's *Botanical Survey Guidelines* (CNPS 2001), California Department of Fish and Game's *Protocols for Surveying and Evaluating Impacts to Special Status Native Plant Populations and Sensitive Natural Communities* (CDFW 2018), and the U.S. Fish and Wildlife Service's *Guidelines for Conducting and Reporting Botanical Inventories for Federally Listed, Proposed and Candidate Plants* (USFWS 2000).

2.6. LIMITATIONS

Based on the timing of this assessment, not all potentially occurring special status plant or wildlife species can be conclusively determined to be absent. However, determinations of presence/absence within the study area were possible for: (1) specific special status plant species that would be identifiable during the site visits and protocol-level surveys; and (2) the direct observation or presence of diagnostic sign for wildlife species. Negative findings during site assessments or protocol or focused surveys may not indicate absence unless field surveys conform to agency approved protocols.

Based on the timing of the surveys, all plant species growing within the study area may not have been observed due to varying flowering phenologies and life forms, such as bulbs, biennials, and annuals. Annuals may be absent in some years due to annual variations in temperature and rainfall, which influence germination and plant phenology. Colonization of new populations within an area may also occur from year to year.

Since vegetation types are based on samples from selected seasonal vegetation descriptions, and their associate species may be subject to change if additional data are collected, annual species dominance may change depending on the sample season or year. The phrase "in part" is used to signify that vegetation descriptions may include additional annual species present if surveyed during other seasons or years. Other potentially dominant species within vegetation communities on site may be present during other times of the year.

The CNDDB tracks user-submitted occurrences of all special- status species in California and is used extensively as a reference for regulatory and planning purposes (CDFW 2020b). This database may substantially under-represent actual densities of species, particularly for species that are difficult to detect and for areas that are in private land ownership and have not been surveyed. It is also likely to under-represent densities of species that are not prominent in regulatory permitting or environmental planning settings.

Several factors constrained the biologists' ability to identify all of the wildlife species that occur within the study area. Songbirds are most easily detected in the early morning or late evening, rather than during other times of the day. Similarly, owls and bats are most easily detected at night. Due to the scope of work, biologists were only on site for a short period of time to assess the general habitat within the study area and could not be present during all the optimal times for wildlife detection. Finally, one reconnaissance visit is not sufficient for identifying all wildlife that may winter, breed, forage, or migrate through the study area.

Section 3. ENVIRONMENTAL SETTING

3.1. REGIONAL SETTING

The study area is geographically situated approximately 7 miles northeast of the peak of Mount Diablo and 6.25 miles south of downtown Antioch. As recorded in the public land survey system, the study area is within Township 1 North Range 2 East of the Mount Diablo Baseline and Meridian as depicted on the Antioch South 7.5-minute USGS topographic quadrangle (Figure 2).The study area lies within the San Joaquin Valley Subregion of the California Floristic Province (Baldwin et al. 2012), within the Sand Creek Watershed (CCCCDD 2003), and within the East Contra Costa County HCP/NCCP Inventory Area (Jones & Stokes 2006).

A Manual of California Vegetation (MCV) (Sawyer et al. 2009) defines the currently recognized method of vegetation classification and mapping in California, which is accepted by CNPS and CDFW. This methodology is used to determine the rarity and endangerment of California vegetation types that can result in a sensitive natural community designation for specific vegetation types. The *Ecological Subregions of California* (Ecoregion; USDA 1997) are the basis for describing regional variation in California alliance descriptions in the MCV. As described in the *Ecological Subregions of California* (USDA 1997), the study area is located in the Suisun Hills and Valleys subsection of the Central California Coast Section.

3.1.1 SUISUN HILLS AND VALLEYS

The Suisun Hills and Valleys subsection consists of low hills north and south of the Carquinez Strait, and includes valleys between the hills, and plains at the west end of the Sacramento-San Joaquin River delta. The hills are aligned northwest. The subsection elevation ranges from sea-level up to 1428 feet in the Briones Hills. Mass wasting and fluvial erosion loss are the main geomorphic processes. The climate is hot and subhumid. It is very windy on hills adjacent to and north of the Carquinez Strait (USDA 1997).

This subsection contains mostly Cretaceous, Eocene, and Miocene marine sedimentary rocks and late Quaternary alluvium, and minor amounts of Pliocene nonmarine sediments and volcanic rocks. The Franklin fault separates Cretaceous and Eocene marine sedimentary rocks in this subsection from Miocene sedimentary and volcanic rocks on the southwest. Most, but not all, of the soils on hills are leached free of carbonates, but calcium carbonates accumulate in many soils on alluvial plains and more soluble salts accumulated in somewhat poorly drained soil (USDA 1997).

For this region the mean annual precipitation is about 15 to 20 inches. Mean annual temperature is about 56° to 60° F. The mean freeze-free period is about 250 to 275 days. Hydrologically, runoff is rapid from the hills, but slow across alluvial plains. All but the larger streams are dry through most of the summer, and natural lakes are absent (USDA 1997).

3.2. LOCAL SETTING

The project is located on the former Roddy Ranch Golf Course, which is an acquisition property of the Conservancy. It is located in southeastern Contra Costa County (Figure 1). It is west of Deer Valley Road, south of Empire Mine Road, and north of Chadbourne Road. The study area is nested within 3,200 acres of Conservancy preserve lands. Immediately adjacent to the north is the Horse Valley Creek and Wetland Restoration project implemented by the Conservancy in 2018. The study area connects through public lands to Black Diamond Mines Regional Park. Representative site photographs are provided in Appendix D.

3.2.1 LAND USE

The golf course was in operation from 2002-2016 and features of that operation remain including paved golf cart trails, a subsurface drainage system, three irrigation ponds, several additional water quality basins, a parking lot, and associated infrastructure including rest rooms and a pump house. Fairways, sand traps, and other golf course features have become colonized by ruderal vegetation (Figure 3). The site has been grazed with cattle the last several years and cattle are generally on site from December through May.

Land cover types present currently in the study area include ruderal, annual grassland, seasonal wetland, permanent wetland, aquatic (concrete-edged and plastic-lined irrigation ponds) and urban (paved areas). Prior to the construction of the golf course, the site was characterized by upland grassland (Sycamore Associates 1998a). All of the wetland features currently present on site were artificially created as irrigation and detention features during golf course construction. Although irrigation has been turned off on site, several of these features continue to pond in the winter, however they have become smaller and drier since irrigation has ceased.

3.2.2 TOPOGRAPHY

The study area occupies the northeast-facing slope of a northwest trending ridge (Figure 2). Topography within the study area ranges from 340-590 feet above mean sea level, with highest elevation along the ridge in the southern portion of the southern area and lower elevations toward the valley bottom in the northern portion of the study area. The highest point is in the southwest corner of the study area and the lowest point in the northeast.

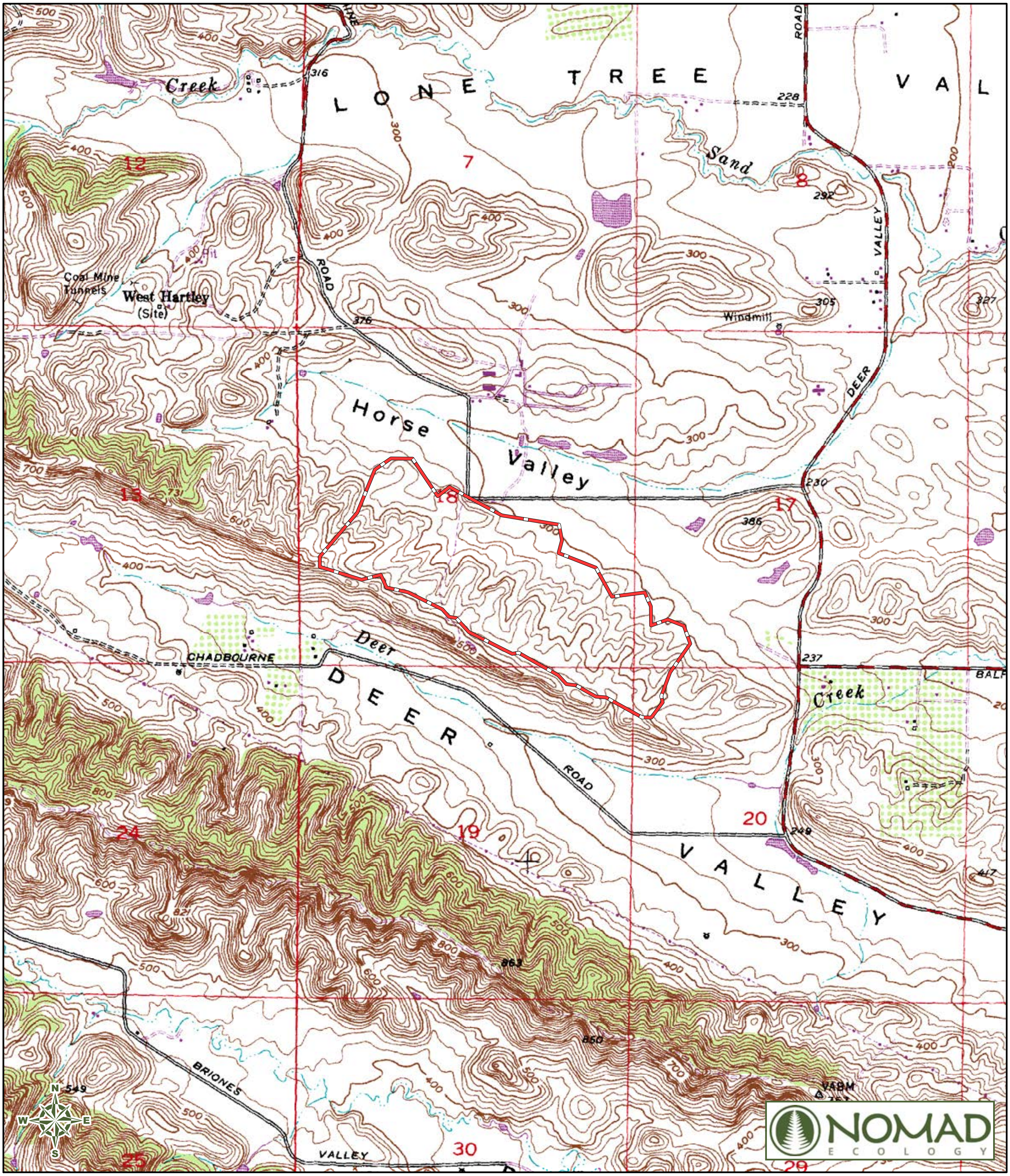
3.2.3 CLIMATE

Locally the climate of the study area is characterized as Mediterranean with cool wet, winters and warm to hot, dry summers. Annual average rainfall for the study area is approximately 13.22 inches (WRCC 2020).

3.2.4 GEOLOGY AND SOILS

The underlying geology of the study area consists primarily of the Maganos Formation (sandstone, shale, and conglomerate) with a small amount of Quaternary sediments covered by surficial deposits at the northern end toward the valley bottom (Graymer et al. 2000).

There are four soil mapping units located within the study area: Rincon clay loam, 0 to 2% slopes (RbA), Rincon clay loam, 2 to 9% slopes (RbC); Altamont clay, 9 to 15% slopes (AbD); and Briones loamy sand, 15 to 30% slopes (BdE2) (USDA 1977). The majority of the site is mapped as Briones loamy sand. There are small amounts of Rincon clay loam and Altamont clay in the northern portion of the study area at the toe of slopes where the ponds are constructed. Additionally, the construction of the golf course may have imported soils and mixed soils on site and possibly exported soils after the golf course closed.



December 2020

Figure 2

Study Area Location on USGS Topographic Map

Former Roddy Ranch Golf Course Habitat Restoration and Public Access Project

East Bay Regional Park District and East Contra Costa County Habitat Conservancy

Legend

🟥 Study Area Boundary

1:24,000

0 1,000 2,000

Feet

Sources: USGS 7.5 Minute Topographic Quadrangle - Antioch South

Contra Costa County, California

December 2020

Legend

Study Area Boundary
🟥

Well Location
●

Constructed Golf Course Aquatic Features
🟦 Irrigation Ponds (plastic-lined with vertical concrete edges)
🟨 Water Quality Basin

1:4,800
0 200 400
Feet

Figure 3

Site Overview

Former Roddy Ranch Golf Course Habitat Restoration and Public Access Project
East Bay Regional Park District and East Contra Costa County Habitat Conservancy

Sources: ESRI Aerial Imagery Basemap

Contra Costa County, California

3.2.5 HYDROLOGIC FEATURES

The construction of the golf course included the creation of irrigation ponds, water quality basins, irrigation infrastructure, subsurface drainage, mass grading, and other infrastructure that have altered the site hydrology. Irrigation has been turned off since 2016. There are three concrete-edged and plastic-lined irrigation ponds on site (labeled depnd030, depnd031, and depnd032[1]), all in the northern portion of the study area (Figure 3). These ponds are filled by the subsurface drainage system. Two of the ponds (depnd030 and depnd031) contained water through the summer months, while depnd032 was completely dry by mid-spring. The plastic liners were removed from the ponds by the Conservancy in October 2020. There are several water quality basins on site: basin 2, basin 3, basin 5, basin 7, and depnd033. Basin 5 contained standing water well into summer and appeared to be fed by depnd031. The other basins and depnd033 were dry by late spring. Basin 4 is upland and does not pond water.

The nearest major hydrologic feature is to the north of the study area in Horse Valley. Horse Valley contains a channel that originates in the upper portion of the valley and heads east through the valley, passing through a culvert under Empire Mine Road. Once water passes under Empire Mine Road, it continues flowing east along the north side of Empire Mine Road, and crosses under Deer Valley Road in a culvert approximately one mile downstream. From there it flows northeast for approximately one mile where it joins Sand Creek. Sand Creek flows into Marsh Creek approximately eight miles in a sinuous channel to the east. Marsh Creek flows northward approximately six miles from the confluence of Sand Creek until it drains into the Sacramento-San Joaquin Delta at Big Break.

3.2.6 LAND COVER TYPES AND VEGETATION

This subsection describes vegetation communities following the land cover types described in the HCP/NCCP (Jones & Stokes 2006). HCP/NCCP land cover types observed within the study area include annual grassland, ruderal, seasonal wetland, permanent wetland, aquatic, and urban (Table 2). The golf course was originally mapped as turf in the HCP/NCCP (which is a Developed land cover type) but since the golf course has ceased operation, these areas have converted to ruderal vegetation. Areas that were not formerly turf are mapped as annual grassland. These two vegetation types intermix on site. The location of land cover types in the study area is shown in Figure 4.

Table 6. HCP Land Cover Types in the Study Area

LAND COVER	AREA (ACRE)
GRASSLANDS	
Annual Grassland	88.48
Ruderal	126.10
WETLANDS	
Seasonal Wetland	0.25
Permanent Wetland	0.26
OTHER	
Aquatic (concrete-edged and plastic-lined ponds)	2.50
Urban (paved areas)	12.25
Total:	**230**

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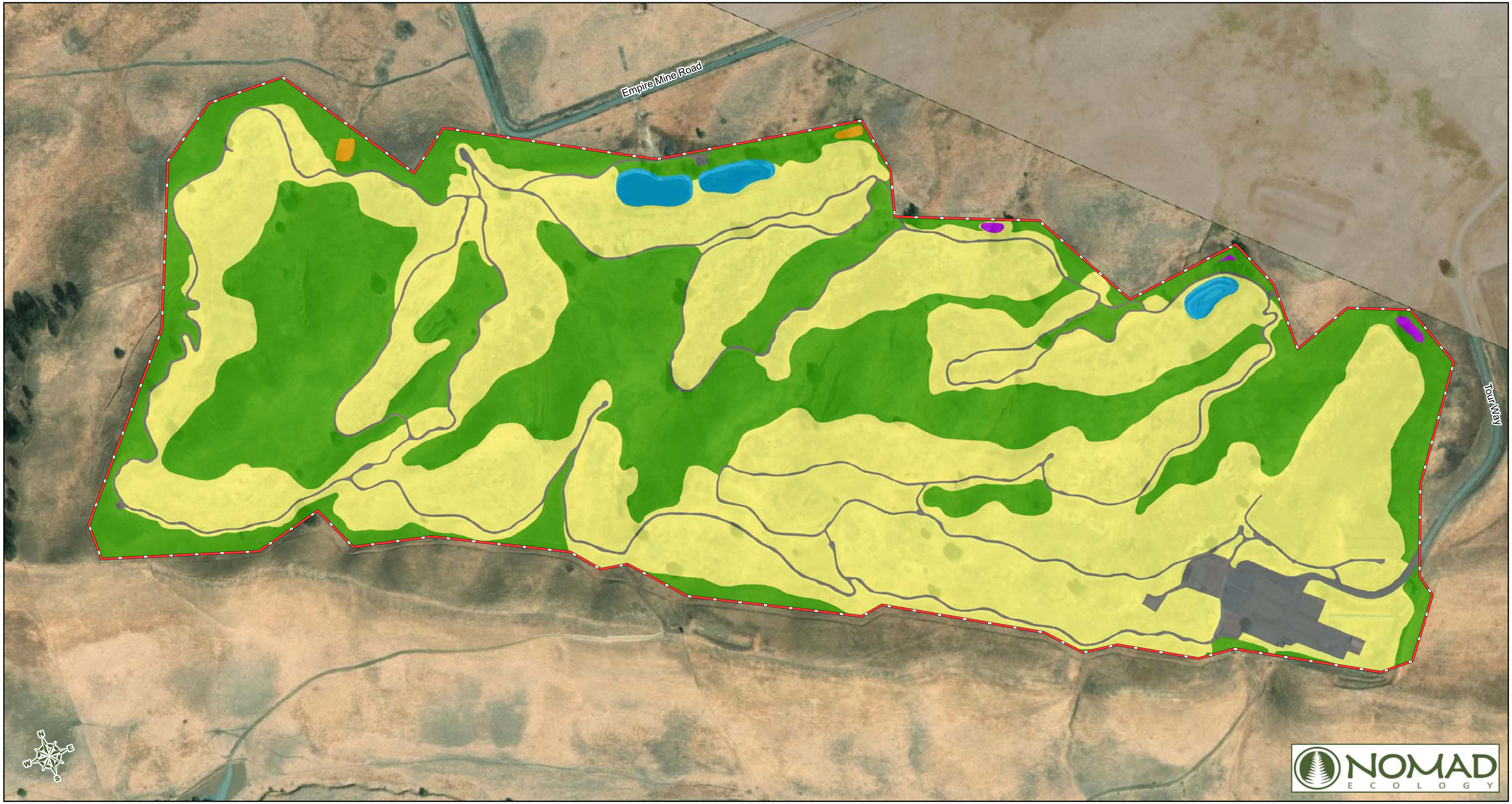
[1] Pond and basin labels follow the internal East Bay Regional Park District pond labeling system.



December 2020

Legend

Study Area Boundary 🟥

Field-Verified Land Cover
- 🟩 Annual Grassland
- 🟨 Ruderal
- 🟦 Aquatic
- 🟧 Permanent Wetland
- 🟪 Seasonal Wetland
- ⬛ Urban

Source: ESRI Aerial Imagery Basemap

1:4,800
0 200 400
Feet

Figure 4

Land Cover in the Study Area

Former Roddy Ranch Golf Course Habitat Restoration and Public Access Project
East Bay Regional Park District and East Contra Costa County Habitat Conservancy

Contra Costa County, California

Land cover types are further described below by referencing *California Vegetation* (Holland and Keil 1995), *Preliminary Descriptions of the Terrestrial Natural Communities of California* (Holland 1986), and *Manual of California Vegetation, Second edition* (Sawyer et al. 2009).[2] In addition, habitat types from the *CNPS Inventory of Rare and Endangered Plants of California* (CNPS 2001a) are included to reference habitat types listed in the CNPS Inventory to HCP/NCCP land cover types found on site (Table 7).

Grasslands

Two land cover types found on site are grasslands as described in the HCP/NCCP: annual grassland and ruderal.

Annual Grassland

As described in the HCP/NCCP, annual grassland is characterized by grass and forb species dominating the land cover and where trees and shrubs comprise less than 5 percent canopy cover. The dominant grass species are non-native annuals. Based on the description by Holland (1986) non-native grassland is a dense to sparse cover of annual grasses with flowering culms up to 3 feet (one meter) tall. Associates often include "showy-flowered" native annual forbs. This community occurs on fine-textured, usually clay soils, moist or even waterlogged during the winter rainy season and very dry during the summer and fall. Germination occurs with the onset of the late fall rains while growth, flowering, and seed-set occur from winter through spring. With a few exceptions, the plants are dead through the summer and fall dry season, persisting as seeds. This community usually occurs below 3,000 feet, but reaches 4,000 feet in the Tehachapi Mountains and interior San Diego County, and intergrades with coastal prairie along the Central Coast.

The majority of the study area that is outside the golf course development footprint comprises annual grassland. This land cover type is dominated by non-native annual grasses including soft chess (*Bromus hordeaceus*[*]), hare barley (*Hordeum murinum* subsp. leporinum*), Mediterranean barley (*Hordeum marinum* subsp. *gussoneanum**), ripgut brome (*Bromus diandrus**), slender oats (*Avena barbata**), Bermuda grass (*Cynodon dactylon**), and Italian ryegrass (*Festuca perennis**). Other non-native species include red-stemmed filaree (*Erodium cicutarium**), hoary mustard (*Hirschfeldia incana**), prickly lettuce (*Lactuca serriola**), Dallis grass (*Paspalum dilatatum**), rose clover (*Trifolium hirtum**), vetch (*Vicia villosa* subsp*. varia**), Russian thistle (*Salsola tragus**), bur clover (*Medicago polymorpha**), and field bindweed (*Convolvulus arvensis**), among others. Native herbs present in this community include American bird's foot trefoil (*Acmispon americanus* var. *americanus*), Great Valley gumplant (*Grindelia camporum*), California poppy (*Eschscholzia californica*), turkey-mullein (*Croton setiger*), horseweed (*Erigeron canadensis*), vinegar weed (*Trichostemma lanceolatum*), narrow leaf milkweed (*Asclepias fascicularis*), salt heliotrope (*Heliotropium curassavicum* var. *occulatum*), branched lagophylla (*Lagophylla ramosissima*), virgate tarweed (*Holocarpha virgata* subsp. *virgata*), telegraph weed (*Heterotheca grandiflora*), tall willowherb (*Epilobium brachycarpum*), and purple owl's clover (*Castilleja exserta* subsp. *exserta*).

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[2] This is due to the fact that the HCP land cover types, in many cases, do not refer to standard vegetation community treatments and is therefore an effort to relate HCP land cover types to these commonly used classification systems for regional context and regulatory continuity.

[*] Denotes a non-native species that has an origin other than California.

Table 7. Land Cover Types and Vegetation Community Classification Systems Comparisons

HCP/NCCP LAND COVER TYPES[1]	TERRESTRIAL COMMUNITIES[2]	CALIFORNIA VEGETATION[3]	CNPS INVENTORY[4]	WETLANDS & DEEPWATER HABITATS[5]
GRASSLANDS				
Annual Grassland	Non-Native Grassland (42200) (*Holland 1986*)	California Annual Grassland Alliance (42.040.00) *Avena* spp. - *Bromus* spp. Herbaceous Semi-Natural Alliance (Wild oats and annual brome grasslands) (42.027.00), in part *Festuca perennis* Semi-Natural Alliance (Perennial rye grass fields) (41.321.00), in part	Valley and Foothill Grassland	Upland
Ruderal	Ruderal (*Holland & Keil 1995*)	*Brassica nigra* - *Raphanus* spp. Herbaceous Semi-Natural Alliance Upland mustards and other ruderal forbs (42.011.00), in part *Avena* spp. - *Bromus* spp. Herbaceous Semi-Natural Alliance (Wild oats and annual brome grasslands) (42.027.00), in part	Not Described	Upland
WETLANDS				
Seasonal Wetland	Freshwater Seep (45400) (*Holland 1986*)	*Festuca perennis* (Perennial rye grass fields) Semi-natural Stands (41.321.00), in part	Valley and Foothill Grassland Meadows and Seeps (in part) Vernal Pools (in part)	Palustrine non-persistent emergent wetlands
Permanent Wetland	Coastal and Valley Freshwater Marsh (52410) *(Holland 1986)*	*Typha* (*angustifolia, domingensis, latifolia*) (Cattail marshes) Alliance (52.050.00), in part	Marshes and Swamps	Palustrine persistent emergent wetland
OTHER				
Aquatic (concrete-edged and plastic-lined ponds)	Not Applicable	Not Applicable	Not Applicable	Not Applicable

HCP/NCCP Land Cover Types[1]	Terrestrial Communities[2]	California Vegetation[3]	CNPS Inventory[4]	Wetlands & Deepwater Habitats[5]
Urban	Not Applicable	Not Applicable	Not Applicable	Not Applicable

[1] East Contra Costa County Habitat Conservation Plan/Natural Community Conservation Plan (Jones & Stokes 2006)
[2] Terrestrial Natural Communities of California (Holland 1986) or California Vegetation (Holland and Keil 1995)
[3] A Manual of California Vegetation (Sawyer et al. 2009) and California Natural Communities List (CDFW 2020a)
[4] CNPS Inventory of Rare and Endangered Plants of California Habitat Types (CNPS 2001)
[5] Classification of Wetlands & Deepwater Habitats of the U.S. (Cowardin et al. 1979)

Ruderal

As described in the HCP/NCCP ruderal vegetation is characterized by sparse nonnative, typically weedy vegetation, occupying vacant parcels surrounded by developed areas. Based on the description by Holland and Keil (1995) ruderal vegetation is an assemblage of plants, often a mixture of both native and non-native weed species that thrive in waste areas, heavily grazed pastures, cultivated and fallow fields, roadsides, parking lots, footpaths, around residences and similar disturbed sites in towns and cities and along rural roadways. Ruderal communities are difficult to characterize and are often temporary assemblages. In areas of frequent human disturbance, the majority of wild plants are often introduced weeds rather than natives. Some urban weeds are ornamentals that have escaped from cultivation. Ruderal species may at times be integrated into various other communities (Holland and Keil 1995).

Within the study area, ruderal vegetation was mapped in the golf course grading footprint and includes former fairways and abandoned golf course features such as sand traps. The golf course was originally mapped as turf in the HCP/NCCP (which is a Developed land cover type) but since the golf course has ceased operation, these areas have converted to ruderal vegetation. Characteristic species of ruderal grassland on site include Italian thistle (*Carduus pycnocephalus* subsp. *pycnocephalus**), black mustard (*Brassica nigra**), wild radish (*Raphanus sativus**), stinkwort (*Dittrichia graveolens**), Russian thistle*, slender oats*, ripgut brome*, red brome*, soft chess*, Italian ryegrass*, and hare barley*.

Wetlands

Two land cover type found on site are wetlands as described in the HCP/NCCP: seasonal wetland and permanent wetland.

Seasonal Wetland

As described by the HCP/NCCP, seasonal wetlands are freshwater wetlands that support ponded or saturated soil conditions during winter and spring and are dry through the summer and fall until the first substantial rainfall. Seasonal wetlands, although not specifically described in Holland (1986) or Holland and Keil (1995), would be classified by Cowardin (1979) as seasonally persistent palustrine emergent wetlands. As defined, this classification indicates that surface water is present for extended periods especially early in the growing season, but is absent by the end of the season in most years. When surface water is absent, the water table is often near the land surface. Vegetation is characterized by erect, rooted, herbaceous hydrophytes.

This community typically occurs as shallow ephemeral bodies of water that occupy low-lying depressions on poorly drained clay soils. Early in the growing season, wetland species of annual and perennial native and non-native grasses and forbs begin their growth as aquatic or semiaquatic plants and this community resembles a wetland community. Later in the growing season, this community transitions to a dry-land environment as the pool dries and upland grasses and forbs germinate and grow while wetland species desiccate. The length of time that water persists has a major effect on species composition. During and after the establishment of upland species these sites may no longer resemble wetlands. These plant species usually have a wetland indicator status of hydrophytic or facultative. Although seasonal wetlands and vernal pools share similar hydrologic characteristics, species composition of seasonal wetlands is typically ruderal in nature. Therefore, seasonal wetlands are not considered vernal pools, which support a more specialized and less common native flora.

Within the study area, seasonal wetlands were present in three manmade water quality basin/pond features: basin 2, basin 3, and depnd033. Characteristic plant species include Italian ryegrass*, Mediterranean barley*, hyssop loosestrife (*Lythrum hyssopifolium**), rabbitsfoot grass (*Polypogon monspeliensis**), swamp grass (*Crypsis schoenoides**), toad rush (*Juncus bufonius* var. *bufonius*), tumbleweed (*Amaranthus albus**), curly dock (*Rumex crispus**) cocklebur (*Xanthium strumarium**), and barnyard grass (*Echinochloa crus-galli**).

Permanent Wetland
As described by the HCP/NCCP Permanent Wetlands are characterized by a year-round water source. They are typically dominated by erect, rooted, herbaceous hydrophytic plant species adapted to growing in conditions of prolonged inundation. Of the vegetation types described by Holland (1986) the most similar is Freshwater Marsh and Freshwater Seep. This vegetation type is dominated by perennial, emergent monocots 1-15 feet (0.40-4.5 meters). It typically occurs on sites that lack a significant current that are permanently flooded by freshwater along the edges of water bodies, dune swales, slough terrace edges, banks, channels and mouth margins of rivers, bottomlands, ditch margins, lagoons, ponds, reservoir margins and along geologic faults. This community is most extensive in the upper portion of the Sacramento-San Joaquin River Delta.

Within the study area, permanent wetland is located in basin 5 and basin 7. This vegetation type was characterized by narrow-leafed cattail (*Typha angustifolia*), alkali bulrush (*Bolboschoenus maritimus*), dotted smartweed (*Persicaria punctata*), swamp grass*, and rabbitfoot grass*. Basin 7 was dry by late spring in 2020 but remained wet later in the season in prior years.

Aquatic
The concrete-edged and plastic-lined were mapped as aquatic land cover type. These ponds hold water and were generally unvegetated with the exception of small patches of narrow-leafed cattail in depnd032.

Other

Urban
The HCP/NCCP defines urban sites as areas where the native vegetation has been cleared for residential, commercial, industrial, transportation, or recreational structures. Developed areas include areas that have structures, paved surfaces, horticultural plantings, and lawns smaller than 10 acres. Within the study area, the area mapped as urban includes the parking lot and paved golf cart paths. The golf course was originally mapped as turf in the HCP/NCCP (which is a Developed land cover type) but since the golf course has ceased operation, these areas have converted to ruderal vegetation.

3.2.7 INVASIVE WEEDS

During the course of the surveys, many non-native plant species were encountered within the study area. A non-native plant species is defined as a species that is occurring outside of its native distributional range and the species has arrived there by human activity. Some of the non-native plant species encountered on-site are tracked by the California Department of Food and Agriculture (CDFA 2020) and the California Invasive Plant Council (Cal-IPC 2020) due to their noxious or invasive behavior. Species tracked by these organizations are given a certain rating based on criteria such as ecological impacts, treatment or eradication priority, and threats they pose to agricultural economics.

Of the non-native plant species tracked by Cal-IPC and CDFA, 17 plant species observed within the study area are of concern (Table 8 and Figure 5). These species have a ranking of Limited, Moderate or High by Cal-IPC. The Conservancy has been actively treating invasive weeds on site since 2018.

Widespread non-native grassland species such as wild oats*, red brome*, ripgut brome*, and Italian ryegrass* were not mapped or inventoried. Though some of these grass species are considered invasive (Cal-IPC 2020), they are not considered invasive weeds for this project as these species are ubiquitous in the study area and surrounding grasslands, comprise substantial cover in grassland communities on site, and mapping them or attempting to control them is not feasible.

During project implementation, the spread of invasive weeds on site can be minimized through implementation of measures summarized in Section 5.2.3.

Table 8. Invasive Weeds Observed in the Study Area

SPECIES NAME	COMMON NAME	California Invasive Plant Council Rank (Cal-IPC 2017)[1]	California Department of Food and Agriculture Noxious Weed List (CDFA 2017)[2]
Ailanthus altissima	tree of heaven	Moderate	On List
Brassica nigra	black mustard	Moderate	–
Carduus pycnocephalus subsp. *pycnocephalus*	Italian thistle	Moderate	On List
Centaurea calcitrapa	purple starthistle	Moderate	On List
Centaurea melitensis	tocalote	Moderate	On List
Centaurea solstitialis	yellow star thistle	High	On List
Cirsium vulgare	bull thistle	Moderate	On List
Cortaderia jubata	jubata grass	High	–
Cynara cardunculus	artichoke thistle	Moderate	On List
Dittrichia graveolens	stinkwort	Moderate	On List
Elymus caput-medusae	medusahead grass	High	On List
Hirschfeldia incana	hoary mustard	Moderate	–
Lepidium latifolium	perennial pepperweed	High	On List
Olea europaea	olive	Limited	–
Raphanus sativus	wild radish	Limited	–
Salsola tragus	Russian thistle	Limited	On List
Silybum marianum	milk thistle	Limited	–

[1] Cal-IPC Weed Ranking Definitions (Cal-IPC 2020):

High: These species have severe ecological impacts on physical processes, plant and animal communities, and vegetation structure. Their reproductive biology and other attributes are conducive to moderate to high rates of dispersal and establishment. Most are widely distributed ecologically.

Moderate: These species have substantial and apparent - but generally not severe - ecological impacts on physical processes, plant and animal communities, and vegetation structure. Their reproductive biology and other attributes are conducive to moderate to high rates of dispersal, though establishment is generally dependent upon ecological disturbance. Ecological amplitude and distribution may range from limited to widespread.

Limited: These species are invasive but their ecological impacts are minor on a statewide level or there was not enough information to justify a higher score. Their reproductive biology and other attributes result in low to moderate rates of invasiveness. Ecological amplitude and distribution are generally limited, but these species may be locally persistent and problematic.

[2] Species considered a noxious weed by CDFA are listed on the California Noxious Weed List (CDFA 2020).

December 2020

Legend

▭ Study Area Boundary
Invasive Weeds
▨ Italian thistle/slender flowered thistle*
■ Russian thistle
■ bull thistle
■ medusahead grass
■ milk thistle

□ perennial pepperweed
■ purple starthistle*
■ stinkwort*
■ tree of heaven
▥ wild radish
■ yellow starthistle*

■ European olive
☆ Russian thistle
★ artichoke thistle*
● bull thistle
■ milk thistle

▲ pampas grass*
△ perennial pepperweed
○ stinkwort*
⬟ tocalote
● wild radish
⬠ yellow starthistle*

*Controlled with herbicide 2019-2020--the infestations are patchy with low cover within distributions.

Figure 5

Invasive Weeds in the Study Area

Former Roddy Ranch Golf Course Habitat Restoration and Public Access Project
East Bay Regional Park District and East Contra Costa County Habitat Conservancy

1:4,800
0 200 400
Feet

Sources: ESRI Aerial Imagery Basemap

Contra Costa County, California

3.3. MOVEMENT CORRIDORS AND HABITAT FRAGMENTATION

Habitat loss, fragmentation, and degradation resulting from land use changes or habitat conversion can alter the use and viability of wildlife movement corridors (i.e. linear habitats that naturally connect and provide passage between two or more otherwise disjunct larger habitats or habitat fragments). In general, studies suggest that habitat corridors provide connectivity for and are used by wildlife, and as such are an important conservation tool (Beier and Noss 1998). According to Beier and Loe (1992), wildlife habitat corridors should fulfill several functions. They should maintain connectivity for daily movement, travel, mate-seeking, and migration; plant propagation; genetic interchange; population movement in response to environmental change or natural disaster; and recolonization of habitats subject to local extirpation.

The suitability of habitat as a wildlife movement corridor is related to, among other factors, the habitat corridor's dimensions (length and width), topography, vegetation, exposure to human influence, and the species in question (Beier and Loe 1992). Species utilize movement corridors in several ways. "Passage species" are those species that use corridors as thru-ways between outlying habitats. The habitat requirements for passage species are generally less than those for corridor dwellers. Passage species use corridors for brief durations, such as for seasonal migrations or movement within a home range. As such, movement corridors do not necessarily have to meet any of the habitat requirements necessary for a passage species' everyday survival. Large herbivores, such as deer and elk, and medium-to-large carnivores, such as coyotes, bobcats and mountain lions, are typically passage species. "Corridor dwellers" are those species that have limited dispersal capabilities – a category that includes most plants, insects, reptiles, amphibians, small mammals, and birds – and that use corridors for a greater length of time. As such, wildlife movement corridors must fulfill key habitat components specific to a species' life history requirements in order for them to survive (Beier and Loe 1992). In general, however, the suitability and/or utility of the landscape – specifically, of the landscape as corridor habitat – is best evaluated on a species-level (Beier and Noss 1998).

The study area is part of a larger mosaic of contiguous grassland and oak woodland habitats that are near the periphery of urban development in eastern Contra Costa County. Numerous species that prefer open habitats may transit through the site, and the closure of the active golf course and associated reduction in routine human disturbance may have improved its utility as a corridor for wildlife. The artificial ponds and water quality basins on site likely provide a drinking water source for both transitory and resident wildlife, and may also represent metapopulation centers for amphibian species and invertebrates with aquatic life stages. The steep concrete banks of the ponds may limit access to the pond by wildlife. There are no obvious barriers to wildlife movement within the study area, although because it is comprised almost entirely of open grasslands, the site may not be suitable for passage by species that require dense vegetative cover. Additionally, there are no permanent or ephemeral waterways, or riparian corridors within the study area, so the site does not provide passage for species that rely on linear aquatic or riparian features.

Section 4. ASSESSMENT AND FINDINGS

In evaluating on-site habitat suitability for special status plant and wildlife species within the study area, relevant literature, knowledge of regional biota, and observations made during the field investigations were applied as analysis criteria to determine occurrence potential. Criteria determinations for occurrence potential of special status species are divided into the six categories described below. These determination categories appear in Appendices B and C, which provide a summary of the status, habitat affinities, flowering phenology , habitat suitability and local distribution, and potential for occurrence for each of the target special status species. It should be noted that local distribution references refer to the CNDDB Element Occurrence Index (EONDX) number. The EONDX is an integer primary key (unique for each record) used within the CNDDB for GIS relational databases. Although the EONDX is assigned sequentially, gaps may appear as records are merged or updated. Determination criteria are defined below.

- None denotes a complete lack of habitat suitability, local range restrictions, and/or regional extirpations.
- Not Expected denotes situations where suitable habitat or key habitat elements may be present but may be of poor quality or isolated from the nearest extant occurrences. Incompatible habitat suitability refers to elevation, geology, soil chemistry and type, vegetation communities, microhabitats, and degraded/significantly altered habitats. These factors create unsuitable ecological conditions for the consideration of even a low occurrence potential within the study area.
- Not Observed indicates that suitable vegetation was present and the specified taxon was considered to have the potential to occur on site but was not observed during appropriately timed rare plant surveys. *This category refers only to plant species.*
- Absent indicates specified taxa not observed during field investigations and were consequently ruled out. This category only refers to diagnostic vegetative material of shrubby perennial species not observed on site. *This category refers only to plant species.*
- Possible indicates the presence of suitable habitat or key habitat elements that potentially support a specific species or taxa.
- Present indicates the target species was either observed directly or its presence was confirmed by diagnostic sign (*i.e*. tracks, scat, burrows, carcasses, castings, prey remains, *etc*.) during field investigations.

4.1. SENSITIVE NATURAL COMMUNITIES

A total of two sensitive communities (land cover types) were observed in the study area: seasonal wetland and permanent wetland.

Seasonal wetland and permanent wetland are considered sensitive natural communities as they may qualify as a water of the U.S. and/or Waters of the State falling under U.S. Army Corps of Engineers and Regional Water Quality Control Board jurisdictions through the Clean Water Act and the Porter Cologne Water Quality Act. Wetland features are also addressed in the HCP/NCCP.

The HCP/NCCP identifies Uncommon Landscape Features. Two of these are present on site: buildings (bat roosts) and potential nest trees (trees or cliffs). These features are discussed in Section 4.3 as they provide habitat for roosting bats and nesting birds.

4.2. SPECIAL STATUS PLANTS

A total of 65 special status plant species are known to occur in the study area vicinity. Based on habitats within the study area, a review of available databases and literature listed in Section 2.3, and familiarity with the regional flora, 9 special status plant species were determined to have the potential to occur within the study area based on habitat present. Based on the results of rare plant surveys conducted in conducted in 2013, 2014, 2019, and 2020, one special status plant species was observed in the study area: big tarplant (*Blepharizonia plumosa*; CRPR 1B.1, HCP/NCCP covered). All of the other potentially-occurring species can be ruled out as occurring on site based on the results of rare plant surveys.

A complete list of all species considered as part of this assessment, their regulatory status, habitat requirements, local distribution, and potential for occurrence are listed in Appendix B. Special status plant species recorded in the study area vicinity from the CNDDB are depicted in Figure 6. The USFWS and CNDDB species lists are shown in Appendices E and F.

4.2.1 HCP/NCCP COVERED AND NO-TAKE PLANT SPECIES

There are 17 covered and no-take plant species listed in the HCP/NCCP. One species, big tarplant, was observed in the study area.

Based on a review of available databases and literature, familiarity with local flora, on-site habitat suitability, and results of rare plant surveys, no other covered or no-take plant species were observed or are considered to have the potential to occur within the study area.

Big Tarplant (*Blepharizonia plumosa*)

Status, Distribution and Habitat Requirements

Big tarplant [*Blepharizonia plumosa* (Kellogg) Greene[3]] is designated a CNPS List 1B.1 species indicating it is rare or endangered in California and elsewhere, and seriously endangered in California (CNPS 2020). This species is an annual of the sunflower family (Asteraceae). The type locality for this species is from Stockton in San Joaquin County, California. The collector of this specimen is unknown (CCH 2020).

Big tarplant is differentiated from other members of the genus by producing longer disk pappus (up to 3mm), gray green leaves, heads in a spike to panicle-like clusters, and branches that are often arched-ascending (Baldwin in Baldwin et al. 2012). This late blooming taxon is in flower from July to October (CNPS 2020).

Big tarplant occupies heavy clay sites in valley and foothill grassland (CNPS 2020). It occurs in Alameda, Contra Costa, San Joaquin, and Stanislaus counties between 98 and 1,657 feet (30 to 505 meters) in elevation (CNPS 2020). Big tarplant is seriously threatened by urbanization and is also threatened by disking, residential development, and non-native plants.

Occurrence Data and Habitat Characteristics

Within the study area, big tarplant was observed in annual grassland in heavy clay soil on a northwest facing slope adjacent to a golf course path, just east of Basin 7 (Figure 7). The colony consisted of approximately 400 individuals. During the site visit on September 21, 2020, 60% were vegetative, 35%

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[3] In botanical literature binomial scientific names are followed immediately by the name of or the abbreviation for the publishing author(s) who validated the name. A scientific name is not strictly complete without the name(s) of the validating author(s) attached. Plant species that appear in this report that have regulatory significance are referred to by their binomial scientific name and author for nomenclatural relevance.

were flowering and 5% were fruiting. This colony is a continuation of a colony that occurs just over the fence that is identified as CNDDB Elemental Occurrence #32/EONDX 41678 (Nomad 2013a, 2018; CDFW 2020b) (Figure 7)[4].

Potential Project Related Effects

The location of the project footprint within the study area has not been determined as the project is still in the conceptual design phase. However, it is anticipated that impacts to big tarplant individuals can be avoided.

The project design and construction related activities could directly impact the known individuals on site. Indirect effects to this species are possible due nearby construction related disturbance which could result in an introduction or increase of invasive weed species. Establishment of new invasive weed species have the potential to out-compete native plants, especially annuals, extirpating them from a site through habitat modification. Big tarplant population enhancement or habitat creation via invasive weed control or restoration, could allow for increased abundance of this species in the newly created/enhanced habitat.

This species is covered by the HCP/NCCP, and impacts will be minimized through preconstruction surveys and avoidance and minimization measures that are consistent with HCP/NCCP requirements and listed in Section 5.2.1.

4.2.2 FEDERAL AND/OR STATE LISTED AND CALIFORNIA RARE PLANT SPECIES

Of the 65 special status plant species known from the region, 11 are federal and/or state listed. Based on review of available databases and literature, familiarity with local flora, on-site habitat suitability, and results of rare plant surveys, none of the federal and/or state listed plant species were observed or are considered to have the potential to occur within the study area.

4.2.3 CALIFORNIA RARE PLANT RANK PLANT SPECIES

Of the 65 special status plant species known from the immediate vicinity of the study area, all but one[5] are included in the California Native Plant Society Rare Plant Inventory (CNPS 2020). One CRPR plant species, big tarplant, was observed in the study area and is discussed in Section 4.2.1.

Based on review of available databases and literature, familiarity with local flora, on-site habitat suitability, and results of rare plant surveys, no other CRPR plant species were observed or are considered to have the potential to occur within the study area.

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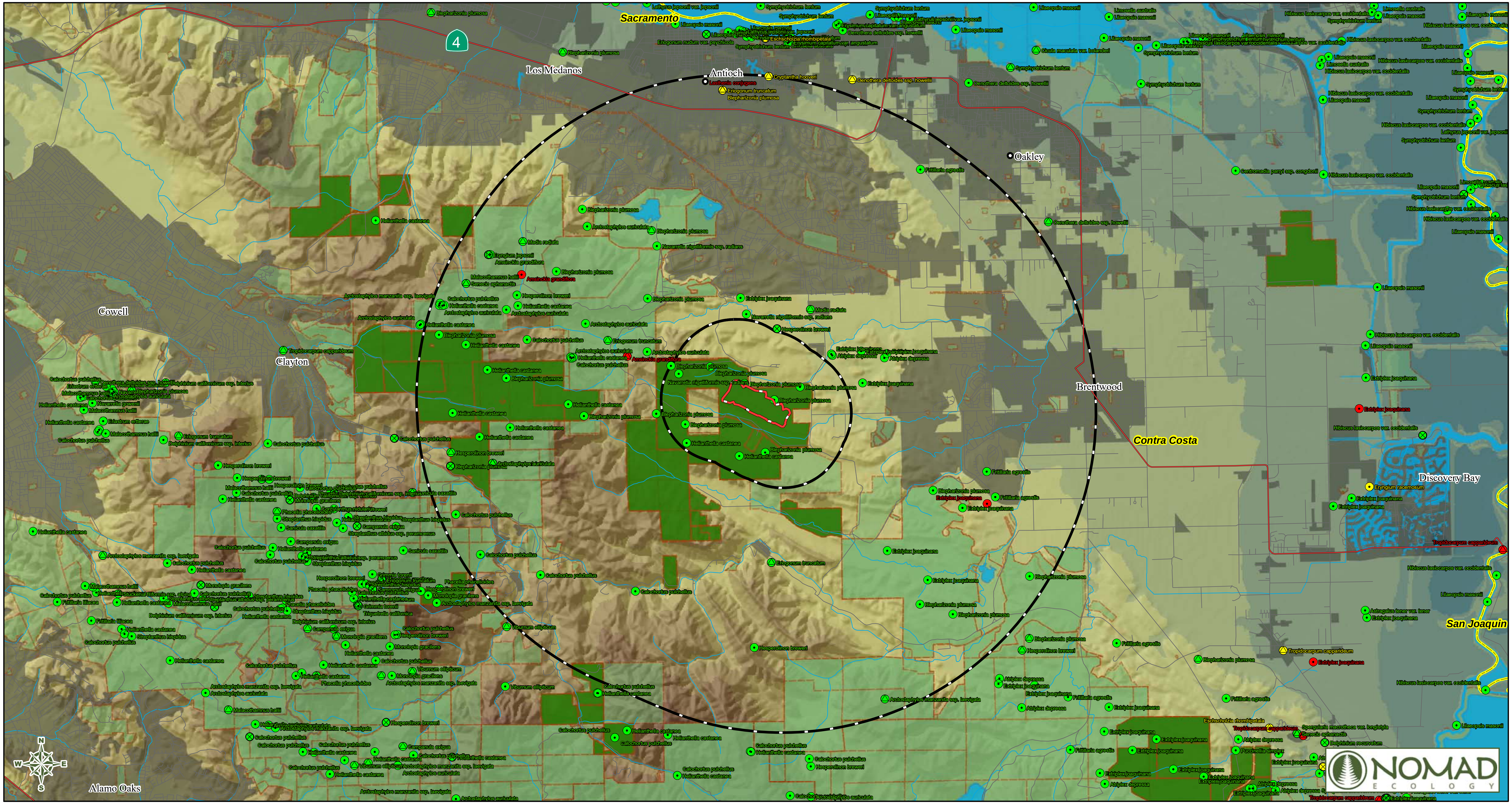
[4] This population is also identified as Blpl6 under the population numbering system for the ECCCHCP.

[5] Round-leaved filaree (*California macrophylla*) was removed from the CNPS Inventory of Rare and Endangered Plants (CNPS 2020), however it is still an HCP/NCCP Covered species.



December 2020

Legend

Study Area Boundary 🟥
ECCCHC Preserve System 🟩
Water Bodies
CNDDB Occurences Accuracy
CNDDB Occurences Presence
County Boundaries 🟨
Public Land and Easements 🟩
Waterways

- ⊙ specific location
- ⊗ within 0.2 - 5 miles
- ⊗ non-specific location

- ● Presumed Extant
- ● Possibly Extirpated
- ● Extirpated

Distance Radii
1 & 5 Miles

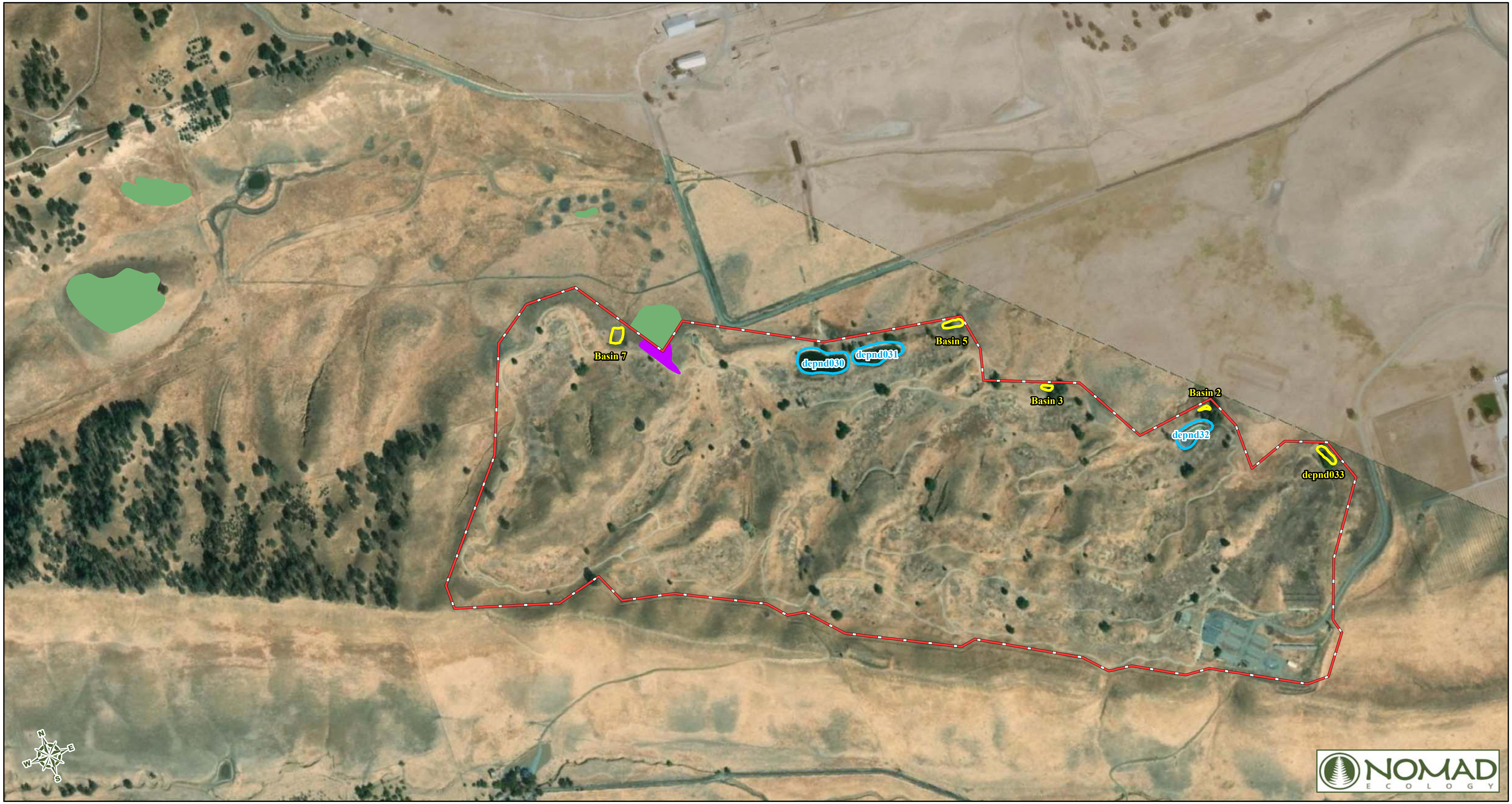
Figure 6

California Natural Diversity Database Special Status Plant Species Occurrences within the Vicinity
Former Roddy Ranch Golf Course Habitat Restoration and Public Access Project
East Bay Regional Park District and East Contra Costa County Habitat Conservancy

1:95,040
0 0.75 1.5
Miles

Sources: ESRI, California Spatial Information Library, Bay Area Open Space Council, California Department of Fish and Game, Eat Bay Regional Park District, East Contra Costa Habitat Conservancy.

Contra Costa County, California



December 2020

Legend

Study Area Boundary

🟥

Constructed Golf Course Aquatic Features

🟦 Irrigation Ponds (plastic-lined with vertical concrete edges)

🟨 Water Quality Basin

Big tarplant (Blepharizonia plumosa) Population Locations

🟪 In the Study Area (approx. 400 Individuals)

🟩 Off Site (approx 15,000 Individuals)

Figure 7

Big Tarplant Population in the Study Area and Vicinity

Former Roddy Ranch Golf Course Habitat Restoration and Public Access Project

East Bay Regional Park District and East Contra Costa County Habitat Conservancy

1:7,200

0 300 600

Feet

Sources: ESRI Aerial Imagery Basemap

Contra Costa County, California

4.2.4 LOCALLY RARE, UNUSUAL, AND SIGNIFICANT PLANT SPECIES

No plant species treated as locally rare by the East Bay Chapter of CNPS were observed within the study area.

4.3. SPECIAL STATUS WILDLIFE

Based on the field investigations, a review of available databases and literature listed in Section 2.3, familiarity with local fauna, and on-site habitat suitability, a total of 55 special status fish and wildlife species were considered as part of this assessment (Appendix C). Of these, 36 were determined to have at least some potential to occur within the study area and could be affected by the project. These include 13 species listed as threatened or endangered, or designated as fully protected, and 23 non-listed species considered to be rare, sensitive, or declining by agency or non-governmental watchlists, such as CDFW's Special Animals List (CDFW 2020c) (Table 9). All 36 of these species are discussed in detail below.

An additional 6 species are not expected to occur on site, but could not be entirely ruled out based on marginal habitat conditions, limited distribution information, or the paucity of available life history data. These are not listed in Table 9 but are discussed in more detail in Appendix C.

The remaining taxa were ruled out based on the lack of suitable habitat (e.g., sand dunes, salt marshes, serpentine, scrub, dense woodlands, mud flats, and shoreline habitats), local extirpations, lack of connectivity between areas of suitable and occupied habitat, incompatible land use, and habitat degradation. There is no riverine or stream habitat within the study area, therefore no special status fish species have potential to occur on site. These species are discussed in more detail in Appendix C.

A complete list of all species considered as part of this assessment, their regulatory status, habitat requirements, local distribution, and potential for occurrence are listed in Appendix C. Special status fish and wildlife species recorded in the California Natural Diversity Database (CDFW 2020b) are shown in Figure 8.

Table 9. Potentially Occurring Special Status Wildlife Species in the Study Area

SPECIES	LISTING STATUS*	HCP/NCCP STATUS	POTENTIAL FOR OCCURRENCE
INVERTEBRATES			
Bombus caliginosus obscure bumble bee	Fed: None CA: SA	–	Possible
Bombus crotchii Crotch bumble bee	Fed: None CA: SCE	–	Possible
Bombus occidentalis western bumble bee	Fed: None CA: SCE	–	Possible
Branchinecta lynchi vernal pool fairy shrimp	Fed: FE, CH CA: SA	Covered	Possible
Branchinecta mesovellensis midvalley fairy shrimp	Fed: None CA: SA	Covered	Possible
Danaus plexippus monarch butterfly	Fed: None CA: SA	–	Possible
Helminthoglypta nickliniana bridgesi Bridge's coast range shoulderband snail	Fed: None CA: SA	–	Possible
Lepidurus packardi vernal pool tadpole shrimp	Fed: FE, CH CA: SA	Covered	Possible
Linderiella occidentalis California linderiella	Fed: None CA: SA	–	Possible

Species	Listing Status*	HCP/NCCP Status	Potential for Occurrence
AMPHIBIANS			
Ambystoma californiense California tiger salamander	Fed: FT, CH CA: ST	Covered	Possible
Rana draytonii California red-legged frog	Fed: FT, CH CA: SSC	Covered	Possible
REPTILES			
Coluber lateralis euryxanthus Alameda whipsnake	Fed: FT, CH CA: ST	Covered	Possible
Emys marmorata western pond turtle	Fed: None CA: SSC	Covered	Possible
Phrynosoma blainvilli Blainville's horned lizard	Fed: None CA: SSC	–	Possible
BIRDS			
Agelaius tricolor tricolored blackbird	Fed: BCC CA: ST, SSC	Covered	Possible (nesting)
Aquila chrysaetos golden eagle	Fed: BGEPA, BCC CA: WL, FP	Covered and No-Take	Possible (nesting and wintering)
Ammodramus savannarum grasshopper sparrow	Fed: None CA: SSC	–	Possible (nesting)
Athene cunicularia burrowing owl	Fed: BCC CA: SSC	Covered	Possible
Buteo regalis ferruginous hawk	Fed: BCC CA: SA, WL	–	Possible (wintering)
Buteo swainsoni Swainson's hawk	Fed: BCC CA: ST	Covered	Possible (nesting)
Circus cyaneus northern harrier	Fed: None CA: SSC	–	Possible (nesting)
Elanus leucurus white-tailed kite	Fed: None CA: FP	No-Take	Possible (nesting)
Eremophila alpestris actia California horned lark	Fed: None CA: SA, WL	–	Possible
Lanius ludovicianus loggerhead shrike	Fed: BCC CA: SSC	–	Possible (nesting)
MAMMALS			
Antrozous pallidus pallid bat	Fed: None CA: SSC WBWG-H	–	Possible
Corynorhinus townsendii Townsend's western big-eared bat	Fed: None CA: SSC WBWG-H	Covered	Possible
Lasiurus blossevillii western red bat	Fed: None CA: SSC WBWG-H	Covered	Possible
Lasiurus cinereus hoary bat	Fed: None CA: SA WBWG-M	–	Possible
Myotis evotis long-eared myotis bat	Fed: None CA: SA WBWG-M	–	Possible
Myotis thysanodes fringed myotis bat	Fed: None CA: SA WBWG-H	–	Possible

SPECIES	LISTING STATUS*	HCP/NCCP STATUS	POTENTIAL FOR OCCURRENCE
Myotis volans long-legged myotis bat	Fed: None CA: SA WBWG-M	–	Possible
Myotis yumanensis Yuma myotis bat	Fed: None CA: SA WBWG-L	–	Possible
Perognathus inornatus inornatus San Joaquin pocket mouse	Fed: None CA: SA	–	Possible
Puma concolor mountain lion (Southern California/Central Coast ESU)	Fed: None CA: SCT	–	Possible
Taxidea taxus American badger	Fed: None CA: SSC	–	Possible
Vulpes macrotis mutica San Joaquin kit fox	Fed: FE CA: ST	Covered	Possible

*Note – See Appendix C for a detailed description of the listing codes and abbreviations.

4.3.1 CRITICAL HABITAT

There is no designated Critical Habitat for any fish or wildlife species anywhere within or in the vicinity of the study area. The nearest Critical Habitat is vernal pool fairy shrimp Unit 19A (USFWS 2006a), which is located approximately 1.75 miles to the southeast of the study area. After the adoption of the HCP/NCCP, Critical Habitat designations were no longer made in the region. This was not due to a lack of lands that could potentially meet the requirements of Critical Habitat, but rather that for regulatory purposes, the HCP/NCCP provided protection to many federally listed species and habitats so the additional designation was not needed.

4.3.2 HCP/NCCP COVERED AND NO-TAKE WILDLIFE SPECIES

There are 17 wildlife species covered by the HCP/NCCP (Table 1) and two additional no-take species identified by HCP/NCCP (Table 2). A total of 14 covered or no-take species were determined to have the potential to occur within the study area based on habitat suitability, the presence of essential land cover types, and the results of reconnaissance surveys. These are discussed in Section 4.3.3 below.

4.3.3 SPECIAL STATUS WILDLIFE SPECIES

Invertebrates

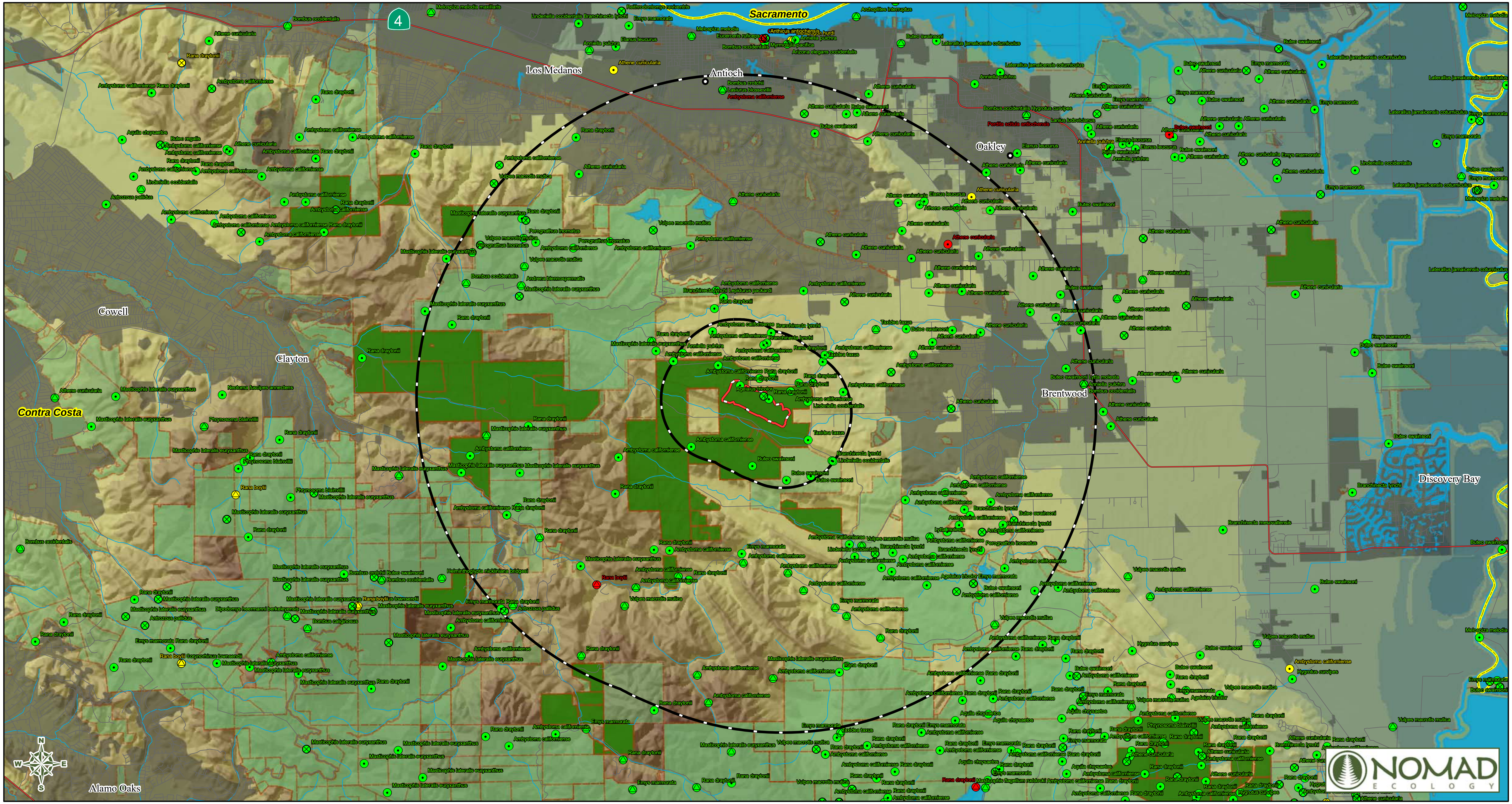
Bumble Bees

Three special status bumble bee species have the potential to occur within the study area:

- obscure bumble bee (*Bombus caliginosus*) – Included on CDFW’s Special Animals List
- Crotch bumble bee (*Bombus crotchii*) – State candidate for listing as endangered
- western bumble bee (*Bombus occidentalis*) – State candidate for listing as endangered

Status, Distribution and Habitat Requirements

Specific habitat requirements for each of these species are variable and not fully understood, but they are generally known to nest underground, in abandoned rodent burrows, or in decaying wood and trees. All three of these bumble bee species may occur in grasslands, scrub, or open woodlands. The obscure bumble bee occurs along the Pacific Coast from southern California to southern British Columbia, with



December 2020

Legend

Study Area Boundary 🟥

ECCCHC Preserve System 🟩

Water Bodies

CNDDB Occurences Accuracy
- ⊙ specific location
- ◬ within 0.2 - 5 miles
- ⊗ non-specific location

CNDDB Occurences Presence
- 🟢 Presumed Extant
- 🟡 Possibly Extirpated
- 🔴 Extirpated

County Boundaries 🟨

Public Land and Easements 🟩

Waterways

Distance Radii
- ⬭ 1 & 5 Miles

Figure 8

California Natural Diversity Database Special Status Wildlife Species Occurrences within the Vicinity

Former Roddy Ranch Golf Course Habitat Restoration and Public Access Project

East Bay Regional Park District and East Contra Costa County Habitat Conservancy

1:95,040

0 0.75 1.5 Miles

Sources: ESRI, California Spatial Information Library, Bay Area Open Space Council, California Department of Fish and Game, Eat Bay Regional Park District, East Contra Costa Habitat Conservancy.

Contra Costa County, California

scattered records from the east side of California's Central Valley. The Crotch bumble bee was previously found throughout southern California and the Central Valley, but is now nearly absent from the Central Valley. The western bumble bee was previously found throughout the Coast Ranges and Sierra Nevada, but more recently appears to be largely restricted to high-elevation sites in the Sierras and scattered coastal locations. Widespread use of pesticides in agricultural lands and habitat fragmentation are thought to have led to severe declines of these species (COSEWIC 2014, CDFW 2019).

Occurrence Data and Habitat Suitability

CNDDB records for these species within 5 miles of the study area are all several decades old. These include an occurrence of Crotch bumble bee recorded in 1921 in Antioch (EONDX #98555) approximately 4 miles north of the study area, an occurrence of western bumblebee in 1974 in the vicinity of Black Diamond Mines (EONDX #100099), approximately 3.6 miles west of the study area.

Occurrences of all bumble bee species are also tracked by Bumble Bee Watch, a collaborative project between several universities and non-profit entities that accepts and vets bumble bee sightings submitted by the public. Bumble Bee Watch has not recorded any recent verified sightings of either obscure bumble bee or western bumble bee anywhere in the greater San Francisco Bay Area. There have, however, been recent verified observations of Crotch bumble bee near Fairfield, Solano County (2014), in Berkeley, Alameda County (2015), and in Santa Teresa County Park, Santa Clara County (2019) (Bumble Bee Watch 2020). This suggests that the Crotch bumble bee is still extant in the region, though the status of the obscure bumble bee and western bumble bee is less certain. Regardless, the study area is within the formerly known range for all three of these species.

Suitable habitat for all three bumble bee species is present in the grasslands throughout the study area. They may build nests anywhere on site either underground or in decaying wood.

Potential Project-Related Effects

Any construction activities associated with the project, such as removal of concrete golf cart paths and construction or modification of wetlands, could damage or destroy underground nests of these bumblebee species. Impacts to special status bumblebee species potentially occurring onsite will be avoided through implementation of avoidance and minimization measures, including preconstruction surveys and biological monitoring.

The project is expected to restore and improve habitat for native flowering plant species, which will in turn expand available nectar sources for pollinators. Grassland habitats utilized for nesting will still be available on site after any project construction activities are completed. The project is therefore expected to have beneficial effects to special status bumblebees.

Vernal Pool Branchiopods

Four special status vernal pool branchiopod species have potential to occur within the study area:

- vernal pool fairy shrimp (*Branchinecta lynchi*) – federally listed as threatened, HCP/NCCP covered
- midvalley fairy shrimp (*Branchinecta mesovallensis*) – Included on CDFW's Special Animals List, HCP/NCCP covered
- vernal pool tadpole shrimp (*Lepidurus packardi*) – federally listed as endangered, HCP/NCCP covered
- California linderiella (*Linderiella occidentalis*) – Included on CDFW's Special Animals List

Status, Distribution and Habitat Requirements

Vernal pool branchiopods are adapted to pools that fill with water temporarily (typically during the winter and spring). Branchiopod cysts (embryos encased in shells) remain dormant in the soil when their habitats are dry. Vernal pool fairy shrimp, midvalley fairy shrimp, and California linderiella may inhabit a variety of vernal pool and swale habitats, with either soil or vegetated (i.e. grassy) substrates. Vernal pool tadpole shrimp inhabit vernal pools and swales containing clear to highly turbid water; such pools are commonly found in grass bottomed swales of unplowed grasslands and are occasionally mud-bottomed and highly turbid. However, these vernal pool branchiopod species are not necessarily restricted to vernal pools; they also occur in vernal pool-like habitats such as seasonal wetlands and pools. They may occur in degraded or otherwise poor quality habitats, such as pools created by tire tracks and roadside ditches (CDFW 2020b).

Habitat loss and fragmentation is the largest threat to the survival and recovery of vernal pool branchiopods. Habitat loss generally is a result of urbanization, agricultural conversion, and mining. Habitat loss also occurs in the form of habitat alteration and degradation as a result of changes to natural hydrology; invasive species; incompatible grazing regimes, including insufficient grazing for prolonged periods; infrastructure projects (e.g., roads, water storage and conveyance, utilities); recreational activities (e.g., off-highway vehicles and hiking); erosion; climate change; and contamination (USFWS 2005a).

Occurrence Data and Habitat Suitability

There are eight occurrences of vernal pool fairy shrimp recorded in the CNDDB within 5 miles of the study area. The nearest was reported in 2003 in vernal pools within grassland habitat approximately 0.7 mile to the north (EONDX# 52755). Vernal pool fairy shrimp have been observed as recently as 2019 in several pools in the flats south of Empire Mine Road and west of Deer Valley Road, immediately northeast of the study area (Lynch pers. comm. 2019).

There are no occurrences of midvalley fairy shrimp recorded in the CNDDB within 5 miles of the study area. The nearest was recorded on an unknown date near Marsh Creek Road (EONDX #48372), approximately 7 miles southeast of the study area.

There are four CNDDB occurrences of California linderiella within 5 miles of the study area. The nearest was recorded in 2006 in a series of seasonal wetlands and stock ponds just west of Deer Valley Road (EONDX #94503), approximately 0.2 mile east of the study area.

There is only one CNDDB occurrence of vernal pool tadpole shrimp within 5 miles of the study area, which was recorded in 2003 in a claypan vernal pool complex (EONDX# 52749) approximately 1.3 miles to the north.

Although there are no vernal pools within the study area, suitable habitat is present in freshwater marsh within the water quality basins along the northern border of the former golf course. These basins accepted irrigation runoff from the golf course for many years, which may have degraded water quality and diminished habitat suitability. These basins are artificial in origin and were built specifically for the golf course, and it is unknown if populations of vernal pool branchiopods would have been able to establish themselves under such conditions. The artificial ponds on site do not provide suitable habitat for vernal pool branchiopods. Given that at least two species (vernal pool fairy shrimp and California linderiella) are known from occurrences very near to the study area, they may be present in wetland habitats on site.

Potential Project-Related Effects

Preconstruction surveys will be required through the HCP/NCCP Planning Survey process and they will identify presence or absence of vernal pool branchiopod species. If any covered branchiopod species are present, avoidance and minimization measures will be implemented per the HCP. If vernal pool branchiopod species are not present, no direct impacts would occur. Direct impacts could occur to vernal pool branchiopod species during any project-related construction activities at the water quality basins containing freshwater marsh habitat, including restoration or enhancement activities. Timing work for the dry season will avoid these impacts as long as potentially cyst-containing surface sediments are preserved.

Long-term effects to vernal pool branchiopods are expected to be positive, as the restoration, enhancement, and possible construction of new freshwater aquatic habitats on site will improve overall habitat suitability.

Monarch Butterfly (*Danaus plexippus*)

Status, Distribution and Habitat Requirements

The monarch butterfly is included on CDFW's Special Animals List, and is under review by USFWS for listing under the Federal Endangered Species Act (though it is not yet formally a candidate for listing). Successive generations of monarchs make long-distance migrations to the same overwintering sites year after year. The western population of monarchs breeds in areas with milkweed (*Ascelpias* sp.) throughout the United States west of the Rockies (Brower 1995), but virtually all of the overwintering sites used by the western population are located along the California coast, from northern Mendocino County south to San Diego County. Overwintering sites are typically located within a half mile of the Pacific Coast, in areas of dense tree cover where the butterflies are protected from the wind (Lane 1993).

Occurrence Data and Habitat Suitability

The CNDDB only tracks occurrences of overwintering aggregations of monarchs, none of which are located within 5 miles of the study area (CDFW 2020b). The study area contains no suitable tree groves and is too far inland to provide overwintering habitat.

Numerous individuals of a potential monarch butterfly host plant, narrowleaf milkweed (*Asclepias fascicularis*), were observed within the study area during the July 2020 site reconnaissance visit, although no adult monarchs or caterpillars were observed. While breeding habitat for monarchs is not subject to any formal legal protection, the preservation of milkweed on site may be of conservation value to the species.

Potential Project-Related Effects

Impacts to monarch butterfly potentially occurring onsite will be avoided through implementation of avoidance and minimization measures, including preconstruction surveys and biological monitoring. The project is expected to restore and improve habitat for native flowering plant species, potentially including milkweed, which will in turn expand available host plants and nectar sources for monarch butterflies. The project is therefore expected to have beneficial effects to monarch butterflies.

Bridges' Coast Range Shoulderband Snail (*Helminthoglypta nickliana bridgesi*)

Status, Distribution and Habitat Requirements

The Bridges' coast range shoulderband is included on CDFW's Special Animals list, and has a NatureServe rank of G3T1 S1S2 meaning that: (1) the species is "vulnerable" and the subspecies is "critically imperiled" at the global level, and (2) the subspecies is "critically imperiled" to "imperiled" at the statewide level. The Bridges' coast range shoulderband occurs in rock piles and weedy grasslands on open hillsides in Alameda and Contra Costa counties (CDFW 2020b).

Occurrence Data and Habitat Suitability

The only CNDDB occurrence of Bridge's coast range shoulderband snail within 5 miles was recorded on an unspecified date on the eastern slope of Mount Diablo (EONDX #23088), approximately 4.5 miles southwest of the study area (CDFW 2020b). Bridges' coast range shoulderband was also observed at the Oakley-Trembath Flood Detention Basin in Antioch, located approximately 4.5 miles north of the study area (Nomad 2010). Suitable habitat is present among grasslands throughout the study area. Furthermore, large exposed riprap boulders placed for slope stabilization in various locations around the former golf course may act as suitable rock pile habitat for this species.

Potential Project Related Effects

Any construction activities associated with the project, such as removal of concrete golf cart paths and construction or modification of wetlands, could result in injury or mortality to individual Bridge's coast range shoulderband snails. Impacts from construction will be avoided through implementation of avoidance and minimization measures, including preconstruction surveys and biological monitoring. Long-term effects of the project can be expected to be beneficial to this species, as the goal is to restore native habitats on site.

Amphibians

California Tiger Salamander (*Ambystoma californiense*)

Status, Distribution and Habitat Requirements

The Central California DPS of California tiger salamander (Central California tiger salamander) is state and federally listed as threatened. The Central California tiger salamander is restricted to the Central Valley and Inner Coast Range from Tulare and San Luis Obispo Counties in the south, to Sacramento and Yolo Counties in the north (USFWS 2014). Within this area, the species is known from sites on the Central Valley floor near sea level, up to a maximum elevation of roughly 3,940 feet (1,200 meters) in the Coast Ranges and 1,640 feet (500 meters) in the Sierra Nevada foothills (USFWS 2014, 2017b).

The California tiger salamander has an obligate biphasic life cycle during which it utilizes both aquatic and terrestrial habitat (USFWS 2017b). Although salamander larvae develop in the vernal pools and ponds in which they were born, once a metamorph leaves its natal pond and enters a burrow, it will then spend the vast majority of its life underground (Trenham et al. 2001). Adult Central California tiger salamanders engage in mass migrations during a few rainy nights per year, typically from November through April, although migrating adults have been observed as early as October and as late as May. During these rain events, adults leave their underground burrows and return to breeding ponds to mate and will then return to their underground burrows. Upland habitats surrounding known Central California tiger salamander breeding pools are usually dominated by grassland, oak savanna, or oak woodland (USFWS 2017b).

Breeding sites are typically fish-free ephemeral ponds that fill during winter and dry by summer (USFWS 2014). Historically, California tiger salamanders utilized vernal pools as breeding sites, but the species now also commonly breeds in livestock ponds (USFWS 2014, 2017b). Vernal pools and ephemeral ponds are better able to support California tiger salamanders than wetlands that hold water year-round because perennial ponds are more likely to support breeding populations of predatory species and typically have higher numbers of hybrid tiger salamanders in areas where hybrids are found (USFWS 2014).

California tiger salamanders have been reported to travel distances up to 1.6 km (1.0-mile) (Austin and Shaffer 1992), but Trenham and Shaffer (2005) estimate that optimal upland habitat is within 630 m (2,067 feet) of breeding ponds. Eggs are laid singly or in small clusters on the pond bottom or attached to individual strands of vegetation (Storer 1925, Barry and Shaffer 1994, Jennings and Hayes 1994). The larval stage of the Central California tiger salamander usually lasts 3 to 6 months, with metamorphosis beginning in late spring or early summer. Once metamorphosis occurs, juveniles typically depart their natal ponds at night and enter into terrestrial habitat in search of underground burrows (Petranka 1998). Peak periods for metamorphs to leave their natal ponds have been reported from May to July; however, peak timing of migration may vary based on locality, environmental conditions, and degree of hybridization with non-native barred tiger salamanders (USFWS 2017b).

Multiple factors have contributed to population declines of this species, including habitat loss and fragmentation; predation from, and competition with, invasive species; hybridization with non-native barred tiger salamanders (*Ambystoma tigrinum*); mortality from road crossings; contaminants; and small mammal burrow control efforts. Potential threats include introduction of diseases such as ranaviruses and chytrid fungi, and also climate change (USFWS 2017b).

Occurrence Data and Habitat Suitability

There are 53 occurrences of the species within 5 miles of the study area, 10 of which are within one mile. The nearest occurrence was recorded in 1998 in a complex of ponds and vernal pools just north of Empire Mine Road (EONDX #33748), approximately 0.1 mile north of the study area (CDFW 2020b). Additionally, California tiger salamander larvae were observed in 2019 in a large stock pond approximately 0.3 mile northwest of the study area during annual monitoring of the Conservancy's Horse Valley Restoration site (Nomad 2019). The study area contains both "Potential Breeding Habitat" and "Suitable Migration and Aestivation Habitat" as mapped by the HCP/NCCP.

Suitable breeding habitat for California tiger salamanders is present in the water quality basins within the study area, though it is unknown if they retain sufficient water depth and hydroperiod during the breeding season to support the species. The water quality basins were dry at the time of the July 2020 site reconnaissance visit with the exception of a very small amount of water in Basin 5. The winter/spring 2019-2020 rainy season saw exceptionally low precipitation (CDWR 2020), and the hydroperiods of aquatic features on site would be expected to be longer during years with greater rainfall. The artificial ponds on site may also be suitable breeding habitat, but the presence of abundant mosquitofish and primarily vertical concrete banks may hinder the ability of California tiger salamanders to reproduce successfully in these features. The conditions of the artificial ponds are discussed in more detail in the California red-legged frog section below.

Suitable upland habitat is present in grasslands throughout the study area. California ground squirrels and their burrows were observed during the July 2020 site reconnaissance visit, though they appeared to be present in isolated clusters rather than being widespread throughout the site. The site was not comprehensively surveyed however, and additional burrow concentrations may be present. These burrows may be used as upland refuge by California tiger salamanders. The species may also be present underneath the concrete slabs of the golf cart paths in areas where large cracks and burrowing mammals may have created burrows and burrow-like spaces.

Potential Project Related Effects

Any construction activities associated with the project, such as construction of new wetlands or modification of the existing water quality basins or artificial ponds, could result in injury or mortality to individual California tiger salamanders. Construction in upland areas, such as removal of golf cart paths, could also result in harm to individuals that may be located in underground burrows or that have taken refuge underneath the concrete slabs of the path itself.

This species is covered by the HCP/NCCP, and impacts will be minimized through preconstruction surveys and avoidance and minimization measures that are consistent with HCP/NCCP requirements.

The restoration project includes an assessment of the feasibility of enhancing the existing aquatic habitats on site or creating new aquatic habitat that would be suitable breeding habitat for California tiger salamanders. The long-term effects of the project to California tiger salamanders are expected to be positive.

California Red-Legged Frog (*Rana draytonii*)

Status, Distribution and Habitat Requirements

The California red-legged frog is a federally listed threatened species and a California Species of Special Concern. The California red-legged frog is one of two species of red-legged frog endemic to the Pacific Coast. Historically it occurred from Riverside County to Mendocino County along the Coast Range; from Calaveras County to Butte County in the Sierra Nevada; and in Baja California, Mexico. California red-legged frogs are still locally abundant within portions of the San Francisco Bay area and the central coast. Within the remaining distribution of the species, only isolated populations have been documented in the Sierra Nevada, northern Coast, and northern Transverse ranges. The species is believed to be extinct from the southern Transverse and Peninsular ranges, but is still present in Baja California, Mexico (USFWS 2017a).

California red-legged frogs predominately inhabit permanent water sources such as streams, lakes, marshes, natural and man-made ponds, and ephemeral drainages in valley bottoms and foothills up to 1,500 meters (4,921 feet) in elevation (Jennings and Hayes 1994, Bulger et al. 2003). Adults breed in a variety of aquatic habitats, while larvae and metamorphs use streams, deep pools, backwaters of streams and creeks, ponds, marshes, sag ponds, dune ponds, and lagoons. Stock ponds are frequently used for breeding when they provide a suitable hydroperiod, pond structure, and vegetative cover, and when they are managed to control nonnative predators such as bullfrogs and exotic fish. Red-legged frog breeding occurs between November and April within still or slow-moving water with light to dense, riparian or emergent vegetation, such as cattails (*Typha* spp.), tules, or overhanging willows (*Salix* spp.) (Hayes and Jennings 1988). Egg masses are attached to vegetation below the surface and hatch after 6 to 14 days (Storer 1925, Jennings and Hayes 1994). Larvae undergo metamorphosis 3.5 to 7 months following hatching and reach sexual maturity at 2 to 3 years of age (Jennings and Hayes 1994).

Some red-legged frogs remain at breeding sites during the non-breeding season, whereas others disperse into adjacent upland habitat or to other aquatic sites (Fellers 2005, Fellers and Kleeman 2007, Tatarian 2008). Tatarian (2008) reported that 57% of frogs fitted with radio transmitters in the Round Valley of eastern Contra Costa County stayed at their breeding pools, whereas 43% moved into adjacent upland habitat or to other aquatic sites. The distance red-legged frogs will travel from breeding sites is site dependent. Fellers and Kleeman (2007) reported that only a few frogs in Marin County moved farther than the nearest suitable non-breeding habitat. In this study, the furthest distance traveled was 1.4 kilometers (0.9-mile) and most dispersing frogs moved through grazed pastures to reach the nearest riparian habitat (Fellers and Kleeman 2007). In general, terrestrial habitats used by red-legged frogs have abundant cover (e.g., burrows, woody debris, and vegetation), and those terrestrial habitats are relatively close to water (USFWS 2002a, Fellers and Kleeman 2007, Tatarian 2008).

Upland movement activities ranged from 3 to 233 feet, averaging 80 feet, and were associated with a variety of refugia including ground squirrel burrows at the bases of trees or rocks, logs, grass thatch, crevices, cow hoof prints, and a downed barn door; others were associated with upland sites lacking refugia (Tatarian 2008). Uplands closer to aquatic sites were more often used and were more commonly associated with areas having abundant sources of cover (e.g., small woody debris, rocks, and vegetation). California red-legged frog diet is site dependent but consists mostly of terrestrial invertebrates (Bishop et al. 2014).

California red-legged frogs are currently threatened by loss of habitat from the growth of cities and suburbs, mining, overgrazing by cattle, invasion of nonnative plants, impoundments, water diversions, stream maintenance for flood control, degraded water quality, and introduced predators, such as bullfrogs. The fragmentation of existing habitat and the continued colonization of existing habitat by nonnative species may represent the most significant threat (USFWS 2017a). Although a positive correlation exists between the absence of California red-legged frogs and the presence of bullfrogs, these two species are known to coexist in some environments (Doubledee et al. 2003, Cook and Currylow 2014).

Habitat Assessment and Occurrence in the Project Vicinity

There are 32 documented CNDDB occurrences within 5 miles of the study area. Two of these occurrences (EONDX #75682 and #75679) were recorded on site in 2009, in the seasonal wetlands in Pond 33 and Basin 3. Additional occurrences from the early- to mid-2000's are present in stock ponds and wetlands within a mile north of the study area (CDFW 2020b). The study area contains both "Potential Breeding Habitat" and "Potential Migration and Aestivation Habitat" as mapped by the HCP/NCCP. This species was observed in Basin 7 in 2015 by Nomad Ecology biologists.

Basin 5 had approximately one inch of standing water in a small area surrounding the basin's inlet pipe at the time of the July 2020 site reconnaissance visit. All of the other water quality basins were dry. Any of the basins may be suitable habitat for California red-legged frogs assuming that sufficient water depth and hydroperiod are maintained during the breeding season. Suitable habitat is also present in the artificial ponds on site, although the pond depnd032 was dry and depnd030 and depnd031 were both observed to have numerous mosquitofish, which would likely hinder successful breeding by California red-legged frogs. Additionally, the majority of the length of the banks of the artificial ponds are vertical concrete, which may be insurmountable by adult California red-legged frogs trying to exit the water. There are short sections of bank with slopes closer to 45 degrees, which would likely represent the only viable exit points.

Potential Project Related Effects

Any construction activities associated with the project, such as construction of new wetlands or modification of the existing water quality basins or artificial ponds, could result in injury or mortality to individual California red-legged frogs. Construction in upland areas, such as removal of golf cart paths, could also result in harm to individuals that may be located in underground burrows or that have taken refuge underneath the concrete slabs of the path itself.

This species is covered by the HCP/NCCP, and impacts will be minimized through preconstruction surveys and avoidance and minimization measures that are consistent with HCP/NCCP requirements.

The restoration project includes an assessment of the feasibility of enhancing the existing aquatic habitats on site or creating new aquatic habitat that would be suitable breeding habitat for California red-legged frogs. The long-term effects of the project to California red-legged frogs are expected to be positive.

Reptiles

Alameda Whipsnake (*Coluber lateralis euryxanthus*)

Status, Distribution and Habitat Requirements

The Alameda whipsnake (also known as the Alameda striped racer) is federally and State listed as threatened. It is endemic to California and occurs only in a small region on the east side of the San Francisco Bay in Contra Costa and Alameda counties, and parts of San Joaquin and Santa Clara Counties (Nafis 2020). The historical range of the Alameda whipsnake has been fragmented into five disjunct populations: Tilden-Briones, Oakland-Las Trampas, Hayward-Pleasanton Ridge, Mount Diablo-Black Hills, and Sunol-Cedar Mountain (USFWS 1997). Potential habitat for this species includes mixed chaparral, coastal scrub, and annual grassland and oak woodlands adjacent to scrub habitats (USFWS 2006b). Grassland areas linked to scrub by rock outcrops or river corridors are also considered primary constituent elements of habitat (USFWS 2002b). The Alameda whipsnake requires open and partially open, low-growing shrub communities for many of its biological needs. Shrub communities provide cover for snakes during dispersal, cover from predators, and a variety of microhabitats where whipsnakes can move to regulate their body temperature (Swaim 1994). Other important habitat features include small mammal burrows, rock outcrops, talus (a sloping mass of rock debris at the base of a cliff), and other forms of shelter. These features provide whipsnakes with alternative habitats for temperature regulation, predator protection, egg laying, and periods of winter dormancy (Alameda whipsnakes generally spend November through March in winter hibernacula) (USFWS 2006b).

Alameda whipsnake populations have declined due to loss of habitat associated with urban expansion (USFWS 2006b). Urban development, particularly road and highway construction, has also fragmented Alameda whipsnake populations and made them more vulnerable to extinction. In addition, urban development adjacent to whipsnake habitat can indirectly impact the species by increasing predator populations (including domestic and feral cats) and public recreational use. Other significant threats to the species include grazing and fire suppression practices that degrade chaparral habitats (USFWS 1997).

Occurrence Data and Habitat Suitability

There are 9 occurrences of Alameda whipsnake within 5 miles of the study area. The nearest was recorded in 2003 in chaparral/oak woodland habitat in the eastern portion of Black Diamond Mines Regional Preserve (EONDX #57893), approximately 1.25 miles northwest of the study area (CDFW 2020b). The study area contains “Movement Habitat” as mapped by the HCP/NCCP. The nearest areas mapped as “Core Habitat” or “Perimeter Core Habitat” are located within scrub and oak woodland on a north-facing slope approximately 0.5 mile south of the study area.

There is no suitable scrub habitat within or adjacent to the study area that could serve as core habitat for Alameda whipsnakes. However, individuals could move through the grasslands that are present on site while dispersing between other suitable scrub habitats farther away in the region. For these reasons Alameda whipsnakes may occur within the study area, although it is likely that they would do so only sporadically and infrequently.

Potential Project Related Effects

Any construction activities associated with the project, such as removal of concrete golf cart paths and construction or modification of wetlands, could potentially cause injury or mortality to individual Alameda whipsnakes that may be present within work areas. The potential for direct effects is expected to be low because the study area contains only passage habitat, and individuals of this species have a low probability of occurring on site at any given time. Furthermore, Alameda whipsnakes are active and wary during the daytime, and would likely be able move away from any disturbance.

This species is covered by the HCP/NCCP, and impacts will be minimized through preconstruction surveys and avoidance and minimization measures that are consistent with HCP/NCCP requirements.

Restoration of grasslands and aquatic habitat within the study area will likely have little or no long-term impact on Alameda whipsnakes because their primary scrub habitat is not present on or adjacent to the site. No barriers to dispersal will be created through implementation of the project, so no long-term impacts to Alameda whipsnakes are expected.

Western pond turtle (*Emys marmorata*)

Status, Distribution and Habitat Requirements

The western pond turtle is a California Species of Special Concern. Its geographical range extends along much of the west coast from Puget Sound in Washington south to the Baja Peninsula in Mexico (Jennings and Hayes 1994). Western pond turtles are habitat generalists. They have been observed in slow-moving rivers and streams, lakes, reservoirs, permanent and ephemeral wetlands, stock ponds, and sewage treatment ponds. They prefer aquatic habitat with refugia, such as undercut banks and submerged vegetation (Holland 1994), and they require emergent basking sites such as mud banks, rocks, logs, root wads, and mats of submergent vegetation to thermoregulate their body temperature (Holland 1994, Jennings and Hayes 1994). Pond turtles are omnivorous and feed on a variety of aquatic and terrestrial invertebrates, fish, amphibians and aquatic plants.

Western pond turtles use terrestrial habitat for refuge, nesting, and resting. Rathbun et al. (2002) reported mean maximum distances of 49.7 meters, 93.7 meters, and 12.0 meters from the nearest water for these three types of terrestrial habitat use, respectively. However, travel distances appear to be a function of site-specific factors, and females have been reported ranging as far as 500 meters (1,640 feet) from a watercourse to find suitable nesting habitat. Nest sites are most often situated on south or west-facing slopes, are sparsely vegetated with short grasses or forbs, and are scraped in sands or hard-packed, dry, silt or clay soils (Rathbun et al. 1992, Holland 1994, Reese and Welsh 1997). Most oviposition occurs during May and June, although some individuals may deposit eggs as early as late April and as late as early August (Jennings and Hayes 1994).

Female pond turtles may lay two clutches in a single year, with the interval between clutches ranging from 27 to 43 days (Scott et al. 2008). The natural incubation period for pond turtle eggs is 80-126 days (Ernst and Lovich 2009). Hatchlings appear to overwinter in the nest because hatchling-sized turtles have almost never been observed in an aquatic site during the fall (Jennings and Hayes 1994). The western pond turtle is believed to be declining throughout most of its range. Threats to the species include habitat loss, ongoing impacts to nesting habitat (e.g., by agricultural and grazing practices), the introduction of exotic predators (e.g., bullfrogs and red foxes) or competitors (e.g., non-native turtles), and artificially high mesopredator (e.g., raccoon, fox, and skunk) populations (Jennings and Hayes 1994, Nafis 2020).

Occurrence Data and Habitat Suitability

There are 5 CNDDB occurrences of western pond turtle within 5 miles of the study area. The nearest was recorded in 2016 in Marsh Creek (EONDX #2205), approximately 2.1 miles south of the study area. Although not recorded in the CNDDB as an occurrence of western pond turtle, an occurrence of California red-legged frog recorded in 2003 in stock ponds 0.15 mile north of the study area (EONDX #33749) noted that western pond turtles were also present. The study area contains “Core Habitat” as mapped by the HCP/NCCP, which appears to correspond to the locations of the artificial ponds on site.

Suitable aquatic habitat is present in the water quality basins and artificial ponds within the study area. As noted for California red-legged frog and California tiger salamander, only limited sections of the largely vertical concrete banks of the artificial ponds are sloped enough for western pond turtles to successfully enter and exit the water. Suitable nesting habitat is present in grasslands throughout the study area. Western pond turtles prefer to nest on south- or southwest-facing slopes, and overall the nesting habitat may be marginal because the site is located on a generally northeast-facing slope. However, the site is topographically complex with ridges and valleys in multiple orientations, and a limited number of south or southeast-facing slopes are present on site. These slopes would be expected to have the highest potential for nesting within the study area.

Potential Project-Related Effects

Construction activities associated with the project could result in injury or mortality to western pond turtles that are present in work areas, particularly any work within or in the vicinity of the water quality basins and artificial ponds on site. Preconstruction surveys and timing activities during the dry season will reduce the potential for impacts to individuals of this species.

This species is covered by the HCP/NCCP, and impacts will be minimized through preconstruction surveys and avoidance and minimization measures that are consistent with HCP/NCCP requirements.

The long term effects of the project are expected to be positive, as one of the goals of the project is enhancing habitat values of aquatic features on site, although establishing perennial water sources that are preferred by this species may not be feasible.

Blainville's horned lizard (*Phrynosoma blainvillii*)

Status, Distribution and Habitat Requirements

Blainville's horned lizard is a California Species of Special Concern and is endemic to California. Its geographical range extends from Shasta County to the Baja California border, west of the deserts and the Sierra Nevada. Blainville's horned lizards occur in open areas with sandy soil and low vegetation in valleys, foothills, and semiarid mountains. The species is associated with a variety of habitat types, including grasslands, coniferous forests, woodlands, and chaparral. Key habitat elements are loose, fine soils with a high sand fraction; an abundance of native ants; open areas for basking; and areas with low, dense shrubs for refuge. The primary threats to Blainville's horned lizard are habitat destruction from human development and agriculture, and the spread of nonnative ants, which displace native ants that are used as a food source (Nafis 2020).

Occurrence Data and Habitat Suitability

The nearest CNDDB occurrence of Blainville's horned lizard was recorded in 2002 in Mount Diablo State Park (EONDX #84126), approximately 7 miles west of the study area. Suitable grassland habitat is present throughout the study area, though the site has relatively few, isolated trees, and no scrub habitat that could serve as cover for the species. Sandy soil is present in the former sand traps, though these were artificially created and managed for golf course operations for decades, likely limiting their utility as habitat. Blainville's horned lizards may occur within the study area, though habitat on site is generally marginal and the potential is low.

Potential Project Related Effects

Any construction activities associated with the project, such as removal of concrete golf cart paths and construction or modification of wetlands, could potentially cause injury or mortality to individual Blainville's horned lizards that may be present within work areas. The potential for direct effects is expected to be low because the study area contains only marginal habitat, and individuals of this species have a low probability of occurring on site at any given time. Impacts to Blainville's horned lizards potentially occurring onsite will be avoided through implementation of avoidance and minimization measures, including preconstruction surveys and biological monitoring.

Long-term effects of the project may be beneficial to Blainville's horned lizards due to the restoration of native vegetation, though the benefits would be only minor as the species' preferred habitats are not present on site.

Birds

Tricolored Blackbird (*Agelaius tricolor*)

Status, Distribution and Habitat Requirements

The tricolored blackbird is a state-listed threatened species. Except for small nesting colonies found locally in Oregon, Washington, Nevada, and coastal Baja California, the tricolored blackbird is endemic to California. In most years, the Central Valley supports > 90% of all breeding individuals (Shuford and Gardali 2008). The species' basic requirements for selecting breeding sites are open accessible water; a protected nesting substrate, including either flooded or thorny or spiny vegetation; and a suitable foraging space providing adequate insect prey within a few kilometers of the nesting colony (Beedy and Hamilton 1999). Tricolored blackbirds are highly colonial and have been reported to breed in groups exceeding 100,000 nests (Shuford and Gardali 2008). They exhibit low site fidelity and are known to change their nesting location from year to year. The greatest threats to this species are the direct loss and degradation of habitat from human activities (Beedy and Hamilton 1999). Entire colonies (up to tens of thousands of nests) in cereal crops and silage are often destroyed by harvesting and plowing of agricultural lands. Other threats include water management activities that facilitate predator access to active colonies, and various poisons and contaminants (Shuford and Gardali 2008).

Occurrence Data and Habitat Suitability

There are two CNDDB occurrences of breeding tricolored blackbirds within 5 miles of the study area. One of these occurrences (EONDX #101790) is located on site, representing the observation of approximately 30 individuals in 2015 at the artificial ponds. The other occurrences was recorded in 1989 at Marsh Creek Reservoir (EONDX #7175), approximately 3.5 miles southeast of the study area (CDFW 2020b). Nomad biologists also observed a nesting tricolored blackbird colony in Upper Sand Creek Basin in 2016, approximately 1.5 miles northeast of the study area (Nomad, personal observation). The study area contains "Suitable Core Habitat" and "Primary Foraging Habitat" as mapped by the HCP/NCCP.

Suitable habitat for nesting tricolored blackbirds is present within the artificial ponds on site. At the time of the July 2020 site reconnaissance visit, Pond 32 was dry and the water levels in Ponds 30 and 31 were relatively low. Furthermore, there was very little emergent vegetation that could serve as nesting substrate for this species. Tricolored blackbirds were observed nesting at these ponds in 2015, though water levels were likely higher at that time because the golf course was active, and they would have been kept full both from irrigation runoff and for aesthetic reasons. Marginally suitable habitat is also present in the water quality basins, though minimal evidence of emergent vegetation was observed that could serve as a nesting substrate. The suitability of habitat within the study area would be highly dependent on the hydroperiod and growth of vegetation in the aquatic features on site, and it is possible that the species was only able to nest on site due to the artificial presence of perennial water from the active golf course. Regardless, aquatic habitats within the study area do not have the expansive, contiguous marshes necessary for the formation of large colonies of tricolored blackbirds. Any colonies that are able to become established would likely be small satellite populations.

Potential Project-Related Effects

Any construction activities associated with the project that occur within or in the vicinity of the water quality basins and artificial ponds on site could harm nesting tricolored blackbirds either through direct destruction of nests or through disturbance leading to abandonment. These impacts would be avoided through preconstruction surveys, non-disturbance buffers, and timing of activities outside of the nesting season.

This species is covered by the HCP/NCCP, and impacts will be minimized through preconstruction surveys and avoidance and minimization measures that are consistent with HCP/NCCP requirements.

Long term effects to tricolored blackbird will likely be beneficial, as aquatic habitats on site are expected to be enhanced.

Golden Eagle (*Aquila chrysaetos*)

Status, Distribution and Habitat Requirements

The golden eagle is a California fully Protected Species, and is protected under the federal Bald and Golden Eagle Protection Act (BGEPA). California law prohibits take of golden eagles, and the USFWS requires a permit to be issued for take of golden eagles where the taking is associated with, but not the purpose of the activity, and cannot be practicably avoided. "Take" is defined as *pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, destroy, molest, or disturb*. Under the BGEPA, disturb means to agitate or bother an eagle to a degree that causes, or is likely to cause, based on the best scientific information available: (1) injury to an eagle; (2) a decrease in productivity, by substantially interfering with normal breeding, feeding, or sheltering behavior; or (3) nest abandonment by substantially interfering with normal breeding, feeding, or sheltering behavior (Pagel et al. 2010).

Golden eagles use nearly all terrestrial habitat types in the western U.S. (Kochert et al. 2002). However, in central California, they prefer open grasslands and oak savanna, with lesser numbers in oak woodland and open shrublands (Hunt et al. 1998). Hilly or mountainous country where takeoff and soaring are supported by updrafts is generally preferred to flat habitats (Johnsgard 1990). Golden eagles require large patches of unfragmented natural landscapes as habitat. In addition, they are relatively intolerant of human activity and other sources of anthropogenic disturbance. They are most sensitive to human activity during the courtship and nest-building phase, which begins as early as December (Pagel et al. 2010; H. Beeler, USFWS, personal communication).

Golden eagles maintain long-enduring nesting territories, some of which have been occupied at least intermittently for a century or longer (Millsap et al. 2015). This persistence extends long past life spans of individual eagles, such that long-term occupancy reflects serial reoccupation of nesting territories by successive individuals. Most golden eagle territories have multiple nests (range 2-14) (Pagel et al. 2010, Millsap et al. 2015). Although eggs are laid in only one nest each year, and pairs may use the same nest for many years, alternate nests serve an important biological function (Millsap et al. 2015). Nests are located on cliffs, in the upper one third of deciduous and coniferous trees, or on artificial structures (e.g., electricity transmission towers), often at a location that provides an unobstructed view of the surrounding habitat (Menkens and Anderson 1987, Pagel et al. 2010).

Golden eagles forage in many different open habitat types, including savannahs and early successional stages of forest and shrub habitats (CDFW 2014). They primarily prey on lagomorphs (i.e., rabbits) and rodents, although other mammals (e.g., deer), birds, reptiles, fish, and carrion also are eaten (Carnie 1954, CDFW 2014). Golden eagles have large home ranges and may travel many miles from the nest site to forage (Marzluff et al. 1997, Katzner et al. 2012). During the breeding season the reproductive success of golden eagles depends on the parents' ability to access prey from core foraging areas so they can provision the chick(s). These "core areas" may be several orders of magnitude smaller than the home range (Marzluff et al. 1997).

Monitoring data indicate golden eagle populations are declining throughout the western United States (USFWS 2009) and may not be able to sustain any additional unmitigated mortality (USFWS 2013). Golden eagle declines, where they have occurred, are attributed primarily to habitat degradation and human-induced disturbances and mortality (Kochert et al. 2002). Golden eagles may be secondarily poisoned by consuming prey that has itself been poisoned by chemicals used to protect crops or kill rodents (Kochert et al. 2002). Additional mortality agents are poaching, electrocution from distribution and utility lines, wire strikes, wind turbine strikes, and lead poisoning (Thelander 1974).

Occurrence Data and Habitat Suitability

There are no occurrences of nesting golden eagle recorded in the CNDDB within 5 miles of the study area (CDFW 2020b). However, a recent survey for golden eagles conducted throughout the entire HCP/NCCP Area detected numerous territorial pairs in the region. This included six nests from various years, most recently in 2019, observed on the wooded, northeast-facing slope approximately 0.75 mile south of the study area (Wiens et al. 2020). Golden eagles are frequently observed throughout Contra Costa County (eBird 2020), and the study area contains "Suitable Habitat" as mapped by the HCP/NCCP.

Although most of the trees within the study area are too small in size, suitable nesting habitat for golden eagles is present in the larger trees on site, such as mature valley oaks and sycamores. This species ranges widely, and individuals may forage within grasslands on site or transit through at any time.

Potential Project-Related Effects

The project is not expected to directly impact any golden eagle nests, because the large trees within the study area that represent the only suitable nesting habitat on site are expected to be retained during the restoration. Any construction activities associated with the project could cause direct, short-term impacts to golden eagles if they are nesting within the study area or the immediate vicinity, such as failure to breed, nest abandonment, reduced fecundity, and decreased survivorship from noise and increased human disturbance.

This species is a covered and no-take species in the HCP/NCCP, and impacts will be minimized through preconstruction surveys and avoidance and minimization measures that are consistent with HCP/NCCP requirements.

Long term impacts to golden eagles are expected to be positive due to the restoration of native vegetation on site and potential increase in prey base.

Western burrowing owl (*Athene cunicularia*)

Status, Distribution and Habitat Requirements

The western burrowing owl is a California Species of Special Concern. It is a year-round resident throughout much of California, including the Central Valley, San Francisco Bay region, Carrizo Plain, and Imperial Valley. Western burrowing owls that nest at higher elevations (e.g., Modoc Plateau) migrate to lower elevations in winter. In addition, migrants from other parts of western North America may augment resident lowland populations in winter (Shuford and Gardali 2008).

Throughout their range, burrowing owls require habitats with three basic attributes: (1) open, well-drained terrain; (2) short, sparse vegetation generally lacking trees; and (3) underground burrows or burrow-like structures (e.g., culverts) (Klute et al. 2003, Shuford and Gardali 2008). The western burrowing owl is well adapted to open, relatively flat expanses. Grassland, shrub steppe, and desert are naturally occurring habitat types used by the species (CDFG 2012).

Once considered "abundant" and "common" throughout California, the western burrowing owl has been declining since at least the 1940s (Shuford and Gardali 2008, Wilkerson and Siegel 2010). Analyses of regional patterns for breeding populations of burrowing owls have detected declines both locally in their central and southern coastal breeding areas, and statewide where the species has experienced modest breeding range retraction. In California, threat factors affecting western burrowing owl populations include habitat loss, degradation and modification, and eradication of ground squirrels resulting in a loss of suitable burrows required by burrowing owls for nesting, protection from predators, and shelter (CDFG 2012).

Occurrence Data and Habitat Suitability

There are 33 CNDDB occurrences of burrowing owl within 5 miles of the study area, primarily within urbanized areas of Antioch, Brentwood, and Oakley. The closest occurrence was recorded in 2003 just north of Empire Mine Road (EONDX #52714), approximately 0.1 mile north of the study area (CDFW 2020b). Additionally, a single wintering burrow owl was observed in January 2019 in the Horse Valley Restoration Area (Nomad personal observation), approximately 0.1 mile northwest of the study area. The study area contains “Suitable Habitat” as mapped by the HCP/NCCP.

Suitable habitat for burrowing owls is present in grasslands throughout the study area. California ground squirrel burrows suitable for the species were observed during the July 2020 site reconnaissance visit, though they appeared to be present in small, isolated clusters rather than being widespread throughout the site. The site was not comprehensively surveyed however, and additional burrow concentrations may be present. Burrowing owls may occupy burrows or forage anywhere within the study area.

Potential Project Related Effects

Any construction activities associated with the project, such as removal of concrete golf cart paths and construction or modification of wetlands, could cause injury or mortality to burrowing owls within the study area through direct destruction of occupied burrows or disturbance from crews and equipment leading to nest abandonment.

This species is covered by the HCP/NCCP, and impacts will be minimized through preconstruction surveys and avoidance and minimization measures that are consistent with HCP/NCCP requirements.

Long term effects to burrowing owls are expected to be positive as the restoration of native vegetation and potential increase in prey base would improve foraging habitat on site. However, restoration activities causing the growth of tall vegetation at burrow complexes would be detrimental to the species because they rely on low-growing vegetation to maintain lines of sight.

Swainson’s Hawk (*Buteo swainsoni*)

Status, Distribution and Habitat Requirements

The Swainson’s hawk is listed as threatened under the California Endangered Species Act. Swainson's hawks require large, open grasslands (or surrogates) with abundant prey in association with suitable nest trees. They were once found throughout lowland California and were absent only from the Sierra Nevada, north Coast Ranges and Klamath Mountains, and portions of the desert regions of the State. The majority of the State’s extant population of nesting Swainson's hawks is restricted to portions of the Central Valley and Great Basin regions where suitable nesting and foraging habitat is still available. Suitable nest sites may be found in mature riparian forest, lone trees or groves of oaks, other trees in agricultural fields, and mature roadside trees. Suitable foraging areas include native grasslands or lightly grazed pastures, alfalfa and other hay crops, and certain grain and row croplands. The loss of agricultural lands to various residential and commercial developments is a serious threat to Swainson's hawks throughout California. Additional threats are habitat loss due to riverbank protection projects, conversion from agricultural crops that provide abundant foraging opportunities to crops such as vineyards and orchards which provide fewer foraging opportunities, shooting, pesticide poisoning of prey animals and hawks on wintering grounds, competition from other raptors, and human disturbance at nest sites (CDFW 2014).

Occurrence Data and Habitat Suitability

There are 10 CNDDB occurrences of Swainson's hawk within 5 miles of the study area. The closest was recorded in 2012 on a hillside dominated by blue oak woodland (EONDX #88710) approximately 0.75 mile south of the study area, and two other recent occurrences (EONDX #88711 and #103661) were recorded along the same hillside (CDFW 2020b). Multiple Swainson's hawks were observed in flight over the study area during the reconnaissance site visit in July 2020. The study area is outside of mapped breeding and foraging habitat in the HCP/NCCP.

Suitable nesting habitat for Swainson's hawks is present in trees throughout the study area, and they may forage anywhere within the grasslands on site.

Potential Project-Related Effects

The project is not expected to directly impact any Swainson's hawk nests, because the trees within the study area that represent suitable nesting habitat on site will be retained during the restoration project. Any construction activities associated with the project could cause direct, short-term impacts to Swainson's hawks if they are nesting within the study area or the immediate vicinity, such as failure to breed, nest abandonment, reduced fecundity, and decreased survivorship from noise and increased human disturbance.

This species is covered by the HCP/NCCP, and impacts will be minimized through preconstruction surveys and avoidance and minimization measures that are consistent with HCP/NCCP requirements.

Long term impacts to Swainson's hawks are expected to be positive due to the restoration of native vegetation on site and potential increase in prey base.

White-Tailed Kite (*Elanus leucurus*)

Status, Distribution, and Habitat Requirements

The white-tailed kite is a California Fully Protected Species. In California, the white-tailed kite is a yearlong resident in coastal and valley lowlands, where it inhabits herbaceous and open stages of most habitat types. It is rarely found away from agricultural areas (CDFW 2014). Nest sites are usually located immediately adjacent to preferred foraging areas and are often in a single, isolated tree (Glover 2009) or near riparian corridors (Niemela 2007). White-tailed kites prey mostly on voles and other small, diurnal mammals, occasionally on birds, insects, reptiles, and amphibians. They forage in undisturbed, open grasslands, meadows, farmlands, and emergent wetlands.

By the 1940's the white-tailed kite had become restricted to a few sites in California due to habitat loss, shooting, and possibly egg collecting. Since then, however, the range and size of the population has increased substantially. Factors influencing population trends directly or indirectly include: (1) conversion of natural or agricultural lands to urban sprawl or commercial properties, (2) clean farming techniques that leave few residual vegetation areas for prey, (3) increased competition for nest sites with corvids and other raptors, (4) drought, (5) increased disturbance at nests, and (6) removal of suitable nesting habitat (Dunk 1995).

Occurrence Data and Habitat Suitability

There is one CNDDB occurrence within 5 miles, recorded in 2005 along Highway 4 (EONDX #64534), approximately 4 miles northeast of the study area (CDFW 2020b). White-tailed kites are ubiquitous throughout the greater San Francisco Bay Area (eBird 2020).

Suitable nesting habitat for white-tailed kites is present in the trees scattered throughout the study area, and the species may forage in grasslands anywhere on site. This species is quite common in Contra Costa County, and has a high potential to occur on site.

Potential Project-Related Effects

The project is not expected to directly impact any white-tailed kite nests, because the trees within the study area that represent suitable nesting habitat on site will be retained during the restoration. Any construction activities associated with the project could cause direct, short-term impacts to white-tailed kites if they are nesting within the study area or the immediate vicinity, such as failure to breed, nest abandonment, reduced fecundity, and decreased survivorship from noise and increased human disturbance.

This species is a no-take species in the HCP/NCCP, and impacts will be minimized through preconstruction surveys and avoidance and minimization measures that are consistent with HCP/NCCP requirements.

Long term impacts to white tailed-kites are expected to be positive due to the restoration of native vegetation on site and potential increase in prey base.

Ferruginous hawk (*Buteo regalis*)

Status, Distribution and Habitat Requirements

The ferruginous hawk (nonbreeding/wintering) is included on the CDFW and Birds of Conservation Concern watchlists (CDFW 2020d). Ferruginous hawks inhabit open areas including grasslands, shrub steppes and deserts throughout western North America from southern Canada to Central Mexico between the Great Plains and the Rocky Mountains (Bechard and Schmutz 1995). This species breeds in the northern states and Canada; winters south from California and Texas to Mexico. Wintering habitat consists of open grasslands, deserts and cultivated fields (Baicich & Harrison 2005). The ferruginous hawk is a California winter resident from August to early March. Ferruginous hawks feed primarily on rabbits, ground squirrels and prairie dogs (Bechard and Schmutz 1995). Breeding for ferruginous hawks begins in April and are single-brooded (Baicich & Harrison 2005).

Occurrence Data and Habitat Suitability

There are no CNDDB occurrences of ferruginous hawk within 5 miles of the study area (CDFW 2020b), though this species is likely under-reported. They are regularly observed in Contra Costa County during the wintering season (eBird 2020).

Suitable habitat is present in grasslands throughout the study area, and they may occur anywhere on site during the wintering season. Ferruginous hawks do not breed in California, and are not expected to nest on site.

Potential Project Related Effects

See ‘Potential Project Related Effects for all Migratory Birds’ below.

Northern Harrier (*Circus cyaneus*)

Status, Distribution and Habitat Requirements

The northern harrier (*Circus hudsonius*) is a California Species of Special Concern. It is a year-round resident of coastal California and the Central Valley (Smith et al. 2011). They occur more broadly and in much greater numbers during migration and winter than during the breeding season. Northern harriers appear to be nomadic, ranging widely, both within the breeding season and across years (Shuford and Gardali 2008).

Northern harriers breed and forage in a variety of open habitats that provide adequate vegetative cover, an abundance of suitable prey (mostly small mammals), and scattered hunting, plucking, and lookout perches such as shrubs or fence posts. In California, such habitats include freshwater marshes, brackish and saltwater marshes, wet meadows, weedy borders of lakes, rivers and streams, annual and perennial grasslands, weed fields, ungrazed or lightly grazed pastures, some croplands, sagebrush flats, and desert sinks. Northern harriers nest on the ground, typically within patches of dense, often tall, vegetation in undisturbed areas (Smith et al. 2011), although they typically prefer marshlands and have greater success at wetter sites (Simmons and Smith 1985). This species is widespread throughout the Central Coast region of California. The primary threats to breeding northern harriers are loss and degradation of nesting and foraging habitat, nest failure from human disturbance, predator-control projects, agricultural practices, and unnatural predation pressure (Shuford and Gardali 2008).

Occurrence Data and Habitat Suitability

There are no CNDDB occurrences of northern harrier within 5 miles of the study area (CDFW 2020b), though this species is likely under-reported. They are regularly observed in Contra Costa County during the breeding season (eBird 2020).

The dry, hilly grassland within the study area is marginally suitable nesting for northern harriers, which typically prefer wetter, flatter sites. However, they may still nest on site when grasses grow tall, and could forage or transit through at any time of year.

Potential Project Related Effects

See ‘Potential Project Related Effects for all Migratory Birds’ below.

California Horned Lark (*Eremophila alpestris actia*)

Status, Distribution and Habitat Requirements

The California horned lark is included on the CDFW Watchlist (CDFW 2020d). This subspecies ranges from the inner Coast Ranges and San Joaquin Valley to northern Baja California, Mexico (Beason 1995). This species inhabits bare ground, deserts, short-grass prairies, tundra, sandy/stony area, agricultural feed lots, and fallow row crops characterized by open, treeless areas with low vegetation from sea level to 4,000 meters (13,123 feet) (Beason 1995, Baicich and Harrison 2005). Nest sites are built on bare ground often next to tufts of grass or a stone (Beason 1995, Baicich and Harrison 2005). Breeding begins in late February, and pairs may produce two or even three broods in a single season (Baicich & Harrison 2005).

Occurrence Data and Habitat Suitability

There are no CNDDB occurrences of horned lark within 5 miles of the study area (CDFW 2020b), though this species is likely under-reported. They are regularly observed in Contra Costa County during the breeding season (eBird 2020).

Suitable nesting and foraging habitat for horned larks is present in grasslands throughout the study area, and the species may occur in open areas anywhere on site.

Potential Project Related Effects

See ‘Potential Project Related Effects for all Migratory Birds’ below.

Grasshopper Sparrow (*Ammodramus savannarum*)

Status, Distribution and Habitat Requirements

The grasshopper sparrow is a California Species of Special Concern. It is an uncommon and local, summer resident and breeder in foothills and lowlands west of the Cascade-Sierra Nevada crest from Mendocino and Trinity counties south to San Diego County (CDFW 2014). In general, grasshopper sparrows in California prefer short to medium-height, moderately open grasslands with scattered shrubs (Shuford and Gardali 2008). Grasshopper sparrows build nests domed with grasses and with a side entrance, typically well-concealed in depressions at the base of grass clumps with the rim approximately level to the ground (Vickery 1996). Areas with native bunchgrasses are important features in southern California. However, it is unclear whether this applies to other parts of California because the ecology of the species varies substantially from region to region (Shuford and Gardali 2008).

Occurrence Data and Habitat Suitability

There are no CNDDB occurrences of grasshopper sparrow within 5 miles of the study area, though this species is likely under-reported. They are regularly observed in Contra Costa County during the breeding season (eBird 2020).

Suitable nesting and foraging habitat for grasshopper sparrows is present in grasslands throughout the study area, and the species may occur in open areas anywhere on site.

Potential Project Related Effects

See ‘Potential Project Related Effects for all Migratory Birds’ below.

Loggerhead Shrike (*Lanius ludovicianus*)

Status, Distribution and Habitat Requirements

The loggerhead shrike is a California Species of Special Concern. It is a common resident and winter visitor in lowlands and foothills throughout California (CDFW 2014). Loggerhead shrikes breed mainly in shrublands or open woodlands with a fair amount of grass cover and areas of bare ground (Shuford and Gardali 2008). They require tall shrubs or trees (but also use fences or power lines) for hunting perches, territorial advertisement, and pair maintenance; open areas of short grasses, forbs, or bare ground for hunting; and large shrubs or trees for nest placement. Shrikes also need impaling sites for prey manipulation or storage, which can include sharp, thorny, or multi-stemmed plants and barbed-wire fences. The threats responsible for shrike declines in California and the West are poorly understood (Shuford and Gardali 2008). However, habitat loss on breeding and wintering grounds, as well as along migratory routes, is undoubtedly a major threat to the species (Shuford and Gardali 2008).

Occurrence Data and Habitat Suitability

There are no CNDDB occurrences of loggerhead shrike within 5 miles of the study area, though this species is likely under-reported. They are regularly observed in Contra Costa County during the breeding season (eBird 2020). One loggerhead shrike was observed during the July 2020 site reconnaissance visit.

Suitable nesting habitat for loggerhead shrikes is present in the small trees and shrubs scattered throughout the study area, and foraging habitat is present in grasslands on site. Loggerhead shrikes may occur throughout the study area.

Potential Project Related Effects

See ‘Potential Project Related Effects for all Migratory Birds’ below.

Migratory Birds

In addition to the special status bird species discussed above, numerous bird species that have no special status may also occur within the study area. Protection is afforded to these species by the Migratory Bird Treaty Act (16 U.S.C. 703-712; MBTA) administered by the U.S. Fish and Wildlife Service (Division of Migratory Bird Management), which makes it unlawful, unless expressly authorized by permit pursuant to federal regulations, to "pursue, hunt, take, capture, kill, attempt to take, capture or kill, offer for sale, sell, offer to purchase, purchase, deliver for shipment, ship, cause to be shipped, deliver for transportation, transport, cause to be transported, carry, or cause to be carried by any means whatever, receive for shipment, transportation or carriage, or export at any time, or in any manner, any migratory bird, or any part, nest, or egg of any such bird." This includes direct and indirect acts, with the exception of harassment and habitat modification, which are not included unless they result in direct loss of birds, nests or eggs. In addition, the Migratory Bird Treaty Reform Act (Division E, Title I, Section 143 of the Consolidated Appropriations Act, 2005, PL 108–447; MBTRA), excludes all migratory birds non-native or that have been human introduced to the U.S. or its territories. It defines a native migratory bird as a species present within the U.S. and its territories as a result of natural biological or ecological processes. Birds receive further protection under state law through California Fish and Game Code §3503, prohibiting the take, possession, or needless destruction of the nest or eggs of any bird; §3503.5 prohibiting the take, possession, or needless destruction of any nests, eggs or birds in the orders Falconiformes (new world vultures, hawks, eagles, ospreys and falcons, among others) or Strigiformes (owls); §3511 prohibiting the take or possession of fully protected birds; and §3513 prohibiting the take or possession of any migratory nongame bird or part thereof as designated in the federal MBTA. Most birds are protected under the MBTA and California Fish and Game Code except for several nonnative species, including the European starling (*Sturnus vulgaris*) and the house sparrow (*Passer domesticus*).

Potential Project Related Effects for all Migratory Birds

For any bird species that are nesting within the study area, construction actions associated with the project could result in short-term impacts such as failure to breed, nest abandonment, reduced fecundity and decreased survivorship from noise and movement of personnel and equipment that exceeds normal background conditions within the study area. Disturbance may alter the bird's behavior in ways that result in injury, mortality and reduced foraging success, such as the temporary loss of habitat due to avoidance of areas that have suitable habitat but intolerable levels of disturbance, and altered activity patterns.

If work activities cannot be timed to avoid the breeding season then preconstruction surveys for nesting bird species will be conducted to identify any active nests that may be disturbed during project implementation. Active nests will be avoided and a non-disturbance buffer zone will be established around them to avoid impacts to migratory birds.

Long-term effects of the project are expected to be beneficial to migratory birds, as the goal is to restore native habitats on site. The various habitats utilized for nesting will still be available on site after any project construction activities are completed and will likely be improved or expanded for the majority of species. Therefore the project will not reduce nesting habitat for these species or result in overall impacts to nesting birds.

Mammals

Mountain Lion (Southern California/Central Coast ESU) (*Puma concolor*)

Status, Distribution and Habitat Requirements

The Southern California/Central Coast Evolutionarily Significant Unit (ESU) mountain lion is a candidate for listing as threatened under the California Endangered Species Act. They are large cats with very large home ranges that may cover many different habitat types, including conifer forests, oak and riparian woodlands, scrub, chaparral, grasslands, and deserts. They typically require areas that are relatively undisturbed by human activity. The Southern California/Central Coast ESU includes all populations from the San Francisco Bay Area south along the Coast Ranges, and in Southern California from Interstate 15 southward to the border with Mexico, and eastward to the Nevada and Arizona borders. The Santa Cruz Mountains are understood to be one of the core habitat areas for this ESU, and populations extend to the limits of urbanization in San Mateo, Santa Cruz, Santa Clara, Alameda, and Contra Costa Counties (CBD and MLF 2019).

Occurrence Data and Habitat Suitability

The CNDDB does not track occurrences of Southern California/Central Coast mountain lions, but the study area is within the known range of this ESU (CBD and MLF 2019). Mountain lions range widely and may use any of the habitats and natural features on site, including trees, open grassland areas, and ponds and water quality basins (i.e. as drinking water sources). They may occur anywhere within the study area, although likely sporadically and unpredictably.

Potential Project Related Effects

Any construction activities associated with the project, such as removal of concrete golf cart paths and construction or modification of wetlands, could cause temporary disturbance to mountain lions on site. Any mountain lions in the vicinity of active construction work would be able to move away from disturbance and would not be harmed. Impacts to mountain lions potentially occurring onsite will be avoided through implementation of avoidance and minimization measures, including preconstruction surveys and biological monitoring.

Long-term effects would likely be beneficial, because native habitats would be restored. Aquatic habitats on site would still be available as drinking water sources for mountain lions that may travel through the study area, and no barriers to movement would be created.

San Joaquin Kit Fox (*Vulpes macrotis mutica*)

Status, Distribution and Habitat Requirements

The San Joaquin kit fox is a federally-listed Endangered and state-listed Threatened species. Historically it was known to occur in semi-arid habitats of the San Joaquin Valley and in arid grasslands of the adjacent foothills, from as far north as Tracy, San Joaquin County, and La Grange, Stanislaus County, south to Kern County. The San Joaquin kit fox continues to occupy a portion, but not all, of the areas of suitable habitat remaining in the San Joaquin Valley and lower foothills of the coastal ranges, Sierra Nevada, and Tehachapi Mountains. However, the population structure has become fragmented, some of the resident satellite subpopulations have been extirpated, and portions of the range now appear to be frequented by dispersing individuals rather than resident kit foxes (USFWS 2010).

Kit foxes currently persist in a metapopulation consisting of 3 larger “core” and a number of smaller “satellite” populations (USFWS 1998). The three core populations exist at:

1. The Carrizo Plan Natural Area in San Luis Obispo County;
2. Natural lands of western Kern County (i.e., Elk Hills, Buena Vista Hill, and the Buena Vista Valley, Lokern Natural Area and adjacent natural land); and
3. The Ciervo-Panoche Natural Area of western Fresno and eastern San Benito counties.

Movement of kit foxes among the metapopulations is critical for maintaining genetic and demographic exchange (USFWS 1998, Cypher et al. 2007). Consequently, movement corridors for kit foxes are essential to preventing local extinctions and allowing recolonization of lands where foxes are extirpated or habitat has been restored (USFWS 1998, Cypher et al. 2007).

Habitat within the northern part of the San Joaquin kit fox range, including Contra Costa, Alameda, and San Joaquin counties, appears to have been marginal historically and has been further degraded due to human development. Individuals and family groups have been identified in the past in the northern part of the range, but there does not appear to be a self-sustaining population. The presence of kit foxes in this area appears to be dependent on occasional immigration from the Ciervo-Panoche core population. For these reasons, the northern part of the species' range may represent a population sink (Clark et al. 2007).

Occurrence Data and Habitat Suitability

There are 7 occurrences of San Joaquin kit fox within 5 miles of the study area. The nearest was recorded in 1975 along Deer Valley Road (EONDX #67969), approximately 2 miles southeast of the study area. Other occurrences were recorded in the early to mid-1990's in and around Black Diamond Mines Regional Preserve and Contra Loma Reservoir (EONDX #41364, 41367, 67419, and 67418), between 2.5 and 5 miles northwest of the study area. The study area contains "Suitable Core Habitat" as mapped by the HCP/NCCP.

Suitable open grassland habitat is present throughout the study area, and California ground squirrel burrows that could be expanded for use as dens are present in scattered locations. The study area also contains no dispersal barriers and could be used as a movement corridor. San Joaquin kit foxes could occur in open areas throughout the study area, though because of the extreme rarity of this species in the northern part of its range, if they are present at all it would likely be infrequently and in low numbers.

Potential Project Related Effects

Any construction activities associated with the project, such as removal of concrete golf cart paths and construction or modification of wetlands, could cause injury or mortality to San Joaquin kit foxes within the study area through direct destruction of occupied burrows or disturbance from crews and equipment leading to burrow abandonment.

This species is covered by the HCP/NCCP, and impacts will be minimized through preconstruction surveys and avoidance and minimization measures that are consistent with HCP/NCCP requirements.

The project will not result in long-term impacts to San Joaquin kit fox, as the open grassland habitats currently present within the study area would still be available after site restoration, and no barriers to movement would be created.

Special Status Bats

Bats are widespread within California and may be found in any habitat. They are nocturnal, aerial predators of insects and other arthropods, and often forage over open water, marshes, and other moist, open areas where flying insects tend to congregate. Different bat species have different roosting requirements and roosts can be found in a variety of habitats and locations. Day roosts, used from sunrise to sunset, provide a protected and sheltered location for bats to rest and sleep within a short flight to foraging areas and a site to raise their young (Erickson et al. 2002). During the day, bats may use three types of roosts: crevices, cavities, and foliage. Crevice and cavity roosts may be found in natural and human-made features such as caves, cliffs, rock outcrops, trees, mines, buildings, bridges, and tunnels.

During the breeding season (April through September), crevice and cavity roosting species typically gather in groups of mothers and young (maternity colonies) that may number in the thousands or even tens of thousands of individuals. In contrast, foliage-roosting bats may be solitary or occur in small groups while breeding. Roosts used during the day and as maternity roosts tend to be well-hidden and require precise temperature and humidity conditions.

Night roosts, which are used from approximately sunset to sunrise, are primarily sites where animals congregate to rest and digest their food between foraging bouts (Erickson et al. 2002). Night roosts are often located in more open but protected areas such as overhangs on buildings and recessed areas on the undersides of bridges. Eight special status bat species have the potential to occur within the study area based on range, habitat, and recorded occurrences in the region, including:

- pallid bat (*Antrozous pallidus*) – California Species of Special Concern
- Townsend's big-eared bat (*Corynorhinus townsendii*) – California Species of Special Concern
- western red bat (*Lasiurus blossevillii*) – California Species of Special Concern
- hoary bat (*Lasiurus cinereus*) – Included on CDFW's Special Animals List
- long-eared myotis bat (*Myotis evotis*) – Included on CDFW's Special Animals List
- fringed myotis bat (*Myotis thysanodes*) – Included on CDFW's Special Animals List
- long-legged myotis bat (*Myotis volans*) – Included on CDFW's Special Animals List
- Yuma myotis bat (*Myotis yumanensis*) – Included on CDFW's Special Animals List

These bat species may occur in any habitat, although riparian corridors, large trees and snags, and relatively undisturbed parts of human-made structures are generally the most suitable roost locations. CNDDB occurrences are reported in the individual species descriptions below. Bats in general are very likely under-reported to the CNDDB relative to their actual abundance in the environment because they are nocturnal, difficult to detect, and difficult to positively identify and assess population levels even when detected.

Potential Project Related Effects to All Bat Species

The removal of trees, including dead trees, or the demolition of any existing structures on site could directly harm roosting bats that may be occupying these features. Any construction activities associated with the project also have the potential to cause impacts to roosting bats through noise and physical disturbance by heavy machinery, vehicles, construction activities and increased human presence. This may result in the permanent removal of roost features and displacement of individual bats utilizing them. Preconstruction surveys would be required prior to any disturbance to the existing structures on site, and any occupied roost features would be avoided during the breeding season. Roost features that are demolished may require the construction of alternative roosting habitat in order to mitigate adverse effects to bats.

Long-term adverse effects to the habitats and bat species are not expected, because the project will restore native habitats and leave aquatic features that attract insect prey and provide drinking water intact.

Pallid Bat (*Antrozous pallidus*)

Status, Distribution and Habitat Requirements

The pallid bat is a California Species of Special Concern, and is designated a High Priority species by the Western Bat Working Group. They are yearlong residents throughout most of California, except for the high Sierra Nevada and the northwestern corner of the state (CDFW 2014). They occur in a wide variety of habitats (including grasslands, shrublands, and woodlands), although are most abundant in xeric ecosystems (CDFW 2014, WBWG 2020).

Pallid bats may roost alone, in small groups (2 to 20 bats), or gregariously (100s of individuals). Roost sites include crevices in rocky outcrops and cliffs, caves, mines, trees (e.g., in basal hollows, bole cavities, and exfoliating bark), and various human structures such as bridges (especially wooden and concrete girder designs), barns, porches, bat boxes, and human-occupied as well as vacant buildings. Roosts generally have unobstructed entrances/exits, and are high above the ground, warm, and inaccessible to terrestrial predators. Although year-to-year and night-to-night roost reuse is common, pallid bats may switch day roosts on a daily (1-13 day) and seasonal basis. Pallid bats usually emerge late in the evening (30-60 minutes after sunset) to forage on a variety of arthropods (WBWG 2020).

Pallid bats' tendency to roost gregariously and their relative sensitivity to disturbance makes them vulnerable to mass displacement. Roosts and hibernacula can be damaged or destroyed by vandalism, mine closures and reclamation, recreational activities such as rock climbing, forestry practices such as timber harvest, and, where human-made structures are occupied, demolition, modification, chemical treatments, or intentional eradication and exclusion. Maternity colonies and hibernating bats are especially susceptible to disturbance. Loss or modification of foraging habitat due to prescribed fire, urban development, agricultural expansion, and pesticide use pose potential threats. This is especially true in coastal California, where urbanization has reduced roosting and foraging habitat (WBWG 2020).

Occurrence Data and Habitat Suitability

The only CNDDB occurrence of pallid bat within 5 miles was recorded in 1929 along Morgan Territory Road (EONDX #66597), approximately 5 miles southwest of the study area (CDFW 2020b). Suitable day roosting habitat may be present in the larger trees on site, as well as in the pumphouse near Ponds 30 and 31. The restrooms on site are only marginally suitable due to their small size and skylights allowing daytime light infiltration.

Potential Project Related Effects

See 'Potential Project Related Effects to All Bat Species' above.

Townsend's Big-Eared Bat (*Corynorhinus townsendii*)

Status, Distribution and Habitat Requirements

Townsend's big-eared bat is a California Species of Special Concern, and is designated as a High Priority Species by the Western Bat Working Group. In California, they are found throughout most of the state in a wide variety of habitat types, including coniferous forests, deserts, native prairies, riparian communities, active agricultural areas, and coastal habitats (CDFW 2014, WBWG 2020).

However, this species' distribution is patchy and strongly correlated with the availability of caves and cave-like roosting habitat, including abandoned mines (WBWG 2020). Townsend's big-eared bats require open surfaces of caves or cave-like structures, such as subsurface hard rock mines, or large undisturbed spaces in buildings, bridges, and water diversion tunnels, for roosting (Gruver and Keinath 2006). They may also use basal hollows in very large trees, such as mature redwoods, in dense forest habitats (Mazurek 2004). Population centers are known to occur in areas dominated by exposed, cavity forming rock or in historic mining districts (WBWG 2020). Maternity colonies are comprised of small clusters or groups (usually fewer than 100 individuals) of females and young (CDFW 2014). Winter hibernating colonies are composed of mixed-sexed groups, which can range in size from a single individual to colonies of several hundred bats. Foraging associations include edge habitats along streams that are adjacent to and within a variety of wooded habitats. The primary threat to the Townsend's big-eared bat is almost certainly related to disturbance or destruction of roost sites (e.g., recreational caving or mine exploration, mine reclamation, and renewed mining in historic districts) (WBWG 2020).

Occurrence Data and Habitat Suitability

There are no CNDDB occurrences of Townsend's big-eared bat within 5 miles of the study area. The closest occurrence was recorded in 1977 in Mount Diablo State Park (EONDX #93520), approximately 6 miles to the southwest (CDFW 2020b). The pumphouse near Ponds 30 and 31 is the only suitable roosting habitat for Townsend's big-eared bat within the study area. This species requires large, cave-like spaces, and the restrooms on site are not suitable for this species due to their small size and skylights allowing daytime light infiltration.

Potential Project Related Effects

See ‘Potential Project Related Effects to All Bat Species’ above.

Townsend’s big-eared bat is covered by the HCP/NCCP, and impacts will be minimized through preconstruction surveys and avoidance and minimization measures that are consistent with HCP/NCCP requirements.

Western Red Bat (*Lasiurus blossevillii*)

Status, Distribution and Habitat Requirements

The western red bat is a California Species of Special Concern, and is designated a High Priority Species by the Western Bat Working Group. The western red bat is primarily a riparian obligate species with a widespread distribution extending from British Columbia to Argentina. They are ubiquitous throughout most of California except the northern Great Basin region. Roosting typically occurs individually in dense clumps of tree foliage in riparian areas, especially willows, cottonwoods and sycamores, and within orchards and suburban areas in trees and shrubs. Roosts are often hidden from view and only accessed from below. Red bats are primarily moth specialists, but individuals will forage for a variety of other insects. The western red bat migrates long distances, but has been reported to overwinter in the San Francisco Bay Area with interspersed winter foraging bouts on warm days. Loss of riparian zones, primarily due to agricultural conversion and creation of water storage reservoirs has reduced both roosting and foraging habitat of red bats (WBWG 2020).

Occurrence Data and Habitat Suitability

The only CNDDB occurrence within 5 miles was recorded in 1998 in Antioch (EONDX #69704), approximately 3.75 miles north of the study area (CDFW 2020b). Suitable roosting habitat is present in the large trees on site, although the study area is generally marginal for this species as it does not contain the preferred habitat of riparian areas and dense foliage in woodlands or forests.

Potential Project Related Effects

See ‘Potential Project Related Effects to All Bat Species’ above.

This species is covered by the HCP/NCCP and all preconstruction surveys and avoidance and minimization measures will be consistent with HCP/NCCP requirements.

Hoary Bat (*Lasiurus cinereus*)

Status, Distribution and Habitat Requirements

The hoary bat is included on CDFW’s Special Animals list, and is designated a Medium Priority Species by the Western Bat Working Group. Hoary bats are ubiquitous throughout California, although their distribution is patchy in the southeastern deserts (CDFW 2014). Hoary bats are solitary and roost primarily in foliage of both coniferous and deciduous trees, near the ends of branches, 3-12 m above the ground and usually at the edge of a clearing (WBWG 2020). Habitats suitable for bearing young include all woodlands and forests with medium to large-size trees and dense foliage (CDFW 2014). Hoary bats usually emerge late in the evening to forage (WBWG 2020). Hoary bats reportedly have a strong preference for moths, but are also known to eat beetles, flies, grasshoppers, termites, dragonflies, and wasps. Loss of roosting habitat due to timber harvest is likely the greatest threat to this species. Use of pesticides may also be a potential source of mortality to roosting bats and their insect prey (WBWG 2020).

Occurrence Data and Habitat Suitability

There are no CNDDB occurrences of hoary bat within 5 miles of the study area. The closest occurrence was recorded in 1957 in Concord (EONDX #68776), approximately 12 miles to the west (CDFW 2020b). Suitable roosting habitat is present in the large trees on site, although the study area is generally marginal for this species as it does not contain the preferred habitat of dense foliage in woodlands or forests.

Potential Project Related Effects

See 'Potential Project Related Effects to All Bat Species' above.

Long-Eared Myotis Bat (*Myotis evotis*)

Status, Distribution and Habitat Requirements

The long-eared myotis is included on CDFW's Special Animals List, and is designated a Medium Priority Species by the Western Bat Working Group. It is widespread in California, but generally is believed to be uncommon in most of its range. It avoids the arid Central Valley and hot deserts, occurring along the entire coast and in the Sierra Nevada, Cascades, and Great Basin from the Oregon border south through the Tehachapi Mountains to the Coast Ranges. This species has been found in nearly all brush, woodland, and forest habitats, from sea level to at least 2700 m (9000 ft), but coniferous woodlands and forests seem to be preferred (CDFW 2014). Individuals roost under exfoliating tree bark, and in hollow trees, caves, mines, cliff crevices, sinkholes, and rocky outcrops on the ground. They also sometimes roost in buildings and under bridges. During the summer, females form small maternity colonies, whereas males and non-reproductive females roost alone or in small groups nearby. Threats to the species include closure of abandoned mines, recreational caving, some forest-management practices, and activities that impact cliff faces or rock outcrops (WBWG 2020).

Occurrence Data and Habitat Suitability

There are no CNDDB occurrences of long-eared myotis within 5 miles of the study area. The nearest occurrence was recorded in San Jose in 2007 (EONDX #79614), approximately 40 miles to the south (CDFW 2020b). Suitable roosting habitat may be present in the larger trees on site, as well as in the pumphouse near Ponds 30 and 31. The restrooms on site are only marginally suitable, due to their small size and skylights allowing daytime light infiltration.

Potential Project Related Effects

See 'Potential Project Related Effects to All Bat Species' above.

Fringed Myotis Bat (*Myotis thysanodes*)

Status, Distribution and Habitat Requirements

The fringed myotis bat is included on CDFW's California State Special Animals List and is designated a High Priority Species by the WBWG. The range of the fringed myotis extends through much of western North America from southern British Columbia, Canada, south to Chiapas, Mexico and from Santa Cruz Island in California, east to the Black Hills of South Dakota. It occurs from sea level to 9,350 feet but is most common at middle elevations (3,937 to 6,890 feet). The distribution of the species is patchy. Although it appears to be most common in drier woodlands (oak, pinyon-juniper, ponderosa pine), it is found in a wide variety of habitats including desert scrub, mesic coniferous forest, grassland, and sage-grass steppe (WBWG 2020).

The fringed myotis roosts in crevices in buildings, underground mines, rocks, cliff faces, and bridges. Roosting in decadent trees and snags, particularly large ones, is common throughout its range in the western U.S. and Canada. Fringed myotis roosts have been documented in a large variety of tree species and it is likely that structural characteristics (e.g., height, decay stage) rather than tree species play a greater role in selection of a snag or tree as a roost. Maternity roosts are colonial with colonies ranging from 10 to 2,000 individuals, though large colonies are exceedingly rare. Much less information is available on roosts of males, but it is thought that they roost singly or in small groups. The information available on hibernation is largely limited to an accounting of the types of structures used as hibernacula, which include caves, mines, and buildings (WBWG 2020).

Occurrence Data and Habitat Suitability

There are no CNDDB occurrences of fringed myotis within 5 miles of the study area. The nearest occurrence was recorded near San Mateo in 2005 (EONDX #68551), approximately 41 miles to the southwest (CDFW 2020b). Suitable roosting habitat may be present in the larger trees on site, as well as in the pumphouse near Ponds 30 and 31. The restrooms on site are only marginally suitable, due to their small size and skylights allowing daytime light infiltration.

Potential Project Related Effects

See 'Potential Project Related Effects to All Bat Species' above.

Long-Legged Myotis Bat (*Myotis volans*)

Status, Distribution and Habitat Requirements

The long-legged myotis bat is included on CDFW's California State Special Animals List and is designated a High Priority species by the Western Bat Working Group. Long-legged myotis bats inhabit brushy woodlands and coniferous forests up to 2,800 meters throughout California except the Central Valley and deserts. They also forage in chaparral, coastal scrub, Great Basin shrub habitats, and in early successional stages of woodlands and forests. They roost in a variety of habitats including exfoliating bark, tree hollows, caves, rotten stumps, snags, cliff crevices and bridges. Trees are likely the most important day roosts. They are foliage-gleaners that require nearby water. This species forms nursery colonies numbering hundreds of individuals, usually under bark or in hollow trees, but occasionally in crevices or buildings. Young are born in June and July. They are nocturnal, emerging at or shortly after dusk, and hibernate during the winter. They likely make short migrations to suitable hibernacula (CDFW 2014).

Occurrence Data and Habitat Suitability

There are no CNDDB occurrences of long-legged myotis within 5 miles of the study area (CDFW 2020b), though the site is within the species' accepted range (CDFW 2014). Suitable roosting habitat may be present in the larger trees on site, as well as in the pumphouse near Ponds 30 and 31. The restrooms on site are only marginally suitable, due to their small size and skylights allowing daytime light infiltration. This species typically prefers woodland, forest, and scrub habitats, and has a low probability of occurring within the study area.

Potential Project Related Effects

See 'Potential Project Related Effects to All Bat Species' above.

Yuma Myotis Bat (*Myotis yumanensis*)

Status, Distribution and Habitat Requirements

The Yuma myotis bat is included on CDFW's Special Animals List and is designated as a Low Priority Species by the Western Bat Working Group. They range throughout western North America from British Columbia, Canada to Mexico, and are ubiquitous throughout California. Typical habitat includes riparian corridors and edge habitat in forested canyons, but also arid shrublands, deserts and forests (WBWG

2020). They are colonial roosters and are typically found in manmade structures such as bridges or building, but will also use caves, mines and old cliff swallow nests (Jameson and Peeters 2004). They also roost in a variety of habitats similar to the pallid bat and forage above the water in riparian corridors and along the forest edge. Yuma myotis bats form maternity colonies of several thousand and give birth from April through July depending on latitude (WBWG 2020).

Occurrence Data and Habitat Suitability

There are no CNDDB occurrences of Yuma myotis within 5 miles of the study area. The nearest occurrence was recorded near Dublin in 2003 (EONDX #68759), approximately 18 miles to the southwest (CDFW 2020b). Suitable roosting habitat may be present in the larger trees on site, as well as in the pumphouse near Ponds 30 and 31. The restrooms on site are only marginally suitable, due to their small size and skylights allowing daytime light infiltration.

Potential Project Related Effects

See ‘Potential Project Related Effects to All Bat Species’ above.

San Joaquin Pocket Mouse (*Perognathus inornatus inornatus*)

Status, Distribution and Habitat Requirements

The San Joaquin pocket mouse is included on CDFW’s Special Animals List. It occurs in dry, open grasslands or scrub areas on fine-textured soils between 350 and 600 m (1100 and 2000 ft) in the Central and Salinas valleys. Seeds probably constitute the majority of the diet; it also eats green vegetation and insects. San Joaquin pocket mice dig burrows for cover and raising young (CDFW 2014).

Occurrence Data and Habitat Suitability

There are 3 CNDDB occurrences within 5 miles, the closest of which was recorded in 1990 in Black Diamond Mines Regional Preserve (EONDX #33760), approximately 3 miles northwest of the study area.

Suitable habitat for San Joaquin pocket mouse is present in grasslands throughout the study area, and they may occur anywhere on site.

Potential Project Related Effects

Any construction activities associated with the project, such as removal of concrete golf cart paths and construction or modification of wetlands, could result in injury or mortality to individual San Joaquin pocket mice. Impacts to San Joaquin pocket mice potentially occurring onsite will be avoided through implementation of avoidance and minimization measures, including preconstruction surveys and biological monitoring. Long-term effects of the project can be expected to be beneficial to this species, as the goal is to restore native habitats on site that would favor this species.

American Badger (*Taxidea taxus*)

Status, Distribution and Habitat Requirements

The American badger is a California Species of Special Concern. This species once occurred throughout California in grasslands and open stages of most shrub, forest, and herbaceous habitats with dry, friable soils. Characterized by a stout, muscular, compressed body adapted to digging, the badger forages on other fossorial (burrowing) species, such as ground squirrels, pocket gophers, and rats. Reproduction occurs in summer and fall, and altricial young are born in March and early April following delayed implantation (Long 1973).

Badger numbers have declined drastically in California. Agricultural and urban development, direct and secondary poisoning, and shooting and trapping have had deleterious effects on badgers. However, there is no reliable data on the species' current distribution or status (Bolster 1998).

Occurrence Data and Habitat Suitability

There are 3 CNDDB occurrences of badger within 5 miles, the nearest of which was a roadkilled individual recorded on Deer Valley Road (EONDX #57212), approximately 0.4 mile east of the study area (CDFW 2020b).

Suitable grassland habitat with friable soils is present throughout the study area. American badgers range widely, and may occur anywhere on site.

Potential Project Related Effects

Any construction activities associated with the project, such as removal of concrete golf cart paths and construction or modification of wetlands, could cause temporary disturbance to American badgers on site. Any American badgers in the vicinity of active construction work would be able to move away from disturbance and would not be harmed. Impacts to American badgers potentially occurring onsite will be avoided through implementation of avoidance and minimization measures, including preconstruction surveys and biological monitoring.

The project will not result in long-term impacts to American badger, as the open grassland habitats currently present within the study area would still be available after site restoration, and no barriers to movement would be created.

Section 5. CONCLUSIONS, AVOIDANCE AND MINIMIZATION MEASURES

5.1. CONCLUSIONS

5.1.1 CRITICAL HABITAT

There is no designated Critical Habitat for any fish, terrestrial wildlife, or plant species located within or in the vicinity of the study area.

5.1.2 SENSITIVE NATURAL COMMUNITIES

A total of two sensitive communities (land cover types) were observed in the study area: seasonal wetland and permanent wetland. All of these features are manmade water quality basins constructed during golf course construction. Although irrigation on site has been turned off, these features continue to meet wetland criteria. A wetland delineation for the study area is currently in preparation.

Seasonal wetland and permanent wetland are considered sensitive natural communities as they may qualify as a water of the U.S. and/or Waters of the State falling under U.S. Army Corps of Engineers and Regional Water Quality Control Board jurisdictions through the Clean Water Act and the Porter Cologne Water Quality Act. Riparian vegetation is regulated by California Department of Fish and Wildlife. Wetland features are also addressed in the HCP/NCCP.

5.1.3 SPECIAL STATUS PLANTS

HCP/NCCP Covered and No-Take Plant Species

Based on the results of rare plant surveys conducted in conducted in 2013, 2014, 2019, and 2020, one special status plant species was observed in the study area: big tarplant (*Blepharizonia plumosa*; CRPR 1B.1, HCP/NCCP covered). Based on a review of available databases and literature, familiarity with local flora, on-site habitat suitability, and results of rare plant surveys, no other covered or no-take plant species were observed or are considered to have the potential to occur within the study area.

Federal and/or State Listed and California Rare Plant Species

Based on review of available databases and literature, familiarity with local flora, on-site habitat suitability, and results of rare plant surveys, none of the federal and/or state listed plant species were observed or are considered to have the potential to occur within the study area.

California Rare Plant Rank Plant Species

Based on the results of rare plant surveys conducted in conducted in 2013, 2014, 2019, and 2020, one CRPR plant species was observed in the study area: big tarplant (*Blepharizonia plumosa*; CRPR 1B.1, HCP/NCCP covered). Based on review of available databases and literature, familiarity with local flora, on-site habitat suitability, and results of rare plant surveys, no other CRPR plant species were observed or are considered to have the potential to occur within the study area.

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Locally Rare, Unusual, and Significant Plant Species

No plant species treated as locally rare by the East Bay Chapter of CNPS were observed within the study area.

5.1.4 SPECIAL STATUS WILDLIFE

HCP/NCCP Covered and No-Take Wildlife Species

A total of 15 covered or no-take species were determined to have the potential to occur within the study area based on habitat suitability and the presence of essential land cover types. These species include vernal pool fairy shrimp, midvalley fairy shrimp, vernal pool tadpole shrimp, California tiger salamander, California red-legged frog, Alameda whipsnake, western pond turtle, tricolored blackbird, burrowing owl, Swainson's hawk, golden eagle, white-tailed kite, Townsend's big-eared bat, and San Joaquin kit fox.

Federal/State Listed, Proposed, Candidate, or Fully Protected Fish and Wildlife Species

Thirteen federally/state-listed, proposed, Candidate or fully protected fish or wildlife species were determined to have the potential to occur within the study area. Ten of these are HCP/NCCP covered or no-take species listed above. The other three federally/state-listed, proposed, Candidate or fully protected fish or wildlife species determined to have the potential to occur within the study area are Crotch bumblebee, western bumblebee, and southern California/central coast ESU mountain lion.

Sensitive and Locally Rare Wildlife Species

A total of 23 sensitive or locally rare wildlife species were considered to have the potential to occur within the study area; four of these are HCP/NCCP covered or no-take species and are listed above. The remaining 19 include four invertebrate species, one reptile species, five bird species, and nine mammal species that have potential to occur in the study area.

5.2. AVOIDANCE AND MINIMIZATION RECOMMENDATIONS

5.2.1 SPECIAL STATUS PLANTS

One special status plant species was observed in the study area: big tarplant, which is an HCP covered species. Minimization measures below are consistent with the HCP/NCCP.

1) Preconstruction Survey

A preconstruction survey should occur in the fall prior to the start of construction to survey for big tarplant. All individuals should be counted, flagged, and mapped with a GPS unit.

2) Avoidance

All individuals of big tarplant in the vicinity of the project area should flagged and/or fenced for avoidance.

If potential impacts to the species are unavoidable then mitigation and minimization measures listed below, taken verbatim from HCP/NCCP *Conservation Measure 3.10. Plant Salvage when Impacts are Unavoidable* should be followed.

3) Minimization Requirements

For annual covered plants, mature seeds will be collected from all individuals for which impacts cannot be avoided (or if the population is large, a representative sample of individuals). If storage is necessary, seed storage studies will be conducted to determine the best storage techniques for each species. If needed, studies will be conducted on seed germinated and plants grown to maturity in garden or greenhouse to propagate larger numbers of seed. Seed propagation methods will ensure that genetic variation is not substantially affected by propagation (i.e., selection for plants best adapted to cultivated conditions). Field studies will be conducted through the Adaptive Management Program to determine the efficacy and best approach to dispersal of seed into suitable habitat. Where seeds are distributed to the field, they will be located in preserves in suitable habitat to establish new populations. If seed collection methods fail (e.g., due to excessive seed predation by insects), alternative propagation techniques will be necessary.

All salvage operations will be conducted by the Implementing Entity. To ensure enough time to plan salvage operations, project proponents will notify the Implementing Entity of their schedule for removing the covered plant population. The Implementing Entity may conduct investigations into the efficacy of salvaging seeds from the soil seed bank for both perennial and annual species. The soil seed bank may add to the genetic variability of the population. Covered species may be separated from the soil though garden/greenhouse germination or other appropriate means. Topsoil taken from impact sites will not be distributed into preserves because of the risk of spreading new nonnative and invasive plants to preserves.

The Implementing Entity will transplant new populations such that they constitute separate populations and do not become part of an existing population of the species, as measured by the potential for genetic exchange among individuals through pollen or propagule (e.g., seed, fruit) dispersal.

Transplanting or seeding “receptor” sites (i.e., habitat suitable for establishing a new population) should be carefully selected on the basis of physical, biological, and logistical considerations (Fiedler and Laven 1996); some examples of these are listed below.

- Historic range of the species
- Soil type
- Soil moisture.
- Topographic position, including slope and aspect.
- Site hydrology.
- Mycorrhizal associates (this may be important for Mount Diablo manzanita).
- Presence or absence of typical associated plant species.
- Presence or absence of herbivores or plant competitors.
- Site accessibility for establishment, monitoring, and protection from trampling by cattle or trail users.

5.2.2 SPECIAL STATUS WILDLIFE

The avoidance and minimization measures including preconstruction surveys and construction monitoring outlined below should be implemented. All measures for HCP/NCCP covered or no-take species are taken directly from the HCP/NCCP (Chapter 6, Section 6.4.3) (Jones & Stokes 2006).

HCP/NCCP Covered and No-Take Wildlife Species

Covered Shrimp

1) Planning Survey

A USFWS/CDFW–approved biologist will identify potential habitat for covered shrimp species. Suitable habitat is defined in the species profiles for each shrimp species (see HCP Appendix D). (Note that the understanding of suitable habitat for each species may change as more occurrences are discovered and additional research is conducted.) If suitable habitat is identified, project proponents will avoid and minimize impacts to the maximum extent practicable. Avoidance measures should include relocating impacts away from the suitable habitat. Avoidance and minimization measures will be incorporated into the project design and other portions of the application package prior to submission for coverage under the HCP. If project does not fully avoid impacts to suitable habitat, preconstruction surveys will be required. If surveys determine that the habitat is occupied, project proponents must compensate for the loss of this habitat as described in HCP Conservation Measure 3.8 (see HCP page 5-119). Project proponents have the option to forgo the following survey, avoidance, and minimization requirements by assuming that suitable habitat is occupied and compensating for the loss of this habitat as described in HCP Conservation Measure 3.8 (see HCP page 5-119).

2) Preconstruction Survey

Prior to any ground disturbance related to covered activities, a USFWS-approved biologist will conduct a preconstruction survey in areas identified in the planning surveys as having suitable shrimp habitat. The surveys will establish the presence or absence of covered shrimp and/or habitat features and evaluate use by listed shrimp in accordance with modified USFWS survey guidelines (U.S. Fish and Wildlife Service 1996b). Project proponents are required to conduct USFWS protocol surveys in one year (rather than two) to determine presence or absence of listed shrimp species. If covered shrimp are absent from the site, there are no further requirements related to covered shrimp. If covered shrimp are present, the following avoidance and minimization and construction monitoring measures are required.

3) Avoidance and Minimization Requirements

To the maximum extent practicable, impacts on occupied habitat of covered shrimp will be avoided by implementing the following measures based on existing mitigation standards (U.S. Fish and Wildlife Service 1996a).

- If suitable habitat for covered shrimp will be retained on site, establish a buffer (described below) from the outer edge of all hydric vegetation associated with seasonal wetlands occupied by covered shrimp. Alternatively, at the request of the project proponent, representatives of the Implementing Entity and USFWS may conduct site visits to inspect the particular characteristics of specific project sites and may approve reductions of the buffer. Buffer reductions may be approved for all or portions of the site whenever reduced setbacks will maintain the hydrology of the seasonal wetland and achieve the same or greater habitat values as would be achieved by the original buffer.

- Activities inconsistent with the maintenance of seasonal wetlands within the buffers and disturbance of the onsite watershed will be prohibited. Inconsistent activities include altering existing topography; placing new structures within the buffers; dumping, burning, and/or burying garbage or any other wastes or fill materials; building new roads or trails; removing or disturbing existing native vegetation; installing storm drains; and using pesticides or other toxic chemicals.

- Filling of seasonal wetlands, if unavoidable, will be delayed until pools are dry and samples from the top 4 inches of wetland soils are collected. Soil collection will be sufficient to include a representative sample of plant and animal life present in the wetland by incorporating seeds, cysts, eggs, spores, and similar inocula. The amount of soil collected will be determined by the size of the wetland filled and the variation in physical and biological conditions within the wetland. The number and size of samples will be sufficient to capture this variation. For very small wetlands it may be most cost effective to simply collect all topsoil. These samples will be provided to the Implementing Entity so that the soil can be translocated to suitable habitat within the inventory area unoccupied by covered shrimp or used to inoculate newly created seasonal wetlands on preserve lands.

- Seasonal wetlands occupied by covered shrimp that are filled will be offset by preserving or acquiring seasonal wetlands occupied by the covered shrimp species and restoring habitat suitable for the covered shrimp species in accordance with Conservation Measure 3.8. Such mitigation will supercede requirements for mitigation of impacts on wetland habitat when covered species are present.

4) Construction Monitoring

If suitable habitat for covered shrimp will be retained on site, project proponents will establish a buffer from the outer edge of all hydric vegetation associated with seasonal wetlands occupied (or assumed to be occupied) by covered shrimp. This buffer zone will be determined in the field by the biologists as the immediate watershed feeding the seasonal wetland or a minimum of 50 feet, whichever is greater. Buffers will be marked by brightly colored fencing or flagging throughout the construction process. Activities will be prohibited within this buffer in accordance with the minimization measure above.

Construction personnel will be trained to avoid affecting shrimp. A qualified biologist approved by USFWS will inform all construction personnel about the life history of covered shrimp, the importance of avoiding their habitat, and the terms and conditions of the HCP/NCCP related to avoiding and minimizing impacts on covered shrimp.

California Red-Legged Frog and California Tiger Salamander

1) Planning Surveys

A USFWS/CDFW–approved biologist will identify potential breeding habitat for California red-legged frog and California tiger salamander. If the project fills or surrounds suitable breeding habitat, the project proponent will notify USFWS, CDFW, and the Implementing Entity of the presence and condition of potential breeding habitat, as described below. No preconstruction surveys are required.

2) Minimization Measures

Written notification to USFWS, CDFW, and the Implementing Entity, including photos and breeding habitat assessment, is required prior to disturbance of any suitable breeding habitat. The project proponent will also notify these parties of the approximate date of removal of the breeding habitat at least 30 days prior to this removal to allow USFWS or CDFW staff to translocate individuals, if requested. USFWS or CDFW must notify the project proponent of their intent to translocate California tiger salamanders and/or California red-legged frogs within 14 days of receiving notice from the project proponent. The applicant must allow USFWS or CDFW access to the site prior to construction if they request it.

There are no restrictions under this Plan on the nature of the disturbance or the date of the disturbance unless CDFW or USFWS notify the project proponent of their intent to translocate individuals within the required time period. In this case, the project proponent must coordinate the timing of disturbance of the breeding habitat to allow USFWS or CDFW to translocate the individuals. USFWS and CDFW shall be allowed 45 days to translocate individuals from the date the first written notification was submitted by the project proponent (or a longer period agreed to by the project proponent, USFWS, and CDFW).

Golden Eagle

1) Planning Surveys

A USFWS/CDFW–approved biologist will identify potential active nests of golden eagle. If nests are identified, the project proponent will avoid and minimize impacts to the maximum extent practicable. Avoidance measures should include relocating impacts away from the nest. Avoidance and minimization measures will be incorporated into the project design and other portions of the application package prior to submission for coverage under the HCP. If the project does not fully avoid impacts on nests and nest trees, preconstruction surveys will be required.

2) Preconstruction Survey

Prior to implementation of covered activities, a qualified biologist will conduct a preconstruction survey to establish whether nests of golden eagles are occupied (see HCP Section 6.3.1, *Planning Surveys*). If nests are occupied, minimization requirements and construction monitoring will be required.

3) Avoidance and Minimization Measures

Covered activities will be prohibited within 0.5 mile of active nests. Nests can be built and active at almost any time of the year, although mating and egg incubation occurs late January through August, with peak activity in March through July. If site-specific conditions or the nature of the covered activity (e.g., steep topography, dense vegetation, limited activities) indicate that a smaller buffer could be appropriate or that a larger buffer should be implemented, the Implementing Entity will coordinate with CDFW/USFWS to determine the appropriate buffer size.

4) Construction Monitoring

Construction monitoring will focus on ensuring that no covered activities occur within the buffer zone established around an active nest. Although no known golden eagle nest sites occur within or near the Urban Limit Line, covered activities inside and outside of the Preserve System have the potential to disturb golden eagle nest sites. Construction monitoring will ensure that direct effects to golden eagles are minimized.

Swainson's Hawk

1) Planning Surveys

A USFWS/CDFW–approved biologist will inspect all large trees with binoculars to document whether Swainson's hawk nests occur on site (See HCP Section 6.3.1, *Planning Surveys*). Survey will be conducted according to the Swainson's Hawk Technical Advisor Committee's methodology (May 31, 2000) or updated methodologies as issued by USFWS or CDFW. If occupied nests are identified, the project proponent will avoid and minimize impacts to these nests in compliance with the Migratory Bird Treaty Act and the Fish and Game Code (Section 3503). Avoidance and minimization measures will be incorporated into the project design and other portions of the application package prior to submission for coverage under the Plan. Avoidance measures will include preserving the nest tree. If project construction occurs during the nesting season (March 15–September 15), a preconstruction survey will be required.

2) Preconstruction Survey

Prior to any ground disturbance related to covered activities that occurs during the nesting season (March 15–September 15), a qualified biologist will conduct a preconstruction survey no more than 1 month prior to construction to establish whether Swainson's hawk nests within 1,000 feet of the project site are occupied. If potentially occupied nests within 1,000 feet are off the project site, then their occupancy will be determined by observation from public roads or by observations of Swainson's hawk activity (e.g., foraging) near the project site. If nests are occupied, minimization measures and construction monitoring are required (see below).

3) Avoidance and Minimization Measures and Construction Monitoring

During the nesting season (March 15–September 15), covered activities within 1,000 feet of occupied nests or nests under construction will be prohibited to prevent nest abandonment. If site-specific conditions or the nature of the covered activity (e.g., steep topography, dense vegetation, limited activities) indicate that a smaller buffer could be used, the Implementing Entity will coordinate with CDFW/USFWS to determine the appropriate buffer size.

If young fledge prior to September 15, covered activities can proceed normally. If the active nest site is shielded from view and noise from the project site by other development, topography, or other features, the project applicant can apply to the Implementing Entity for a waiver of this avoidance measure. Any waiver must also be approved by USFWS and CDFW. While the nest is occupied, activities outside the buffer can take place.

All active nest trees will be preserved on site, if feasible. Nest trees, including non-native trees, lost to covered activities will be mitigated by the project proponent according to the requirements below.

Mitigation for Loss of Nest Trees

The loss of non-riparian Swainson's hawk nest trees will be mitigated by the project proponent by:

- If feasible on-site, planting 15 saplings for every tree lost with the objective of having at least 5 mature trees established for every tree lost according to the requirements listed below.

AND either

1) Pay the Implementing Entity an additional fee to purchase, plant, maintain, and monitor 15 saplings on the HCP/NCCP Preserve System for every tree lost according to the requirements listed below, OR
2) The project proponent will plant, maintain, and monitor 15 saplings for every tree lost at a site to be approved by the Implementing Entity (e.g., within an HCP/NCCP Preserve or existing open space linked to HCP/NCCP preserves), according to the requirements listed below.

The following requirements will be met for all planting options:

- Tree survival shall be monitored at least annually for 5 years, then every other year until year 12. All trees lost during the first 5 years will be replaced. Success will be reached at the end of 12 years if at least 5 trees per tree lost survive without supplemental irrigation or protection from herbivory. Trees must also survive for at least three years without irrigation.
- Irrigation and fencing to protect from deer and other herbivores may be needed for the first several years to ensure maximum tree survival.
- Native trees suitable for this site should be planted. When site conditions permit, a variety of native trees will be planted for each tree lost to provide trees with different growth rates, maturation, and life span, and to provide a variety of tree canopy structures for Swainson's hawk. This variety will help to ensure that nest trees will be available in the short term (5-10

years for cottonwoods and willows) and in the long term (e.g., Valley oak, sycamore). This will also minimize the temporal loss of nest trees.

- Riparian woodland restoration conducted as a result of covered activities (i.e., loss of riparian woodland) can be used to offset the nest tree planting requirement above, if the nest trees are riparian species.
- Whenever feasible and when site conditions permit, trees should be planted in clumps together or with existing trees to provide larger areas of suitable nesting habitat and to create a natural buffer between nest trees and adjacent development (if plantings occur on the development site).
- Whenever feasible, plantings on the site should occur closest to suitable foraging habitat outside the UDA.
- Trees planted in the HCP/NCCP preserves or other approved offsite location will occur within the known range of Swainson's hawk in the inventory area and as close as possible to high-quality foraging habitat.

Western Burrowing Owl

1) Planning Surveys

A USFWS/CDFW–approved biologist will identify potential burrowing owl breeding habitat (see HCP Section 6.3.1, *Planning Surveys*). If project does not fully avoid impacts to suitable breeding habitat, preconstruction surveys will be required.

2) Preconstruction Survey

Prior to any ground disturbance related to covered activities, a USFWS/CDFW- approved biologist will conduct a preconstruction survey in areas identified in the planning surveys as having potential western burrowing owl habitat. The surveys will establish the presence or absence of western burrowing owl and/or habitat features and evaluate use by owls in accordance with CDFW survey guidelines (California Department of Fish and Game 1995).

On the parcel where the activity is proposed, the biologist will survey the proposed disturbance footprint and a 500-foot radius from the perimeter of the proposed footprint to identify burrows and owls. Adjacent parcels under different land ownership will not be surveyed. Surveys should take place near sunrise or sunset in accordance with CDFW guidelines. All burrows or burrowing owls will be identified and mapped. Surveys will take place no more than 30 days prior to construction. During the breeding season (February 1– August 31), surveys will document whether burrowing owls are nesting in or directly adjacent to disturbance areas. During the nonbreeding season (September 1– January 31), surveys will document whether burrowing owls are using habitat in or directly adjacent to any disturbance area. Survey results will be valid only for the season (breeding or nonbreeding) during which the survey is conducted.

3) Avoidance and Minimization Measures and Construction Monitoring

This measure incorporates avoidance and minimization guidelines from CDFW's Staff Report on Burrowing Owl Mitigation (California Department of Fish and Game 1995).

If burrowing owls are found during the breeding season (February 1 – August 31), the project proponent will avoid all nest sites that could be disturbed by project construction during the remainder of the breeding season or while the nest is occupied by adults or young. Avoidance will include establishment of a non-disturbance buffer zone (described below). Construction may occur during the breeding season if a qualified biologist monitors the nest and determines that the birds have not begun egg-laying and incubation or that the juveniles from the occupied burrows have fledged. During the nonbreeding season (September 1 – January 31), the project proponent should avoid the owls and the burrows they are using, if possible. Avoidance will include the establishment of a buffer zone (described below).

During the breeding season, buffer zones of at least 250 feet in which no construction activities can occur will be established around each occupied burrow (nest site). Buffer zones of 160 feet will be established around each burrow being used during the nonbreeding season. The buffers will be delineated by highly visible, temporary construction fencing.

If occupied burrows for burrowing owls are not avoided, passive relocation will be implemented. Owls should be excluded from burrows in the immediate impact zone and within a 160-foot buffer zone by installing one-way doors in burrow entrances. These doors should be in place for 48 hours prior to excavation. The project area should be monitored daily for 1 week to confirm that the owl has abandoned the burrow. Whenever possible, burrows should be excavated using hand tools and refilled to prevent reoccupation (California Department of Fish and Game 1995). Plastic tubing or a similar structure should be inserted in the tunnels during excavation to maintain an escape route for any owls inside the burrow.

San Joaquin Kit Fox

1) Planning Surveys

A USFWS/CDFW–approved biologist will identify potential breeding or denning habitat for kit fox (Section HCP 6.3.1, *Planning Surveys*). If the project does not fully avoid impacts to suitable breeding and denning habitat, preconstruction surveys will be required.

2) Preconstruction Surveys

Prior to any ground disturbance related to covered activities, a USFWS/CDFW– approved biologist will conduct a preconstruction survey in areas identified in the planning surveys as supporting suitable breeding or denning habitat for San Joaquin kit fox. The surveys will establish the presence or absence of San Joaquin kit foxes and/or suitable dens and evaluate use by kit foxes in accordance with USFWS survey guidelines (U.S. Fish and Wildlife Service 1999). Preconstruction surveys will be conducted within 30 days of ground disturbance. On the parcel where the activity is proposed, the biologist will survey the proposed disturbance footprint and a 250-foot radius from the perimeter of the proposed footprint to identify San Joaquin kit foxes and/or suitable dens. Adjacent parcels under different land ownership will not be surveyed. The status of all dens will be determined and mapped. Written results of preconstruction surveys will be submitted to USFWS within 5 working days after survey completion and before the start of ground disturbance. Concurrence is not required prior to initiation of covered activities.

If San Joaquin kit foxes and/or suitable dens are identified in the survey area, the measures described below will be implemented.

3) Avoidance and Minimization Requirements

- If a San Joaquin kit fox den is discovered in the proposed development footprint, the den will be monitored for 3 days by a USFWS/CDFW– approved biologist using a tracking medium or an infrared beam camera to determine if the den is currently being used.
- Unoccupied dens should be destroyed immediately to prevent subsequent use.
- If a natal or pupping den is found, USFWS and CDFW will be notified immediately. The den will not be destroyed until the pups and adults have vacated and then only after further consultation

with USFWS and CDFW.

- If kit fox activity is observed at the den during the initial monitoring period, the den will be monitored for an additional 5 consecutive days from the time of the first observation to allow any resident animals to move to another den while den use is actively discouraged. For dens other than natal or pupping dens, use of the den can be discouraged by partially plugging the entrance with soil such that any resident animal can easily escape. Once the den is determined to be unoccupied it may be excavated under the direction of the biologist. Alternatively, if the animal is still present after 5 or more consecutive days of plugging and monitoring, the den may have to be excavated when, in the judgment of a biologist, it is temporarily vacant (i.e., during the animal's normal foraging activities).

4) Construction Monitoring

If dens are identified in the survey area outside the proposed disturbance footprint, exclusion zones around each den entrance or cluster of entrances will be demarcated. The configuration of exclusion zones should be circular, with a radius measured outward from the den entrance(s). No covered activities will occur within the exclusion zones. Exclusion zone radii for potential dens will be at least 50 feet and will be demarcated with four to five flagged stakes. Exclusion zone radii for known dens will be at least 100 feet and will be demarcated with staking and flagging that encircles each den or cluster of dens but does not prevent access to the den by kit fox.

Alameda Whipsnake, Western Pond Turtle, Tricolored Blackbird, White-Tailed Kite

The HCP/NCCP does not outline planning surveys, preconstruction surveys, or construction monitoring requirements for these species.

1) Recommended Avoidance and Minimization Efforts

No avoidance and minimization measures are recommended beyond the standard nesting bird and reptile preconstruction survey recommendations listed in the Non-HCP covered Wildlife section below.

Non-HCP Covered Wildlife

Special status Bumblebees

1. Preconstruction surveys for special status bumblebees will be conducted within 48 hours prior to initial ground disturbance. Surveys will focus on identifying nests within proposed work areas and access routes by observing the area for bumblebees entering and exiting holes or crevices in the ground or in decaying wood. Any identified nests will be flagged for avoidance during project activities.

Monarch Butterfly

1. Avoid damaging monarch butterfly host plants (milkweed [*Asclepias* sp.]) to the greatest extent feasible during project implementation.

Bridges' Coast Range Shoulderband Snail

1. Conduct pre-construction surveys and minimize habitat loss in areas known to support Bridge's coast range shoulderband snail.

Vernal Pool Branchiopods (Species not covered by HCP)

1. The HCP preconstruction and avoidance and minimization measures, and construction monitoring requirements for covered shrimp stated above will also be implemented for all other special status vernal pool branchiopod species that are not covered by the HCP.

Special status Reptiles (Species not covered by the HCP or covered by the HCP but have no preconstruction survey requirements)

1. Preconstruction surveys for Alameda whipsnake, western pond turtle, and Blainville's horned lizard will be conducted within 48 hours prior to initial ground disturbance. If any of these species are observed or if it is determined by the biologist that a monitor is recommended, a biological monitor would be on site to monitor construction during initial ground disturbance work.

Nesting Birds

1. If tree removal, pruning, or grubbing activities are necessary, such activities should be conducted during the non-nesting season (September 1-January 31) to avoid impacts to nesting birds.
2. If project construction begins during the breeding season (February 1 – August 31), preconstruction surveys should be conducted within the study area and should encompass adjacent habitats up to 300 feet from the project boundary, by a qualified biologist no more than two weeks prior to equipment or material staging, pruning/grubbing or surface-disturbing activities. If no active nests are found within the survey area, no further mitigation is necessary.
3. If active nests, i.e. nests with eggs or young present, are found within the survey area, non-disturbance buffers should be established at a distance sufficient to minimize disturbance based on the nest location, topography, cover, the nesting pair's tolerance to disturbance and the type/duration of potential disturbance. No work should occur within the non-disturbance buffers until the young have fledged as determined by a qualified biologist. Buffer size should be determined in cooperation with CDFW and USFWS Migratory Bird Permit Office. If buffers are established and it is determined that project activities are resulting in nest disturbance, work should cease immediately and CDFW and USFWS Migratory Bird Permit Office should be contacted for further guidance.

Special status Mammals (Species not covered by the HCP)

1. Preconstruction surveys for mountain lions, badgers, and San Joaquin pocket mice will be conducted within 48 hours prior to initial ground disturbance. If any of these species are observed or if it is determined by the biologist that a monitor is recommended, a biological monitor would be on site to monitor construction during initial ground disturbance work.

Special status Bats

1. If suitable bat roosting habitat would be disturbed (i.e trees or structures), the roosting habitat and a 100-foot buffer shall be surveyed by a qualified biologist to determine if bats are using the site for roosting, during either the maternity or hibernation seasons. The survey shall include a visual inspection of features within 100 feet of the work area for potential roosting features and sign of roosting bats no more than two weeks prior to disturbance of such features. If bats (individuals or colonies) or recent bat sign (urine stains, guano) are detected during the survey or during work activities, the following additional avoidance recommendations shall be implemented in order to avoid impacts to special status bats and their roosts (Johnston et al. 2004).

    - Airspace access to and from the roost shall remain approximately the same.

- No work will occur and no materials will be staged within 100 feet of the roost.

If any occupied roosts identified during the survey will be altered or disturbed by project activities, CDFW will be contacted for further instructions on how to proceed.

5.2.3 INVASIVE WEEDS

1. As feasible, avoid, treat, or contain any weed populations near work areas that may be impacted or disturbed by construction activity.
2. Certify that all construction material sources used for supplies of filter fabric, sand, gravel, rock, and mulch are weed-free prior to obtaining or transporting any material.
3. Obtain and use only weed-free straw or use fiber roll logs for sediment containment.
4. Install stormwater BMPs to prevent erosion in work areas and the potential transport of weedy material onto or off of the project site.

5.2.4 GENERAL AVOIDANCE AND MINIMIZATION RECOMMENDATIONS

- A biological monitor should be on site when required by the HCP to ensure implementation of, and compliance with, all avoidance measures.
- Prior to the start of construction within areas containing sensitive biological resources, the resources should be delineated and conspicuously flagged to prevent impacts. If required, setback or non-disturbance buffer zones around these resources should be established and monitored by a biologist.
- Work within wetlands/waters will be conducted during the dry season typically between May 1 and October 15.
- Staging areas should be located outside areas containing sensitive aquatic resources.
- Vehicles should remain on established roadways and access roads to the extent feasible Vehicles should not park on vegetated shoulders or in nearby fields.
- All trash should be placed in secure containers with secure lids and removed from the site daily.
- Trash dumping, firearms, open fires, hunting, and pets should be prohibited in the construction area.
- Vehicles or other equipment should be refueled away from vegetated habitat.
- All practicable erosion control Best Management Practices (BMPs) should be implemented.
- Any spills of hazardous materials in sensitive habitat should be cleaned up and/or removed immediately. Any such spills should be reported to the appropriate resource agency(s).
- Following the completion of construction activities, any temporary fill and construction debris should be removed and, wherever feasible, disturbed areas should be restored to pre-project conditions. Restoration work may include such activities as replanting or reseeding of native species in a manner that compliments the nearby habitat type(s).

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APPENDIX A LAWS, ORDINANCES & REGULATIONS

FEDERAL REGULATIONS

FEDERAL ENDANGERED SPECIES ACT (FESA)

The Federal Endangered Species Act of 1973, as amended (FESA), was created to "conserve the ecosystems upon which endangered and threatened species depend." The U.S. Fish and Wildlife Service (USFWS) and National Oceanic and Atmospheric Administration, National Marine Fisheries Service have authority over projects that may result in a "take" of a species listed as threatened or endangered under the FESA. Under the FESA, plant and wildlife species, including all lower taxa including subspecies and varieties, are listed threatened or endangered based on (A) the present or threatened destruction, modification, or curtailment of their habitat or range, (B) overutilization for commercial, recreational, scientific, or educational purposes, (C) disease or predation, (D) the inadequacy of existing regulatory mechanisms, or (E) other natural or manmade factors affecting their continued existence. FESA listing categories include endangered, threatened and candidates for listing. FESA provides protection for species listed as endangered, and prohibits the "take" of such species in areas under federal jurisdiction or in violation of state law. A "take" is defined as any action to "harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Species listed as threatened do not warrant listing as endangered and are not provided the same protection under Section 9; however, USFWS often applies the same protection as authorized by Section 4(d) of the FESA. Section 4(d) also allows for exceptions to the take rule under special circumstances. If a project would result in a take of a federally listed species, either an incidental take permit, under Section 10(a) of the FESA, or a federal interagency consultation under Section 7 of FESA, is required prior to the take. Current inventories published for species listed under the FESA include the *Endangered and Threatened Wildlife and Plants; Review of Native Species That are Candidates or Proposed for Listing as Endangered or Threatened; Annual Notice of Findings on Resubmitted Petitions; Annual Description of Progress on Listing Actions; Proposed Rule*, *Endangered and Threatened Species; Establishment of Species of Concern List, Addition of Species to Species of Concern List, Description of Factors for Identifying Species of Concern, and Revision of Candidate Species List Under the Endangered Species Act* (NOAA 2004).

CLEAN WATER ACT OF 1977

The U.S. Army Corps of Engineers (USACE) and the U.S. Environmental Protection Agency (EPA) have jurisdiction over "Waters of the United States, which include navigable waters of the United States, interstate waters, all other waters where the use or degradation or destruction of the waters could affect interstate or foreign commerce, tributaries to any of these waters, and wetlands that meet any of these criteria or that are adjacent to any of these waters or their tributaries. Waters of the United States include marine waters, tidal areas, and stream channels. Under federal regulations, wetlands are defined as "those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas" [33 C.F.R. §328.3(b)]. Presently, to be considered a wetland, a site must exhibit three criteria: hydrophytic vegetation, hydric soils, and wetland hydrology existing under the "normal circumstances" for the site.

The Navigable Waters Protection Rule: Definition of "Waters of the United States" (USACE 2020) further defined the scope of waters federally regulated under the Clean Water Act to "encompass relatively permanent flowing and standing waterbodies that are traditional navigable waters in their own right or that have a specific surface connection to traditional navigable waters, as well as wetlands that abut or are otherwise inseparably bound up with such relatively permanent waters."

Although certain types of wetlands may not be subject to USACE jurisdiction, they are considered "waters of the State" under California's Porter-Cologne Water Quality Control Act (Cal. Water Code §§ 13020, et seq.) and, as such, are subject to regulation by Regional Water Quality Control Boards (RWQCB). There are nine RWQCBs under the State Water Resources Control Board.

Policies regulating the loss of wetlands generally stress the need to compensate for wetland acreage losses by creating wetlands from non-wetland habitat on at least an acre-for-acre basis. That is, mitigation requiring a no-net-loss of wetland functions and values is typically required. Projects that cause the discharge of dredged or fill materials in Waters of the United States require permitting by the USACE. Actions affecting small areas of jurisdictional Waters may qualify for a Nationwide Permit, provided conditions of the permit are met (such as avoiding impacts to threatened or endangered species or to important cultural sites). Projects that do not meet the Nationwide Permit conditions, or projects that disturb a larger area, require an Individual Permit. The process for obtaining an Individual Permit requires a detailed alternatives analysis and development of a comprehensive mitigation/monitoring plan.

Section 401 of the Clean Water Act is discussed below.

WATERS OF THE UNITED STATES

"Waters of the United States", which includes "wetlands" and "other waters", are defined by 33 CFR §328.3 as follows:

- All waters which are currently used, or were used in the past, or may be susceptible to use in interstate or foreign commerce, including all waters which are subject to the ebb and flow of the tide.
- All interstate waters including interstate wetlands.
- All "other waters" such as intrastate lakes, rivers, streams (including intermittent streams), mudflats, sandflats, wetlands, sloughs, prairie potholes, wet meadows, playa lakes, or natural ponds, the use, degradation or destruction of which could affect interstate or foreign commerce including any such waters:
    - which are or could be used by interstate or foreign travelers for recreational or other purposes; or
    - from which fish or shellfish are or could be taken and sold in interstate or foreign commerce; or
    - which are used or could be used for industrial purpose by industries in interstate commerce.
- All impoundments of waters otherwise defined as waters of the United States under the definition.
- Tributaries of waters identified above.
- The territorial seas.
- Wetlands adjacent to other jurisdictional waters (other than waters that are themselves wetlands) identified above.

The Corps generally does not consider the following waters to be "waters of the United States." However, the Corps reserves the right on a case-by-case basis to determine that a particular water body within these categories of waters is a water of the United States. The Environmental Protection Agency also has the right to determine on a case-by-case basis if any of these waters are "waters of the United States."

- Non-tidal drainage and irrigation ditches excavated on dry land.
- Artificially irrigated areas which would revert to upland if the irrigation ceased.
- Artificial lakes or ponds created by excavating and/or diking dry land to collect and retain water and which are used exclusively for such purposes as stock watering, irrigation, settling basins, or rice growing.
- Artificial reflecting or swimming pools or other small ornamental bodies of water created by excavating and/or diking dry land to retain water for primarily aesthetic reasons.
- Water filled depressions created in dry land incidental to construction activity and pits excavated in dry land for the purpose of obtaining fill, sand, or gravel unless and until the construction or excavation operation is abandoned and the resulting body of water meets the definition of waters of the United States [see 33 CFR 328.3(a)].

Wetlands

Corps jurisdictional "wetlands", as defined by 33 CFR §328.3(b), are those areas which are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances, do support a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas. Wetlands are regulated by the Corps if they are "adjacent wetlands" as defined in Navigable Waters Protection Rule: Definition of "Waters of the United States" (USACE 2020).

Ordinary High Water Mark

The Corps' jurisdiction over "other waters" extends to the limit of the Ordinary High Water Mark or the upward extent of any adjacent wetland. The Ordinary high water mark, as defined by 33 CFR §328.3(e), is the visible line on the shore/bank established by the fluctuations of water and indicated by physical characteristics such as:

- A clear, natural line impressed on the bank;
- shelving;
- changes in the character of soil;
- destruction of terrestrial vegetation;
- the presence of litter and debris; or
- other appropriate means that consider the characteristics of the surrounding areas.

RIVERS AND HARBORS ACT

Section 10 of the Rivers and Harbors Act of 1899 requires authorization from the Secretary of the Army, acting through the U.S. Army Corps of Engineers, to construct any structure in or over any "navigable water of the United States." Structures or work outside the limits defined as navigable waters requires a Section 10 permit if the structure or work affects the course, location, or condition of the water body. The law applies to dredging or disposal of dredged materials, excavation, filling, rechannelization, or any other modification of a navigable water of the United States. It includes without limitation, any wharf, dolphin, weir, boom breakwater, jetty, groin, bank protection (*e.g.* riprap, revetment, bulkhead), mooring structures such as pilings, aerial or subaqueous power transmission lines, intake or outfall pipes, permanently moored floating vessel, tunnel, artificial canal, boat ramp, aids to navigation, and any other permanent, or semi-permanent obstacle or obstruction.

Navigable waters are generally defined as waters of the United States that are subject to the ebb and flow of the tide, shoreward to the mean high water mark, and/or are presently used, or have been used in the past, or may be susceptible to use to transport interstate or foreign commerce, as defined in 32 CFR §322.2(a).

MIGRATORY BIRD TREATY ACT (MBTA)

The Migratory Bird Treaty Act (16 U.S.C. 703-712), administered by the U.S. Fish and Wildlife Service, implements four treaties between the United States and Canada, Mexico, Japan and Russia, respectively, to manage and conserve migratory birds that cross national borders. The Migratory Bird Treaty Act makes it unlawful in any manner, unless expressly authorized by permit pursuant to federal regulations, to pursue, hunt, take, capture, kill, attempt to take, capture or kill, possess, offer for sale, sell, offer to barter, barter, offer to purchase, purchase, deliver for shipment, ship, export, import, cause to be shipped, exported, or imported, deliver for transportation, transport or cause to be transported, carry or cause to be carried, or receive for shipment, transportation, carriage, or export at any time, or in any manner, any migratory bird, or any part, nest, or egg of any such bird. The definition of “take” is defined as any act to “pursue, hunt, shoot, wound, kill, trap, capture or collect, or attempt to pursue, hunt, shoot, wound, kill, trap, capture or collect.” This includes most actions, direct and indirect, that could result in “take” or possession, whether it is temporary or permanent, of any protected species (APLIC and USFWS 2005c). Although harassment and habitat modification do not constitute a take in themselves under the Migratory Bird Treaty Act or Fish and Game Code, such actions that result in direct loss of birds, nests or eggs including nest abandonment or failure are considered take under such regulations. A list of migratory birds protected under the Migratory Bird Treaty Act, available in Section 10.13 of Title 50 of the Code of Federal Regulation, excludes nonnative species that have not been introduced into the U.S. or its territories, and species that belong to the families not listed in any of the four treaties underlying the Migratory Bird Treaty Act, such as wrentit (*Chamaea fasciata*), European starling (*Sturnus vulgaris*), California quail (*Callipepla californica*), Ring-necked Pheasant (*Phasianus colchicus*) and Chukar (*Alectoris chukar*), among other species less common in California.

On December 8, 2004 the U.S. Congress passed the Migratory Bird Treaty Reform Act (Division E, Title I, Section 143 of the Consolidated Appropriations Act, 2005, PL 108–447; MBTRA), which excludes all migratory birds nonnative or have been human introduced to the U.S. or its territories. It defines a native migratory bird as a species present within the U.S. and its territories as a result of natural biological or ecological processes. The USFWS published a list of the bird species excluded from the Migratory Bird Treaty Act on March 15, 2005 (USFWS 2005b), which included two species commonly observed in the U.S., the rock pigeon (*Columba livia*) and domestic goose (*Anser anser* ‘*domesticus’*).

BALD AND GOLDEN EAGLE PROTECTION ACT

The Bald and Golden Eagle Protection Act (16 U.S.C. 668-668d; June 8, 1940) as amended, provides protection for the bald eagle (*Haliaeetus leucocephalus*) and golden eagle (*Aquila chrysaetos*) by prohibiting the taking, possession and commerce of such birds, their nests, eggs or feathers unless expressly authorized by permit pursuant to federal regulations. The Act also provides criminal and civil penalties for violations of the Act and defines take as any action to pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest or disturb.

STATE REGULATIONS

CALIFORNIA ENDANGERED SPECIES ACT (CESA)

The California Endangered Species Act of 1984, administered by the California Department of Fish and Wildlife (CDFW), recognizes that certain species of fish, wildlife and plants are in danger of, or threatened with, extinction because their habitats are threatened with destruction, adverse modification, or severe curtailment, or because of overexploitation, disease, predation, or other factors. The Legislature recognized that these species of fish, wildlife and plants are of ecological, educational, historical, recreational, aesthetic, economic and scientific value to the people of the state, and the conservation, protection and enhancement of these species and their habitat is of statewide concern. The CESA built on the California Native Plant Protection Act (NPPA) (discussed below) and increased regulatory protection for plant species to parallel the CESA. Listing categories under the CESA include endangered, threatened, rare or candidate for listing (Cal. Fish and Game Code §§ 2062, 2067 and 2068). The current inventories published for plants listed under the CESA are the *State and Federally Listed Endangered, Threatened and Rare Plants of California* CDFW (2020c) and the *Special Vascular Plants, Bryophytes and Lichens List* CDFW (2020b). Current inventories for fish and wildlife species include *State and Federally Listed Endangered and Threatened Animals of California* (CDFW 2020a) and the *Special Animals* (CDFW 2020d).

CESA requires state agencies to consult with the CDFW when preparing California Environmental Quality Act (CEQA) documents to ensure that the state lead agency actions do not jeopardize the existence of listed species. It directs agencies to consult with CDFW on projects or actions that could affect listed species, directs CDFW to determine whether jeopardy would occur, and allows CDFW to identify “reasonable and prudent alternatives” to the project consistent with conserving the species.

CESA prohibits the taking of state-listed endangered or threatened plant and wildlife species. CDFW exercises authority over mitigation projects involving state-listed species, including those resulting from CEQA mitigation requirements. CDFW may authorize a taking through an incidental take permit, if the impacts of the take are minimized and fully mitigated. Mitigation often takes the form of an approved habitat management plan or management agreement that avoids or compensates for possible jeopardy. CDFW requires preparation of mitigation plans in accordance with published guidelines.

CALIFORNIA FISH AND GAME CODE

The California Fish and Game Code provides protection for California’s plant and wildlife species and precludes taking of species listed as fully protected by the CDFW. Section 86 defines take as any action to hunt, pursue, catch, capture, or kill, or attempt to hunt, pursue, catch, capture, or kill. Unless expressly authorized under Chapter 1.5, Article 3, Section 2081, which outlines exceptions for taking of endangered and threatened species, endangered, threatened and fully protected species shall not be taken for any purpose. Section 3503 prohibits the take, possession, or needless destruction of the nest or eggs of any bird; §3503.5 prohibits the take, possession, or needless destruction of any nests, eggs or birds in the orders Falconiformes (new world vultures, hawks, eagles, ospreys and falcons, among others)or Strigiformes (owls); §3511 prohibits the take or possession of fully protected birds; and §3513 prohibits the take or possession of any migratory nongame bird or part thereof as designated in the Migratory Bird Treaty Act. Section 4700 provides protection for fully protected mammals unless expressly authorized under §2081.7. Fully protected mammals include Morrow Bay kangaroo rat, bighorn sheep, except Nelson bighorn sheep, northern elephant seal, Guadalupe fur seal, ring-tailed cat, Pacific right whale, salt-marsh harvest mouse, southern sea otter and wolverine. Section 5050 provides protection for fully protected amphibians and reptiles unless expressly authorized under §2081.7. Fully protected amphibians and reptiles include blunt-nosed leopard lizard, San Francisco garter snake, Santa Cruz long-toed salamander, limestone salamander and black toad. Section 5515 provides protection for fully protected fish unless expressly authorized under §2081.7. Fully protected fish include Colorado River squawfish, thicktail chub, Mohave chub, Lost River sucker, Modoc sucker, shortnose sucker, humpback sucker, Owens River pupfish, unarmored threespine stickleback and rough sculpin.

PORTER-COLOGNE WATER QUALITY CONTROL ACT AND SECTION 401 OF THE CLEAN WATER ACT

The Regional Water Quality Control Board administers both the Porter-Cologne Water Quality Control Act and Section 401 of the Clean Water Act. The Porter-Cologne Water Quality Control Act requires "any person discharging waste, or proposing to discharge waste, within any region that could affect the 'waters of the State' to file a report of discharge" with the RWQCB (Cal. Water Code Section 13260). Waters of the State are "any surface water or groundwater, including saline waters, within the boundaries of the state" [Cal. Water Code Section 13050(e)].

Pursuant to Section 401 of the Clean Water Act, the RWQCBs consider waters of the State to include (without limitation) rivers, streams, lakes, bays, marshes, mudflats, unvegetated seasonally ponded areas, drainage swales, sloughs, wet meadows, natural ponds, vernal pools, diked bay lands, seasonal wetlands, and riparian woodlands. The RWQCBs have also claimed jurisdiction and exercised discretionary authority over "isolated waters", as discussed above.

NATIVE PLANT PROTECTION ACT (NPPA)

The Native Plant Protection Act of 1977, which is implemented by the CDFW, was created to "preserve, protect and enhance rare and endangered plants in this State." The NPPA gave the CDFW the authority to designate native plants as endangered or rare and to regulate, through permits, activities such as collecting, transporting, or selling plants protected by the NPPA. The NPPA also provides the definitions of native, threatened and endangered plants in Section 1901 of the California Fish and Game Code.

CALIFORNIA ENVIRONMENTAL QUALITY ACT (CEQA)

The California Environmental Quality Act of 1970 requires public agencies to evaluate the environmental implications of their actions, and to prevent environmental effects by avoiding or reducing significant impacts of their decisions, where feasible. CEQA was intended to assist public agencies in systematically identifying both the significant effects of proposed projects and the feasible alternatives or feasible mitigation measures which will avoid or substantially lessen such significant effects. In enacting CEQA, the Legislature expressed a policy that public agencies should not approve projects as proposed if there are such feasible alternatives or mitigation measures. Among its goals, CEQA was intended "to preserve for future generations representations of all plant and animal communities" (Cal. Pub. Res. Code §21001c). Through this process impacts and mitigation to state and federally listed plant species are discussed.-

The California Native Plant Society (CNPS) has developed and maintains an inventory of rare, Threatened and Endangered plants of California. This information is published in the Inventory of Rare and Endangered Vascular Plants of California. The inventory presents a ranking system for rare plants within the state known as California Rare Plant Ranks. The CNPS inventory is endorsed by the CDFW and effectively serves as its list of "candidate" plant species. The following identifies the definitions of the California Rare Plant Ranks:

- Rank 1A: Plants presumed to be extinct in California;
- Rank 1B: Plants that are rare, Threatened, or Endangered in California and elsewhere;
- Rank 2: Plants that are rare, Threatened, or Endangered in California, but are more numerous elsewhere;

- Rank 3: Plants about which more information is needed (a review list): and
- Rank 4: Plants of limited distribution (a watch list).

Rank 1B and 2 species are considered eligible for state listing as Endangered or Threatened pursuant to the California Fish and Game Code. As part of the CEQA process, such species should be fully considered, as they meet the definition of Threatened or Endangered under the NPPA and Sections 2062 and 2067 of the California Fish and Game Code. Rank 3 and 4 species are considered to be either plants about which more information is needed or are uncommon enough that their status should be regularly monitored. Such plants may be eligible or may become eligible for state listing, and CNPS and CDFW recommend that these species be evaluated for consideration during the preparation of CEQA documents (CNPS 2001a), as some of these species may meet NPPA and CESA criteria as Threatened or Endangered.

In addition, CEQA requires that impacts to "resources that are rare or unique to that region" be evaluated [CEQA Guidelines 15125(c)]. This includes botanical resources that are, but not limited to, peripheral populations and disjunct subpopulations. These are informal terms that refer to those species that might be declining or be in need of concentrated conservation actions to prevent decline, but have no legal protection of their own. Also, CEQA Guidelines Section 15380 states "a species not included in any listing…shall nevertheless be considered to be rare or Endangered if the species is likely to become Endangered within the foreseeable future throughout all or a significant portion of its range and may be considered Threatened as that term is used in the ESA."

APPENDIX B SPECIAL STATUS PLANT SPECIES KNOWN TO OCCUR OR POTENTIALLY OCCURRING IN THE PROJECT VICINITY

SPECIES NAME COMMON NAME	LISTING STATUS [1]	HABITAT PREFERENCES, DISTRIBUTION INFORMATION, & ADDITIONAL NOTES*	FLOWERING PHENOLOGY/ LIFE FORM	HABITAT SUITABILITY & LOCAL DISTRIBUTION	OCCURRENCE POTENTIAL
FEDERAL/STATE ENDANGERED OR THREATENED AND CALIFORNIA RARE SPECIES					
Amsinckia grandiflora large-flowered fiddleneck	Fed: FE CA: SE, 1B.1 HCP: Covered (No-Take)	Occurs in cismontane woodland and valley and foothill grassland in the foothills of the Diablo Range. Known from only three natural occurrences between 275-550 meters, however reintroductions have also occurred but those populations are declining. Known from ALA, CCA and SJQ counties.	April-May annual herb	Although suitable vegetation associations are present, the only known natural populations (either extant or extirpated) are from vicinities of Corral Hollow and Black Diamond Mines. The nearest CNDDB occurrence (EONDX 51004, from 1887) is 1.65 miles west of the study area, at Black Diamond Regional Park.	Not Expected
Chloropyron molle subsp. *molle* soft bird's-beak	Fed: FE CA: SR, 1B.2	Coastal salt marshes and swamps. Known from fewer than 20 locations in CCA, NAP, and SOL counties from between 0-3 meters. Presumed extirpated in MRN, SAC, and SON counties. Recognized as *Cordylanthus nidularius* in TJM.	July-November annual herb (hemiparasitic)	No suitable vegetation associations or appropriate hydrologic characteristics present.	None
Cordylanthus nidularius Mt. Diablo bird's-beak	Fed: None CA: SR, 1B.1	Occurs in chaparral on serpentinite from 600-800 meters elevation. Know only from CCA counties.	July-August annual herb (hemiparasitic)	No suitable vegetation associations or appropriate substrate are present.	None
Cordylanthus palmatus Palmate-bracted bird's beak	Fed: FE CA: SE, 1B.1	Occurs on alkaline soils in chenopod scrub and valley and foothill grassland, mainly in the Central Valley. Known from ALA, COL, FRE, GLE, MAD, and YOL counties from between 5-155 meters. Presumed extirpated SJQ County.	May-October annual herb (hemiparasitic)	No appropriate substrate types present.	None
Erysimum capitatum var. *angustatum* Contra Costa wallflower	Fed: FE CA: SE, 1B.1	Occurs on inland dunes at an elevation of 3-20 meters. Known only from Antioch Dunes. This species is now recognized as *E. c.* var. *capitatum* in TJMII.	March-July perennial herb	No suitable vegetation associations or appropriate substrate are present.	None

SPECIES NAME COMMON NAME	LISTING STATUS [1]	HABITAT PREFERENCES, DISTRIBUTION INFORMATION, & ADDITIONAL NOTES*	FLOWERING PHENOLOGY/ LIFE FORM	HABITAT SUITABILITY & LOCAL DISTRIBUTION	OCCURRENCE POTENTIAL
Lasthenia conjugens Contra Costa goldfields	Fed: FE CA: CEQA, 1B.1 HCP: No- Take	Occurs in cismontane woodland, alkaline playas, valley and foothill grassland, and vernal pools. Occurs on mesic sites between 0-470 meters. Known from ALA, CCA, MNT, NAP, and SOL counties. Presumed extirpated from MEN, SBA, and SCL counties.	March-June annual herb	Although suitable grassland vegetation associations are present, no vernal pools or appropriate hydrology are present. Nearest recorded CNDDB occurrence is an extirpated occurrence 5 miles to the north (CNDDB EONDX #42501).	Not Expected
Lilaeopsis masonii Mason's lilaeopsis	Fed: None CA: SR, 1B.1	Occurs in brackish or freshwater marshes and swamps, riparian scrub between 0-10 meters. Known from ALA, CCA, NAP, SAC, SJQ, and SOL counties.	April-November perennial herb (rhizomatous)	No suitable vegetation associations or appropriate hydrologic characteristics present.	None
Neostapfia colusana Colusa grass	Fed: FT CA: SE, 1B.1	Occurs in vernal pools, usually large pools on adobe substrate between of 5-200 meters. Known from GLE, MER, SOL, STA, and Yolo counties. Presumed extirpated from COL County.	May-August annual herb	No suitable vegetation associations, appropriate hydrologic characteristics, or appropriate substrate present.	None
Oeothera deltoides subsp. howellii Antioch Dunes evening-primrose	Fed: FE CA: SE, 1B.1	Occurs on inland dunes at an elevation of 3-20 meters. Known only from three native occurrences in CCA County. An occurrence in SAC County is introduced.	March-September perennial herb	No suitable vegetation associations or appropriate substrate are present.	None
Sanicula saxatilis rock sanicle	Fed: FE CA: SR, 1B.2	Occurs on rocky substrates in broadleafed upland forest, chaparral, and valley and foothill grassland on bedrock outcrops and talus slopes from 620-1,175 meters elevation. Known from fewer than fifteen occurrences from CCA and SCL.	April-May perennial herb	No appropriate substrate types present.	None
Sidalcea keckii Keck's checkerbloom	Fed: FE CA: CEQA 1B.1	Occurs in cismontane woodland and valley and foothill grassland on serpentinite or clay substrates. Known from FRE, MER, and TUL counties from 75-650 meters. Possibly known from COL, NAP, SOL, and YOL counties.	April-June annual herb	Although suitable grassland vegetation associations and suitable clay substrate are present the preferred serpentine substrate is absent. This species has also never been recorded from CCA. Nearest recorded CNDDB occurrence is an occurrence 14 miles to the north (CNDDB EONDX #75788, from 1892).	Not Expected
CALIFORNIA NATIVE PLANT SOCIETY LISTED AND LOCALLY RARE SPECIES					
Arctostaphylos auriculata Mt. Diablo manzanita	Fed: None CA: CEQA, 1B.3 HCP: Covered	Occurs in chaparral on sandstone substrate, and in cismontane woodland between from 135-600 meters. Known only from Contra Costa County. Known from fewer than 20 occurrences.	January-March shrub (evergreen)	No suitable vegetation associations or appropriate substrate types present.	Absent

SPECIES NAME **COMMON NAME**	**LISTING STATUS** [1]	**HABITAT PREFERENCES, DISTRIBUTION INFORMATION, & ADDITIONAL NOTES***	**FLOWERING PHENOLOGY/ LIFE FORM**	**HABITAT SUITABILITY & LOCAL DISTRIBUTION**	**OCCURRENCE POTENTIAL**
Arctostaphylos manzanita subsp. *laevigata* Contra Costa manzanita	Fed: None CA: CEQA, 1B.2	Occurs in chaparral on rocky substrates between 500-1100 meters. Known only from Contra Costa County.	January-February shrub (evergreen)	No suitable vegetation associations or appropriate substrate types present. Nearest recorded CNDDB occurrence is an occurrence 4.7 miles to the south (CNDDB EONDX #91008, from 1932).	Absent
Astragalus tener var. *tener* alkali milk-vetch	Fed: None CA: CEQA, 1B.2 HCP/NCCP No-Take	Occurs on alkaline substrates in playas, valley and foothill grassland on adobe clay, and vernal pools between 1-60 meters. Known from ALA, MER, NAP, SOL and YOL counties. Presumed extirpated from CCA, MNT, SBT, SCL, SFO, SJQ, SON, and STA counties.	March-June annual herb	Although suitable vegetation associations are present, no appropriate substrate types are present. The nearest CNDDB occurrence (EONDX 6897, from 1989) is from 10 miles north of the study area and is thought to be extirpated. The next closest occurrence (EONDX 4693, from 2010) is 11.8 miles north.	Not Expected
Atriplex cordulata var. *cordulata* heartscale	Fed: None CA: CEQA, 1B.2	Occurs in chenopod scrub, meadows and seeps, valley and foothill grassland on sandy, saline or alkaline substrates between 1-375 meters elevation. Known from ALA, BUT, CCA, COL, FRE, GLE, KRN, MAD, MER, SLO, SLO, SOL, and TUL counties. Presumed extirpated from SJQ, STA, and YOL counties.	April-October annual herb	Although suitable grassland vegetation associations are present, no appropriate substrate types are present. Nearest recorded CNDDB occurrence is 12.6 miles to the south (CNDDB EONDX #84181, from 2005).	Not Expected
Atriplex coronata var. *coronata* crownscale	Fed: None CA: CEQA, 4.2	Occurs on alkaline substrates in chenopod scrub, valley and foothill grassland, and vernal pools between 1-590 meters. Known from ALA, CCA, FRE, GLE, KNG, KNG, KNR, MER, MNT, SLO, SOL, and STA counties. Possibly occurs in SJQ county.	March-October annual herb	Although suitable vegetation associations are present, no appropriate substrate types are present. The nearest CCH occurrence (Accession Number CHSC98937, from 2007) is from 3.8 miles southeast of the study area.	Not Expected
Atriplex depressa brittlescale	Fed: None CA: CEQA, 1B.2 HCP/NCCP Covered	Occurs in chenopod scrub, meadows and seeps, playas, valley and foothill grassland, and vernal pools on alkaline clay substrates between 1-320 meters. Known from ALA, CCA, COL, FRE, GLE, MER, SOL, STA, TUL, and YOL counties.	May-October annual herb	Although suitable vegetation associations are present, no appropriate substrate types or hydrology are present. Nearest recorded CNDDB occurrence is 1.8 miles to the northeast (CNDDB EONDX #76066, from 2006).	Not Expected
Atriplex miniscula lesser saltscale	Fed: None CA: CEQA, 1B.1	Occurs in shadscale scrub, valley grassland, and alkali sinks on sandy and alkaline substrates between 1-100 meters. Known from ALA, BUT, FRE, KNG, KRN, MAD, MER, TUL counties. Presumed extirpated in STA county.	May-October annual herb	Although suitable vegetation associations are present, no appropriate substrate types are present. This species has also never been recorded in CCA. Nearest recorded CNDDB occurrence is 12.7 miles to the south (CNDDB EONDX #112610, from 2008).	Not Expected

Species Name Common Name	Listing Status [1]	Habitat Preferences, Distribution Information, & Additional Notes*	Flowering Phenology/ Life Form	Habitat Suitability & Local Distribution	Occurrence Potential
Blepharizonia plumosa big tarplant	Fed: None CA: CEQA, 1B.1 HCP/NCCP Covered	Occurs in valley and foothill grassland counties between 30-505 meters. Known from ALA and CCA, KRN, MNT, SBT, SJQ, SLO, and STA. Presumed extirpated in SOL county.	July-October annual herb	Suitable vegetation associations are present. There are multiple CNDDB occurrences within the vicinity of the study area. The nearest CNDDB occurrences (EONDX 41678, and EONDX 41678, from 2013) are both located adjacent to, and north of, the study area.	Present
California macrophylla Round-leaved filaree	Fed: None CA: None HCP/NCCP Covered	Occurs in cismontane woodland, valley and foothill grassland on clay soils between 15-1,200 meters. Known from ALA, CCA, COL, FRE, GLE, KNG, KRN, LAK, LAS, LAX, MER, MNT, NAP, RIV, SBA, SBT, SDG, SJQ, SLO, SMT, SOL, STA, THE, VEN, and YOL counties. Presumed extirpated from SCZ Island.	March-May annual herb	Suitable vegetation associations and substrate are present. The nearest CNDDB occurrence (EONDX 45809, from 2005) is from 7 miles west of the study area, in the northern Lone Tree Valley.	Would have been detected during previous surveys
Calochortus pulchellus Mt. Diablo fairy-lantern	Fed: None CA: CEQA, 1B.2 HCP/NCCP Covered	Occurs in chaparral, cismontane woodland, riparian woodland, and valley and foothill grassland on wooded and brushy slopes between 30-840 meters. Known from ALA, CCA, and SOL counties.	April-June perennial herb (bulbiferous)	Although grassland is present this species prefers woodland and chaparral ecotones. Nearest recorded CNDDB occurrence is 2.5 miles to the south (CNDDB EONDX #84633, from 2002).	Not Expected
Campanula exigua chaparral hairbell	Fed: None CA: CEQA 1B.2	Occurs on rocky sites, usually on serpentinite, in chaparral from 275-1,250 meters elevation. Known from ALA, CCA, SBT, SCL, and STA counties.	May-June annual herb	No suitable vegetation associations or appropriate substrate are present.	None
Centromadia parryi subsp. *congdonii* Congdon's tarplant	Fed: None CA: CEQA, 1B.1	Occurs in alkaline valley and foothill grassland between 1-230 meters. Known from ALA, CCA, MNT, SCL, SLO, and SMT counties. Presumed extirpated from SCR and SOL counties. Recognized as *Hemizonia parryi* subsp. *congdonii* in TJM.	June-November annual herb	Although suitable vegetation associations are present, no appropriate substrate types are present. Nearest recorded CNDDB occurrence is 9.1 miles to the southeast (CNDDB EONDX #84654, from 2005).	Not Expected
Cicuta maculata var. *bolanderi* Bolander's water hemlock	Fed: None CA: CEQA, 2B.1	Occurs in coastal, fresh or brackish water marshes and swamps between 0-200 meters. Known from CCA, MRN, SAC, and SOL counties and from Arizona, New Mexico, and Washington. Presumed extirpated in LAX, SBA, and SLO counties.	July-September perennial herb	No suitable vegetation associations or appropriate hydrologic characteristics present.	None

SPECIES NAME COMMON NAME	LISTING STATUS [1]	HABITAT PREFERENCES, DISTRIBUTION INFORMATION, & ADDITIONAL NOTES*	FLOWERING PHENOLOGY/ LIFE FORM	HABITAT SUITABILITY & LOCAL DISTRIBUTION	OCCURRENCE POTENTIAL
Convolvulus simulans small-flowered morning-glory	Fed: None CA: CEQA, 4.2	Occurs on clay and serpentinite seeps in chaparral (openings), coastal scrub and valley and foothill grassland between 30-700 meters. Known from CCA, FRE, KRN, LAX, ORA, RIV, SBA, SBT, SCM, SCT, SCZ, SDG, SJQ, SLO, and STA counties.	March-July annual herb	Suitable vegetation associations and clay habitat are present. Known from clay barrens in Horse Valley approximately 0.4 mile to the northwest. The nearest CCH occurrence (Accession Number UCD58755, from 2007) is from approximately 100 meters northwest of the study area.	Would have been detected during previous surveys
Cryptantha hooveri Hoover's cryptantha	Fed: None CA: CEQA, 1A	Occurs on inland dunes and sandy valley and foothill grassland between 9-150 meters. Known from KRN County. Presumed extirpated in CCA, MAD, and STA counties. Last seen in 1939.	April-May annual herb	Although suitable vegetation associations are present, no appropriate substrate types are present. The nearest CNDDB occurrence (EONDX 57196, from 1908) is from 5 miles north of the study area and is thought to be extirpated. The next closest occurrence (EONDX 67194, from 1937) is 70.6 miles southeast, in Stanislaus county.	Not Expected
Delphinium californicum subsp. *interius* Hospital Canyon larkspur	Fed: None CA: CEQA, 1B.2	Occurs in openings in chaparral and mesic cismontane woodland from 230-1,095 meters elevation. Known from ALA, CCA, MER, SBT, SCL, SJQ, and STA counties.	April-June perennial	No suitable vegetation associations present.	None
Delphinium recurvatum recurved larkspur	Fed: None CA: CEQA, 1B.2 HCP/NCCP Covered	Occurs on alkaline substrates in chenopod scrub, cismontane woodland, and valley and foothill grassland between 3-750 meters. Known from ALA, CCA, FRE, GLE, KNG, KRN, MAD, MER, MNT, SJQ, SLO, SOL, and TUL counties. Presumed extirpated from BUT and COL counties.	March-June perennial herb	Although suitable grassland vegetation associations are present, no appropriate substrate types are present. The nearest CNDDB occurrence (EONDX 21628, from 1967) is 10.2 miles southeast.	Not Expected
Dirca occidentalis western leatherwood	Fed: None CA: CEQA, 1B.2	Occurs on mesic sites in broadleafed upland forest, closed-cone coniferous forest, chaparral, cismontane woodland, North Coast coniferous forest, riparian forest, and riparian woodland from 50-395 meters elevation. Known from ALA, CCA, MRN, SCL, SMT, and SON counties.	January-March(April) perennial deciduous shrub	No suitable vegetation associations present.	Absent
Downingia pusilla dwarf downingia	Fed: None CA: CEQA, 2B.2	Occurs in mesic sites in valley and foothill grassland and vernal pools between 0-10 meters. Known from FRE, MER, NAP, PLA, SAC, SJQ, SOL, SON, STA, TEH, and YUB counties.	March-May annual herb	Although suitable vegetation associations are present, no vernal pools or appropriate hydrology are present. The nearest CNDDB occurrence (EONDX 4990, from 2011) is 11.9 miles north, within the Montezuma Wetlands Vernal Pool Preserve.	Not Expected

SPECIES NAME COMMON NAME	LISTING STATUS [1]	HABITAT PREFERENCES, DISTRIBUTION INFORMATION, & ADDITIONAL NOTES*	FLOWERING PHENOLOGY/ LIFE FORM	HABITAT SUITABILITY & LOCAL DISTRIBUTION	OCCURRENCE POTENTIAL
Eriastrum ertterae Lime ridge eriastrum	Fed: None CA: CEQA 1B.1	Occurs on volcanic or sandy substrates in chaparral and cismontane woodland from 305-1,030 meters elevation. Known from COL, GLE, LAK, SCL, SHA, SMT, THE, and TRI counties. Identity of CCA occurrence needs confirmation.	April-August annual herb	No suitable vegetation associations or appropriate substrate are present.	None
Eriogonum nudum var. *psychicola* Antioch Dunes buckwheat	Fed: None CA: CEQA, 1B.1	Occurs in inland dunes from 0-20 meters. Known from a single occurrence in the Antioch Dunes (CCA Co.).	July-October perennial herb	No suitable vegetation associations or appropriate substrate are present.	None
Eriogonum truncatum Mt. Diablo buckwheat	Fed: None CA: CEQA, 1B.1 HCP/NCCP No-Take	Occurs on sandy sites in chaparral, coastal scrub, and valley and foothill grassland between 3-350 meters. Known from ALA and CCA counties. Presumed extirpated from SOL County. Rediscovered in May 2005, now known from one extant occurrence.	April-September annual herb	Although suitable vegetation associations are present, no appropriate substrate types are present. The nearest CNDDB occurrence (EONDX 106275, from 2016) is 2 miles northeast, within the Black Diamond Mines Regional Preserve.	Not Expected
Eryngium jepsonii Jepson's coyote thistle	Fed: None CA: CEQA, 1B.2	Occurs on clay substrates in valley and foothill grassland and vernal pools between 3-300 meters. Known from ALA, AMA, CAL, CCA, FRE, NAP, SMT, SOL, STA, TUO, and YOL counties.	April-August annual herb	Suitable vegetation associations are present. The nearest CNDDB occurrence (EONDX 103660, from 1998) is 4.5 miles west, at Black Diamond Regional Preserve. The next closest occurrence (EONDX 103659, from 2015) is 15.40 miles southwest, within the Bishop Ranch Regional Preserve.	Not Expected
Eschscholzia rhombipetala diamond-petaled California poppy	Fed: None CA: CEQA, 1B.1 HCP/NCCP No-Take	Occurs on alkaline valley and foothill grassland between 0-975 meters. Known from ALA, SJQ, and SLO counties. Presumed extirpated from CCA, COL, and STA counties.	March-April annual herb	Suitable vegetation associations are present and this species has been observed on similar substrates as those in the study area. The nearest CNDDB occurrence (EONDX 21507, from 1994) is from 5.6 miles north of the study area and is thought to be extirpated. The next closest occurrence (EONDX 31877, from 1888) is 9.3 miles southeast, and is thought to be extirpated.	Would have been detected during previous surveys
Extriplex joaquinana San Joaquin spearscale	Fed: None CA: CEQA, 1B.2 HCP/NCCP Covered	Occurs in chenopod scrub, meadows and seeps, playas, and valley and foothill grassland on alkaline substrates between 1-835 meters elevation. Known from ALA, CCA, COL, FRE, GLE, MER, MNT, NAP, SBT, SOL, YOL, and possibly SLO counties. Presumed extirpated from SCL, SJQ, and TUL counties.	April-October annual herb	Although suitable vegetation associations are present, no appropriate substrate types are present. Nearest recorded CNDDB occurrence is 1.1 miles to the northeast (CNDDB EONDX #9591, from 1989).	Not Expected

SPECIES NAME COMMON NAME	LISTING STATUS [1]	HABITAT PREFERENCES, DISTRIBUTION INFORMATION, & ADDITIONAL NOTES*	FLOWERING PHENOLOGY/ LIFE FORM	HABITAT SUITABILITY & LOCAL DISTRIBUTION	OCCURRENCE POTENTIAL
Fritillaria agrestis stinkbells	Fed: None CA: CEQA, 4.2	Chaparral, cismontane woodland, pinyon and juniper woodland and valley and foothill grassland, on clay or sometimes serpentinite between 10-1,555 meters. Known from ALA, CCA, FRE, KRN, MEN, MER, MNT, MPA, PLA, SAC, SBA, SBT, SCL, SLO, STA, TUO, VEN, and YUB counties. Presumed extirpated from SCR and SMT counties.	March-June perennial herb (bulbiferous)	Suitable vegetation associations and clay substrate are present. The nearest CNDDB occurrence (EONDX 9429, from 1989) is from 3.3 miles east of the study area.	Would have been detected during previous surveys
Fritillaria liliacea Fragrant fritillary	Fed: None CA: CEQA, 1B.2	Cismontane woodland, coastal prairie, coastal scrub, valley and foothill grassland near the coast, on clay or serpentinite substrates between 3-410 meters. Known from ALA, CCA, MNT, MRN, SBT, SCL, SFO, SMT, SOL and SON.	February-April perennial herb (bulbiferous)	Although suitable grassland vegetation associations and clay substrate are present, this species is only known from coastally influenced habitats closer to the San Fransisco Bay. Nearest recorded CNDDB occurrence is 10 miles to the west (CNDDB EONDX #14266, from 2010).	Not Expected
Galium andrewsii ssp. *gatense* phlox-leaf serpentine bedstraw	Fed: None CA: CEQA, 4.2	Occurs in rocky, serpentinite habitats in chaparral, cismontane woodland, and lower montane coniferous forest between 150-1450 meters. Known from elevation in ALA, CCA, COL, FRE, LAX, MNT, SBT, SCL, and SLO counties.	April-July perennial herb	No suitable vegetation associations or appropriate substrate are present. The nearest CCH occurrence (Accession Number UC171670, from 1889) is from 4.4 miles north of the study area.	None
Grimmia torenii Torren's grimmia	Fed: None CA: CEQA, 1B.3	Occurs in openings, rocky, boulder and rock walls, carbonate, volcanic, in chaparral, cismontane woodland, and lower montane coniferous forest from 325-1160 elevation. Known from CCA, COL, LAK, MEN, MNT, SCR, and SMT counties.	None	No suitable vegetation associations or appropriate substrate are present.	None
Helianthella castanea Diablo helianthella	Fed: None CA: CEQA, 1B.2 HCP/NCCP Covered	Occurs in broadleaved upland forest, chaparral cismontane woodland, coastal scrub, riparian woodland, and valley and foothill grassland between on rocky, azonal soils 60-1,300. Known from ALA, CCA, SDG, and SMT counties. Presumed extirpated from MRN and SFO counties. .	March-June perennial herb	Although suitable vegetation associations are present this species prefers the ecotone of woodland and shrubland. The nearest CNDDB occurrence (EONDX 14266, from 1998) is from 0.82 mile south of the study area.	Not Expected
Hesperevax caulescens hogwallow starfish	Fed: None CA: CEQA, 4.2	Occurs in clayey and mesic valley and foothill grassland and shallow vernal pools between 0-505 meters. Known from ALA, AMA, BUT, CCA, COL, FRE, GLE, KRN, MER, MNT, SAC, SJQ, SLO, SOL, STA, SUT, THE, and YOL counties, and presumed extirpated from NAP and SDG counties.	March-June annual herb	Suitable grassland vegetation associations and clay substrate are present. The nearest CCH occurrence (Accession Number CAS-BOT-BC124027, from 1883) is from 4.3 miles north of the study area.	Would have been detected during previous surveys

SPECIES NAME COMMON NAME	LISTING STATUS [1]	HABITAT PREFERENCES, DISTRIBUTION INFORMATION, & ADDITIONAL NOTES*	FLOWERING PHENOLOGY/ LIFE FORM	HABITAT SUITABILITY & LOCAL DISTRIBUTION	OCCURRENCE POTENTIAL
Hesperolinon breweri Brewer's western flax	Fed: None CA: CEQA, 1B.2 HCP/NCCP Covered	Occurs in chaparral, cismontane woodland, and valley and foothill grassland usually on serpentinite between 30 to 900 meters. Known from CCA, NAP, and SOL counties.	May-July annual herb	Although suitable vegetation associations are present, this species prefers the ecotone of woodland and or shrubland habitats. The nearest CNDDB occurrence (EONDX 84808, from 2002) is from approximately 1 mile northwest of the study area.	Not Expected
Hibiscus lasiocarpos var. *occidentalis* rose-mallow	Fed: None CA: CEQA, 1B.2	Occurs in marshes and swamps between 0-120 meters. Known from BUT, CCA, COL, GLE, SAC, SJQ, SOL, SUT, and YOL counties. .	June-September perennial rhizomatous herb aquatic, emergent	No suitable vegetation associations or appropriate hydrologic characteristics present.	None
Isocoma arguta Carquinez goldenbush	Fed: None CA: CEQA, 1B.1	Occurs in valley and foothill grassland, often on alkaline soils. Known only from SOL County from between 1-2 meters elevation.	August-December perennial shrub	Although suitable grassland vegetation associations are present, no suitable alkaline substrate is present. This species is also not known from CCA. The nearest CNDDB occurrence (EONDX 8266, from 1992) is from 14.4 miles northeast of the study area.	Not Expected
Lathyrus jepsonii var. *jepsonii* Delta tule pea	Fed: None CA: CEQA, 1B.2	Occurs in freshwater and brackish marshes. Known from ALA, CCA, NAP, SAC, SJQ, and SOL counties. Presumed extirpated from SCL county.	May-September perennial herb	No suitable vegetation associations or appropriate hydrologic characteristics present.	None
Limosella australis Delta mudwort	Fed: None CA: CEQA, 2B.1	Occurs usually in mud banks in marshes and swamps (freshwater or brackish) and riparian scrub between 0-4 meters. Known from CCA, SAC, SJQ, and SOL counties between 0-3 meters.	May-August perennial herb (stoloniferous)	No suitable vegetation associations or appropriate hydrologic characteristics present.	None
Madia radiata showy madia	Fed: None CA: CEQA, 1B.1 HCP/NCCP Covered	Occurs in cismontane woodland and valley and foothill grassland between 25-900 meters. Known from FRE, KRN, SBT, SLO, and STA counties. Presumed extirpated from CCA, KNG, MNT, SBA, and SJQ counties.	March-May annual herb	Suitable vegetation associations are present. The nearest CNDDB occurrence (EONDX 6396, from 1938) is 4 miles west of the study area along Somersville Road.	Not Expected
Malacothamnus hallii Hall's bush mallow	Fed: None CA: CEQA, 1B.2	Occurs in chaparral and coastal scrub at elevations between 10-760 meters. Known from CCA, MEN, MER, SCL, SMT, and STA counties.	May-October perennial shrub (evergreen)	No suitable vegetation associations present.	Absent
Monardella a ntonina ssp. *antonina* San Antonia hills monardella	Fed: None CA: CEQA, 3	Occurs in chaparral and cismontane woodland between 320-1,000 meters. Known from MNT County. Possibly occurs in ALA, CCA, SBT, and SCL counties. This species is now recognized as *M. villosa* subsp. *villosa* in TJMII.	June-August perennial rhizomatous herb	No suitable vegetation associations present.	None

SPECIES NAME COMMON NAME	LISTING STATUS [1]	HABITAT PREFERENCES, DISTRIBUTION INFORMATION, & ADDITIONAL NOTES*	FLOWERING PHENOLOGY/ LIFE FORM	HABITAT SUITABILITY & LOCAL DISTRIBUTION	OCCURRENCE POTENTIAL
Monolopia gracilens woodland woollythreads	None CEQA 1B.2	Occurs on serpentinitic sites in openings of broadleafed upland forest, chaparral, cismontane woodland, North Coast coniferous forest, and valley and foothill grassland from100-1,200 meters elevation. Known from ALA, CCA, MNT, SCL, SCR, SLO, and SMT counties.	March-July annual herb	No suitable vegetation associations or substrates are present.	None
Navarretia gowenii Lime Ridge navarretia	Fed: None CA: CEQA, 1B.1	Occurs on chaparral from180-305 meters elevation. Known only from four occurrences CCA and STA counties.	May-June annual herb	No suitable vegetation associations or substrates are present.	None
Navarettia nigelliformis subsp. *nigelliformis* adobe navarretia	Fed: None CA: CEQA, 4.2 HCP/NCCP Covered	Occurs in vernally mesic valley and foothill grassland and vernal pools, on serpentine or clay substrates at elevations between 100-1000 meters. Known from ALA, BUT, COL, FRE, KRN, MER, MNT, PLA, SUT, and TUL counties. This species is no longer considered to occur in CCA based on specimen annotations at the UC and Jepson Herbaria at the University of California Berkeley as well as the opinions of experts in the genus.	April-June annual herb	Suitable vegetation associations and substrates are present. The closest herbarium record is a Curran collection (Accession# CAS-BOT-BC230478) from Antioch. The species is no longer occur within Contra Costa County.	Would have been detected during previous surveys
Navarretia nigelliformis subsp. *radians* shining navarretia	Fed: None CA: CEQA, 1B.2	Occurs on sometimes clay substrates in cismontane woodland, valley and foothill grassland, and vernal pools between 76-1000 meters. Known from ALA, CCA, COL, FRE, MAD, MER, MNT, SBT, SJQ, and SLO.	April-July annual herb	Suitable vegetation associations are present however clay soils are absent. The nearest CNDDB occurrence (EONDX 87631, from 2008) is 0.7 miles west of the study area, in the west end of Horse Valley. Known from clay barrens in Horse Valley approximately 0.4 mile to the northwest.	Would have been detectable during previous surveys
Phacelia phaceliodes Mt. Diablo phacelia	Fed: None CA: CEQA, 1B.1	Occurs on rocky substrates in chaparral and cismontane woodland from 500-1,370 meters elevation. Known from CCA, SBT, SCL, and STA counties.	April-May annual herb	No suitable vegetation associations or substrates are present.	None
Plagiobothrys hystriculus bearded popcorn-flower	Fed: None CA: CEQA, 1B.1	Occurs in valley and foothill grassland (often mesic), vernal pool margins, often vernal swales between 0-52 meters. Known only from SOL and NAP Counties.	April-May annual herb	Although suitable vegetation associations and hydrologic regimes present this is a narrowly endemic species to SOL and NAP counties. The nearest CNDDB occurrence (EONDX 84544, from 1892) is 13.75 miles north of the study area, in the Montezuma Hills vicinity.	Not Expected
Potamogeton zosteriformis eel-grass pondweed	Fed: None CA: CEQA, 2B.2	Occurs in freshwater marshes and swamps between 0 -1860 meters elevation. Known from CCA, LAK, LAS, MOD, and SHA counties and Idaho, Oregon, Utah, and Washington.	June-July annual herb (aquatic)	No suitable vegetation associations or appropriate hydrologic characteristics present.	None

SPECIES NAME COMMON NAME	LISTING STATUS [1]	HABITAT PREFERENCES, DISTRIBUTION INFORMATION, & ADDITIONAL NOTES*	FLOWERING PHENOLOGY/ LIFE FORM	HABITAT SUITABILITY & LOCAL DISTRIBUTION	OCCURRENCE POTENTIAL
Puccinellia simplex California alkali grass	Fed: None CA: CEQA, 1B.2	Occurs in alkaline and vernally mesic substrates, sinks, flats, and lake margins in chenopod scrub, meadows and seeps, valley and foothill grassland, and vernal pools between 2-930 meters. Known from ALA, BUT, CCA, COL, FRE, GLE, KNG, KRN, LAK, LAX, MAD, MER, NAP, SBD, SCL, SCR, SLO, SOL, STA, TUL, and YOL counties.	March-May annual herb	Although suitable vegetation associations are present no appropriate hydrologic characteristics or appropriate substrates are present. The nearest CNDDB occurrence (EONDX 114932, from 2019) is from 7.64 miles southeast of the study area.	Not Expected
Ranunculus lobbii Lobb's aquatic buttercup	Fed: None CA: CEQA, 4.2	Occurs in mesic soils in cismontane woodland, North Coast coniferous forest, valley and foothill grassland, and vernal pools from 15-470 meters elevation. Known from ALA, CCA, MEN, MRN, NAP, SOL and SON counties.	February-May annual herb (aquatic)	Suitable vegetation associations and ponded habitat are present. The nearest CCH occurrence (Accession Number JEPS102904, from 1995) is from 4.3 miles southwest of the study area.	Would have been detected during previous surveys
Senecio aphanactis rayless ragwort	Fed: None CA: CEQA, 2.2	Occurs on coastal scrub, chaparral, and cismontane woodland on alkaline soils between 15-800 meters. Known from ALA, CCA, FRE, LAX, MER, MNT, ORA, RIV, SBA, SCL, SCT, SCZ, SDG, SLO, SOL, SRO, and VEN counties.	January-April annual herb	No suitable vegetation associations or substrates are present.	None
Spergularia macrotheca var. *longistyla* long-styled sand-spurrey	Fed: None CA: CEQA, 1B.2	Occurs on alkaline substrates in meadows and seeps, and marshes and swamps between 0-255 meters. Know from ALA, CCA, NAP, and SOL counties.	February-May perennial herb	No suitable vegetation associations, appropriate hydrologic characteristics, or appropriate substrate present.	None
Streptanthus albidus subsp. *peramoenus* most-beautiful jewel flower	Fed: None CA: CEQA, 1B.2	Occurs on serpentinite in chaparral, cismontane woodland, and valley and foothill grassland from 94-1,000 meters elevation. Known from ALA, CCA, MNT, SCL, and SLO counties. Treated as *Streptanthus glandulosus* subsp. *albidus in* TJM 2.	March-October annual herb	No appropriate substrate types present.	None
Streptanthus hispidus Mt. Diablo jewel-flower	Fed: None CA: CEQA, 1B.3	Occurs on rocky sites in chaparral and valley and foothill grassland from 365-1,200 meters elevation. Known from fewer than 15 occurrences only in CCA.	March-June annual herb	No appropriate substrate types present.	None
Stuckenia filiformis subsp. *alpina* slender-leaved pondweed	Fed: None CA: CEQA, 2B.2	Occurs in assorted shallow freshwater marshes and swamps from 300-2,150 meters elevation. Known CCA, LAS, MER, MNO, and SIE counties. Presumed extirpated from SCL County. To be expected in the San Joaquin Valley, San Francisco Bay area, and the Central high Sierra Nevada.	May-July rhizomatous aquatic herb	No suitable vegetation associations or appropriate hydrologic characteristics present.	None

Species Name Common Name	Listing Status [1]	Habitat Preferences, Distribution Information, & Additional Notes*	Flowering Phenology/ Life Form	Habitat Suitability & Local Distribution	Occurrence Potential
Symphyotrichum lentum Suisun Marsh aster	Fed: None CA: CEQA, 1B.2	Occurs in brackish and freshwater marshes and swamps between 0-3 meters. Known from CCA, MRN, NAP, SAC, SJQ, SOL, and SON counties. Recognized as *Aster lentus* in TJM. Intergrades into *A. chilensis*. USFWS uses the name *A. chilensis* var. *lentus*.	May-November perennial herb (rhizomatous)	No suitable vegetation associations or appropriate hydrologic characteristics present.	None
Triquetrella californica Coastal triquetrella	Fed: None CA: CEQA, 1B.2	Occurs on soil in coastal bluff scrub and coastal scrub from 10-100 meters elevation. Known from CA, DNT, MEN, MRN, SDG, SFO, SMT, and SON counties.	Moss wet season	No suitable vegetation associations or substrates are present.	None
Tropidocarpum capparideum caper-fruited tropidocarpum	Fed: None CA: CEQA, 1B.1 HCP/NCCP HCP/NCCP No-Take	Occurs on alkaline clay in valley and foothill grassland, often alkaline hills, between 1 to 455 meters. Known from FRE, MNT, and SLO counties. Presumed extirpated from ALA, CCA, GLE, SCL, and SJQ counties. Rediscovered in 2000 on Ft. Hunter Liggett.	March-April annual herb	Although suitable vegetation associations are present, no appropriate alkaline substrate is present. Nearest recorded CNDDB occurrence is 7.2 miles to the west (CNDDB EONDX #20435, from 1896).	Not Expected
Viburnum ellipticum oval-leaved viburnum	Fed: None CA: CEQA, 2B.3	Occurs on chaparral, cismontane woodland, and lower montane coniferous forest between 215-1,400 meters. Known from CCA, FRE, ELD, GLE, HUM, MEN, NAP, SHA, and SON counties.	May-June shrub (deciduous)	No suitable vegetation associations present. Nearest recorded CNDDB occurrence is 5.1 miles to the southwest (CNDDB EONDX #74275, exact date unknown).	Absent

[1]Explanation of State and Federal Listing Codes and HCP/NCCP Coverage

Federal listing codes:

FE	Federally listed as Endangered
FT	Federally listed as Threatened
FPE	Federally proposed for listing as Endangered
FPT	Federally proposed for listing as Threatened
FPD	Federally proposed for delisting
FC	Federal candidate species (former Category 1 candidates)
SC	Species of Concern – No longer maintained by USFWS
SLC	Species of local concern or conservation importance – No longer maintained by USFWS

California listing codes:

SE	State listed as Endangered
ST	State listed as Threatened
SR	State listed as Rare
SCE	State candidate for listing as Endangered
SCT	State candidate for listing as Threatened

California Native Plant Society codes:

1A	Presumed extinct in California
1B	Rare or Endangered in California and elsewhere
2	Rare or Endangered in California, more common elsewhere
3	Plants for which we need more information - Review list
4	Plants of limited distribution - Watch list

California Native Plant Society Threat Codes:

.1	Seriously Endangered in California (over 80% of occurrences Threatened / high degree and immediacy of threat)
.2	Fairly Endangered in California (20-80% occurrences Threatened)
.3	Not very Endangered in California (<20% of occurrences Threatened or no current threats known)
Notes:	*CNPS List 1A and some List 3 plant species lacking any threat information receive no threat code extension.* *CNPS R-E-D Codes have been discontinued*

Survey Recommendation Determinations Based On

- Observed phenology at the time of reconnaissance
- Seasonal weather patters
- Collection dates of herbarium specimens
- Blooming times given by the CNPS Inventory

East Contra Costa County Habitat Conservation Plan/Natural Community Conservation Plan (HCP/NCCP) includes special status species designated as Covered or No-Take. To be a Covered Species, a species had to meet certain criteria about range, status, impact, and data. Certain species were considered extremely rare and fully protected and are designated No-Take Species.
EONDX is the CNDDB Element Occurrence Index number which corresponds to unique records in the California Natural Diversity Database.

Abbreviations

AMA Amador
BUT Butte
CAL Calaveras
CCA Contra Costa
CNDDB CA Natural Diversity Database
CNPS CA Native Plant Society
COL Colusa
DNT Del Norte
ELD El Dorado
FRE Fresno
GLE Glenn
HUM Humboldt
KRN Kern
LAK Lake
LAS Lassen
LAX Los Angeles
LCP Local Coastal Plan
MAD Madera
MOD Modoc
MEN Mendocino
MER Merced
MNT Monterey
MPA Mariposa
MRN Marin
NAP Napa
NEV Nevada
ORA Orange
PLA Placer
PLU Plumas
RIV Riverside
SAC Sacramento
SBA Santa Barbara
SBD San Bernardino
SBT San Benito
SCL Santa Clara
SCR Santa Cruz
SCT Santa Catalina Island
SCZ Santa Cruz Island
SDG San Diego
SFO San Francisco
SHA Shasta
SIE Sierra
SIS Siskiyou
SJQ San Joaquin
SMI San Miguel Island
SMT San Mateo
SNI San Nicolas Island
SOL Solano
SON Sonoma
SRO Santa Rosa Island
TEH Tehama
TJM The Jepson Manual
TJMII The Jepson Manual, 2nd. Ed.
TRI Trinity
TUL Tulare
VEN Ventura
YOL Yolo
YUB Yuba

APPENDIX C SPECIAL STATUS FISH AND WILDLIFE SPECIES KNOWN TO OCCUR OR POTENTIALLY OCCURRING IN THE PROJECT VICINITY

SPECIES NAME COMMON NAME	LISTING STATUS[1]	HABITAT REQUIREMENTS & ADDITIONAL NOTES	HABITAT SUITABILITY & LOCAL DISTRIBUTION	OCCURRENCE POTENTIAL
FEDERAL/STATE LISTED, PROPOSED, CANDIDATE AND/OR FULLY PROTECTED SPECIES				
INVERTEBRATES:				
Apodemia mormo langei Lange's metalmark butterfly	Fed: FE, CH CA: SA	Inhabits stabilized dunes along the San Joaquin River; current distribution is restricted to the Antioch Dunes National Wildlife Refuge. Primary host plant for larvae and adults is the naked buckwheat (*Eriogonum nudum* var. *auriculaturm*). Adult flight season is August through September.	The study area is outside of the species' known range, and there is no suitable dune habitat present on site. Species is restricted to the Antioch Dunes National Wildlife Refuge. The nearest occurrence (EONDX #12922) is located at the Refuge, approximately 5.5 miles north of the study area.	None
Bombus crotchii Crotch bumble bee	Fed: None CA: SCE	This species occurs from coastal California east to the Sierra Nevada Cascade crest. They occur at relatively warm and dry sites in open grassland and scrub habitats. Colonies are annual and only the new, mated queens overwinter. Nests are often located underground in abandoned rodent nests, or above ground in tufts of grass, old bird nests, rock piles, or cavities in dead trees. Previously found throughout southern California and the Central Valley, but is now nearly absent from the Central Valley (CDFW 2019). Widespread use of pesticides in agricultural lands and habitat fragmentation are thought to have led to severe declines of this species.	Suitable grassland habitat is present throughout the study area. The nearest CNDDB occurrence was recorded in 1921 in Antioch (EONDX #98555), approximately 4 miles to the north. There have been recent verified observations of the species near Fairfield, Solano County (2014), in Berkeley, Alameda County (2015), and in Santa Teresa County Park, Santa Clara County (2019) (Bumble Bee Watch 2020).	Possible

SPECIES NAME COMMON NAME	LISTING STATUS[1]	HABITAT REQUIREMENTS & ADDITIONAL NOTES	HABITAT SUITABILITY & LOCAL DISTRIBUTION	OCCURRENCE POTENTIAL
Bombus occidentalis western bumble bee	Fed: None CA: SCE	Medium-sized (1 – 2 cm) bumble bee with a short head. The abdomen varies in color, but all individuals have a transverse band of yellow hair on the thorax in front of the wing bases, and the tip of the abdomen is almost always white. Western bumble bees live in a diverse range of habitats, including mixed woodlands, farmlands, urban areas, montane meadows and into the western edge of the prairie grasslands. Like many bumble bees, they typically nest underground in abandoned rodent burrows or within hollows in decaying wood (COSEWIC 2014). Widespread use of pesticides in agricultural lands and habitat fragmentation are thought to have led to severe declines of this species.	Suitable grassland habitat is present throughout the study area. The nearest CNDDB occurrence of this species was recorded in 1974 in the vicinity of Black Diamond Mines (EONDX #100099), approximately 3.6 miles west of the study area. They were also recorded as recently as 1979 at the Antioch Dunes National Wildlife Refuge (EONDX #100104). There have been no recent verified observations of this species in the greater San Francisco Bay Area (Bumble Bee Watch 2020), though the study area is within its formerly known range.	Possible
Branchinecta conservatio Conservancy fairy shrimp	Fed: FE, CH CA: SA	Endemic to relatively large, highly turbid vernal pools, playas, lakes, and grassy swales in the Central Valley from 16 to 5,577 feet (5-1,700 meters) in elevation (59 FR 48136). Six disjunct populations reported from Vina Plains in Tehama and Butte counties; greater Jepson Prairie in Solano County; Sacramento NWR in Sacramento County; Tule Ranch portion of Yolo Basin Wildlife Area in Yolo County; Grasslands Ecological Area, Flying M Ranch, Ichord Ranch, and Virginia Smith Trust lands in Merced County, single location in Stanislaus County; and two locations in the Los Padres National Forest in Ventura County (59 FR 48136). Designated critical habitat encompasses 8 units totaling 161,786 acres in Butte, Colusa, Mariposa, Merced, Solano, Stanislaus, Tehama, and Ventura counties (71 FR 7118).	This species is not known from Contra Costa County, and the study area is outside of its known range. The nearest occurrence was recorded in 2011 at the Montezuma Wetlands Vernal Pool Complex (EONDX# 61696), approximately 11.5 miles north of the study area.	Not Expected
Branchinecta longiantenna longhorn fairy shrimp	Fed: FE, CH CA: SA HCP/NCCP Covered	Species is extremely rare and endemic to small disjunct areas within Contra Costa, Alameda, Merced and San Luis Obispo counties. In the Livermore Vernal Pool Region of Alameda and Contra Costa counties, inhabits small, clear, sandstone outcrop vernal pools with low alkalinity (USFWS 2005a). Inhabits larger and warmer grassland pools with clear to turbid water in the San Joaquin and Carrizo Vernal Pool Regions from 75-2,887 feet (23-880 meters) (USFWS 2005a).	There are no suitable sandstone outcrop vernal pools within the study area. The specific locations of CNDDB occurrences are suppressed due to the sensitivity of the species, though they are known to occur at Vasco Caves Regional Preserve, approximately 9 miles southeast of the study area.	Not Expected

SPECIES NAME COMMON NAME	LISTING STATUS[1]	HABITAT REQUIREMENTS & ADDITIONAL NOTES	HABITAT SUITABILITY & LOCAL DISTRIBUTION	OCCURRENCE POTENTIAL
Branchinecta lynchi vernal pool fairy shrimp	Fed: FT, CH CA: SA HCP/NCCP Covered	Inhabit clear to tea-colored freshwater vernal pools in grass or mud bottomed swales, or basalt flow depression pools in unplowed grasslands (59 FR 48136, Eriksen and Belk 1999). Thirty-two known populations in the Central Valley from Shasta to Tulare counties, and along the Central and South Coast Ranges from Solano to San Benito counties (59 FR 48136). Often occur in low densities and rarely co-occurs with other branchiopod species (Eng et al. 1990, Simovich et al. 1992). Designated critical habitat encompasses 35 units totaling 597,821 acres in Jackson County in Oregon, and Alameda, Amador, Butte, Contra Costa, Fresno, Kings, Madera, Mariposa, Merced, Monterey, Napa, Placer, Sacramento, San Benito, San Joaquin, Alameda, Amador, Butte, Contra Costa, Fresno, Kings, Madera, Mariposa, Merced, Monterey, Napa, Placer, Sacramento, San Benito, San Joaquin counties in California (71 FR 7118).	There are eight occurrences of this species recorded with five miles of the study area. The nearest was reported in 2003 in vernal pools within grassland habitat approximately 0.7 mile to the north (EONDX# 52755). Suitable habitat may be present in seasonal wetlands along the northern edge of the study area.	Possible
Callophrys mossii bayensis San Bruno elfin butterfly	Fed: FE CA: SA	The San Bruno elfin butterfly is federally listed as endangered and is designated as critically imperiled by the Xerces Society's Red List of Pollinator Insects of North America. It is a small, brownish butterfly with a wingspan of 1 inch belonging to the Lycaenidae family. The primary larval host plant for the San Bruno elfin is broadleaf stonecrop (*Sedum spathulifolium*). Adult nectar plants include bladder parsnip (*Lomatium utriculatum*), hog fennel (*Lomatium dasycarpum*) and Oregon grape (*Berberis pinnata*) San Bruno elfin butterflies are relatively weak flyers, and move less than 0.25 miles between habitat patches. The adult flight period occurs between February and April. San Bruno elfin deposit their eggs on the underside of *S. spathulifolium* and the larvae hatch and begin feeding on its leaves within seven days (Shepherd et al. 2005). Beginning in June the larvae enter diapause within the soil and leaf litter around the base of the host plant. Extant populations are restricted to north facing slopes in the fog belt; three locales in San Mateo County (San Bruno Mountain, Montara Mountain and Milagra Ridge), two locales in Marin County (Alpine Lake and Dillon Beach) and one locale in Contra Costa County (Mount Diablo).	There is no suitable habitat within the study area. The study area is outside of the known range of the species.	None

SPECIES NAME COMMON NAME	LISTING STATUS[1]	HABITAT REQUIREMENTS & ADDITIONAL NOTES	HABITAT SUITABILITY & LOCAL DISTRIBUTION	OCCURRENCE POTENTIAL
Desmocerus californicus dimorphus valley elderberry longhorn beetle	Fed: FT, CH CA: SA	The Valley elderberry longhorn beetle is an elongate, red & black bodied beetle with long antenna measuring ½ to 1 inch in length. The valley elderberry longhorn beetle is a federally threatened species (CDFW 2017a), that is known to occur from southern Shasta County to Fresno County where elderberry bushes (*Sambucus* spp.) grow. The beetle inhabits living, “stressed” elderberry bushes, and their presence is often inferred based on oval exit holes created when individuals leave the inner shrub to mate and feed. For larvae to be successful in completing the cycle the stems of the elderberries must be at least 1.0 inch or greater in diameter at ground level (USFWS 1999b). The active period for adults occurs from March to June. This species is known to occur from southern Shasta County to Fresno County. Specimens have also been collected along the American River in Sacramento County, the Merced River at McConnel State Recreation Area, and Putah Creek in Solano County.	There are no elderberry bushes within the study area. There are no records of this species in Contra Costa County.	None
Lepidurus packardi vernal pool tadpole shrimp	Fed: FE, CH CA: SA HCP/NCCP Covered	A large, distinctive crustacean with an oval carapace and single, long pair of cercopods (59 FR 48136). Inhabits vernal pools and swales in the Sacramento Valley containing clear to highly turbid water; such pools are commonly found in grass bottomed swales of unplowed grasslands and are occasionally mud-bottomed and highly turbid (59 FR 48136). Designated critical habitat encompasses 18 units totaling 228,785 acres in Alameda, Amador, Butte, Colusa, Fresno, Kings, Madera, Mariposa, Merced, Sacramento, Shasta, Solano, Stanislaus, Tehama, Tulare, Yolo, and Yuba counties (71 FR 7118).	Suitable habitat may be present in seasonal wetlands along the northern edge of the study area. The nearest occurrence was recorded in 2003 in a claypan vernal pool complex (EONDX# 52749) approximately 1.3 miles north of the study area.	Possible
FISH:				
Hypomesus transpacificus Delta smelt	Fed: FT, CH CA: SE AFS-T	Inhabits brackish water in the Sacramento-San Joaquin Delta. Known from Sacramento/San Joaquin Delta, Sacramento River as high as the confluence with the Feather River, Mokelumne River, Cache Slough, Montezuma Slough, San Pablo Bay, Suisun Bay, Suisun Marsh, Carquinez Strait, and Napa River and Marsh. Spawns in freshwater habitat from February to August in shallow water areas with submersed aquatic plants, suitable substrates and refugia. Important spawning habitat include Barker, Lindsey, Cache, Prospect, Georgiana, Beaver, Hog, and Sycamore sloughs and the Sacramento River in the Delta, and tributaries of northern Suisun Bay. Critical habitat includes: areas of all water and all submerged lands below ordinary high water and the entire water column bounded by and contained in Suisun Bay (including Grizzly and Honker Bays); Goodyear, Suisun, Cutoff, First Mallard and Montezuma sloughs; and the existing contiguous waters contained within the Delta (59 FR 65256).	There is no suitable aquatic habitat for delta smelt within the study area.	None

SPECIES NAME COMMON NAME	LISTING STATUS[1]	HABITAT REQUIREMENTS & ADDITIONAL NOTES	HABITAT SUITABILITY & LOCAL DISTRIBUTION	OCCURRENCE POTENTIAL
Oncorhynchus mykiss irideus steelhead – central California coast DPS	Fed: FT, CH CA: SA AFS-TH	This species is an anadromous fish that spend several years in the ocean; returning to freshwater rivers and tributaries to spawn and rear. Listing includes all naturally spawned anadromous steelhead populations below natural and human-made impassable barriers in California streams from the Russian River (inclusive) to Aptos Creek (inclusive), and the drainages of San Francisco, San Pablo, and Suisun Bays eastward to Chipps Island at the confluence of the Sacramento and San Joaquin Rivers (70 FR 37160). Tributary streams to Suisun Marsh including Suisun Creek, Green Valley Creek, and an unnamed tributary to Cordelia Slough (commonly referred to as Red Top Creek), excluding the Sacramento-San Joaquin River Basin, as well as two artificial propagation programs: the Don Clausen Fish Hatchery, and Kingfisher Flat Hatchery/ Scott Creek (Monterey Bay Salmon and Trout Project) steelhead hatchery programs (70 FR 37160).	There is no suitable aquatic habitat for anadromous fish within the study area.	None
Oncorhynchus mykiss irideus steelhead - California Central Valley DPS	Fed: FT CA: SA AFS-T	An anadromous fish that spends several years in the ocean; returning to freshwater rivers to spawn and rear. Listing includes all naturally spawned anadromous steelhead populations (and their progeny) below natural and manmade impassable barriers in the Sacramento and San Joaquin Rivers and their tributaries, excluding steelhead from San Francisco and San Pablo Bays and their tributaries, as well as two artificial propagation programs: the Coleman NFH, and Feather River Hatchery steelhead hatchery programs (70 FR 37160). Designated critical habitat encompasses 2,308 miles streams, 254 square miles estuary habitat in Tehama, Butte, Glenn, Shasta, Yolo, Sacramento, Solano, Yuba, Sutter, Placer, Calaveras, San Joaquin, Stanislaus, Tuolumne, Merced, Alameda, Contra Costa counties (70 FR 52488). The North Diablo Range watershed and South San Francisco Bay entire unit were excluded from the designation based on their potential economic impact (70 FR 52488). Primary constituent elements include: (1) freshwater spawning sites, (2) freshwater rearing sites, (3) freshwater migration corridors free of obstructions, (4) estuarine areas free of obstructions, and (5) nearshore marine areas free of obstructions (70 FR 52488).	There is no suitable aquatic habitat for anadromous fish within the study area.	None

Species Name Common Name	Listing Status[1]	Habitat Requirements & Additional Notes	Habitat Suitability & Local Distribution	Occurrence Potential
AMPHIBIANS:				
Ambystoma californiense California tiger salamander Central California DPS	Fed: FT, CH CA: ST HCP/NCCP Covered	A large terrestrial salamander that inhabits seasonal/semi-permanent water sources (3-4 months in duration) and adjacent upland habitat with small fossorial mammal activity in lowland grasslands, oak savannah and mixed woodlands. Range includes the Central Valley and Central Coast ranges from Colusa County south to San Luis Obispo and Kern counties from sea level to 3,460 feet (1,054 meters) in elevation with two disjunct populations within Sonoma County and Santa Barbara County. Species have been documented traveling distances up to 1 mile (1.6 km) (Austin and Shaffer 1992).	Suitable breeding habitat is present in the artificial ponds and wetlands on site, and suitable upland habitat is present in grasslands throughout the study area. There are 53 occurrences of the species within 5 miles of the study area, 10 of which are within one mile. The nearest occurrence was recorded in 1998 in a complex of ponds and vernal pools just north of Empire Mine Road (EONDX #33748), approximately 0.1 mile north of the study area. This species is well-distributed throughout eastern Contra Costa County. The study area contains both “Potential Breeding Habitat” and “Suitable Migration and Aestivation Habitat” as mapped by the HCP/NCCP.	Possible
Rana boylii foothill yellow-legged frog (West/Central coast clade)	Fed: None CA: SE, SSC HCP/NCCP Covered	A medium-sized frog that inhabits rocky, cascading streams in woodland, chaparral and coniferous forests. The current known range of the West/Central Coast clade extends south from the San Francisco Bay through the Diablo Range and down the peninsula through the Santa Cruz and Gabilan Mountains in the Coast Range east of the Salinas Valley.	There is no suitable rocky/cobbly stream habitat within the study area. The only CNDDB occurrence within 5 miles was recorded in 1953 in an area east of Mount Diablo (EONDX #76065), and is considered extirpated.	None

SPECIES NAME COMMON NAME	LISTING STATUS[1]	HABITAT REQUIREMENTS & ADDITIONAL NOTES	HABITAT SUITABILITY & LOCAL DISTRIBUTION	OCCURRENCE POTENTIAL
Rana draytonii California red-legged frog	Fed: FT, CH CA: SSC HCP/NCCP Covered	A medium-sized frog that inhabits lowlands & foothills in or near permanent sources of deep water with dense, shrubby or emergent riparian vegetation up to 4,921 feet (1,500 meters) in elevation (Jennings and Hayes 1994, Bulger et al. 2003, Stebbins 2003). Range extends from Redding to Baja California, Mexico with hybridization occurring with the California red-legged frog from the Oregon border to Marin County. Breeding occurs between November and April in standing or slow moving water with emergent vegetation, such as cattails (*Typha* spp.), tules (*Scirpus* spp.) or overhanging willows (*Salix* spp.) (Hayes and Jennings 1988). Larvae undergo metamorphosis 3 ½ to 7 months following hatching (Jennings and Hayes 1984, 1994).	Suitable breeding habitat is present in the seasonal wetlands and artificial ponds on site. Upland habitat is present in grasslands throughout the study area. There are 32 documented CNDDB occurrences within 5 miles of the study area. Two of these occurrences (EONDX #75682 and #75679) were recorded within the study area in 2009, in seasonal wetlands along the northern edge of the site boundary. The study area contains both “Potential Breeding Habitat” and “Potential Migration and Aestivation Habitat” as mapped by the HCP/NCCP.	Possible
REPTILES:				
Masticophis lateralis euryxanthus Alameda whipsnake	Fed: FT, CH CA: ST HCP/NCCP Covered	The Alameda whipsnake is a subspecies of the California whipsnake, *Masticophis lateralis*, which inhabits the foothills and mixed deciduous and pine forests of the Sierra Nevada and Coast Range mountains from Siskiyou County in northern California to the flatland desert in Cañon de Los Reyes in southern Baja California (Stebbins 2003). The Alameda whipsnake inhabits the inner Coast Ranges in western and central Contra Costa and Alameda counties (Jennings 1983, McGinnis 1992, Swaim 1994). Habitat fragmentation has restricted its range into five recognized subpopulations: Tilden-Briones population, Oakland-Las Trampas population, Hayward-Pleasanton Ridge population, Mount Diablo-Black Hills population, and Sunol-Cedar Mountain population.	There is suitable dispersal habitat in grasslands throughout the study area. Suitable oak woodland and scrub habitat is present in the hills and valleys west and south of the site, and individuals residing in these areas may enter the study area during dispersal movements. There are 9 occurrences of the species within 5 miles of the study area. The nearest was recorded in 2003 in chaparral/oak woodland habitat in the eastern portion of Black Diamond Mines Regional Preserve (EONDX #57893), approximately 1.25 miles northwest of the study area. The study area contains “Movement Habitat” as mapped by the HCP/NCCP.	Possible

SPECIES NAME COMMON NAME	LISTING STATUS[1]	HABITAT REQUIREMENTS & ADDITIONAL NOTES	HABITAT SUITABILITY & LOCAL DISTRIBUTION	OCCURRENCE POTENTIAL
Thamnophis gigas giant garter snake	Fed: FT CA: ST HCP/NCCP Covered	The most aquatic of California garter snakes, this species prefers freshwater marsh and low-gradient streams, and has adapted to drainage canals and irrigation ditches (CNDDB 2017) predominantly in the Central Valley.	There is no suitable giant garter snake habitat within the study area or the surrounding vicinity. There are no CNDDB occurrences of giant garter snake within 5 miles of the study area. The study area does not contain any suitable habitat for giant garter snake as mapped in the HCP/NCCP.	None
BIRDS:				
Agelaius tricolor tricolored blackbird (nesting colony)	Fed: BCC CA: ST, SSC HCP/NCCP Covered	Highly colonial species, most numerous in the Central Valley & vicinity. Largely endemic to California. Nest in emergent vegetation within aquatic and riparian habitats. Breeds from mid-March through early August; double-brooded (Baicich & Harrison 2005, Shuford and Gardali 2008).	Suitable nesting habitat is present in seasonal wetlands and artificial ponds present within the study area. There are two CNDDB occurrences of breeding tricolored blackbirds within 5 miles of the study area. One of these occurrences (EONDX #101790) is located on site, representing the observation of approximately 30 individuals in 2015 at the artificial ponds. The study area contains "Suitable Core Habitat" and "Primary Foraging Habitat" as mapped by the HCP/NCCP.	Possible (nesting)
Aquila chrysaetos golden eagle	Fed: BGEPA, BCC CA: WL, FP HCP/NCCP Covered and No-Take	A large diurnal raptor that nests on cliffs and in large trees in open areas. Forages in open terrain including grasslands, deserts, savannahs and early successional stages of forest and shrub habitats (Kochert et al. 2002). A year-round resident in the greater Bay Area. Breeding begins in February to late May; single-brooded (Baicich & Harrison 2005)	Suitable nesting habitat is present in large trees within the study area. There are no CNDDB occurrences of golden eagle within 5 miles of the study area. The study area contains "Suitable Habitat" as mapped by the HCP/NCCP.	Possible

SPECIES NAME COMMON NAME	LISTING STATUS[1]	HABITAT REQUIREMENTS & ADDITIONAL NOTES	HABITAT SUITABILITY & LOCAL DISTRIBUTION	OCCURRENCE POTENTIAL
Buteo swainsoni Swainson's hawk (nesting)	Fed: BCC CA: ST HCP/NCCP Covered	A gregarious summer resident that inhabits open grasslands, shrublands, woodlands, and agricultural areas throughout the Central Valley and the valleys of the Sierra Nevada in Inyo and Mono counties (England et al. 1997). Nests are built in a variety of trees and shrubs; breeding occurs from March to August and are single brooded (Baicich & Harrison 2005).	Suitable nesting habitat is present in trees located within and adjacent to the study area. There are 10 CNDDB occurrences of Swainson's hawk within 5 miles of the study area. The closest was recorded in 2012 on a hillside dominated by blue oak woodland (EONDX #88710) approximately 0.75 mile south of the study area. Two other recent occurrences (EONDX #88711 and #103661) were recorded along the same hillside. Multiple Swainson's hawks were observed in flight over the study area during the reconnaissance site visit in July 2020. The study area is outside of mapped breeding and foraging habitat in the HCP/NCCP.	Possible (nesting)
Elanus leucurus white-tailed kite	Fed: None CA: FP HCP/NCCP No-Take	Inhabits grasslands, agriculture fields, oak woodlands, savannah and riparian habitats in rural and urban areas. Feeds primarily on California voles. Year-round resident of Central and Coastal California. Breeding begins in February; sometimes double-brooded (Baicich & Harrison 2005).	Suitable nesting habitat is present in trees scattered throughout the study area, and the species may forage in grasslands anywhere on site. There is one CNDDB occurrence within 5 miles, recorded in 2005 along Highway 4 (EONDX #64534), approximately 4 miles northeast of the study area. White-tailed kites are relatively common in open areas in Contra Costa County (eBird 2020).	Possible (nesting)
Rallus obsoletus Ridgway's rail	Fed: FE CA: SE, FP	Restricted to the San Francisco Bay Area. Inhabits coastal wetlands dominated by pickleweed (*Salicornia* spp.) and cordgrass (*Spartina* spp.). Wintering habitat similar to breeding habitat. Breeding begins in March; single-brooded (Baicich & Harrison 2005).	There is no suitable coastal wetland or marsh habitat within or adjacent to the study area. There are no CNDDB occurrences of Ridgway's rail within 5 miles of the study area.	None

SPECIES NAME COMMON NAME	LISTING STATUS[1]	HABITAT REQUIREMENTS & ADDITIONAL NOTES	HABITAT SUITABILITY & LOCAL DISTRIBUTION	OCCURRENCE POTENTIAL
Sternula antillarum browni California least tern (nesting colony)	Fed: FE CA: SE, FP	Breeds in colonies on bare soil, sand and mudflats along the California coast and the San Francisco Bay Area. Winters south to Mexico. Breeding begins in May; single-brooded (Baicich & Harrison 2005).	There is no suitable sandy beach or coastal habitat within or adjacent to the study area. There are no CNDDB occurrences of the species within 5 miles of the study area.	None (nesting colony)
MAMMALS:				
Puma concolor mountain lion (Southern California/Central Coast ESU)	Fed: None CA: SCT	Large, slender cats with large home ranges, requiring relatively undisturbed areas. Inhabit many different habitat types, including conifer forests, oak and riparian woodlands, scrub, chaparral, grasslands, and deserts. The Southern California/Central Coast ESU includes all populations from the San Francisco Bay Area south along the Coast Ranges, and throughout Southern California from Interstate 15 southward to the Mexico border, and eastward to the Nevada and Arizona borders (CBD and MLF 2019).	Suitable habitat is present throughout the study area. The CNDDB does not track occurrences of Southern California/Central Coast mountain lions, but the study area is within the known range of this ESU (CBD and MLF 2019).	Possible
Vulpes macrotis mutica San Joaquin kit fox	Fed: FE CA: ST HCP/NCCP Covered	The smallest North American canid, the kit fox inhabits valley bottom and foothills from southern Kern County north to Contra Costa, Alameda, and San Joaquin Counties on the west, and near La Grange, Stanislaus County on the east side of the Central Valley and some of the larger scattered islands of natural land on the Valley floor in Kern, Tulare, Kings, Fresno, Madera, and Merced Counties (USFWS 1998). Species occupies habitats with open or low vegetation with loose soils. In the northern portion of their range, they occupy grazed grasslands and to a lesser extent valley oak woodlands (USFWS 1998). Kit fox are also found in grazed grasslands including areas adjacent to tilled or fallow fields, and suburban settings (USFWS 1998). Requires loose-textured sandy soils for burrowing, and a suitable prey base.	Suitable grassland habitat is present throughout the study area. There are 7 occurrences of San Joaquin kit fox within 5 miles of the study area. The nearest was recorded in 1975 along Deer Valley Road (EONDX #67969), approximately 2 miles southeast of the study area. Other occurrences were recorded in the early to mid-1990's in and around Black Diamond Mines Regional Preserve and Contra Loma Reservoir (EONDX #41364, 41367, 67419, and 67418), between 2.5 and 5 miles northwest of the study area. The study area contains "Suitable Core Habitat" as mapped by the HCP/NCCP.	Possible

SPECIES NAME COMMON NAME	LISTING STATUS[1]	HABITAT REQUIREMENTS & ADDITIONAL NOTES	HABITAT SUITABILITY & LOCAL DISTRIBUTION	OCCURRENCE POTENTIAL
<u>SENSITIVE AND LOCALLY RARE SPECIES</u>				
<u>INVERTEBRATES:</u>				
Andrena blennospermatis Blennosperma vernal pool andrenid bee	Fed: None CA: SA	A native solitary bee that specializes in pollinating yellow carpet (*Blennosperma* spp.) within vernal pools. These bees inhabit the soils in adjacent uplands surrounding vernal pools.	No suitable habitat is present. The study area lacks vernal pools, and the host plant, *Blennosperma* spp., is absent. There is one CNDDB occurrence within 5 miles, recorded on an unknown date in Black Diamond Mines Regional Preserve (EONDX #59380), approximately 3.5 miles northwest of the study area.	None
Branchinecta mesovallensis- midvalley fairy shrimp	Fed: None CA: SA HCP/NCCP Covered	Endemic to the Central Valley vernal pools and artificial habitats such as roadside ditches and railroad toe-drains. Restricted to the Southeastern Sacramento, Southern Sierra Foothill, San Joaquin, and Solano-Colusa Vernal Pool regions (USFWS 2005a). Inhabits vernal pools and grassy swales; species tolerant of warm water and extremely short-lived pools/swales (USFWS 2005a). Reported from Jepson Prairie, Travis Air Force Base, Mather Field, Byron Airport, Haystack Mountain, Arena Plains National Wildlife Reserve in Solano, Sacramento, Contra Costa, San Joaquin, Merced, Madera and Fresno counties. May co-occur with vernal pool fairy shrimp (USFWS 2005a).	Suitable habitat may be present in seasonal wetlands along the northern edge of the study area. The nearest CNDDB occurrence was recorded on an unknown date near Marsh Creek Road (EONDX #48372), approximately 7 miles southeast of the study area.	Possible
Bombus caliginosus obscure bumble bee	Fed: None CA: SA	Occurs along the Pacific Coast from southern California to southern British Columbia, with scattered records from the east side of California's Central Valley.	Suitable grassland habitat is present throughout the study area. The nearest CNDDB occurrence was recorded in 1977 in Mount Diablo State Park (EONDX #97885), approximately 7 miles southwest of the study area. There are no recent verified records of obscure bumble bee anywhere in the greater Bay Area (Bumble Bee Watch 2020), though the study area is within their formerly known range.	Possible

SPECIES NAME COMMON NAME	LISTING STATUS[1]	HABITAT REQUIREMENTS & ADDITIONAL NOTES	HABITAT SUITABILITY & LOCAL DISTRIBUTION	OCCURRENCE POTENTIAL
Danaus plexippus pop. 1 monarch butterfly - California overwintering population	Fed: None CA: SA	Along the California Coast, overwintering roosts typically occur in wind-protected groves of eucalyptus, pine, and cypress trees within 1 kilometer of the coast. The winter migratory lifespan reaches >9 months and adults return to northern habitats in spring.	No suitable wind-protected tree groves are present, and the study area is too far inland to support overwintering aggregations. A potential hostplant, narrowleaf milkweed (*Asclepias fascicularis*), was abundant on site during the July 2020 site reconnaissance visit. There are no CNDDB occurrences of overwintering monarch butterflies within 5 miles of the study area.	Possible
Helminthoglypta nickliniana bridgesi Bridges' coast range shoulderband (snail)	Fed: None CA: SA	Inhabits open hillsides and lowland grassland areas with thistles, weeds and rock piles. The Bridges' Coast Range shoulderband snail's range includes Contra Costa County and northern Alameda County, as well as on the west slope of the Berkeley Hills, Marsh Creek Canyon, Tilden Park and Point Isabel (Roth 1999).	Suitable grassland habitat is present throughout the study area. There is only one CNDDB occurrence within 5 miles, recorded on an unspecified date on the eastern face of Mount Diablo (EONDX #23088), approximately 4.5 miles southwest of the study area.	Possible
Linderiella occidentalis California linderiella	Fed: None CA: SA	An aquatic crustacean in the Anostroca family smaller than the vernal pool fairy shrimp with distinctive red eyes. Inhabit clear large vernal pools and lakes, but are fairly tolerant of high water temperatures and turbidity. Most common fairy shrimp in the Central Valley.	Suitable habitat may be present in seasonal wetlands along the northern edge of the study area. There are 4 CNDDB occurrences of California linderiella within 5 miles of the study area. The nearest was recorded in 2006 in a series of seasonal wetlands and stock ponds west of Deer Valley Road (EONDX #94503), approximately 0.2 mile east of the study area.	Possible
Lytta molesta molestan blister beetle	Fed: None CA: SA	There is limited life history information known about the molestan blister beetle, though it has been found inhabiting dry vernal pools on plants including *Lupinus* spp. (Halstead and Haines 1992), *Trifolium wormskioldii* (Holstein 1980), and *Eriodium* spp. (Selander 1960). They range from 11-22 mm in body length. Identified by black coloration with orange markings on the thorax. The larvae are nest parasites of solitary bees. Recorded from Tulare, Kern, Yolo, Contra Costa, Fresno, Merced, and Madera counties.	No vernal pool habitat present within the study area. *Lupinus* spp. and non-native *Eriodium* spp. are present on site, but are not associated with vernal pools. There are 2 historic CNDDB occurrences within 5 miles. The nearest was recorded in 1945 (EONDX #12876) approximately 2 miles southeast of the study area.	Not Expected

SPECIES NAME COMMON NAME	LISTING STATUS[1]	HABITAT REQUIREMENTS & ADDITIONAL NOTES	HABITAT SUITABILITY & LOCAL DISTRIBUTION	OCCURRENCE POTENTIAL
Metapogon hurdi Hurd's metapogon robberfly	Fed: None CA: SA	Predaceous fly that feeds on other insects. Type locality from Antioch; paratypes collected from unspecified location near Fresno in 1922. Virtually nothing is known about the population sites, life histories, or habitat requirements of this species, other than that they may prefer sandy soils (USFWS 2002).	There is marginally suitable sandy soil habitat in former sand traps within the study area, although they were managed for golf course operations and subject to continuous disturbance for decades. The only CNDDB occurrence within 5 miles was recorded in 1975 at the Antioch Dunes National Wildlife Refuge (EONDX #60265).	Not Expected
REPTILES:				
Anniella pulchra northern California legless lizard	Fed: None CA: SSC HCP/NCCP Covered	A small legless lizard measuring up to 7 inches in length with shovel-shaped nose and blunt tail. Displays distinct coloration: a bright silver dorsal surface with a yellowish underbelly and a single black dorsal stripe. Feeds on a variety of insects, beetles, and arachnids. Inhabits sandy or loose loamy soils and leaf litter from Contra Costa County to northwestern Baja. Occurs in moist warm loose soil with plant cover. Occurs in sparsely vegetated areas of beach dunes, chaparral, pine-oak woodlands, desert scrub, sandy washes, and stream terraces with sycamores, cottonwoods, or oaks. Leaf litter under trees and bushes in sunny areas and dunes stabilized with bush lupine and mock heather often indicate suitable habitat (Nafis 2020).	There is marginal sandy soil habitat isolated in former sand traps within the study area, although they were managed for golf course operations and subject to continuous disturbance for decades. There is no natural sandy soil habitat within the study area. There are two CNDDB occurrences reported within 5 miles of the study area. The closest was recorded in 2004 in sandy soil near rock outcrops (EONDX #50217) approximately 0.8 mile northwest of the study area. The study area is not mapped as "Suitable Habitat" by the HCP/NCCP.	Not Expected

SPECIES NAME COMMON NAME	LISTING STATUS[1]	HABITAT REQUIREMENTS & ADDITIONAL NOTES	HABITAT SUITABILITY & LOCAL DISTRIBUTION	OCCURRENCE POTENTIAL
Emys marmorata western pond turtle	Fed: None CA: SSC HCP/NCCP Covered	A moderate sized freshwater turtle that inhabits permanent or nearly permanent bodies of water and low gradient slow moving streams below 6,000 feet elevation. Range extends from Washington to the northern Bay Area counties along the Pacific slope drainages. Two recognized subspecies the northwestern pond turtle (*E. m. marmorata*) which ranges north of the American River and the southwestern pond turtle (*E. m. pallida*) which ranges from the coastal areas south of San Francisco. Subspecies interbreed within the gradation zone that defines the two subspecies.	Suitable aquatic habitat is present in the artificial ponds and seasonal wetlands present along the northern edge of the study area. There are 5 CNDDB occurrences of western pond turtle within 5 miles of the study area. The nearest was recorded in 2016 in Marsh Creek (EONDX #2205), approximately 2.1 miles south of the study area. Although not recorded in the CNDDB as an occurrence of western pond turtle, an occurrence of California red-legged frog recorded in 2003 in stock ponds 0.15 mile north of the study area (EONDX #33749) noted that western pond turtles were also present. The study area contains “Core Habitat” as mapped by the HCP/NCCP.	Possible
Phrynosoma blainvillii Blainville’s horned lizard	Fed: None CA: SSC	A dorsoventrally flattened lizard with several spiny dorsal scales and backward projecting spines on the head. Inhabits a variety of habitats including scrub, chaparral, grasslands, and woodlands with sandy to gravelly substrate from Shasta County to Los Angeles County within the Sacramento and San Joaquin Valleys and neighboring foothills. Active from April-October, peaking in April/May. Diet consists of native ants and beetles, but may also feed on other insects that are seasonally abundant.	Suitable grassland habitat is present throughout the study area. There is marginally suitable sandy soil habitat in former sand traps, although they were managed for golf course operations and subject to continuous disturbance for decades. The nearest CNDDB occurrence was recorded in 2002 in Mount Diablo State Park (EONDX #84126), approximately 7 miles west of the study area.	Possible

SPECIES NAME COMMON NAME	LISTING STATUS[1]	HABITAT REQUIREMENTS & ADDITIONAL NOTES	HABITAT SUITABILITY & LOCAL DISTRIBUTION	OCCURRENCE POTENTIAL
BIRDS:				
Ammodramus savannarum grasshopper sparrow (nesting)	Fed: None CA: SSC	An inconspicuous sparrow that inhabits moderately open grasslands and prairies with patchy bare ground, cultivated fields and forest clearings with short to moderately tall grasses and scattered shrubs (Vickery 1996, Baicich & Harrison 2005, Shuford and Gardali 2008). Areas with native bunchgrasses are important features in southern California (Shuford and Gardali 2008). Breeds from mid-March through August; double or triple-brooded (Baicich & Harrison 2005, Shuford and Gardali 2008).	Suitable nesting habitat is present grassland habitat throughout the study area. There are no CNDDB occurrences of grasshopper sparrow within 5 miles of the study area, though this species is likely under-reported. They are regularly observed in Contra Costa County during the breeding season (eBird 2020).	Possible (nesting)
Athene cunicularia western burrowing owl	Fed: BCC CA: SSC HCP/NCCP Covered	Valley bottoms and foothills with low vegetation and fossorial mammal activity. Listing includes wintering observations with/without a burrow in San Francisco, Ventura, Sonoma, Marin, Napa and Santa Cruz counties. Breeding begins in March; single-brooded (Baicich & Harrison 2005).	Suitable habitat is present in grasslands throughout the study area. There are 33 CNDDB occurrences of burrowing owl within 5 miles of the study area, primarily within urbanized areas of Antioch, Brentwood, and Oakley. The closest occurrence was recorded in 2003 just north of Empire Mine Road (EONDX #52714), approximately 0.1 mile north of the study area. Additionally, a wintering burrow owl was observed in January 2019 in the Horse Valley Restoration Area (Nomad personal observation), approximately 0.1 mile northwest of the study area. The study area contains "Suitable Habitat" as mapped by the HCP/NCCP.	Possible
Buteo regalis ferruginous hawk (wintering)	Fed: BCC CA: WL	Breeds in the northern states and Canada; winters south from California and Texas to Mexico. Wintering habitat consists of open grasslands, deserts and cultivated fields. Breeding begins in April; single-brooded (Baicich & Harrison 2005).	Suitable wintering habitat is present in grasslands throughout the study area. Ferruginous hawks do not breed in California. There are no CNDDB occurrences of ferruginous hawk within 5 miles of the study area, though this species is likely under-reported. They are regularly observed in Contra Costa County during the wintering season (eBird 2020).	Possible (wintering)

Species Name Common Name	Listing Status[1]	Habitat Requirements & Additional Notes	Habitat Suitability & Local Distribution	Occurrence Potential
Circus hudsonius northern harrier (nesting)	Fed: None CA: SSC	Inhabits both freshwater and saltwater marshes and adjacent upland grasslands. Nests on the ground in tall grasses in grasslands and meadows. Breeding begins in March; single-brooded (Baicich & Harrison 2005).	Marginally suitable nesting habitat is present in grasslands throughout the study area. There are no CNDDB occurrences of northern harrier within 5 miles of the study area, though this species is likely under-reported. They are regularly observed in Contra Costa County during the breeding season (eBird 2020).	Possible (nesting)
Eremophila alpestris actia California horned lark	Fed: None CA: WL	Common, abundant resident in a variety of open habitats, usually where large trees and shrubs are absent, ranging from low-elevation grasslands and deserts to dwarf shrub habitats above tree line. Found throughout much of the state. Less common in mountainous areas of the north coast and in conifer and chaparral habitats. Breeding begins in late-February; double to treble-brooded (Baicich & Harrison 2005).	Suitable nesting habitat is present in grasslands throughout the study area. There are no CNDDB occurrences of horned lark within 5 miles of the study area, though this species is likely under-reported. They are regularly observed in Contra Costa County during the breeding season (eBird 2020).	Possible
Falco mexicanus prairie falcon (nesting)	Fed: BCC CA: WL	Nests on cliffs & at times in old raven or eagle stick nests on cliff, bluff, or rock outcrop. Inhabits perennial grasslands, savannahs, rangeland, some agricultural fields, & desert scrub communities. Breeding begins in April; single-brooded (Baicich & Harrison 2005).	There is no suitable cliff nesting habitat within the study area. Prairie falcons range widely, and individuals nesting far from the site may still forage on or transit through the site at any time. Specific occurrence for this species are suppressed in the CNDDB, but they are regularly observed in Contra Costa County during the breeding season (eBird 2020).	None (nesting)
Falco peregrinus anatum American peregrine falcon	Fed: BCC CA: FP HCP/NCCP No-Take	Typically a year-round resident in California and most common along the coast. Nests on cliffs, but frequently uses human-made structures such as bridges and buildings. Nests are generally located close to water bodies with abundant avian prey. Breeding begins in March; single-brooded (Baicich & Harrison 2005).	There is no suitable cliff nesting habitat within the study area. Prairie falcons range widely, and individuals nesting far from the site may still forage on or transit through the site at any time. Specific occurrence for this species are suppressed in the CNDDB, but they are regularly observed in Contra Costa County during the breeding season (eBird 2020).	None (nesting)

SPECIES NAME COMMON NAME	LISTING STATUS[1]	HABITAT REQUIREMENTS & ADDITIONAL NOTES	HABITAT SUITABILITY & LOCAL DISTRIBUTION	OCCURRENCE POTENTIAL
Lanius ludovicianus loggerhead shrike (nesting)	Fed: BCC CA: SSC	Year-round resident in California. Inhabits shrublands and open woodlands associated with grasslands with areas bare ground and impaling sites such as thorny vegetation, multi-stemmed plants or barbed wire (Shuford and Gardali 2008). Breeds from early February through July; double- to triple-brooded (Baicich & Harrison 2005, Shuford and Gardali 2008).	Suitable nesting habitat is present in shrubs and trees scattered throughout grasslands within the study area. There are no CNDDB occurrences of loggerhead shrike within 5 miles of the study area, though this species is likely under-reported. They are regularly observed in Contra Costa County during the breeding season (eBird 2020). A loggerhead shrike was observed within the study area during the reconnaissance survey in July 2020.	Possible (nesting)
Melospiza melodia song sparrow ("Modesto" population)	Fed: None CA: SSC	The Modesto Song Sparrow is endemic to California, where it resides only in the north-central portion of the Central Valley (Shuford and Gardali 2008). Highest densities occur in the Butte Sink area of the Sacramento Valley and in the Sacramento–San Joaquin River Delta (PRBO unpubl. data). The song sparrow nests in emergent freshwater marshes dominated by tules (*Scirpus* spp.) and cattails (*Typha* spp.) as well as riparian willow (*Salix* spp.) thickets (Grinnell and Miller 1944). These Song Sparrows also nest in riparian forests of Valley Oak (*Quercus lobata*) with a sufficient understory of blackberry (*Rubus* spp.), along vegetated irrigation canals and levees, and in recently planted Valley Oak restoration sites (DiGaudio and Geupel 1998, PRBO unpubl. data).	Locally, this subspecies is generally restricted to riverine and riparian areas of the Sacramento/San Joaquin Delta, and the study area is at the far periphery of their range. The only CNDDB occurrence of this subspecies within 5 miles was recorded in 1901 with only "Antioch" given as its locality (EONDX #91061), and was mapped approximately 4.7 miles north of the study area. Several recent occurrences of this subspecies are located in the Delta region, greater than 10 miles to the east.	Not Expected
MAMMALS:				
Antrozous pallidus pallid bat	Fed: None CA: SSC WBWG-H	Inhabits rocky terrain in open areas in lowlands, foothills and mountainous areas near water throughout California below 2,000 meters. Roost in caves, rock crevices, mines, hollow trees, buildings and bridges in arid regions in low numbers (<200). Active from March-November; migrates in some areas, but may hibernate locally.	Suitable roosting habitat is present in the trees and existing structures (pumphouse and restrooms) within the study area. The only CNDDB occurrence of pallid bat within 5 miles was recorded in 1929 along Morgan Territory Road (EONDX #66597), approximately 5 miles southwest of the study area.	Possible

Species Name Common Name	Listing Status[1]	Habitat Requirements & Additional Notes	Habitat Suitability & Local Distribution	Occurrence Potential
Corynorhinus townsendii Townsend's western big-eared bat	Fed: None CA: SSC WBWG-H HCP/NCCP Covered	An obligate cave-roosting species and moth specialist. Inhabits caves and mines, but may also use bridges, buildings, rock crevices and hollows in very large trees in coastal lowlands, cultivated valleys and nearby hills characterized by mixed vegetation throughout California below 3,300 meters. Exhibits high site fidelity and is highly sensitive to disturbance. Forages along edge habitats near water; may travel long distances during foraging bouts.	Marginally suitable roosting habitat is present in the existing structures (pumphouse and restrooms) within the study area. There are no CNDDB occurrences of Townsend's big-eared bat within 5 miles of the study area, though this species is likely under-reported. The closest occurrence was recorded in 1977 in Mount Diablo State Park (EONDX #93520), approximately 6 miles to the southwest.	Possible
Lasiurus blossevillii western red bat	Fed: None CA: SSC WBWG-H	Primarily associated with intact riparian habitat; species is ubiquitous throughout most of California except the northern Great Basin region. Roosts individually in foliage within trees along riparian areas, orchards and suburban areas. Favors cottonwoods, willows, sycamores, and walnut trees (WBWG 2020). Feeds primarily on moths, but will eat a variety of other insects.	Suitable roosting habitat is present in trees scattered throughout the study area. The only CNDDB occurrence within 5 miles was recorded in 1998 in Antioch (EONDX #69704), approximately 3.75 miles north of the study area.	Possible
Lasiurus cinereus hoary bat	Fed: None CA: SA WBWG-M	Ubiquitous throughout California. A solitary foliage rooster that prefers evergreens, but will use deciduous trees in forested habitats, particularly in edge habitat (WBWG 2020). May forage in small to large groups. Feeds primarily on moths, but will eat a variety of other insects. Migrates great distances.	Suitable roosting habitat is present in trees scattered throughout the study area. There are no CNDDB occurrences of hoary bat within 5 miles of the study area, though this species is likely under-reported. The closest occurrence was recorded in 1957 in Concord (EONDX #68776), approximately 12 miles to the west.	Possible
Myotis evotis long-eared myotis bat	Fed: None CA: SA WBWG-M	Typically inhabits brushy woodland habitats and coniferous forests up to 2,800 meters throughout California except the Central Valley and deserts. Roosts in a variety of habitats including exfoliating bark, tree hollows, caves, rotten stumps, snags, cliff crevices and bridges. A foliage gleaner that requires nearby water.	Suitable roosting habitat is present in the trees and existing structures (pumphouse and restrooms) within the study area. There are no CNDDB occurrences of long-eared myotis within 5 miles of the study area, though this species is likely under-reported.	Possible

SPECIES NAME COMMON NAME	LISTING STATUS[1]	HABITAT REQUIREMENTS & ADDITIONAL NOTES	HABITAT SUITABILITY & LOCAL DISTRIBUTION	OCCURRENCE POTENTIAL
Myotis thysanodes fringed myotis bat	Fed: None CA: SA WBWG-H	Exhibits a strong roosting preference for large trees and snags, but will use buildings, caves, rock crevices, *etc*., if necessary. Inhabits a variety of woodland, scrub and grassland habitats up to 2,850 meters throughout California except for Central Valley and southern deserts. Forages great distances and is active during winter months. Highly sensitive to human disturbance.	Suitable roosting habitat is present in the trees and existing structures (pumphouse and restrooms) within the study area. There are no CNDDB occurrences of fringed myotis within 5 miles of the study area, though this species is likely under-reported.	Possible
Myotis volans long-legged myotis bat	Fed: None CA: SA WBWG-H	Primarily occurs in coniferous forests, but also occurs seasonally in riparian and desert habitats. Most common in woodland and forest habitats above 1200 m (4000 ft). Also forages in chaparral, coastal scrub, Great Basin shrub habitats, and in early successional stages of woodlands and forests. Roosts under exfoliating bark in small groups, but may also use rock crevices, cliffs and human-made structures in absence of old growth trees. Forages aerially around the forest canopy.	Suitable roosting habitat is present in the trees and existing structures (pumphouse and restrooms) within the study area. There are no CNDDB occurrences of long-legged myotis within 5 miles of the study area, though this species is likely under-reported.	Possible
Myotis yumanensis Yuma myotis bat	Fed: None CA: SA WBWG-L	A riparian obligate species. Ubiquitous throughout California. Inhabits riparian areas near permanent water sources. Roosts in a variety of habitats including bridges, buildings, caves, mines, cliff crevices and trees. Forages above water and in riparian areas.	Suitable roosting habitat is present in the trees and existing structures (pumphouse and restrooms) within the study area. There are no CNDDB occurrences of Yuma myotis within 5 miles of the study area, though this species is likely under-reported.	Possible
Perognathus inornatus inornatus San Joaquin pocket mouse	Fed: None CA: SA	Endemic to California. Inhabits grasslands and blue oak woodlands with friable soils in the foothills and valley bottoms of the Central Valley from the Marysville Buttes to the Corrizo Plain. Eats insects and seeds of various grasses, forbs and shrub including *Artemisia* and *Atriplex* spp., has fur-lined cheek pouches, and experiences daily torpor. Breeding occurs from March to July; two litters are typical (Jameson and Peeters 2004).	Suitable grassland habitat is present throughout the study area. There are 3 CNDDB occurrences within 5 miles, the closest of which was recorded in 1990 in Black Diamond Mines Regional Preserve (EONDX #33760), approximately 3 miles northwest of the study area.	Possible

Species Name Common Name	Listing Status[1]	Habitat Requirements & Additional Notes	Habitat Suitability & Local Distribution	Occurrence Potential
Taxidea taxus American badger	Fed: None CA: SSC	A large mustelid that inhabits open areas with friable soils within woodland, grassland, savannah and desert habitats. A fossorial mammal that preys predominately on ground squirrels (*Ammospermophilus* and *Spermophilus* spp.) and pocket gophers (*Thomomys* spp.). Mating occurs in late summer; young are born in March and April (Jameson and Peeters 2004).	Suitable grassland habitat with friable soils is present throughout the study area. There are 3 CNDDB occurrences within 5 miles, the nearest of which was a roadkilled individual recorded on Deer Valley Road (EONDX #57212), approximately 0.4 mile east of the study area.	Possible

[1] **Explanation of Species Status Codes**

Federal Status Codes:

FE	Federally listed as Endangered
FT	Federally listed as Threatened
FPE	Federally proposed for listing as Endangered
FPT	Federally proposed for listing as Threatened
FPD	Federally proposed for delisting
FC	Federal candidate species (former Category 1 candidates)
SC	Species of Concern (NOAA Fisheries regulated species only)
CH	Critical Habitat (Proposed or Final) is designated
SSC	Species of Special Concern designated by the Marine Mammal Commission
BCC	U.S. Fish and Wildlife Service Birds of Conservation Concern

California Status Codes:

SE	State listed as Endangered
ST	State listed as Threatened
SCE	State candidate for listing as Endangered
SCT	State candidate for listing as Threatened
SCD	State candidate for delisting
SSC	California Species of Special Concern
FP	Fully Protected
WL	CDFW Watch List
SA	Included on CDFW's Special Animals List

Other Status Codes:

AFS	American Fisheries Society identifies marine, estuarine and diadromous fish species that are at risk of extinction in North America. The AFS has designated the following four classifications in order of conservation importance E – Endangered, T – Threatened, V – Vulnerable, and CD – Conservation Dependent.
WBWG	Western Bat Working Group: H – High Priority indicates species that are imperiled or are at high risk of imperilment based on available information on distribution, status, ecology and known threats; M – Medium Priority indicates a lack of information to assess the species' status; L – Low Priority indicates relatively stable populations based on available data. The WBWG also uses intermediary designations including MH – Medium-High and LM – Low-Medium priorities.

APPENDIX D PROJECT PHOTOGRAPHS

Photo 1. Parking lot at entrance to the former golf course (urban land cover). Facing northwest. July 16, 2020.

Photo 2. Golf cart path, urban land cover. Facing northwest. January 24, 2020.

Photo 3. Sand trap feature in former golf course. Facing north. January 24, 2020.

Photo 4. View of former fairway characterized by ruderal grassland land cover (visible as green vegetation). The slope are characterized by annual grassland land cover. Facing southwest. January 24, 2020.

Photo 5. Annual grassland land cover. Facing west. May 1, 2020.

Photo 6. Ruderal grassland land cover in the former fairways dominated by Italian thistle. Facing southwest. May 2, 2019.

Photo 7. Photo 7. View of construted water quality basin 5 which contains permanent wetland land cover. Facing northwest. May 10, 2018.

Photo 8. View of depnd030 and depnd031 which are constructed concrete-edged and plastic-lined irrigation ponds. Facing northeast. May 5, 2020.

Photo 9. View of depnd031 which is a constructed concrete-edged and plastic-lined irrigation pond. The spillway from depnd030 is visible to the left of the photo. Facing northwest. May 5, 2020.

Photo 10. View of depnd032 which was a constructed concrete-edged and plastic-lined irrigation pond. A small patch of cattails was present. Facing east. February 4, 2020.

Photo 11. View of depnd033 which is a constructed earthen basin for golf course operation. Facing east. March 29, 2019.

Photo 12. Basin 2 which is a earthen water quality basin constructed when the golf course was built. Facing east. July 27, 2020.

Photo 13. Basin 5 which is a earthen water quality basin constructed when the golf course was built. It is fed by a culvert from depnd031. Facing southeast. May 5, 2020.

Photo 14. Basin 7 which is a earthen water quality basin constructed when the golf course was built. It is fed by the subsurface drainage system. Facing north. July 27, 2020.

Photo 15. Concrete golf cart path with buckling concrete that may provide refugia for special status species. Facing south. July 16, 2020.

Photo 16. Edge of depnd031 showing vertical concrete bank (background) and short section of sloped bank (foreground) potentially allowing access for special status species. Facing west. July 16, 2020.

Photo 17. California ground squirrel burrow complex providing habitat for special status wildlife species. Facing west. July 16, 2020.

Photo 18. Pumphouse near depnd030 and depnd031 providing suitable habitat for rootsing bats. Facing northwest. July 16, 2020.

Photo 19. Restroom structure providing marginal roosting habitat for bats. Facing northeast. July 16, 2020.

APPENDIX E U.S. FISH AND WILDLIFE SERVICE SPECIES LIST

United States Department of the Interior

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

In Reply Refer To:
Consultation Code: 08ESMF00-2020-SLI-2433
Event Code: 08ESMF00-2020-E-07505
Project Name: Roddy Ranch Golf Course Restoration

July 23, 2020

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

To Whom It May Concern:

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

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

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

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

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

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

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

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

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

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

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

Attachment(s):

- Official Species List

Official Species List

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

This species list is provided by:

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

Project Summary

Consultation Code: 08ESMF00-2020-SLI-2433

Event Code: 08ESMF00-2020-E-07505

Project Name: Roddy Ranch Golf Course Restoration

Project Type: LAND - RESTORATION / ENHANCEMENT

Project Description: Habitat restoration

Project Location:

Approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/place/37.928416999999996N121.79460634113005W

Counties: Contra Costa, CA

Endangered Species Act Species

There is a total of 16 threatened, endangered, or candidate species on this species list.

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

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

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

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

Mammals

NAME	STATUS
San Joaquin Kit Fox *Vulpes macrotis mutica* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/2873	Endangered

Birds

NAME	STATUS
California Clapper Rail *Rallus longirostris obsoletus* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/4240	Endangered
California Least Tern *Sterna antillarum browni* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/8104	Endangered

Reptiles

NAME	STATUS
Alameda Whipsnake (=striped Racer) *Masticophis lateralis euryxanthus* There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/5524	Threatened
Giant Garter Snake *Thamnophis gigas* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/4482	Threatened

Amphibians

NAME	STATUS
California Red-legged Frog *Rana draytonii* There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/2891 Species survey guidelines: https://ecos.fws.gov/ipac/guideline/survey/population/205/office/11420.pdf	Threatened
California Tiger Salamander *Ambystoma californiense* Population: U.S.A. (Central CA DPS) There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/2076	Threatened

Fishes

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

Insects

NAME	STATUS
San Bruno Elfin Butterfly *Callophrys mossii bayensis* There is **proposed** critical habitat for this species. The location of the critical habitat is not available. Species profile: https://ecos.fws.gov/ecp/species/3394	Endangered
Valley Elderberry Longhorn Beetle *Desmocerus californicus dimorphus* There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/7850 Habitat assessment guidelines: https://ecos.fws.gov/ipac/guideline/assessment/population/436/office/11420.pdf	Threatened

Crustaceans

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

Flowering Plants

NAME	STATUS
Antioch Dunes Evening-primrose *Oenothera deltoides ssp. howellii* There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/5970	Endangered
Contra Costa Goldfields *Lasthenia conjugens* There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/7058	Endangered
Large-flowered Fiddleneck *Amsinckia grandiflora* There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/5558	Endangered

Critical habitats

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

APPENDIX F CALIFORNIA NATURAL DIVERSITY DATABASE SEARCH RESULTS

Selected Elements by Scientific Name

California Department of Fish and Wildlife

California Natural Diversity Database

Query Criteria: Quad IS (Antioch North (3812117) OR Antioch South (3712187) OR Tassajara (3712177) OR Honker Bay (3812118) OR Jersey Island (3812116) OR Clayton (3712188) OR Diablo (3712178) OR Brentwood (3712186) OR Byron Hot Springs (3712176))
 AND Taxonomic Group IS (Fish OR Amphibians OR Reptiles OR Birds OR Mammals OR Mollusks OR Arachnids OR Crustaceans OR Insects OR Ferns OR Gymnosperms OR Monocots OR Dicots OR Lichens OR Bryophytes)

Species	Element Code	Federal Status	State Status	Global Rank	State Rank	Rare Plant Rank/CDFW SSC or FP
Agelaius tricolor tricolored blackbird	ABPBXB0020	None	Threatened	G2G3	S1S2	SSC
Ambystoma californiense California tiger salamander	AAAAA01180	Threatened	Threatened	G2G3	S2S3	WL
Ammodramus savannarum grasshopper sparrow	ABPBXA0020	None	None	G5	S3	SSC
Amsinckia grandiflora large-flowered fiddleneck	PDBOR01050	Endangered	Endangered	G1	S1	1B.1
Andrena blennospermatis Blennosperma vernal pool andrenid bee	IIHYM35030	None	None	G2	S2	
Anniella pulchra Northern California legless lizard	ARACC01020	None	None	G3	S3	SSC
Anomobryum julaceum slender silver moss	NBMUS80010	None	None	G5?	S2	4.2
Anthicus antiochensis Antioch Dunes anthicid beetle	IICOL49020	None	None	G1	S1	
Antrozous pallidus pallid bat	AMACC10010	None	None	G5	S3	SSC
Apodemia mormo langei Lange's metalmark butterfly	IILEPH7012	Endangered	None	G5T1	S1	
Aquila chrysaetos golden eagle	ABNKC22010	None	None	G5	S3	FP
Archoplites interruptus Sacramento perch	AFCQB07010	None	None	G2G3	S1	SSC
Arctostaphylos auriculata Mt. Diablo manzanita	PDERI04040	None	None	G2	S2	1B.3
Arctostaphylos manzanita ssp. laevigata Contra Costa manzanita	PDERI04273	None	None	G5T2	S2	1B.2
Ardea herodias great blue heron	ABNGA04010	None	None	G5	S4	
Arizona elegans occidentalis California glossy snake	ARADB01017	None	None	G5T2	S2	SSC
Asio flammeus short-eared owl	ABNSB13040	None	None	G5	S3	SSC

Species	Element Code	Federal Status	State Status	Global Rank	State Rank	Rare Plant Rank/CDFW SSC or FP
Astragalus tener var. tener alkali milk-vetch	PDFAB0F8R1	None	None	G2T1	S1	1B.2
Athene cunicularia burrowing owl	ABNSB10010	None	None	G4	S3	SSC
Atriplex cordulata var. cordulata heartscale	PDCHE040B0	None	None	G3T2	S2	1B.2
Atriplex depressa brittlescale	PDCHE042L0	None	None	G2	S2	1B.2
Atriplex minuscula lesser saltscale	PDCHE042M0	None	None	G2	S2	1B.1
Blepharizonia plumosa big tarplant	PDAST1C011	None	None	G1G2	S1S2	1B.1
Bombus caliginosus obscure bumble bee	IIHYM24380	None	None	G4?	S1S2	
Bombus crotchii Crotch bumble bee	IIHYM24480	None	Candidate Endangered	G3G4	S1S2	
Bombus occidentalis western bumble bee	IIHYM24250	None	Candidate Endangered	G2G3	S1	
Branchinecta conservatio Conservancy fairy shrimp	ICBRA03010	Endangered	None	G2	S2	
Branchinecta longiantenna longhorn fairy shrimp	ICBRA03020	Endangered	None	G1	S1S2	
Branchinecta lynchi vernal pool fairy shrimp	ICBRA03030	Threatened	None	G3	S3	
Branchinecta mesovallensis midvalley fairy shrimp	ICBRA03150	None	None	G2	S2S3	
Buteo regalis ferruginous hawk	ABNKC19120	None	None	G4	S3S4	WL
Buteo swainsoni Swainson's hawk	ABNKC19070	None	Threatened	G5	S3	
Calochortus pulchellus Mt. Diablo fairy-lantern	PMLIL0D160	None	None	G2	S2	1B.2
Campanula exigua chaparral harebell	PDCAM020A0	None	None	G2	S2	1B.2
Centromadia parryi ssp. congdonii Congdon's tarplant	PDAST4R0P1	None	None	G3T1T2	S1S2	1B.1
Chloropyron molle ssp. molle soft salty bird's-beak	PDSCR0J0D2	Endangered	Rare	G2T1	S1	1B.2
Cicuta maculata var. bolanderi Bolander's water-hemlock	PDAPI0M051	None	None	G5T4T5	S2?	2B.1
Circus hudsonius northern harrier	ABNKC11011	None	None	G5	S3	SSC

Species	Element Code	Federal Status	State Status	Global Rank	State Rank	Rare Plant Rank/CDFW SSC or FP
Coelus gracilis San Joaquin dune beetle	IICOL4A020	None	None	G1	S1	
Cordylanthus nidularius Mt. Diablo bird's-beak	PDSCR0J0F0	None	Rare	G1	S1	1B.1
Corynorhinus townsendii Townsend's big-eared bat	AMACC08010	None	None	G3G4	S2	SSC
Coturnicops noveboracensis yellow rail	ABNME01010	None	None	G4	S1S2	SSC
Cryptantha hooveri Hoover's cryptantha	PDBOR0A190	None	None	GH	SH	1A
Delphinium californicum ssp. interius Hospital Canyon larkspur	PDRAN0B0A2	None	None	G3T3	S3	1B.2
Delphinium recurvatum recurved larkspur	PDRAN0B1J0	None	None	G2?	S2?	1B.2
Dipodomys heermanni berkeleyensis Berkeley kangaroo rat	AMAFD03061	None	None	G3G4T1	S1	
Downingia pusilla dwarf downingia	PDCAM060C0	None	None	GU	S2	2B.2
Efferia antiochi Antioch efferian robberfly	IIDIP07010	None	None	G1G2	S1S2	
Elanus leucurus white-tailed kite	ABNKC06010	None	None	G5	S3S4	FP
Emys marmorata western pond turtle	ARAAD02030	None	None	G3G4	S3	SSC
Eremophila alpestris actia California horned lark	ABPAT02011	None	None	G5T4Q	S4	WL
Eriastrum ertterae Lime Ridge eriastrum	PDPLM030F0	None	None	G1	S1	1B.1
Eriogonum nudum var. psychicola Antioch Dunes buckwheat	PDPGN0849Q	None	None	G5T1	S1	1B.1
Eriogonum truncatum Mt. Diablo buckwheat	PDPGN085Z0	None	None	G1	S1	1B.1
Eryngium jepsonii Jepson's coyote-thistle	PDAPI0Z130	None	None	G2	S2	1B.2
Erysimum capitatum var. angustatum Contra Costa wallflower	PDBRA16052	Endangered	Endangered	G5T1	S1	1B.1
Eschscholzia rhombipetala diamond-petaled California poppy	PDPAP0A0D0	None	None	G1	S1	1B.1
Eucerceris ruficeps redheaded sphecid wasp	IIHYM18010	None	None	G1G3	S1S2	
Extriplex joaquinana San Joaquin spearscale	PDCHE041F3	None	None	G2	S2	1B.2

Species	Element Code	Federal Status	State Status	Global Rank	State Rank	Rare Plant Rank/CDFW SSC or FP
Falco mexicanus prairie falcon	ABNKD06090	None	None	G5	S4	WL
Falco peregrinus anatum American peregrine falcon	ABNKD06071	Delisted	Delisted	G4T4	S3S4	FP
Fritillaria agrestis stinkbells	PMLIL0V010	None	None	G3	S3	4.2
Fritillaria liliacea fragrant fritillary	PMLIL0V0C0	None	None	G2	S2	1B.2
Geothlypis trichas sinuosa saltmarsh common yellowthroat	ABPBX1201A	None	None	G5T3	S3	SSC
Grimmia torenii Toren's grimmia	NBMUS32330	None	None	G2	S2	1B.3
Helianthella castanea Diablo helianthella	PDAST4M020	None	None	G2	S2	1B.2
Helminthoglypta nickliniana bridgesi Bridges' coast range shoulderband	IMGASC2362	None	None	G3T1	S1S2	
Hesperolinon breweri Brewer's western flax	PDLIN01030	None	None	G2	S2	1B.2
Hibiscus lasiocarpos var. occidentalis woolly rose-mallow	PDMAL0H0R3	None	None	G5T3	S3	1B.2
Hygrotus curvipes curved-foot hygrotus diving beetle	IICOL38030	None	None	G1	S1	
Hypomesus transpacificus Delta smelt	AFCHB01040	Threatened	Endangered	G1	S1	
Idiostatus middlekauffi Middlekauff's shieldback katydid	IIORT31010	None	None	G1G2	S1	
Lanius ludovicianus loggerhead shrike	ABPBR01030	None	None	G4	S4	SSC
Lasiurus blossevillii western red bat	AMACC05060	None	None	G5	S3	SSC
Lasiurus cinereus hoary bat	AMACC05030	None	None	G5	S4	
Lasthenia conjugens Contra Costa goldfields	PDAST5L040	Endangered	None	G1	S1	1B.1
Laterallus jamaicensis coturniculus California black rail	ABNME03041	None	Threatened	G3G4T1	S1	FP
Lathyrus jepsonii var. jepsonii Delta tule pea	PDFAB250D2	None	None	G5T2	S2	1B.2
Lepidurus packardi vernal pool tadpole shrimp	ICBRA10010	Endangered	None	G4	S3S4	
Lilaeopsis masonii Mason's lilaeopsis	PDAPI19030	None	Rare	G2	S2	1B.1

Species	Element Code	Federal Status	State Status	Global Rank	State Rank	Rare Plant Rank/CDFW SSC or FP
Limosella australis Delta mudwort	PDSCR10030	None	None	G4G5	S2	2B.1
Linderiella occidentalis California linderiella	ICBRA06010	None	None	G2G3	S2S3	
Lytta molesta molestan blister beetle	IICOL4C030	None	None	G2	S2	
Madia radiata showy golden madia	PDAST650E0	None	None	G3	S3	1B.1
Malacothamnus hallii Hall's bush-mallow	PDMAL0Q0F0	None	None	G2	S2	1B.2
Masticophis flagellum ruddocki San Joaquin coachwhip	ARADB21021	None	None	G5T2T3	S2?	SSC
Masticophis lateralis euryxanthus Alameda whipsnake	ARADB21031	Threatened	Threatened	G4T2	S2	
Melospiza melodia song sparrow ("Modesto" population)	ABPBXA3010	None	None	G5	S3?	SSC
Melospiza melodia maxillaris Suisun song sparrow	ABPBXA301K	None	None	G5T3	S3	SSC
Metapogon hurdi Hurd's metapogon robberfly	IIDIP08010	None	None	G1G2	S1S2	
Monolopia gracilens woodland woollythreads	PDAST6G010	None	None	G3	S3	1B.2
Myrmosula pacifica Antioch multilid wasp	IIHYM15010	None	None	GH	SH	
Navarretia gowenii Lime Ridge navarretia	PDPLM0C120	None	None	G1	S1	1B.1
Navarretia nigelliformis ssp. radians shining navarretia	PDPLM0C0J2	None	None	G4T2	S2	1B.2
Neotoma fuscipes annectens San Francisco dusky-footed woodrat	AMAFF08082	None	None	G5T2T3	S2S3	SSC
Oenothera deltoides ssp. howellii Antioch Dunes evening-primrose	PDONA0C0B4	Endangered	Endangered	G5T1	S1	1B.1
Oncorhynchus mykiss irideus pop. 11 steelhead - Central Valley DPS	AFCHA0209K	Threatened	None	G5T2Q	S2	
Perdita scitula antiochensis Antioch andrenid bee	IIHYM01031	None	None	G1T1	S1	
Perognathus inornatus San Joaquin pocket mouse	AMAFD01060	None	None	G2G3	S2S3	
Phacelia phacelioides Mt. Diablo phacelia	PDHYD0C3Q0	None	None	G2	S2	1B.2
Phalacrocorax auritus double-crested cormorant	ABNFD01020	None	None	G5	S4	WL

Species	Element Code	Federal Status	State Status	Global Rank	State Rank	Rare Plant Rank/CDFW SSC or FP
Philanthus nasalis Antioch specid wasp	IIHYM20010	None	None	G1	S1	
Phrynosoma blainvillii coast horned lizard	ARACF12100	None	None	G3G4	S3S4	SSC
Plagiobothrys hystriculus bearded popcornflower	PDBOR0V0H0	None	None	G2	S2	1B.1
Potamogeton zosteriformis eel-grass pondweed	PMPOT03160	None	None	G5	S3	2B.2
Puccinellia simplex California alkali grass	PMPOA53110	None	None	G3	S2	1B.2
Rallus obsoletus obsoletus California Ridgway's rail	ABNME05011	Endangered	Endangered	G5T1	S1	FP
Rana boylii foothill yellow-legged frog	AAABH01050	None	Endangered	G3	S3	SSC
Rana draytonii California red-legged frog	AAABH01022	Threatened	None	G2G3	S2S3	SSC
Reithrodontomys raviventris salt-marsh harvest mouse	AMAFF02040	Endangered	Endangered	G1G2	S1S2	FP
Riparia riparia bank swallow	ABPAU08010	None	Threatened	G5	S2	
Sanicula saxatilis rock sanicle	PDAPI1Z0H0	None	Rare	G2	S2	1B.2
Senecio aphanactis chaparral ragwort	PDAST8H060	None	None	G3	S2	2B.2
Sidalcea keckii Keck's checkerbloom	PDMAL110D0	Endangered	None	G2	S2	1B.1
Spergularia macrotheca var. longistyla long-styled sand-spurrey	PDCAR0W062	None	None	G5T2	S2	1B.2
Sphecodogastra antiochensis Antioch Dunes halcitid bee	IIHYM78010	None	None	G1	S1	
Spirinchus thaleichthys longfin smelt	AFCHB03010	Candidate	Threatened	G5	S1	
Sternula antillarum browni California least tern	ABNNM08103	Endangered	Endangered	G4T2T3Q	S2	FP
Streptanthus albidus ssp. peramoenus most beautiful jewelflower	PDBRA2G012	None	None	G2T2	S2	1B.2
Streptanthus hispidus Mt. Diablo jewelflower	PDBRA2G0M0	None	None	G2	S2	1B.3
Stuckenia filiformis ssp. alpina slender-leaved pondweed	PMPOT03091	None	None	G5T5	S2S3	2B.2
Symphyotrichum lentum Suisun Marsh aster	PDASTE8470	None	None	G2	S2	1B.2

Species	Element Code	Federal Status	State Status	Global Rank	State Rank	Rare Plant Rank/CDFW SSC or FP
Taxidea taxus American badger	AMAJF04010	None	None	G5	S3	SSC
Thamnophis gigas giant gartersnake	ARADB36150	Threatened	Threatened	G2	S2	
Triquetrella californica coastal triquetrella	NBMUS7S010	None	None	G2	S2	1B.2
Tropidocarpum capparideum caper-fruited tropidocarpum	PDBRA2R010	None	None	G1	S1	1B.1
Viburnum ellipticum oval-leaved viburnum	PDCPR07080	None	None	G4G5	S3?	2B.3
Vulpes macrotis mutica San Joaquin kit fox	AMAJA03041	Endangered	Threatened	G4T2	S2	

Record Count: 128

APPENDIX G CALIFORNIA NATURAL DIVERSITY DATABASE FIELD SURVEY FORM

Mail to:
California Natural Diversity Database
California Dept. of Fish & Wildlife
P.O. Box 944209
Sacramento, CA 94244-2090
CNDDB@wildlife.ca.gov

For Office Use Only

Source Code: ______ Quad Code: ______
Elm Code: ______ Occ No.: ______
EO Index: ______ Map Index: ______

Date of Field Work (mm/dd/yyyy): 9/22/2020

Clear Form

California Native Species Field Survey Form

Print Form

Scientific Name: Blepharizonia plumosa

Common Name: big tarplant

Species Found? ☒ Yes ○ No ______ If not found, why?

Total No. Individuals: 400 Subsequent Visit? ○ Yes ○ No

Is this an existing NDDB occurrence? Yes #32 (Yes, Occ. #) ☐ No ☐ Unk.

Collection? If yes: no (Number) ______ (Museum / Herbarium)

Reporter: Adam Chasey, Nomad Ecology
Address: 822 Main St
Martinez CA 94553
E-mail Address: achasey@nomadecology.com
Phone: (925) 228-1027

Plant Information

Phenology: 60% (% vegetative) 35% (% flowering) 5% (% fruiting)

Animal Information

______ # adults ______ # juveniles ______ # larvae ______ # egg masses ______ # unknown

☐ wintering ☐ breeding ☐ nesting ☐ rookery ☐ burrow site ☐ lek ☐ other

Location Description (please attach map AND/OR fill out your choice of coordinates, below)

County: Contra Costa County Landowner / Mgr: East Contra Costa County Habitat Conservancy

Quad Name: Antioch South Elevation: 360 ft

T___ R___ Sec___, ___1/4 of ___ 1/4, Meridian: H○ M○ S○ Source of Coordinates (GPS, topo. map & type): GPS

T___ R___ Sec___, ___1/4 of ___ 1/4, Meridian: H○ M○ S○ GPS Make & Model: Android smartphone

Horizontal Accuracy: 3 [✓ meters]/feet

DATUM: NAD27 ○ NAD83 ○ WGS84 ☒

Coordinate System: UTM Zone 10 ○ UTM Zone 11 ○ ***OR*** Geographic (Latitude & Longitude) ☒

Coordinates: 37.932377, -121.798042

Habitat Description (plants & animals) *plant communities, dominants, associates, substrates/soils, aspects/slope:*
Animal Behavior *(Describe observed behavior, such as territoriality, foraging, singing, calling, copulating, perching, roosting, etc., especially for avifauna):*

Annual grassland on clay soils on northwest facing slope adjacent to golf course path. Golf course closed several years ago. Associates include Festuca perennis, Hirschfeldia incana, Avena barbata, Carduus pycnocephalus Sunny, gentle slope, dry moisture regime, clay

Please fill out separate form for other rare taxa seen at this site.

Site Information Overall site/occurrence quality/viability (site + population): ○ Excellent ☒ Good ○ Fair ○ Poor

Immediate AND surrounding land use: Land bank - previous golf course

Visible disturbances: ______

Threats: Invasive plants (Carduus pycnocephalus, Hirschfeldia incana)

Comments: Population adjacent + contiguous with population on other side of fence.

Determination: *(check one or more, and fill in blanks)*
- ☐ Keyed (cite reference): ______
- ☐ Compared with specimen housed at: ______
- ☐ Compared with photo / drawing in: ______
- ☐ By another person (name): ______
- ☐ Other: ______

Photographs: *(check one or more)*

	Slide	Print	Digital
Plant / animal	☐	☐	☐
Habitat	☐	☐	☐
Diagnostic feature	☐	☐	☐

May we obtain duplicates at our expense? ○ yes ○ no

CDFW/BDB/1747 Rev. 7/3/2018

5

RDG. 2021. THE FORMER RODDY RANCH GOLF COURSE HABITAT RESTORATION AND PUBLIC ACCESS PROJECT - RECREATIONAL AND ENVIRONMENTAL EDUCATION OPPORTUNITIES.

RDG

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THE FORMER RODDY RANCH GOLF COURSE HABITAT RESTORATION AND PUBLIC ACCESS PROJECT

Recreational and Environmental Education Opportunities

The former Roddy Ranch Golf Course is a 230-acre property in east Contra Costa County which operated as a golf course from 2002 until 2016. The property occupies the north-east facing slope of a northwest trending ridge above the City of Antioch and Brentwood. The remnants of the golf course remain - approximately 5.9 miles of golf cart paths, a water line and pump station on the north side of the property, 10 miles of storm drain infrastructure, and miles of subsurface irrigation pipes. The property provides a critical linkage for habitat connectivity and is situated within 3,200 acres of Conservancy landbank. The site sits adjacent to the recently completed Horse Valley Creek and Wetland Restoration project and connects through public lands to Black Diamond Mines Regional Preserve.

The East Bay Regional Park District and the East Contra Costa County Habitat Conservancy seek to enhance habitat and improve public access at the former Roddy Ranch Golf Course. The habitat restoration portion of the project will help the Conservancy meet the conservation goals of the Habitat Conservation Plan/Natural Community Conservation Plan (HCP/NCCP). The public access goals are consistent with the governing HCP/NCCP and include providing passive recreation opportunities and acting as the primary staging area for the future 3,600-acre Deer Valley Regional Park. Planned public access amenities include picnic tables, a restroom, shade structures and interpretive elements. The site's remnant golf infrastructure will be used when feasible.

Planning Context

Habitat Conservation Plan

The East Contra Costa County Habitat Conservancy (ECCCHC) was formed by the cities of Brentwood, Clayton, Oakley, Pittsburg, and Contra Costa County. In 1998, The US Fish & Wildlife Services and the California Department of Fish and Game requested that the East Contra Costa County develop a regional Habitat Conservation Plan. The regional plan was approved in 2007 and its ordinances took effect in 2008. The HCP/NCCP aims to improve the permitting process for protection of endangered species. Strengthening control over land use, the plan focuses on protecting natural resources in East Contra Costa County, and in turn protecting endangered species. The plan provides a habitat-focused framework for ecosystem and wetland conservation in Northern California (East Contra Costa County Habitat Conservancy, 2020).

In partnership with The East Bay Regional Park District (EBRPD), the ECCHC seeks to enhance habitat and improve public access to the former Roddy Ranch. The goals of the HCP/NCCP are guiding the analysis of Roddy Ranch. According to the plan, "In all preserves, recreation is of secondary importance and must defer to the biological goals and objectives of this HCP/NCCP" (Jones & Stokes, October 2007).

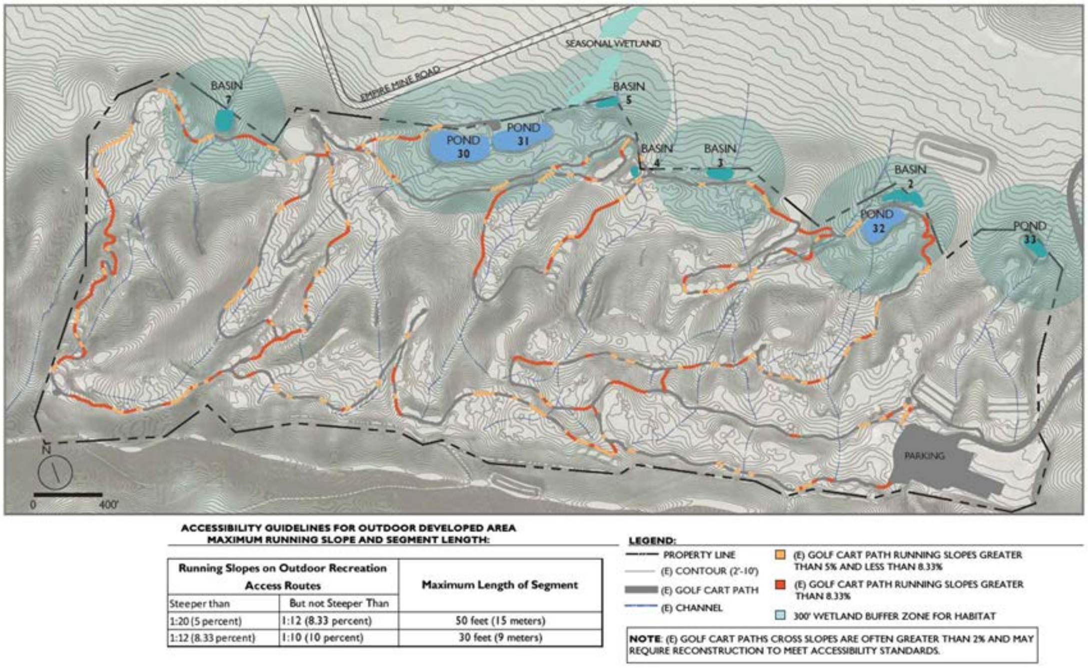
The former Roddy Ranch is likely to be a popular destination due to its proximity to population centers (Antioch and Brentwood). The site's road access, existing parking, and pathways contribute to conditions suitable for passive recreation. Activities will be allowed based on the ecological needs of the given habitat but limited to on-trail activities. "Any activities off-trails and other active recreation not listed above (e.g. outdoor sports) are prohibited" (Jones & Stokes, October 2007).

Accessibility Guidelines for Outdoor Developed Areas (AGODA)

The Access Board Accessibility Guidelines set federal standards for outdoor developed areas based on the American with Disabilities Act of 1990 and the Architectural Barriers Act of 1968. The Access Board was founded in 1973 and created new guidelines in 2004, and later amended them to include trails on federal government lands in 2013. Although AGODA pertains to federal lands, the guidelines are frequently used by local agencies to guide accessibility in non-federal open spaces and parklands. In most cases, careful analysis and study is recommended in the initial phases of a project to ensure compliant trails can be made accessible to the public. Trails should be planned in such a way that steep slopes are minimized, providing more access (United States Access Board, 2014). Federal guidelines state that running slopes of accessible trail never exceed 10% at a maximum length of 30-foot segments.

Constraints to Public Access

Figure 1 below provides a constraints analysis pertaining to the ECCHC buffer around aquatic resources and for the adequacy of the existing golf cart paths at meeting AGODA guidelines for running slope. The results of this analysis show that the existing golf cart paths overlap with sensitive habitat. These protective buffers intersect with paths adjacent to all aquatic features except for Pond 33, which has no nearby trails, although it is within 300-ft of Tour Way.



ACCESSIBILITY GUIDELINES FOR OUTDOOR DEVELOPED AREA MAXIMUM RUNNING SLOPE AND SEGMENT LENGTH:

Running Slopes on Outdoor Recreation Access Routes		Maximum Length of Segment
Steeper than	But not Steeper Than	
1:20 (5 percent)	1:12 (8.33 percent)	50 feet (15 meters)
1:12 (8.33 percent)	1:10 (10 percent)	30 feet (9 meters)

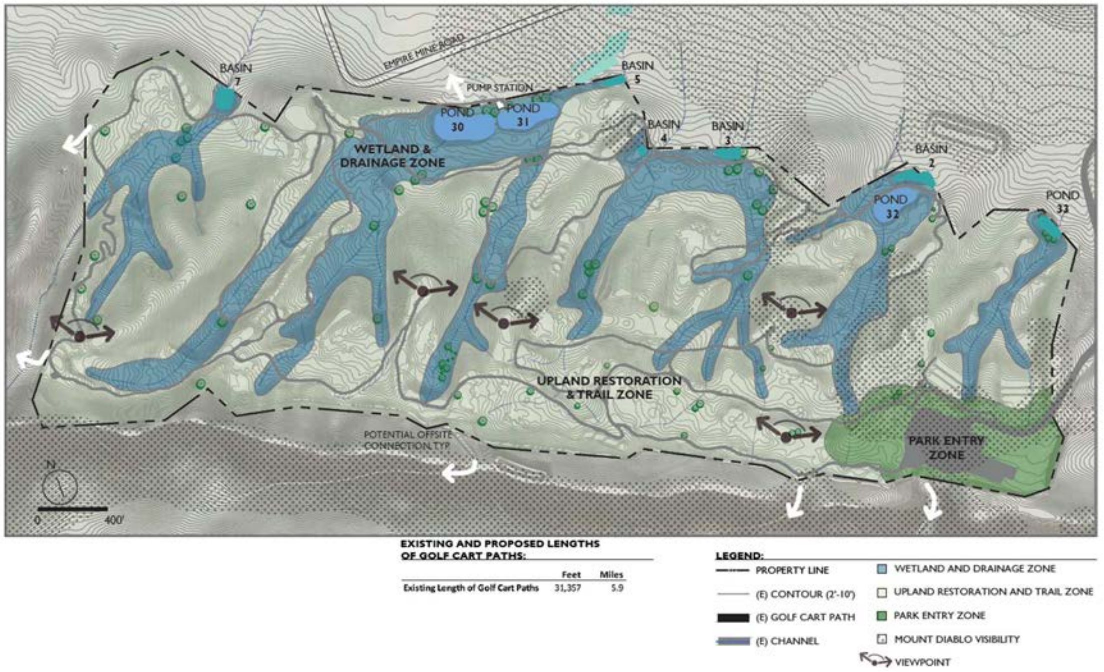
Figure 1: Public Access Constraints

The diagram indicates running slopes with three colors. Slopes greater than 8.33% are red. Those that are less than 8.33%, but greater than 5% are orange and slopes less than 5% are grey. When we analyzed the existing golf cart path cross slopes, we found many cross slopes to be greater than 2%. AGODA cross slopes for concrete or asphalt should not be steeper than 2%, while trails made of pervious material should not be steeper than 5% (United States Access Board, 2014). Existing sections of cart paths may require reconstruction to make them compliant with ADA and AGODA.

This analysis shows that the greatest opportunity for an accessible loop is on the South-East area of the site near the existing parking area and that sections will require reconstruction to meet running slope and cross slope requirements.

Site Inventory and Analysis

This Site Analysis covers three programming categories: Park Entry Zone, Upland Restoration and Trail Zone, and Wetland and Drainage Zone. The Park Entry Zone identifies the existing parking lot and golf clubhouse areas as a site to prioritize the park entry components including staging, picnicking, and trailhead features. The Wetland and Drainage Zone is an area set aside to prioritize the preservation and restoration of the site hydrology. Lastly, the Upland Restoration and Trail Zone is the area of the site that focuses on grassland restoration and public access via a network of trails.



EXISTING AND PROPOSED LENGTHS OF GOLF CART PATHS:

	Feet	Miles
Existing Length of Golf Cart Paths	31,357	5.9

Figure 2: Site Analysis

Park Entry Zone

The Park Entry Zone designates the portion of the former golf course where most of the facilities were located to be converted for public access to this preserve. This location currently consists of a recently resurfaced parking lot with 142 existing parking stalls, six of which are ADA stalls. A crosswalk leads to a level area where the former clubhouse once stood. A large, redwood deck and an electrical service point remain and offer potential for reuse or adaptation.

There is an assortment of infrastructure at the parking area that remain. A solar panel array and cell tower sit prominently at the eastern end of the parking lot and are visible as you enter the site along Tour Way. The EBPRD has noted that these will remain for now but may be relocated or removed in the future to a less conspicuous location. In addition, there are a series of electrical panels near the well to the south and existing parking lot light standards that have had the wires pulled. The parking lot also has fire hydrants throughout, although at least one has been damaged. The system is in need of significant repair (BkF, 2021).

Potable water was provided from a well that remains on-site today. There is no municipal water connection. It is understood that the well served the potable water needs of the clubhouse. Preliminary tests by EBRPD have confirmed the well appears suitable to meet the demand for restrooms and drinking water for the future staging area. In addition, an assessment of the existing septic system has shown that it is also suitable for anticipated restroom demand (BkF 2021).

The HCP/NCCP allows for the development of up to four staging areas within the preserve system. The Plan favors staging areas that are built on the edges of the preserves and sites in areas already disturbed and not suitable for habitat (East Contra Costa County Habitat Conservancy, 2020). The former Roddy Ranch is seen as the main staging area for the future Deer Valley Regional Park and will serve as an entry to a large portion of the preserve system. Converting the former golf course parking and clubhouse areas into a staging area is consistent with the HCP/NCCP.

The recreation guidelines outlined in the HCP/NCCP inform the programming ideas put forth in this proposal:

> *"As approved by USFWS and CDFG, new picnic areas shall be operated during daylight hours only and limited to eight standard picnic benches, restrooms, potable water and trash receptacles…. To the extent feasible, picnic areas will be located on the perimeter of the preserve areas and will be sited in already disturbed areas. No private vehicles shall be allowed in picnic areas unless the picnic area is at a staging area and except for limited special events approved by the Implementing Entity. Maintenance and emergency vehicles shall be permitted access to picnic areas." (Jones & Stokes, October 2007)*

In addition, locating a picnic area within the Park Entry Zone meets the HCP/NCCP guidelines for picnic areas being placed at the perimeter of the preserve and in an area already disturbed. The HCP limits new picnic areas to eight standard picnic tables, potable water and trash receptacles (Jones & Stokes, October 2007).

Upland Restoration and Trail Zone

The upland portion of the site is predominantly covered in annual grasslands (Nomad Ecology, 2020). Remnant golf course infrastructure includes, the storm drain network, irrigation lines and wiring, cart paths, sand traps and legacy grading. The existing 5.9 miles of golf cart paths provide the greatest opportunity for trail alignments and were analyzed for suitability as multi-use trails.

This analysis revealed the most suitable areas for an accessible trail are in the Southeastern end of the site. Most of the existing paths are laid out around golf holes and do not provide an adequate trail experience. Mainly through the process of deletion, a final trail network can be developed. The trails will follow existing path alignments where appropriate and will provide access to views while offering an engaging experience that explores the varied topography on site. The final alignment should consider the benefit of providing multiple loops of varying distances to allow users a variety of routes through the site. In the Site Analysis Diagram (Figure 2), potential viewpoints are highlighted in yellow and offer local views of the preserve as well as distant views to Mt. Diablo, the Delta and on clear days the Sierra Nevada Mountains.

Wetland and Drainage Zone

The availability and movement of water drives ecological function in this region. The Wetland and Drainage Zone identifies the areas on site that have the potential to offer aquatic habitat directly or benefit aquatic habitat by affecting infiltration, supporting wetland obligate plant species and wildlife corridors. In addition, this zone encapsulates the majority of the Rincon Clay Loam and Altamont Clay that occurs on site. They high clay content of both of these soil types tend to support wetland habitats and compared to the highly erosive and quick draining Briones Sandy Loam found in most of the upland areas on site.

Setting aside the wetland and drainage areas for habitat enhancement will reduce conflicts in the future and prioritizes ecological function on site. The HCP requires a 300' buffer around aquatic elements for habitat protection for this reason. Existing golf cart paths fall within this area and will need to be evaluated to determine if it is best to formalize these paths for public access or find an alternative alignment that provides a greater separation between the trail and the aquatic resource. Figure 2 shows how the existing circulation system of golf cart paths intersect with the existing wetlands and drainages. This information can be used to derive trail alignments that limit disturbance to these areas. Trail alignments are not expected to avoid this zone; however, the trails should limit encroachment were feasible.

Recreational Opportunities

Park Entry Zone

Although there are currently few trees in the Park Entry Zone, there is an opportunity to plant additional trees to provide needed shade. In addition to trees, installing shade structures at the picnic area will provide immediate shade without needing to wait for young trees to mature. There is also a stockpile of boulders that can be repurposed as landscape boulders and site control barriers.

The staging area facilities will comply with ADA guidelines. Anticipated facilities include bicycle parking, future staging area for equestrians, garbage and recycling cans, and an ADA accessible restroom. Currently the California Building Code does not require providing electric vehicle charging stations for site retrofits, the EBPRD envisions adding electric vehicle charging stations in the future. EBRPD plans to provide bus parking at the equestrian staging area at the eastern end of the lot. A drop off and pick-up area will accommodate bus and passenger vehicle loading adjacent to the picnic area and trailhead.

After evaluating the opportunities and constraints of maintaining the existing parking area lights, the EBRPD has elected to not restore these lights. The park will be closed outside of daylight hours and providing lights has the potential to affect the habitat goals of the preserve system. In addition, the lights will require rewiring and on-going maintenance to remain operable.

Consistent with the project's habitat restoration and daytime, passive recreation goals, electrical power and design will be sufficient to power maintenance / utility equipment and provide minimum foot-candle safety lighting at the restroom building. An evaluation for electrical vehicle charging station power supply will be conducted at a subsequent phase of design.

There are opportunities to locate picnic tables on the western edge of the Park Entry Zone. Multiple clusters of picnic tables can be sited to take advantage of views, shade, and shelter from wind.

The western end will also provide trailhead facilities for the trails that lead into the preserve. Depending on the final layout, the trailhead may be one larger area or two to three smaller areas. Each area would have wayfinding signage and potentially interpretive elements.

The existing well is anticipated to supply potable water for up to four drinking fountains at the Park Entry Zone. Depending on supply, this water may also support temporary irrigation for the establishment of shade trees at the picnic areas and auxiliary water for adjacent grazing.

Table 1: Anticipated Site Amenities at the Park Entry Zone

Amenity	***Quantity***	***Comments***
Parking	~140 (6 Accessible)	Maintain approximate number of existing stalls[1]
Equestrian Parking	15,000 sf	Provide an open parking lot for equestrian and bus parking
Unloading Zone	70-100 ft	Provide location for loading/unloading of passengers at entry

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[1] Electric vehicle charging connections are not required by the California Building Code for retrofits to parking areas; however, EBRPD may provide in the future.

Bicycle Parking	5-15	Provide in multiple locations at staging area
Restroom	2-4 stalls	Preference is to use septic; vault may be installed if necessary
Picnic Tables	8	Max allowed under HCP guidelines
Drinking Fountain	2-4	Bottle refill and drinking fountain
Shade Structure	1-4	Provide at entry and picnic tables. Quantity depends on size.
Wayfinding Signage	Multiple	Kiosk, Trail markers
Interpretive Signage	Multiple	Signage and site integrated

Upland Restoration and Trail Zone

The Upland Restoration and Trail Zone will accommodate hikers, equestrians, and bikers on multi-use trails. As for dogs at the site, the HCP/NCCP guidelines state, “When compatible with HCP/NCCP biological goals and objectives, dogs may be allowed in daylight hours in designated preserves or in designated areas of preserves but only on leash.” (Jones & Stokes, October 2007)

Wayfinding signage will guide users throughout the site. Connections to other regional trails from Roddy Ranch include Black Diamond Mines Regional Preserve through Star Mine Trail. Currently, EBPRD is in discussion with the City of Antioch to potentially increase access through Empire Mine Road that will connect with Black Diamond Mines Regional Preserve. There is also an opportunity to connect a trail to the former Roddy House site to the south along an existing ranch road that crosses the east-west ridge through a saddle at the Park Entry Zone. Although the network of external trail connections is has yet to be determined, it is expected that the former golf course will serve as the primary staging area to the larger EBRPD lands in the region and offer multiple connections to existing and future trails off site.

On site, the topography and existing cart path network provide opportunities for multiple loop options. Loops allow visitors to link various trail segments together and provide opportunities to explore different routes through the preserve. The topography does not easily permit an accessible loop to connect the top and bottom of the site. The elevation change would require a circuitous one-mile route down and another mile route back up to the staging area. However, a larger loop would provide a popular hiking route across the majority of the former Roddy Ranch golf course. There are options for accessible routes to be developed within the upper portion of the site. These trails will complement the Short-Loop Trails that EBRPD has been developing at other EBRPD parks and preserves.

In addition to the general north facing slope of the site, the former golf course is segmented into seven drainages that further break up the site into a series of experiences with unique views and topography. Some of the ridges between these drainages provide unique high points that offer territorial views across the site and at times far off-site to the north and east. These areas are suitable for informal overlooks and smaller destinations along the trail network.

Other than wayfinding and potentially interpretive signage, no facilities are anticipated within the Upland Restoration and Trail Zone. Formal seating will not be provided, however there is potential to situate logs and boulders within the preserve that could be used informally.

The vision for the restoration of the uplands will be covered in more detail in the Restoration Opportunities Memorandum; however, the intent of the upland zone will be to maintain and enhance the existing grasslands. These areas are anticipated to provide valuable habitat for native species but are not anticipated to be priority sites for sensitive species. This makes focusing public access in these areas consistent with the intent of the HCP.

Environmental Education Opportunities

As the primary staging area for the future Deer Valley Regional Park, the former Roddy Ranch golf course is well suited to provide environmental education to a large visitor base. The site will be the first Habitat Conservancy preserve with formal public access. As noted above, Conservancy lands have a unique management paradigm that will be unfamiliar to most visitors. This site provides an opportunity to introduce visitors to the Conservancy-protected lands. Specific themes can provide an overview of the Conservancy and how and where it operates in the region. In addition, the value of this preserve system can also be discussed from a species and habitat protection perspective. This education component can also provide the basis for understanding rules and regulations that may be different than what users would expect for this type of park. This includes limiting dogs to leash only and prohibition of amplified music.

The introduction of the Conservancy lands lends itself to be sited at the Park Entry Zone. This will provide the greatest exposure to this information and can be conveyed with traditional signage or integrated with site elements such as the shade structure, paving and picnic areas.

The site and surrounding lands will also be grazed as part of the management of the greater grasslands. Providing visitors with information of how grazing is used as a land management tool and the effects grazing has on the landscape will allow visitors to have a better understanding and acceptance for grazing in the landscape. In addition, this topic can also coincide with educating visitors on the etiquette of hiking through active ranch lands. This theme can be introduced along the trail as users pass through gates between pastures, at trailheads or as a general overview at the Park Entry Zone.

The history of the site as a golf course that has been restored back to a natural landscape is another unique characteristic of this site. Even after the restoration, there will be evidence in the landscape of this past use that could afford an interesting opportunity for interpretation. Some of these education elements could be provided by leaving certain elements of the golf course in place. This includes the landforms from a select group of sand traps and/or the distance markers that remain on the cart path. Creative protection and framing of these elements can add richness to the site and set it apart from other parklands in the region.

The process of restoration and resource protection make another compelling theme to consider. Grassland ecology, the role soils play in the expression of vegetation on-site, and the importance of how water moves and is retained on site are examples of themes that can provide visitors with a deeper understanding of the natural landscape on-site. These themes can be introduced at the Park Entry Zone and along the trail network.

Discussion

The former golf course parking lot and club house provide a suitable location for a new staging area and Park Entry Zone. The Park Entry Zone will follow ADA standards, as well as meet the recreational objectives laid out by the HCP/NCCP by following the quantity of recreational elements that are allowed throughout preserve system. The existing cart paths can be modified to provide an AGODA-complaint accessible loop trail near the Park Entry Zone. Additional loop trails can use modified cart paths to provide various routes through the site and access overlooks with views to the north and east. Within the Wetland and Drainage Zone there is a 300’ buffer around aquatic elements for habitat protection. Existing golf cart paths fall within this area and will need to be evaluated to determine if it is best to formalize these paths for public access or find an alternative alignment that provides a greater separation between the trail and the aquatic resources.

The opportunities provided here are derived from the site assessments. They offer guidance to the EBRPD and the Conservancy during the design development phase and are expected to evolve as additional information is collected, including from the site survey and public outreach process. These changes will be reflected in future documents.

References

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Jones & Stokes. (October 2007). *Final East Contra Costa County Habitat Conservation Plan/Natural Community Conservation Plan.* San Jose, CA.

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6

PALEOWEST. 2021. FIELDWORK CLOSURE MEMORANDUM FOR THE RODDY RANCH PROJECT IN ANTIOCH, CONTRA COSTA COUNTY, CALIFORNIA.

PALEOWEST

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BAY AREA
1870 Olympic Blvd, Suite 100
Walnut Creek, CA 94596

February 2, 2021

Rich Walking, Planning Director & CFO
Restoration Design Group Inc
2332 5th St, Suite C
Berkeley, CA 94710

RE: Fieldwork Closure Memorandum for the Roddy Ranch Project in Antioch, Contra Costa County, California

Dear Mr. Walking,

At the request of the Restoration Design Group, LLC (RDG), PaleoWest, LLC (PaleoWest) is providing a fieldwork closure memorandum for Roddy Ranch Project (Project) in Antioch, Contra Costa County, California (Figure 1). This Project has both a State and Federal nexus and as such will need to comply with both the California Environmental Quality Act (CEQA) and Section 106 of the National Historic Preservation Act (NHPA).

This memorandum is a summary of current work through the completion of fieldwork and does not satisfy either the CEQA or Section 106 regulatory components of this Project. PaleoWest will provide two reports, one to State reporting standards and one to Federal reporting standards once the final Project description and Project area/Area of Potential Effects has been provided and approved.

PROJECT DESCRIPTION

The following Project description is preliminary and is being used as a guideline until the final project components have been approved. In 2018, the former Roddy Ranch Golf Course was acquired by the Park District in partnership with the Habitat Conservancy. The Park District removed most structures, and what remains are three small restrooms, a wooden deck, a parking lot, lighting, fabricated irrigation ponds, an access road, pumphouse, irrigation infrastructure, cell tower, weather station, and several miles of cement golf cart paths that wind through the property. There is also a buried water main that brings water to the former golf course.

The Park District intends to open the former golf course to the public as the first stage of a larger regional park (Figure 2). A conceptual trail alignment will connect new park visitors at the former golf course to the neighboring 6,000-acre Black Diamond Mines Regional Preserve, via the Star Mine Trail, as it intersects with Empire Mine Road. The larger assembly of land, 3,200 acres that surround the former golf course, will remain in the Park District's Land Bank status for the near future and will not be open for public access at this time.

Figure 1: Project Vicinity Map

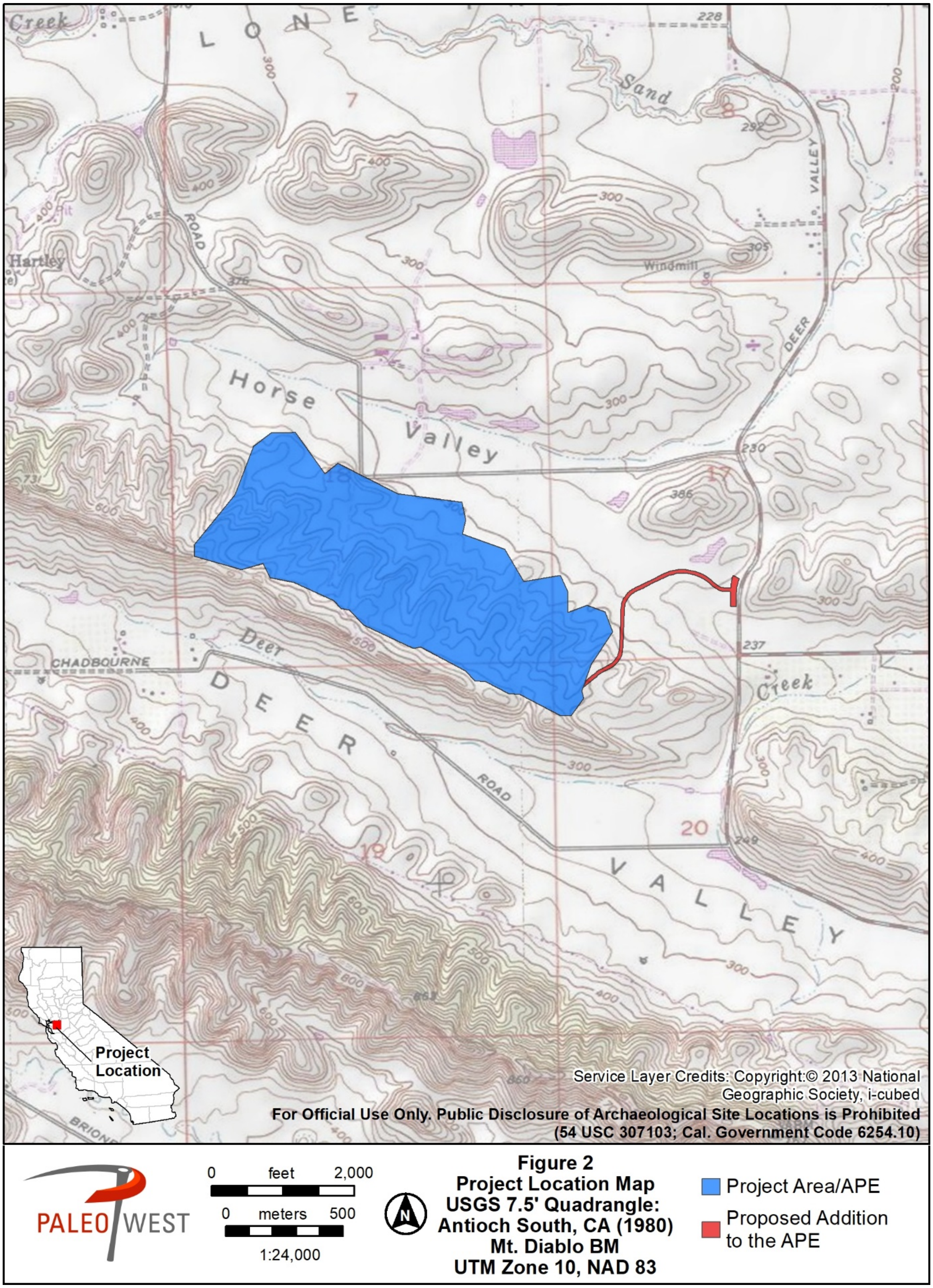

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Figure 2
Project Location Map
USGS 7.5' Quadrangle:
Antioch South, CA (1980)
Mt. Diablo BM
UTM Zone 10, NAD 83

Figure 2: Project are/APE map

CULTURAL RESOURCES RECORDS SEARCH

On June 11, 2020, a records search for the Project was conducted by staff at the Northwest Information Center (NWIC) at Sonoma State University (NWIC File No. 19-2019). The records search included a review of cultural resource surveys, excavation reports, and recorded cultural resources within a $^{1}/_{2}$-mile radius of the Project.

Previous Cultural Resource Investigations

Four cultural resource investigations were conducted within the Project APE (S-34074, 3123, 4411, and 33697; Table 1) and six were conducted within $^{1}/_{2}$-mile of the Project area (S-18047, 37075, 39266, 41536, 43191, 43328[a], 43328[b], 45670, and 49125; Table 2).

Table 1
Previous Cultural Resource Studies Within the Project Area

Report No.	Authors	Year	Title	Publisher
S-006927	Suzanne Baker	1984	Archaeological Reconnaissance of the Horse Valley Estates, Contra Costa County, California	Archaeological Consultants
S-011826	Dorothea J. Theodoratus, Mary Pyle Peters, Clinton M. Blount, Pamela J. McGuire, Richard D. Ambro, Michael Crist, Billy J. Peck, and Myrna Saxe	1980	Montezuma I and II Cultural Resources	Theodoratus Cultural Research; Archaeological and Environmental Services
S-020481	Carrie D. Wills	1998	Cultural Resources Assessment, Roddy Ranch Golf Course Project, Antioch, Contra Costa County, California	William Self Associates
S-020635	William Self Associates	1998	Cultural Resources Assessment Report, Horse Valley and Adjoining Lands, Contra Costa County, California	William Self Associates
S-032885	Lorna Billat	2006	New Tower ("NT") Submission Packet, FCC Form 620, Deer Valley, CA-2787D	EarthTouch, Inc.

Table 2
Previous Cultural Resource Studies Within 1/2 Mile of the Project Study Area

Report No.	**Authors**	**Year**	**Title**	**Publisher**
S-010672	Suzanne Baker	1988	Archaeological Reconnaissance of the Roddy Property, near Brentwood, Contra Costa County, California	Archaeological Consultants
S-016916	Ann Samuelson, Carolyn Rice, and William Self	1994	Archaeological Survey Report, Future Urban Area 1, Antioch, Contra Costa County, California	William Self Associates
S-023656	William Self	2001	Archaeological Survey and Assessment of Harris Family Ranch (APN 007-010-031), Contra Costa County, California (letter report)	William Self Associates, Inc.
S-035455	Angela Cook and Aimee Arrigoni	2008	Final Cultural Resources Assessment Report, Roddy Ranch Project, Contra Costa County, California	William Self Associates, Inc.

S-035796	Barbra Siskin, Cassidy DeBaker, and Jennifer Lang	2009	Cultural Resources Investigation and Architectural Evaluation of the Pittsburg-Tesla Transmission Line, Contra Costa and Alameda Counties, California	Garcia and Associates
S-038250	James M. Allan	2011	Roddy Ranch Project-Empire Mine Road Relocation, Antioch, Contra Costa County, California (letter report)	William Self Associates, Inc.

CULTURAL RESOURCES REPORTED WITHIN 1/2 MILE OF THE STUDY AREA

No previously recorded cultural resources were located within the Project area. A total of 16 previously recorded cultural resources are present within ½-mile of the Project area. These resources are listed below in Table 3.

Table 3
Cultural Resources Within 1/2 Mile of the Project Area

Primary No.	Trinomial	Type	Age	Description
P-07-000007	CA-CCO-000684H	Site	Historic	Former Teutonia Coal Mine, consists of depressions, rock terraces, adits, historic trash
P-07-000013	CA-CCO-000690H	Site	Historic	Remains of Israel Mine
P-07-000268	CA-CCO-000496H	Site	Historic	Historic ranching/ farming complex consisting of portions of a brick foundation with an associated sparse artifact scatter, and a well or cistern.
P-07-000269	CA-CCO-000497H	Site	Historic	Israel Mine
P-07-000762		Structure	Historic	Series of metal animal feed troughs resting on a concrete pad, fenced stock pen area, and an olive tree grove
P-07-000763		Structure, Site	Historic	A brick cistern and a large eucalyptus tree
P-07-000768		Site	Historic	‘WSA-7
P-07-000770		Building, Structure, Other	Historic	‘WSA-9
P-07-000771		Building, Structure, Site	Historic	‘WSA-10
P-07-000772		Site	Historic	Historic trash scatter along both banks of Deer Creek
P-07-000854		Building, Other	Historic	Harris Ranch consisting of a wood frame house and associated outbuilding
P-07-002961		Site	Historic	‘GANDA 05
P-07-002973		Object	Historic	‘GANDA26
P-07-002974		Site	Historic	‘GANDA 27
P-07-002975		Site	Historic	‘GANDA 28
P-07-004765		Other	Prehistoric	Isolate 1 – Horse Valley

SURVEY RESULTS

The survey began in the southeast corner of the APE. Crews walked 15-20 meter transects on northwest/southeast alignments. Ground visibility was very good, with short, dried grasses growing over the entire property with some bare spots; there were also a good number of ground-squirrel and jackrabbit burrows throughout the survey area that provided a good glimpse into the subsurface conditions. The native soil was a reddish-brown clayey silt, with very few inclusions, blocky, dry and compact. Sand was also present throughout the survey area, presumably imported for the golf course. Trees in the area were sparse, and were mainly oak trees, with the exception of a couple willow trees and pepper trees in some of the seasonal drainages.

Modern features related to the golf course included: a low-profile wood perimeter fence that was likely installed to delineate the greenway from the surrounding land and to prevent balls from rolling outside of the golf course property; cement-paved pathways for pedestrian and golf-cart traffic; stacked rock retaining walls in various configurations; terraced landforms for treeboxes and greens; stand-alone bathroom structures; a wood platform picnic area near the parking lot; water features with associated pump-houses; irrigation and sprinkler systems; sand-traps; and the parking lot and driveway access from Deer Valley Road. Thousands of golf balls were noted during the survey.

The entire parcel was able to be surveyed (100%), with no access or safety issues. The terrain consists of the main southeast-northwest oriented ridgeline marking the southern edge of the property, which is also the highest elevation. Hillslopes and drainages originate from this ridgeline and slope downward (north) to the valley below. Modifications to the landscape include excavated areas for sand traps and built-up areas for tee boxes and greens. Hillslopes ranged from 20-40 percent, and there were very few flat areas. The water features were located at the northern edge of the parcel, which was the lowest elevation and the flattest area. These features were concrete-lined and had associated distribution lines and a pumphouse. Major modifications were made to the land surrounding the water features.

Several stacked rock walls were noted during the survey. Due to the quantity and size of the rocks used, they were likely brought in from off-site. At one of the locations, two of the boulders were observed to contain fossilized clamshells. The survey crew investigated all rocks for the presence of bedrock mortars or rock art, but none were observed. The rocks were stacked in either a straight-line or on a curved line and were packed with earth from behind. No mortar or other joining material could be seen. The rock walls seemed to serve as erosion control, or as retaining wall for modern features of the golf course, such as a tee-box or green.

No cultural resources were observed during the survey, and due to the modification of the land for building the golf course it is unlikely that any exist in the project area.

SUMMARY

The records search results and the field survey indicate that there are no known resources within the current Project area/APE. PaleoWest understands that the Project area/APE is expanding and, as such, an additional survey will be required for the Project (Refer to Figure 2).

Thank you for the opportunity to provide this fieldwork closure memorandum and update you on the current status of the Project. PaleoWest is prepared to provide management recommendations in the draft and final report once the Project area/APE is solidified. Please do not hesitate to give me a call if we can be of further assistance or answer any questions you may have on the work.

Sincerely,

PALEOWEST

Christina Alonso, M.A., RPA | Senior Archaeologist

7

BKF. 2021. CIVIL ENGINEERING UTILITY REVIEW - RODDY RANCH – ANTIOCH, CA. J

Civil Engineering Utility Review

Roddy Ranch
Antioch, California

February 9, 2021

PREPARED BY:

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1646 N. California Blvd, Suite 400
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CIVIL ENGINEERING UTILITY REVIEW

TABLE OF CONTENTS

1. Introduction

This Feasibility Review Study is intended to support the repurposing of the former Roddy Ranch Golf Course into an East Bay Regional Park District park. The site is located at 1 Tour Way in Antioch, California. Repositioning the use on the site is intended to transform the site from golf course facility use to a regional park use. Therefore the District is investigating the options for connecting to off-site facilities to serve the new park. The study identifies the proximity and potential for connecting public domestic water and wastewater facilities to the future park.

While the site is within the City of Antioch city boundaries, we research the potential for connecting to either the City of Antioch or the City of Brentwood facilities. Connecting to Brentwood would likely require a Local Agency Formation Commission (LAFCo) process to evaluate the impacts in order to change the service provider.

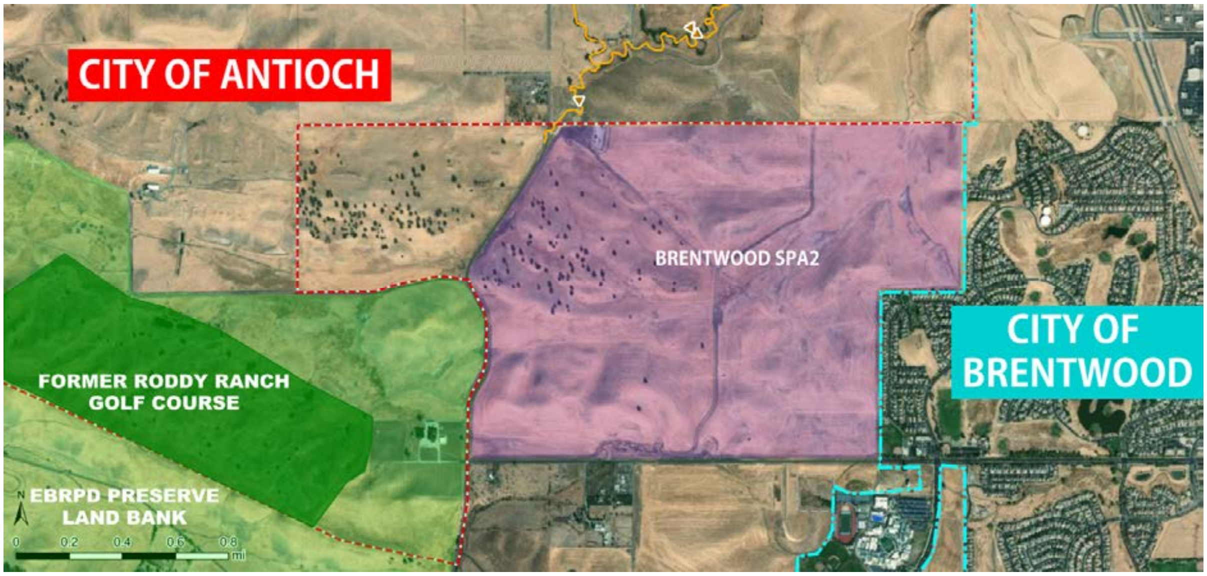


Figure 1: City Limits

2. Wastewater/Sanitary Sewer

The Roddy Ranch site is currently unserved with regards to wastewater collection and transmission to a disposal/treatment site. Based on information obtained, the former golf course facility used a septic system to dispose of wastewater.

A. <u>On-Site Septic System</u>

The State Water Resources Control Board adopted "Water Quality Control Policy for Siting, Design, Operation, and Maintenance of Onsite Wastewater Treatment Systems (OWTS)" is the statewide standard for wastewater disposal. The County's Environmental Health Division issued a permit for the original septic system in 2003 (ON0000162).

Figure 2: Approximate Tank Location

The septic system application and design was based on:

- Generation rate of 525 gallons per day
- Soil percolation rate of 11 MPI (minutes per inch of water)

Based on these design parameters, the system included:

- 3,000 gallon septic tank (based on submittal, manufacturer appears to be Jensen Precast Model JZ3000).
- Leach field (334 lineal feet total comprised of a main line and 4 84-long branches)

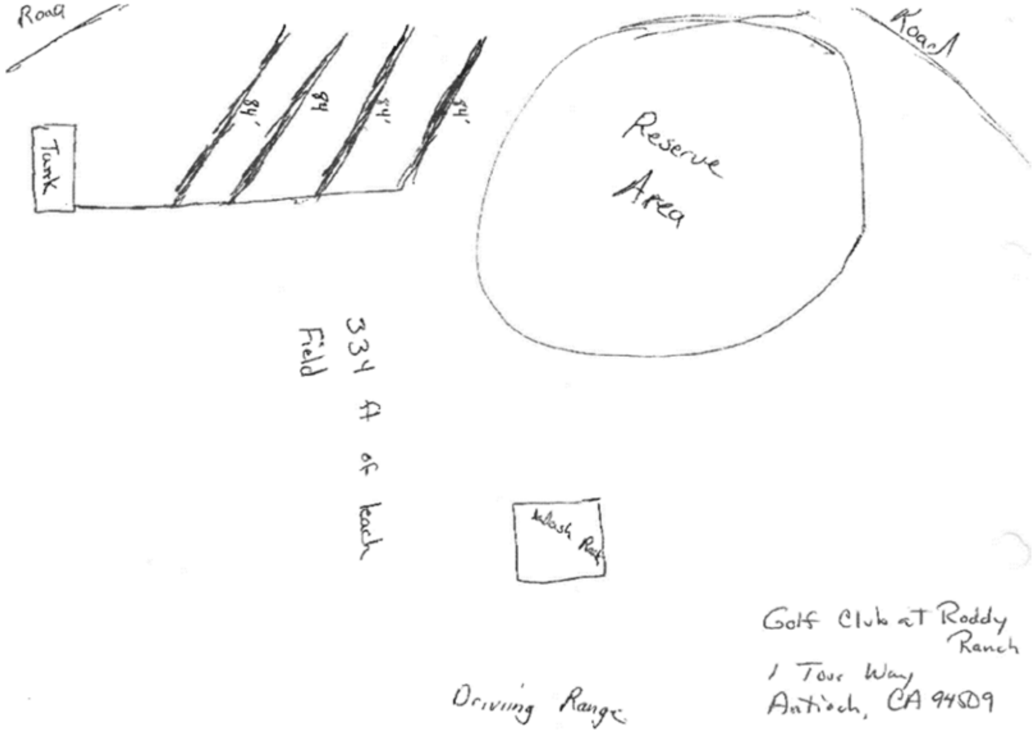


Figure 3: Septic Tank and Leach Field (from Permit Application)

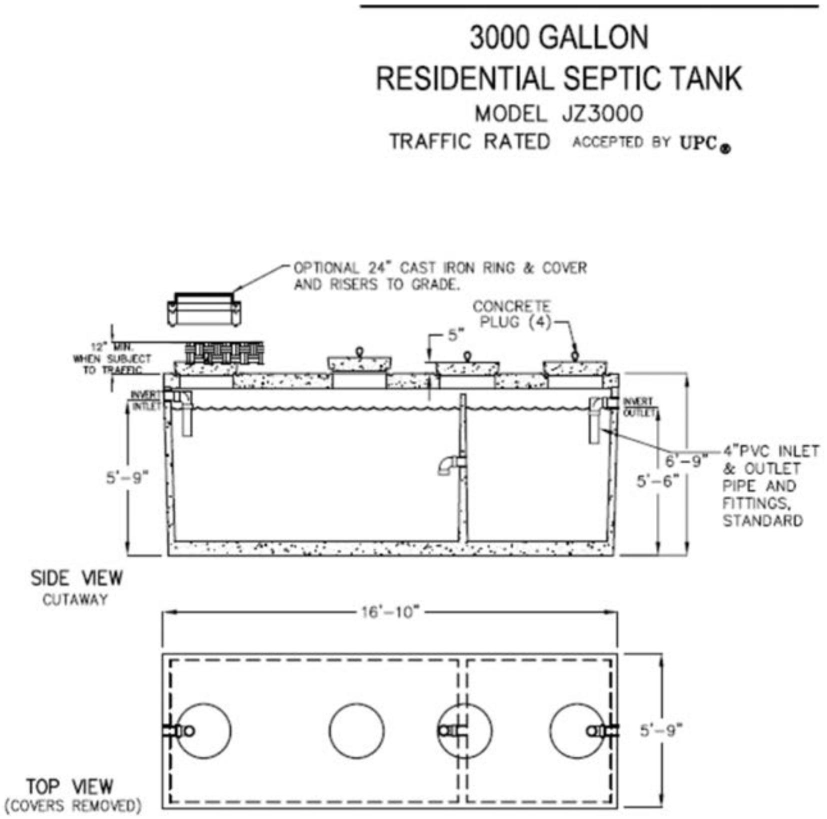


Figure 4: Septic Tank

A 6-inch pvc sewer line with manholes at bends connected the golf facility wastewater fixtures within the buildings to the septic tank.

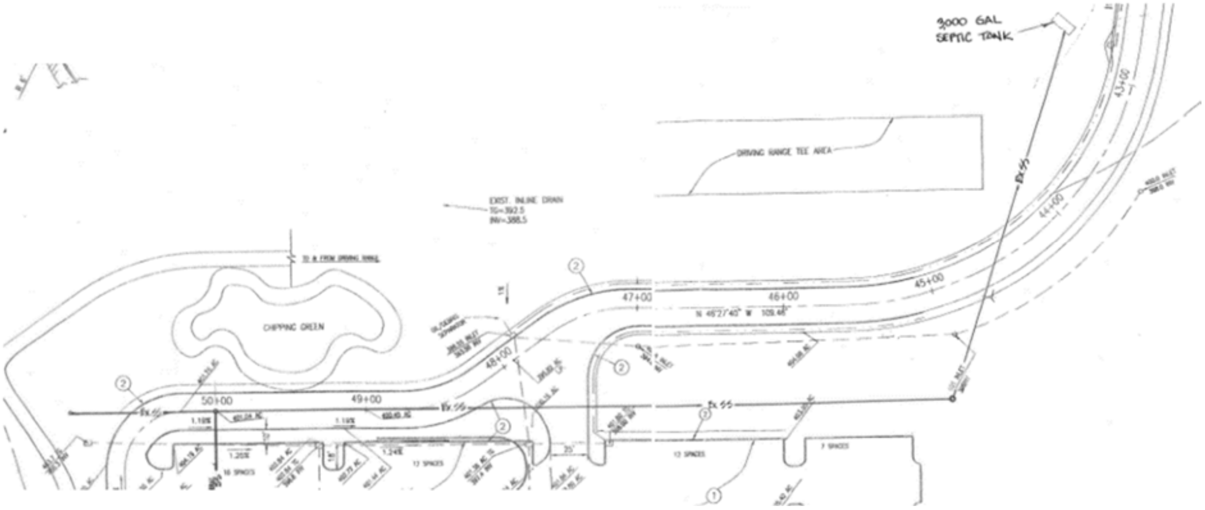


Figure 5: Sewer Line (from permit application)

To reuse the existing sewer system, septic tank and leach field will require a new permit to reuse the facilities (based on the new use). It will likely require:

(1) Sewer Main – Video inspection of the 6-inch main to verify its integrity (looking for damage, infiltration and/or defects) and suitability for reuse. The manhole inverts should be measured to determine their depth and the slope of the wastewater main.

(2) Septic Tank – Pumping out and visual inspection of 3,000 gallon tank to verify its integrity and suitability for reuse. The District may want to have the material in the tank tested to validate that only suitable material was disposed in the system.

(3) Leach Field – Leach field drainage test to verify the continued soil percolation.

While we were not able to locate the septic tank in the field, based on the Figure 4, it appears that the existing ground near this location is roughly elevation 395. The parking lot area is roughly at elevation 400. As recommended above, a field survey of the system should be conducted to verify the invert depths and capacity of the piping system.

The system was designed for 525 gallon per day. If the system is used solely for lavatories (restrooms/washrooms) with low flow fixtures, each flush/wash would generate 3 gallons or 175 patrons per day. Depending on use, this would roughly equate to 3 lavatories (58 uses each per day or 7 time per hour for an 8 hour period).

a. ***EBRPD Action Items:***
   1. *Sewer Main - Video inspection of 6-inch main for condition assessment on potential for reuse. Locate any laterals that may need to be plugged.*
   2. *Sewer Main – Survey rim and invert elevations of existing structures to verify capacity of the pipe.*
   3. *Septic Tank – Remove existing sludge and inspect condition and size. Assess for potential reuse.*
   4. *Leach Field – Conduct Leach field drainage test to verify the continued soil percolation.*

b. ***Future Design/Permitting Items:***
   1. *Verify that the existing infrastructure can handle and treat proposed flow rates.*
   2. *Apply for County permit to reuse septic system*

B. <u>On-Site Vault System</u>

On-Site vault toilet systems would be suitable for the site and could be sized together to accommodate pumping.

a. ***EBRPD Action Items:*** *None*

b. ***Future Design/Permitting Items:*** *None*

C. Off-Site City of Antioch Connection

1) Deer Valley Road

With the construction of Kaiser Permanente on Deer Valley Road, an 8-inch wastewater main was extended to Wellness Way to serve that facility. Extending this main line to the Roddy Ranch entry from Deer Valley Road would require:

- 10,100 lineal feet of new sewer gravity or force main in Deer Valley Road
- Approximately 34 manholes
- One new sewer pump station at roughly midway between Tour Way and Wellness Way
- Encroachment Permit from, and an agreement with, the City of Brentwood as approximately 0.5 miles (2,700 lineal feet) of the pipeline would be fully within the City of Brentwood city limits.

The total order of magnitude cost for this improvements, assuming that they are size to serve only the park, is roughly estimated at $3M.

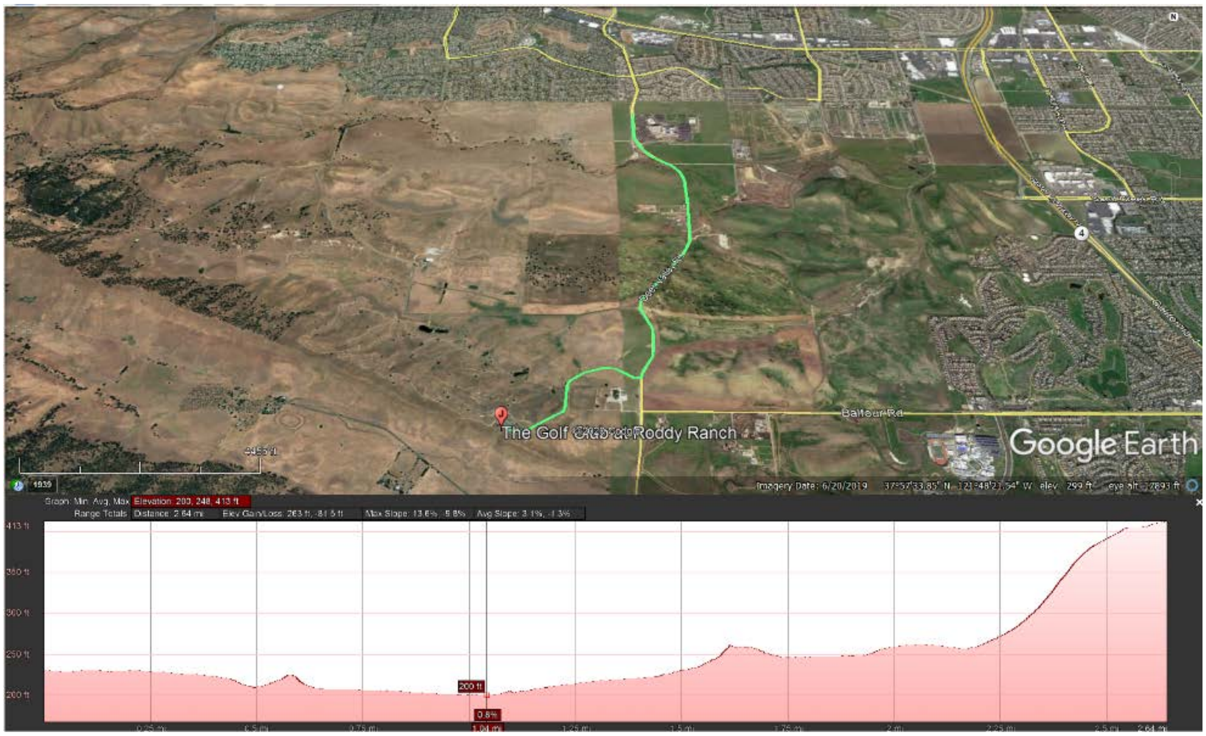


Figure 6: Deer Valley Road to Wellness Way

Figure 7: Wellness Way Tie-In Point

a. *EBRPD Action Items:*

1. *Contact City of Antioch about the potential for connecting to their system and the potential requirements, logistics, and costs.*

b. *Future Design/Permitting Items:* *TBD*

2) Empire Mine Road

We also reviewed the option of utilizing Empire Mine Road. Based on the undulating horizontal and vertical alignment of the roadway, at least two pump stations would be required to extend the system to the park. Additionally the distance to the Mesa Ridge Road is an additional 3,000 lineal feet, 25% more than the Deer Valley Road alignment.

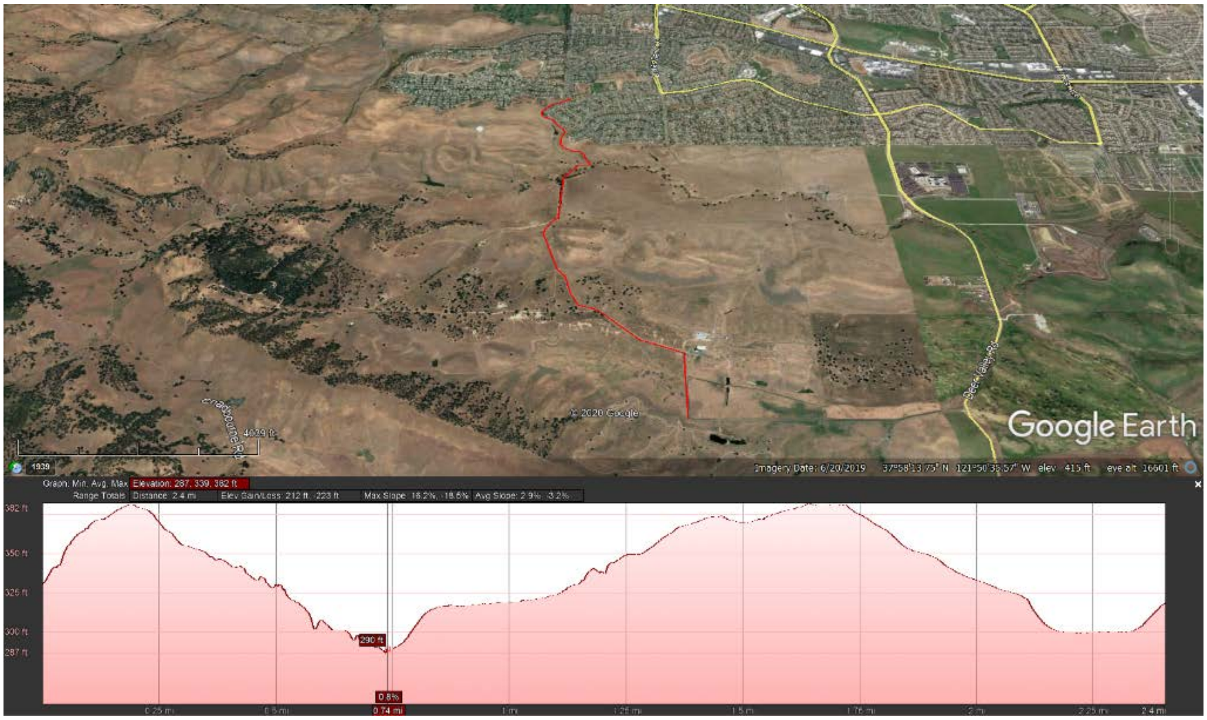


Figure 8: Empire Mine Road to Mesa Ridge Road

a. ***EBRPD Action Items:*** *None – not feasible*

b. ***Future Design/Permitting Items:*** *TBD*

D. Off-Site City of Brentwood Connection

1) Deer Valley Road to Balfour Road

Wastewater facilities within Balfour Road have been extended to east of West Country Club Drive. Extending this main line to the Roddy Ranch entry along Balfour Road to Deer Valley Road would require:

- 7,900 lineal feet of new sewer gravity or force main in Deer Valley Road and Balfour Road
- Approximately 26 manholes
- A portion of the wastewater main would likely require deep excavation (approximately 18-feet) to maintain gravity flow in Balfour Road

The total order of magnitude cost for this improvements, assuming that they are sized to serve only the park, is roughly estimated at $1.8M.

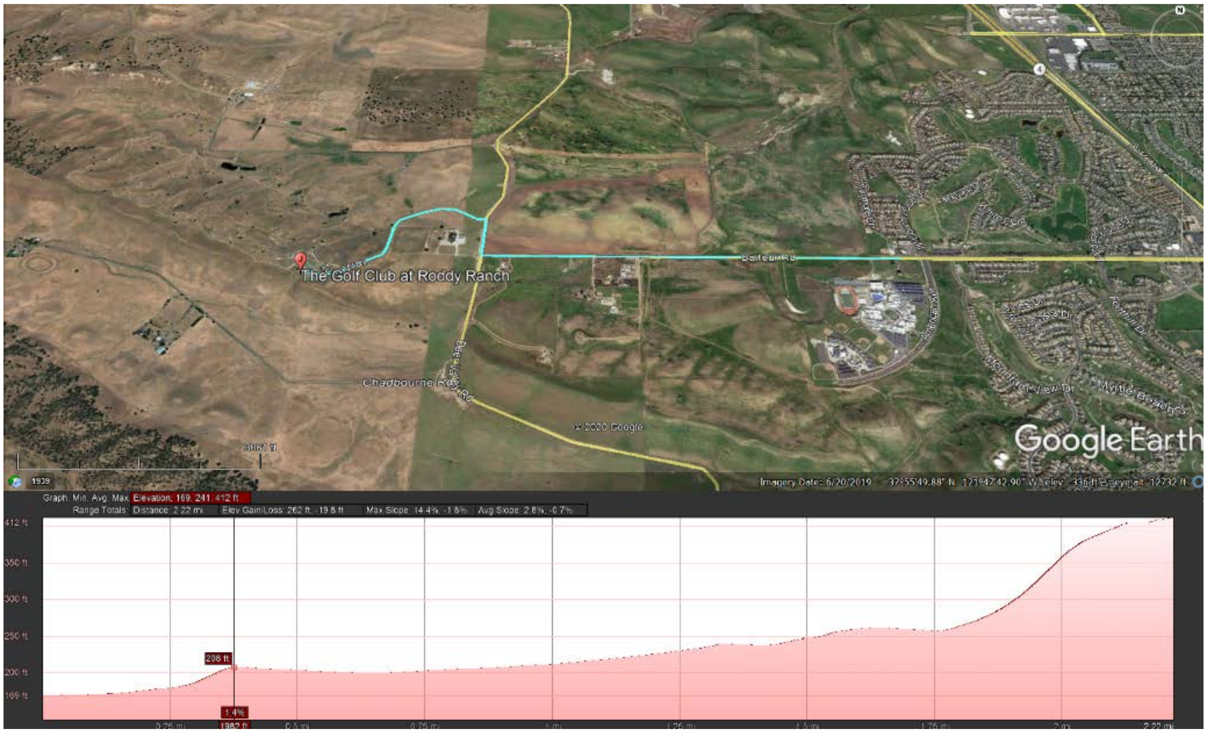


Figure 9: Deer Valley Road to Balfour Road

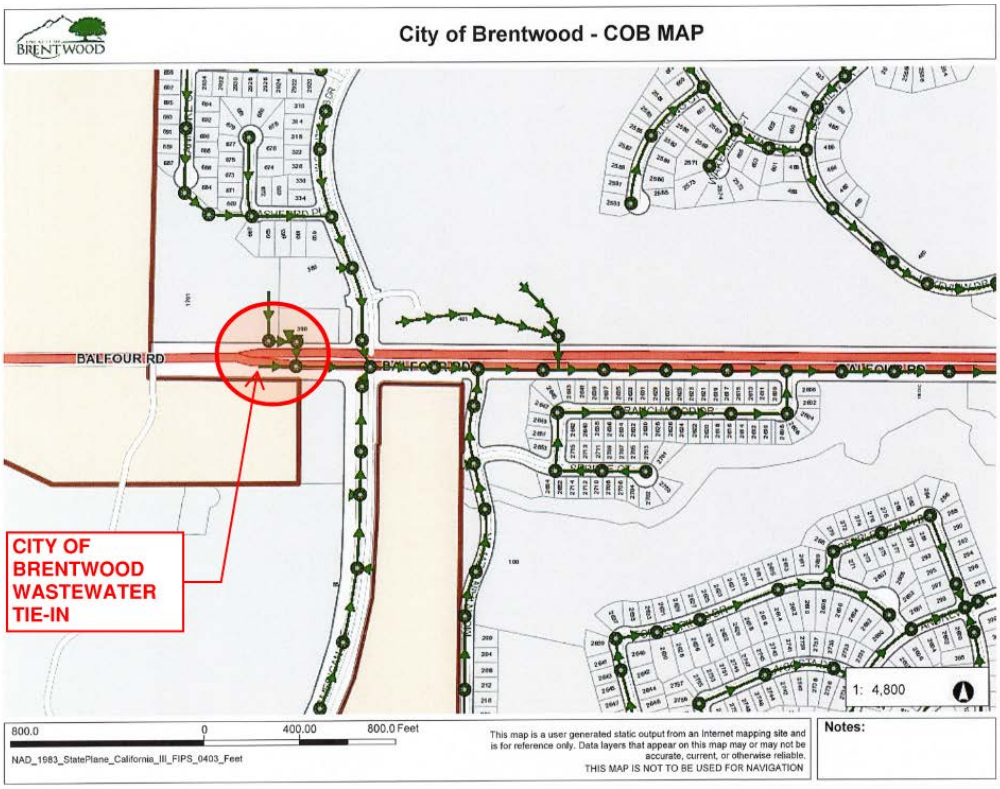


Figure 10: Balfour Road Tie-In Point

a. ***EBRPD Action Items:***

1. *Determine with attorney if LAFCO process is feasible.*
2. *Contact City of Brentwood about the potential for connecting to their system and the potential requirements, logistics, and costs.*

b. ***Future Design/Permitting Items:*** *TBD*

3. Non-Potable Water

A. Existing Irrigation System Routing

We understand that the existing irrigation system is not operational and has been disconnected.

The Zone 2 Water Project main extension from the Irrigation District meter near Deer Valley Road feeds the existing pond/lakes on-site. The main pump house that feeds the existing irrigation system.

The existing pump station was sized to pump 2,300 gpm @ 125 psi at 289 feet of head. The main feed to the existing hydrants would require reuse of several loop systems. To validate that the highlighted main lines could supply adequate fire flow to the hydrants, they should be isolated from the remaining water supply to test the pressure at the hydrants when the pumps are activated.

a. ***EBRPD Action Items:***

1. *Isolate interior irrigation mains and run flow test to determine existing pressure and flow rates.*

b. ***Future Design/Permitting Items:*** *TBD based on results of flow test.*

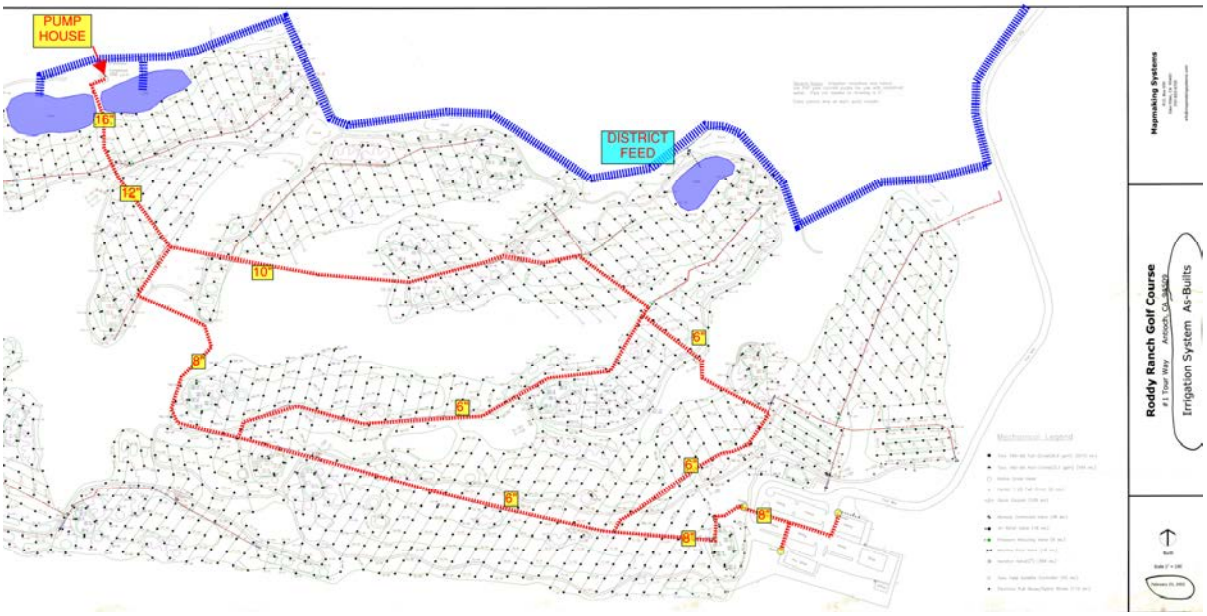


Figure 11: Existing Irrigation/Fire Mains

B. Potential for Using Irrigation System for Fire Fighting

Non-potable water is suitable for firefighting capabilities. The supply and pond system should provide a sufficient volume of water for firefighting capabilities. Alternatively the pond system could be disconnected and a fire pump installed if sufficient storage is available.

As there is over 100 vertical feet in difference between the ponds and the parking lot, it is not feasible to install a “dry” fire hydrant system where the pipes do not have pressurized water in them continually) to serve the parking lot area. However, the ponds could be used as a water source during firefighting at lower elevations (e.g. at entry roadway at the same elevation as the ponds or at the bend in Empire Mine Road) or through a helicopter bucket system.

Delivering water to the existing on-site fire hydrants from the pond system or directly from the irrigation main would require installing a fire pump in combination with a water storage tank or using the existing pump house to feed a new water storage tank.

The existing piping on-site would need to be pressure tested to verify that it can handle the pressure and flows from a pumped system. Typically a pumped system and a tank system act similarly as the pump head or water tank elevation serve to pressurize the system. Many tank systems also include a pump to delivery water to the tank, although the pump is much smaller as it is only needed to fill the tank over time and not needed to supply fire flows.

Alternatively, a new fire water main with booster pump station would need to be installed from the Irrigation District to a new gravity water tank above the fire hydrants. With a 2,300-foot main line, booster pump station and water tank, the cost for a new on-site system using irrigation water from the Irrigation District would cost roughly $3.5M depending on the size and capacity of the system.

Figure 12: New Fire System with Pump and Tank

a. *EBRPD Action Items:*

1. *To evaluate the existing system, the irrigation branches would need to be tied off (disconnected) and the main line valves determined operational.*

2. *The main line pressure testing could occur through the existing fire hydrants. The system would need to be filled to determine if leaks*

are present and then pressure tested to determine losses through the system.

b. ***Future Design/Permitting Items:***

1. *Based on the pressure testing results, a water model would determine the ability for fire flow and the sizing of a pumping station and reservoir.*

4. Domestic Water

A. City of Antioch - Deer Valley Road

With the construction of Kaiser Permanente on Deer Valley Road, a 20-inch water main was extended to Sand Creek Road to serve that facility. Extending this main line to the Roddy Ranch entry from Deer Valley Road would require:

- 8,700 lineal feet of new water main in Deer Valley Road
- Encroachment Permit from, and an agreement with, the City of Brentwood as approximately 0.5 miles (2,700 lineal feet) of the pipeline would be fully within the City of Brentwood city limits.

The total order of magnitude cost for this improvements, assuming that they are sized to serve only the park, is roughly estimated at $2.0M. This is the cost for service to the site, and does not included on-site mains or storage.

a. ***EBRPD Action Items:***

1. *Contact City of Antioch about the potential for connecting to their system and the potential requirements, logistics, and costs.*

b. ***Future Design/Permitting Items:*** *TBD*

Figure 13: Deer Valley Water Tie-In

B. Existing On-Site Well

1) Water Quality

The former water well at the Roddy Ranch Golf Course couple be used to provide domestic water for the park. The District took water samples from the well which were analyzed by EBMUD. The results of the water samples were compared relative to the State of California's standards for Maximum Contaminant Levels and Regulatory Dates for Drinking Water U.S. EPA VS California, Last Updated October 2018 and from Titles 17 and 22 California Code of Regulations, California Regulations Related to Drinking Water (9/23/2016 update).

Based on a cursory review, the level of Sulfate (350 mg/L) exceeds the recommend level of 250 mg/L. While below the Upper range of 500 mg/L, a Reverse Osmosis (RO) should be considered. The RO water treatment system would remove most dissolved substances, including sulfate, from water. RO systems could be installed within the current well, pump, filtration, and water tank system (as an add-on after the current filtration system before the water is stored in the tank). Alternatively small RO devices could be installed at the potable water fixtures within each rest room or other domestic water usage. All of these systems are fairly low in initial installation costs and would be maintained in conjunction with the current filtration setup. RO systems filters typical last between 10 and 15 years.

The water samples should be coordinated with the Contra Costa Health Services Department along with permitting the small water system with the Department.

The well and pumping system should be properly inspected, cleaned, and tested.

2) Capacity based on Use

Based on information provided, we understand that the well has a capacity of 10 gallons per minute. In reviewing the suitability of the well to accommodate park visitors and activities, we analyzed the use at toilet facilities assuming that the fixtures would use potable water.

Fixture Assumptions:
  Toilet – 1.6 gallon/flush
  Sink – 3 gallons/minute

Restroom Use:
  1 time every 5 minutes = 12 times per hour
  Availability = 8 hours
  Total use per day = 96 times per unit
  Total volume per day = 442 gallons/day/unit

Demand per Number of Units:
  1 = 442 gallons per day
  2 = 884 gallons per day
  3 = 1,326 gallons per day
  4 = 1,768 gallons per day

At pump rate of 10 gallons per minute =
  600 gallons per hour
  4,800 gallons per day (8 hour day)

Based on the intended use, a well producing 10 gallons per minute should be suitable for restroom and sink/drinking fountain use. The storage tank system may need to be modified to cycle the water within the tanks or increase the capacity of the tanks if additional facilities are constructed.

As mentioned in the wastewater section, the existing septic system was designed to handle 525 gallons per day, while the existing water system appears to have the capacity of 4,800 gallons per day or roughly 9 times the capacity of the existing sewer system.

a. *EBRPD Action Items:*

1. *The well and pumping system should be properly inspected, cleaned, and tested.*
2. *The capacity of the well should be monitored over time (e.g. monthly) to verify capacity.*
3. *The water samples should be coordinated with the Contra Costa Health Services Department along with permitting the small water system with the Department.*

b. *Future Design/Permitting Items:*

1. *Consider installing RO system to improve water quality*
2. *Validate use and capacity*

8

FEHR & PEERS. 2020. FORMER RODDY RANCH GOLF COURSE RESTORATION AND PUBLIC ACCESS – TRANSPORTATION ASSESSMENT.

Memorandum

Date: October 9, 2020

To: Vanessa Williford, Impact Sciences

From: Shane Russell, Bill Burton, Fehr & Peers

Subject: Former Roddy Ranch Golf Course Restoration and Public Access – Transportation Assessment

WC20-3717

This Technical Memorandum has been prepared to document the results of our transportation assessment for the proposed development of a new regional park at the site of the former Roddy Ranch Golf Course in Antioch. The primary purpose of this evaluation is to identify the potential impacts of the Project on the surrounding transportation system. This memorandum describes the Project and presents the methodology, results, and findings.

Project Description

The Project proposes both habitat restoration and public access improvements at the site of the former 230-acre Roddy Ranch Golf Course. The East Bay Regional Park District proposes to open the site to serve as the gateway to a future 3,500-acre regional park between Antioch and Brentwood. The park will support passive recreational activities using the site's existing infrastructure and provide public access to the neighboring 6,000-acre Black Diamond Mines Regional Preserve. Sole access to the Project site will be provided via the existing Tour Way, at its intersection with Deer Valley Road. The Project site and vicinity are shown on **Figure 1** (all figures are provided as attachments at the end of this memorandum).

The existing roadway and parking infrastructure at the site is to remain. This includes the existing asphalt parking lot and its 142 parking stalls, 6 of which are designated ADA spaces.

Existing Transportation System

All vehicular access to the site is provided via Tour Way.

Tour Way is a two-lane approximately 4,000-ft-long east-west driveway that connects Deer Valley Road to the Project site. Access to the site is currently prohibited by a locked gate at the intersection of Tour Way and Deer Valley Road which would be opened as part of the Project. The posted speed limit along Tour Way is 15 miles per hour. One lane of travel is provided in each direction and no sidewalks along the road exist.

Deer Valley Road is a north-south rural roadway that provides one travel lane in each direction, connecting Brentwood to Antioch. Areas adjacent to this roadway are mostly undeveloped and agricultural. There is a posted speed limit of 45 miles per hour, with no designated pedestrian or bicycle facilities provided in the study area. Deer Valley Road is a designated Route of Regional Significance by the Contra Costa County Transportation Authority (CCTA).

Transit Service

There is no transit service within a half mile of the Project site.

Bicycle Facilities

There are no designated bicycle facilities (bicycle routes, lanes, or paths) provided within the study area along Tour Way, or on Deer Valley along the Project's frontage. However, bicycles are not forbidden from using any of the roadways in the vicinity of the Project site.

The *Countywide Bicycle and Pedestrian Plan* (Contra Costa County, 2018) proposes a network of bicycle facilities that when completed, "will provide facilities to connect Contra Costa's communities and key destinations, serve all ages and abilities by addressing the barriers created by high-stress arterials and collectors, and create a regional "backbone" that connects and supports more local bikeways." The CBN will consist of only "regionally significant" facilities that operate at low Levels of Traffic Stress (LTS), LTS 1 or 2. Deer Valley Road is included in the CBN's roughly 513 miles of proposed bicycle facilities.

Pedestrian Facilities

There are no formal pedestrian facilities (i.e. sidewalks or crosswalks) provided within the study area along Tour Way, or on Deer Valley along the Project's frontage. The Project does include conceptual trail alignments within the park to connect trail users at the Roddy Ranch site to the existing Black Diamond Mines Regional Preserve, via the Star Mine Trail, as it intersects with Empire Mine Road in Antioch.

Analysis Methodology

Vehicle Miles of Travel

"VMT" or Vehicle Miles of Travel is a measure used to describe automobile use on a daily basis. VMT is the product of the total number of vehicles traveling and the number of miles traveled per vehicle. In December 2018, the Governor's Office of Planning and Research (OPR) finalized new CEQA guidelines (CEQA Guidelines section 15064.3) that identify VMT as the most appropriate criterium to evaluate a project's transportation impacts.

The implementation of Senate Bill (SB) 743 eliminated the use of criteria such as auto delay, level of service, and similar measures of vehicle capacity of traffic congestion as the basis for determining significant impacts as part of CEQA compliance. The SB 743 VMT criteria promote the reduction of greenhouse gas emissions, the development of multimodal transportation networks, and a diversity of land uses. In compliance with SB 743 mandates, VMT was employed to assess the impacts of this project on the transportation network.

Significance Criteria

Significance criteria are used to determine if a project impact is considered significant and therefore requires mitigation. Currently neither the City of Antioch nor the Contra Costa Transportation Authority have established specific standards or thresholds on VMT. Therefore, recently adopted Contra Costa County significance thresholds, which are consistent with OPR guidance, have been utilized in this assessment. The *Contra Costa County Transportation Analysis Guidelines* (Contra Costa County Public Works Department, June 23, 2020) provides screening criteria in order to determine if a proposed project should be expected to prepare a detailed VMT analysis. Absent substantial evidence indicating that a project would generate a potentially significant level of VMT, the following types of projects should be expected to cause a less-than-significant impact under CEQA and would not require further VMT analysis.

i. Projects that:

   A. Generate or attract fewer than 110 daily vehicle trips; or,

   B. Projects of 10,000 square feet or less of non-residential space or 20 residential units or less, or otherwise generating less than 836 VMT per day.

ii. Residential, retail, office projects, or mixed-use projects proposed within ½ mile of an existing major transit stop or an existing stop along a high-quality transit corridor.

iii. Residential projects (home-based VMT) at 15% or below the baseline County-wide home-based average VMT per capita, or employment projects (employee VMT) at 15% or below the baseline Bay Area average commute VMT per employee in areas with low VMT that incorporate similar VMT reducing features (i.e., density, mix of uses, transit accessibility).

iv. Public facilities (e.g. emergency services, passive parks (low-intensity recreation, open space), libraries, community centers, public utilities) and government buildings.

Additionally, Senate Bill 743 establishes the significance of a project's impact if it:

- Conflicts with a plan, ordinance, or policy addressing the safety or performance of the circulation system, including transit, roadways, bicycle lanes, and pedestrian paths (except for automobile level of service or other measures of vehicle delay).
- Substantially induces additional automobile travel by increasing physical roadway capacity in congested areas (i.e., by adding new mixed-flow lanes) or by adding new roadways to the network.

The proposed Roddy Ranch Project has the characteristics of a "passive park" in that it provides users with low intensity recreation in the form of open space and a network of trails. No sports fields or facilities are proposed as part of the Project. As such, the Project aligns with the County's definition of a public facility within its screening criteria, and is expected to result in a less-than-significant impact relative to VMT. The Project is not expected to be accretive to overall VMT within the County. It will likely shorten existing trips currently occurring to other recreational uses, thereby reducing overall VMT.

An estimate of the total VMT to be generated by the proposed Project has been prepared for informational purposes. Additionally, a Level of Service (LOS) analysis has been prepared to help evaluate the Project's effect on operational performance of the County's transportation facilities. The results of these analyses are detailed in the sections below.

Level of Service

Though VMT dictates significant impact under CEQA guidelines, an evaluation of level of service at the Tour Way and Deer Valley Road intersection has been prepared as an informational supplement. LOS is a measure of traffic operating conditions, which varies from LOS A (indicating free-flow traffic conditions with little or no delay) to LOS F (representing over-saturated conditions where traffic flows exceed design capacity resulting in long queues and delays). These grades represent the perspective of drivers and are an indication of the comfort and convenience associated with driving.

The following operational standards were developed based on City of Antioch and East Contra Costa County Action Plan policies, CCTA's *Technical Procedures* (2013).

1. Would the Project conflict with an applicable plan, ordinance or policy establishing measures of effectiveness for the performance of the circulation system, taking into account all modes of transportation including mass transit and non-motorized travel and relevant components of the circulation system, including but not limited to intersections, streets, highways and freeways, pedestrian and bicycle paths, and mass transit?
    a. Would the operations of a study intersection not on a route of regional significance decline from LOS D (an average delay of 55 seconds for signalized intersections) or better to LOS E or F, based on the HCM LOS method, with the addition of project traffic?
    b. Would the Project deteriorate already unacceptable operations at a signalized intersection by adding traffic?
    c. Would the operations of an unsignalized study intersection decline from acceptable to unacceptable with the addition of project traffic, and would the installation of a traffic signal based on the Manual on Uniform Traffic Control Devices (MUTCD) Peak Hour Signal Warrant (Warrant 3), be warranted?
    d. Would construction traffic from the Project have a significant, though temporary, impact on the environment, or would project construction substantially affect traffic flow and circulation, parking, and pedestrian safety?
2. Would the Project conflict with an applicable congestion management program, including but not limited to level of service standards and travel demand measures, or other standards established by the county congestion management agency for designated roads and highways?
    a. Would the operations of a study intersection on a route of regional significance decline from LOS high-D (an average delay of 55 seconds for signalized intersections) or better to LOS E or F, based on the HCM LOS method, with the addition of project traffic?

At unsignalized side-street stop-controlled intersections, the delay is calculated for each stop-controlled movement and the left-turn movement from the major street, as well as the average delay for the intersection. **Table 1** summarizes the relationship between the average control delay per vehicle and LOS at unsignalized intersections. The intersection average delay and highest movement/approach delay are reported for side-street stop-controlled intersections.

Table 1: Intersection Level of Service Thresholds

Level of Service	Unsignalized Intersection Control Delay (sec/veh)[1]	General Description
A	0 – 10.0	Little or no delays.
B	10.1 – 15.0	Short traffic delays.
C	15.1 – 25.0	Average traffic delays.
D	25.1 – 35.0	Long traffic delays.
E	35.1 – 50.0	Very long traffic delays.
F	> 50.0	Extreme traffic, delays where intersection capacity exceeded.

[1] Control delay includes initial deceleration delay, queue move-up time, stopped delay, and acceleration delay.
Source: *Highway Capacity Manual,* 6th Edition.

Project Transportation Assessment

To estimate project-generated VMT and other impacts to the transportation network, vehicle trips expected to be added to the roadway system were combined with existing traffic volumes. The analyses of the Project's trip generation and potential impact on the proposed driveway location are described in the following sections.

Data Collection

As part of the *Vineyards at Deer Creek Transportation Impact Assessment* (July, 2019) conducted by Fehr & Peers, weekday morning (6:00 – 10:00 AM) and evening (3:00 to 6:00 PM) peak period intersection turning movement counts were collected in January 2019 at the intersection of Deer Valley Road and Balfour Road, immediately south of the Project driveway at Tour Way and Deer Valley Road. Due to the COVID-19 pandemic, conducting accurate new traffic counts for the Project was not possible. This analysis therefore utilizes the 2019 count data at Deer Valley Road and Balfour Road to inform the weekday peak hour analysis. The Project driveway's proximity to the Deer Valley Road and Balfour Road intersection allows for volumes calculated given there are no access points between the two intersections. As pre-COVID-19 Saturday midday peak hour turning movement counts were not available from previous studies, the use of "Big Data" was employed as an alternative method of data collection. Streetlight data from 2019 was obtained and incorporated into the assessment to inform the weekend peak hour analysis. The 2019 count data previously collected manually was checked against the Streetlight data turning movement count data from 2019. Total weekday peak hour traffic at the Project's driveway between the two data sources was found to be similar – Streetlight estimates proved to be about 5.5% higher and therefore provide a slightly conservative analysis. Existing conditions volumes are shown on **Figure 2.**

Project Trip Generation, Distribution and Assignment

The number of vehicle trips that would be generated by the proposed Project were estimated through a trip generation analysis. Daily and peak hour estimates were prepared using data from multiple sources, including the Institute of Transportation Engineers (ITE) *Trip Generation, 10th Edition*, as well as supplemental traffic studies provided by EBRPD staff that were previously prepared for other parks in the area. **Table 2** presents the results of the trip generation analysis performed for the proposed Project.

Table 2: Project Trip Generation Summary

ITE Land Use	Size	ITE Code	AM Peak Hour[1]			PM Peak Hour[2]			Saturday Peak Hour[3]			Daily[3]
			In	Out	Total	In	Out	Total	In	Out	Total	
Public Park	230 acres	411	3	2	5	14	12	26	-	-	-	-
-	142 Stalls	-	-	-	-	-	-	-	66	54	120	713

Notes:
1. Trips calculated using ITE average rate. Weekday, peak hour of adjacent street traffic, one hour between 7:00 and 9:00 AM.
2. Trips calculated using ITE average rate. Weekday, peak hour of adjacent street traffic, one hour between 4:00 and 6:00 PM.
3. Trips calculated custom rate developed from Black Diamond Mines study.

Source: Institute of Transportation Engineers (ITE), *Trip Generation Manual, 10th Edition*; *Traffic Engineering and Air Quality Study for the Black Diamond Mines Regional Preserve,* Stantec, June 2017; Fehr & Peers, July 2020.

Trip Generation estimates for the Saturday peak hour were prepared using data from a study previously conducted for staging areas providing access to the nearby Black Diamond Mines Regional Preserve. The study used driveway counts conducted at existing sites in the area during the peak season to generate trip generation estimates for the Project. Using these reported trip generation estimates and the relative size of the proposed Black Diamond Mines staging areas in number of parking stalls, a custom trip generation rate was calculated and applied to the Roddy Ranch parking supply for both Saturday peak hour and daily estimates.

Project trip distribution refers to the directions of approach and departure that vehicles would take to access and leave the site. Estimates of Project trip distribution percentages were developed based on existing count data and are shown on **Figure 3**. Project trips were then assigned to the roadway network, as shown on **Figure 4.**

Level of Service Analysis

The following scenarios were evaluated to assess level-of-service:

- ***Existing:*** Based on existing traffic counts.
- ***Existing Plus Project:*** Existing traffic counts with traffic expected to be generated by the Project.
- ***Near-Term:*** Existing traffic counts plus traffic from approved projects expected to be developed in the next 5 to 10 years. Anticipated developments in the study area considered in the analysis of near-term conditions are summarized in **Table 3.**
- ***Near-Term Plus Project:*** Near-term conditions with traffic expected to be generated by the Project.
- ***Cumulative:*** The cumulative conditions analysis was developed using growth rates from the Contra Costa County Travel Demand model for the year 2040. The model considers buildout of the City of Brentwood and City of Antioch General Plans.
- ***Cumulative Plus Project:*** Cumulative forecasts plus traffic expected to be generated by the Project.

Table 3: Near-Term Approved Projects Summary

City	Project Name	Size	Land Use	Status
Brentwood	Bridle Gate Residential Elementary School Commercial	252 dwelling units 258 dwelling units 700 students 150,000 square-feet	Unrestricted Single Family Homes Apartments Elementary School Commercial	Pending; construction not yet started
Brentwood	Trilogy at the Vineyards Pioneer Square	1,600 units 72 units	Age-restricted Single Family Homes Age-restricted Attached Homes	Under Construction; 707 units remaining Under Construction; 72 units remaining

Brentwood	Contra Costa County Community College District	5,000 students	Community College	Under Construction; not yet occupied
Brentwood	Sciortino Ranch (9356)	326 units	Unrestricted Single Family Homes	Under Construction
Brentwood	Streets of Brentwood	320 dwelling units 32,000 square feet	Multi-family Units Shopping Center	Pending; construction not yet started
Antioch	Heidorn Village	117 dwelling units	Unrestricted Single Family Homes	Approved; Under Construction
Antioch	Aviano	533 dwelling units	Unrestricted Single Family Homes	Approved; Under Construction
Antioch	Vineyard at Sand Creek (Promenade)	192 dwelling units 440 dwelling units	Unrestricted Single Family Homes Age Restricted Single Family Homes	Under Construction; not yet occupied
Antioch	The Ranch	755 dwelling units 422 dwelling units 54,000 square feet	Unrestricted Homes Age Restricted Homes Commercial	Initiative adopted by Council; construction not yet started
Antioch	Laurel Ranch	180 dwelling units 10 acres commercial	Unrestricted Single Family Homes Commercial	Approved; construction not yet started
Antioch	Quail Cove	32 dwelling units	Unrestricted Single Family Homes	Approved; construction not yet started
Antioch	Park Ridge	525 dwelling units	Unrestricted Single Family Homes	Under Construction; 178 units remaining
Brentwood	Orfanos, Brentwood	160 dwelling units	Single Family Homes	Under Construction
Brentwood	Alvarez Partners, Brentwood	48 dwelling units	Single Family Homes	Approved
Brentwood	Shops at Lone Tree Village, Brentwood	54,000 square feet	Shopping Center	Under Construction
Antioch	Creekside Vineyards at Sand Creek	220 Dwelling Units	Single Family Homes	Under Review

Source: *City of Brentwood Project Status* as of July 2020 and City of Antioch Development Project Pipeline (July 2020).

The following peak hours were evaluated for the scenarios listed above:

- Weekday AM and PM peak hour peak season
- Saturday peak hour peak season

As previously mentioned, access to the Project site would be provided via a single driveway: Tour Way. At this location, Deer Valley Road is a two-lane roadway. The Project driveway approach to Deer Valley Road is controlled by a stop sign, with through traffic on Deer Valley Road being uncontrolled. Intersection operations at the Project driveway were assessed using the Synchro 10.0 software and methodology of the Transportation Research Board's *Highway Capacity Manual, 6th Edition*. **Table 4** presents the results of the Level of Service analysis for the Project driveway under the various analysis scenarios.

Table 4: Tour Way and Deer Valley Road Level of Service Summary

Scenario	Peak Hour	Intersection LOS	Intersection Delay[1]
Existing	Weekday AM	A (A)	0 (0)
	Weekday PM	A (A)	0 (0)
	Saturday	A (A)	0 (0)
Existing Plus Project	Weekday AM	A (B)	0 (13.1)
	Weekday PM	A (B)	0.3 (12.7)
	Saturday	A (B)	2 (10.8)
Near-Term	Weekday AM	A (A)	0 (0)
	Weekday PM	A (A)	0 (0)
	Saturday	A (A)	0 (0)
Near-Term Plus Project	Weekday AM	A (B)	0 (14.9)
	Weekday PM	A (C)	0.2 (16.2)
	Saturday	A (B)	1.7 (11.9)
Cumulative	Weekday AM	A (A)	0 (0)
	Weekday PM	A (A)	0 (0)
	Saturday	A (A)	0 (0)
Cumulative Plus Project	Weekday AM	A (C)	0 (18.3)
	Weekday PM	A (C)	0.2 (20.4)
	Saturday	A (B)	1.5 (12.9)

Notes:
1. For Side Street Stop-Controlled intersections, average delay or LOS is listed first, followed by the delay or LOS for the worst approach in parentheses.
2. Average intersection delay is calculated per HCM 6th Edition methodologies.
Source: Fehr & Peers, July 2020.

As presented in **Table 4**, the driveway intersection as a whole operates acceptably under all plus-project analysis scenarios. Given that the intersection remains uncontrolled in the no-project scenarios, drivers would not experience any delay (i.e. delay of zero seconds). Based on the level of service analysis, the addition of Project traffic is not expected to cause any substantial effects to intersection operations.

VMT Analysis

As previously stated, due to the Project's characteristics, County screening VMT screening criteria are met and the Project would not have a significant adverse impact associated with VMT.

However, a VMT estimate was prepared as part of this report for informational purposes using the daily trip generation estimates presented in **Table 2**, and an estimated average project trip length developed with consideration of local geographic context.

Given the nature, location, and recreational opportunities offered by the Project, it is expected that a majority of the park's users will originate from the adjacent cities of Antioch and Brentwood. However, a proportion of the park's users are likely to travel longer distances from more regional destinations. Using information from the County's travel demand model (while the County model does not specifically include a recreational or park use, the trip lengths and origins/destinations of other trip types were reviewed to help inform the estimate of recreational trip activities) and a weighted average of each City's population and respective distance from the project, an average recreational trip length was estimated. This trip length was then adjusted to account for regional trips. This resulted in an average project one-way trip length of 6.7 miles. This trip length combined with the estimated daily trips presented in **Table 2** yielded a total estimate of approximately 4,800 daily vehicle miles of travel associated with the Project.

Traffic Engineering & Safety Review

Fehr & Peers has prepared a safety assessment of site access conditions at the proposed Deer Valley Road and Tour Way Project entrance. During field observations, staff conducted sight distance measurements, and reviewed existing roadway geometry and topography in an effort to identify any potentially hazardous conditions for various users including bicyclists, pedestrians and vehicles entering or exiting the area.

Available collision records for Deer Valley Road and Tour Way were compiled from the University of California, Berkeley's Transportation Injury Mapping System (TIMS). TIMS provides access to injury-related crash data through the California Statewide Integrated Traffic Records System (SWITRS). Collision records were taken from 2013 to 2019, to capture any collision records available. It should be noted that 2018 and 2019 crash data reported by SWITRS is still considered provisional and may be subject to change.

There were two reported collisions near the Project driveway. One of these collisions, which occurred on Deer Valley Road about 800 feet north of the Tour Way intersection, involved a motor vehicle colliding with a fixed object due to travel at an unsafe speed. The second record involved two motor vehicles headed southbound and was the result of a rear-end collision at the intersection. It was reported that the leading vehicle was making a turning movement and struck by the following vehicle. As this collision is dated December of 2015, it occurred during the period when the previous Roddy Ranch Golf course was still in operation. Both collisions resulted in a minor injury or complaint of pain. No fatalities were reported in the study area.

These types of collisions are not uncharacteristic given the study area's rural setting. Preventative best practices commonly employed in such settings include curve warning signage and edge-line rumble strips. A discussion regarding potential treatments is provided at the end of this section.

The posted speed limit on Deer Valley Road along the Project's frontage is 45 miles per hour. Based on Table 201.1 of the Caltrans Highway Design Manual (HDM) a minimum stopping sight distance of 450 feet is required for a design speed of 50 miles per hour. Sight distance looking south from the Project driveway is unobstructed for more than 1,000 feet. Looking north from the Project driveway a horizontal curve obstructs sight distance a few hundred upstream of the site. Fehr & Peers staff has calculated the sight distance for a vehicle exiting the Project driveway at 745 feet looking to the north.

For northbound vehicles wanting to turn left into the Project site, a potential conflict exists with southbound traffic proceeding through the intersection. Sight distance for a vehicle making a northbound left turn was calculated to be 465 feet, but due to the curvature of the road, this line of sight would be dependent on the righthand shoulder remaining clear of obstruction (vegetation). Given the speed of vehicles proceeding straight through the uncontrolled southbound approach of the intersection, and the existing vegetation along the right side of the roadway, this conflicting northbound left and southbound through movement has been identified as a **significant adverse impact**. Sufficient sight distance in accordance with the Caltrans Highway Design Manual is not currently provided for this movement.

Mitigation Measure Transportation 1: The Project should include the construction of a separate northbound left turn pocket on Deer Valley Road providing access to Tour Way. The turn pocket should be designed in accordance with County and Caltrans standards. Standard striping, transitions, tapers, and acceleration/deceleration distances should be provided.

Additionally, we recommend that consideration be given to the possible widening of the southbound shoulder approaching the Project driveway. A sloped, unpaved shoulder currently exists, and a potential widening would provide southbound vehicles turning right into the Project site space to decelerate and decrease the potential for rear-end collisions. Implementation of these recommendations would reduce the Project's impact to less-than-significant.

Emergency Vehicle Access

The Project proposes a single point of access from Deer Valley Road via Tour Way. The *2016 California Fire Code* (California Code of Regulations Title 24, Part 9, California Building Standards Commission) provides standards wherein multiple points of emergency vehicle access are provided. While detailed standards are mandated for residential and commercial uses, for a passive recreational use such as the Project, the Code articulates "*The fire code official is authorized to require more than one fire apparatus access road based on the potential for impairment of a single road by vehicle congestion, condition of terrain, climatic conditions or other factors that could limit access*." Thus, the decision to require a second means of entry and exit to the Project site is within the purview of the local fire official and is not an environmental issue within this assessment.

CEQA Checklist Review

This section provides a summary of the potential Project impacts related to roadways, VMT bicycles, pedestrians, and transit based on CEQA criteria, and summarized for each topic area, as presented in **Table 5.**

Table 5: CEQA Checklist Review

Significance Criteria	Discussion	Mitigation
A. Conflict with a program, plan, ordinance, or policy addressing the circulation system, including roadway, transit, bicycle and pedestrian facilities?		
The project would create a significant impact related to the roadway system if any of the following criteria is met:		
Disrupt existing roadway facilities	The Project was not found to disrupt the operation or performance of roadway facilities	None required
Interfere with planned roadway facilities	The Project would not interfere with planned roadway facilities	None required.

Table 5: CEQA Checklist Review

Significance Criteria	Discussion	Mitigation
Create inconsistencies with adopted system plans, guidelines, policies, or standards	The Project was not found to interfere with any plans, guidelines, policies, or standards related to roadways	None required.
A pedestrian impact is considered significant if the project would:		
Disrupt existing pedestrian facilities	The Project was not found to disrupt the operation or performance of pedestrian facilities	None required.
Interfere with planned pedestrian facilities	The Project would not interfere with planned pedestrian facilities	None required.
Create inconsistencies with adopted pedestrian system plans, guidelines, policies, or standards.	The Project does not create inconsistencies with adopted pedestrian system plans, guidelines, policies, or standards.	None required.
A bicycle impact is considered significant if the project would:		
Disrupt existing bicycle facilities	The Project was not found to disrupt the operation or performance of bicycle facilities	None required.
Interfere with planned bicycle facilities	The Project would not interfere with planned bicycle facilities	None Required.
Create inconsistencies with adopted bicycle system plans, guidelines, policies, or standards	The proposed development does not create any inconsistencies with the adopted bicycle system plans, guidelines, policies, or standards.	None Required.
A transit impact is considered significant if the project would:		
Interfere with existing transit facilities or precluded the construction of planned transit facilities.	There are no existing or planned transit facilities in the Project's vicinity.	None Required.
Create inconsistencies with adopted transit system plans, guidelines, policies, or standards	The proposed development does not create any inconsistencies with adopted transit system plans, guidelines, policies, or standards.	None Required.
B. Conflict or be inconsistent with CEQA Guidelines section 15064.3, subdivision (b)?		

Table 5: CEQA Checklist Review

Significance Criteria	Discussion	Mitigation
An impact could occur if the project would result in a substantial increase of vehicle miles of travel relative to the established standards of significance.	As detailed in the VMT analysis, the Project meets the applicable VMT screening criteria. The Project was not found to result in significant adverse impacts pertaining to VMT.	None Required.
C. Substantially increase hazards due to a geometric design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment)?		
Would implementation of the project result in a geometric design feature that do not meet design standards?	The left turn into the Project's proposed driveway on Tour Way was found to have inadequate stopping sight distance as measured by the Caltrans Highway Design Manual.	Install a northbound left turn lane on Deer Valley Road at Tour Way entering the Project site.
D. Result in inadequate emergency access?		
Would the project result in inadequate emergency access?	One means of ingress and egress is provided to the Project site via Tour Way. As proposed, the Project is not in violation of the governing 2016 California Fire Code, however, the local official can require a second EVA if found necessary.	None required.

Source: Fehr & Peers, July 2020.

Conclusions

The results of our analysis indicate that the Project meets the applicable County screening criteria pertaining to VMT, as the proposed Roddy Ranch Project aligns with the County's definition of a public facility. It is therefore expected to result in a less-than-significant impact under CEQA pertaining to VMT. The Project's driveway is expected to operate at an appropriate level of service with minimal vehicular delays; however, a potentially hazardous condition was identified due to the lack of adequate stopping sight distance. The installation of a northbound left turn lane on Deer Valley Road entering the Tour Way driveway is proposed to mitigate this impact.

Please to not hesitate to call if you have any questions or require further information regarding this analysis.

Attachments:

- Figure 1: Project Site Vicinity & Study Location
- Figure 2: Existing Peak Hour Traffic Volumes, Lane Configurations and Traffic Control
- Figure 3: Project Trip Distribution
- Figure 4: Project Trip Assignment
- Appendix A: Counts
- Appendix B: LOS Reports

🟦 Project Site

Study Intersection

Figure 1

Project Site Vicinity and Study Location

WC20-3717_1_StudyArea

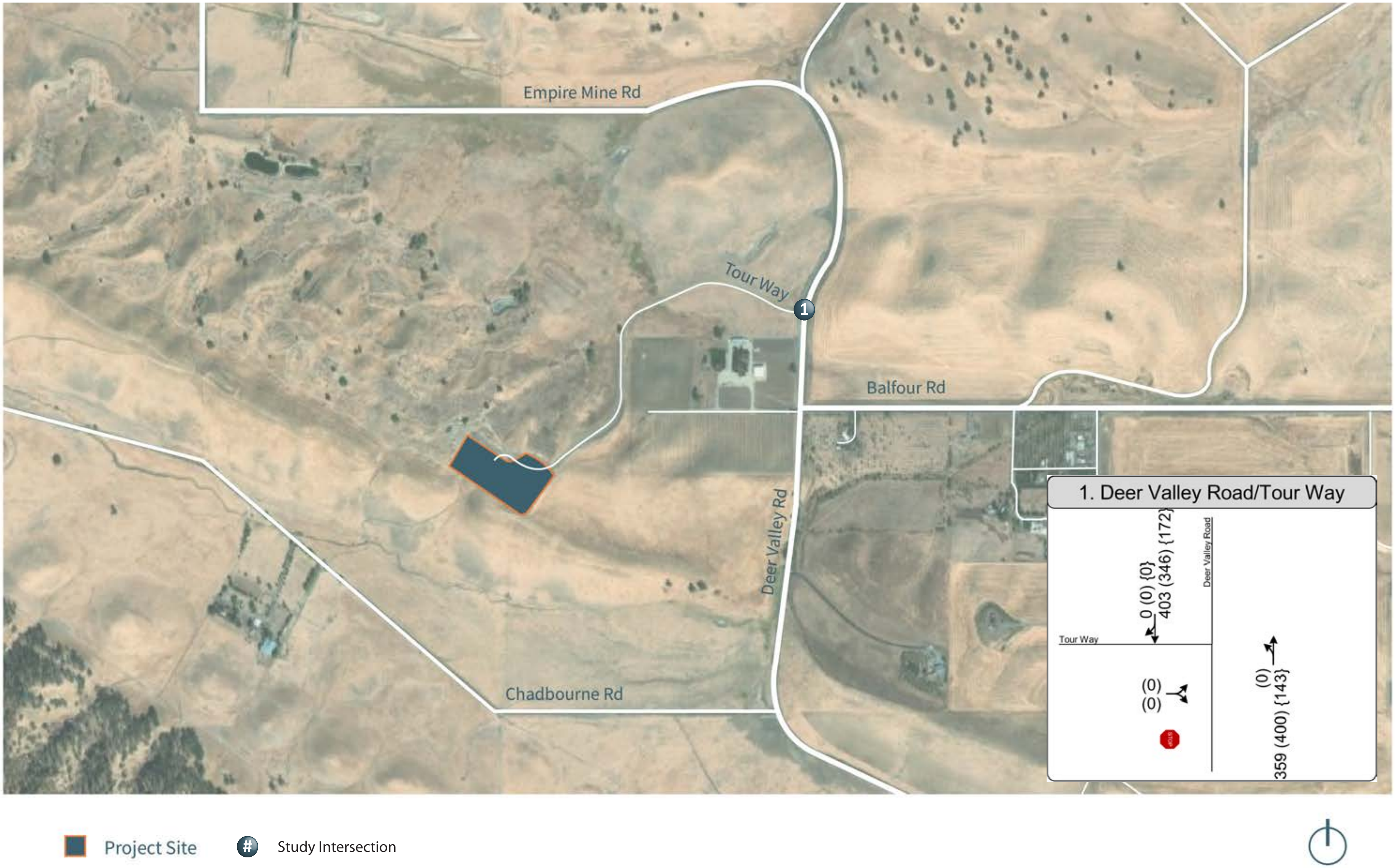


Figure 2
Traffic Volumes, Lane Configurations, and Traffic Control
Existing Peak Hour

■ Project Site

● Trip Distribution

Study Intersection

Figure 3

Project Trip Distribution

🟦 Project Site

Study Intersection

N

Figure 4
Project Trip Assignment

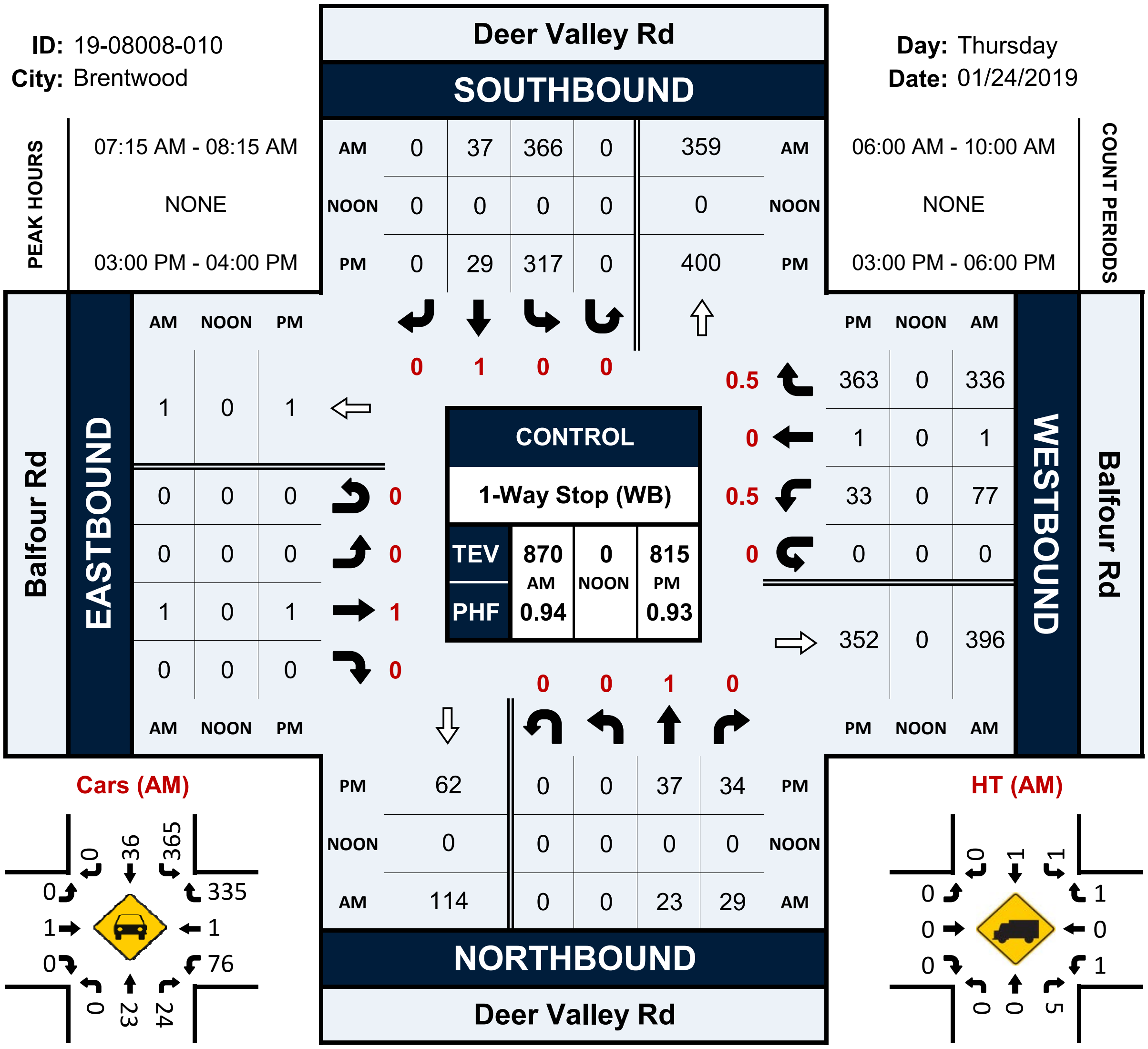
Prepared by National Data & Surveying Services

Deer Valley Rd & Balfour Rd

Peak Hour Turning Movement Count

ID: 19-08008-010
City: Brentwood

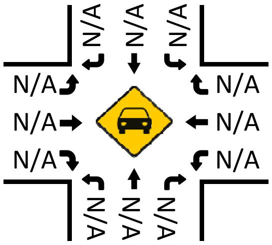
Day: Thursday
Date: 01/24/2019



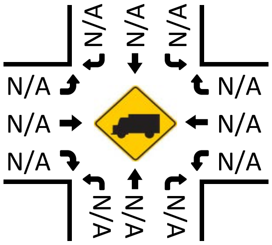
Cars (AM)

HT (AM)

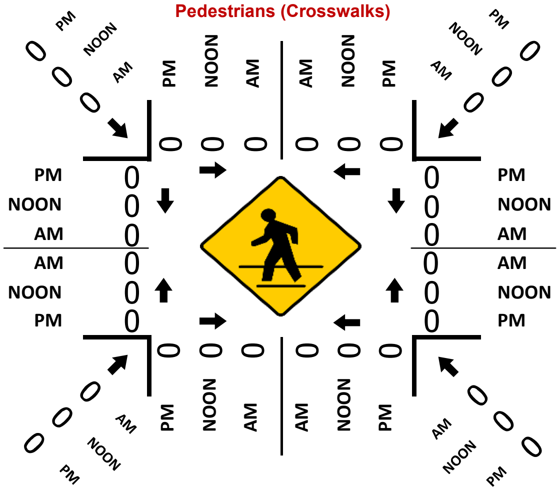
Cars (NOON)



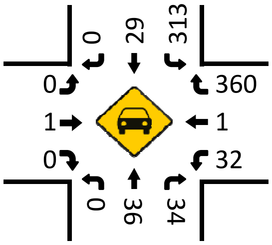
HT (NOON)



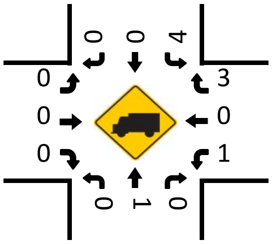
Pedestrians (Crosswalks)



Cars (PM)



HT (PM)



HCM 6th TWSC
1: Deer Valley Road & Tour Way

Existing AM

Intersection	
Int Delay, s/veh	0

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	Y			↰	↱	
Traffic Vol, veh/h	0	0	0	359	403	0
Future Vol, veh/h	0	0	0	359	403	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	94	94	94	94	94	94
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	0	0	382	429	0

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	811	429	429	0	-	0
Stage 1	429	-	-	-	-	-
Stage 2	382	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	349	626	1130	-	-	-
Stage 1	657	-	-	-	-	-
Stage 2	690	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	349	626	1130	-	-	-
Mov Cap-2 Maneuver	349	-	-	-	-	-
Stage 1	657	-	-	-	-	-
Stage 2	690	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	0	0	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1130	-	-	-	-
HCM Lane V/C Ratio	-	-	-	-	-
HCM Control Delay (s)	0	-	0	-	-
HCM Lane LOS	A	-	A	-	-
HCM 95th %tile Q(veh)	0	-	-	-	-

Intersection	
Int Delay, s/veh	0

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	Y			↰	↱	
Traffic Vol, veh/h	0	0	0	400	346	0
Future Vol, veh/h	0	0	0	400	346	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	93	93	93	93	93	93
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	0	0	430	372	0

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	802	372	372	0	-	0
Stage 1	372	-	-	-	-	-
Stage 2	430	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	353	674	1186	-	-	-
Stage 1	697	-	-	-	-	-
Stage 2	656	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	353	674	1186	-	-	-
Mov Cap-2 Maneuver	353	-	-	-	-	-
Stage 1	697	-	-	-	-	-
Stage 2	656	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	0	0	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1186	-	-	-	-
HCM Lane V/C Ratio	-	-	-	-	-
HCM Control Delay (s)	0	-	0	-	-
HCM Lane LOS	A	-	A	-	-
HCM 95th %tile Q(veh)	0	-	-	-	-

Intersection	
Int Delay, s/veh	0

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	⅄			↰	↱	
Traffic Vol, veh/h	0	0	0	143	172	0
Future Vol, veh/h	0	0	0	143	172	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	0	0	155	187	0

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	342	187	187	0	-	0
Stage 1	187	-	-	-	-	-
Stage 2	155	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	654	855	1387	-	-	-
Stage 1	845	-	-	-	-	-
Stage 2	873	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	654	855	1387	-	-	-
Mov Cap-2 Maneuver	654	-	-	-	-	-
Stage 1	845	-	-	-	-	-
Stage 2	873	-	-	-	-	-

Approach	EB		NB		SB
HCM Control Delay, s	0		0		0
HCM LOS	A				

Minor Lane/Major Mvmt		NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)		1387	-	-	-	-
HCM Lane V/C Ratio		-	-	-	-	-
HCM Control Delay (s)		0	-	0	-	-
HCM Lane LOS		A	-	A	-	-
HCM 95th %tile Q(veh)		0	-	-	-	-

HCM 6th TWSC
1: Deer Valley Road & Tour Way

Existing Plus Project AM

Intersection	
Int Delay, s/veh	0

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↰↱			↰	↱	
Traffic Vol, veh/h	1	1	1	359	403	1
Future Vol, veh/h	1	1	1	359	403	1
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	94	94	94	94	94	94
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	1	1	1	382	429	1

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	814	430	430	0	-	0
Stage 1	430	-	-	-	-	-
Stage 2	384	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	347	625	1129	-	-	-
Stage 1	656	-	-	-	-	-
Stage 2	688	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	347	625	1129	-	-	-
Mov Cap-2 Maneuver	347	-	-	-	-	-
Stage 1	655	-	-	-	-	-
Stage 2	688	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	13.1	0	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1129	-	446	-	-
HCM Lane V/C Ratio	0.001	-	0.005	-	-
HCM Control Delay (s)	8.2	0	13.1	-	-
HCM Lane LOS	A	A	B	-	-
HCM 95th %tile Q(veh)	0	-	0	-	-

Intersection	
Int Delay, s/veh	0.3

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	Y			↰	↱	
Traffic Vol, veh/h	5	7	7	400	346	6
Future Vol, veh/h	5	7	7	400	346	6
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	93	93	93	93	93	93
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	5	8	8	430	372	6

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	821	375	378	0	-	0
Stage 1	375	-	-	-	-	-
Stage 2	446	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	344	671	1180	-	-	-
Stage 1	695	-	-	-	-	-
Stage 2	645	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	341	671	1180	-	-	-
Mov Cap-2 Maneuver	341	-	-	-	-	-
Stage 1	689	-	-	-	-	-
Stage 2	645	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	12.7	0.1	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1180	-	478	-	-
HCM Lane V/C Ratio	0.006	-	0.027	-	-
HCM Control Delay (s)	8.1	0	12.7	-	-
HCM Lane LOS	A	A	B	-	-
HCM 95th %tile Q(veh)	0	-	0.1	-	-

Intersection	
Int Delay, s/veh	2

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	⋎			↰	↱	
Traffic Vol, veh/h	24	30	37	143	172	30
Future Vol, veh/h	24	30	37	143	172	30
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	26	33	40	155	187	33

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	439	204	220	0	-	0
Stage 1	204	-	-	-	-	-
Stage 2	235	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	575	837	1349	-	-	-
Stage 1	830	-	-	-	-	-
Stage 2	804	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	557	837	1349	-	-	-
Mov Cap-2 Maneuver	557	-	-	-	-	-
Stage 1	803	-	-	-	-	-
Stage 2	804	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	10.8	1.6	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1349	-	684	-	-
HCM Lane V/C Ratio	0.03	-	0.086	-	-
HCM Control Delay (s)	7.8	0	10.8	-	-
HCM Lane LOS	A	A	B	-	-
HCM 95th %tile Q(veh)	0.1	-	0.3	-	-

HCM 6th TWSC
1: Deer Valley Road & Tour Way

07/14/2020

Intersection	
Int Delay, s/veh	0

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↰↱			↰	↱	
Traffic Vol, veh/h	0	0	0	422	504	0
Future Vol, veh/h	0	0	0	422	504	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	94	94	94	94	94	94
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	0	0	449	536	0

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	985	536	536	0	-	0
Stage 1	536	-	-	-	-	-
Stage 2	449	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	275	545	1032	-	-	-
Stage 1	587	-	-	-	-	-
Stage 2	643	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	275	545	1032	-	-	-
Mov Cap-2 Maneuver	275	-	-	-	-	-
Stage 1	587	-	-	-	-	-
Stage 2	643	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	0	0	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1032	-	-	-	-
HCM Lane V/C Ratio	-	-	-	-	-
HCM Control Delay (s)	0	-	0	-	-
HCM Lane LOS	A	-	A	-	-
HCM 95th %tile Q(veh)	0	-	-	-	-

Intersection	
Int Delay, s/veh	0

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↰↱			↰↑	↑↱	
Traffic Vol, veh/h	0	0	0	472	549	0
Future Vol, veh/h	0	0	0	472	549	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	93	93	93	93	93	93
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	0	0	508	590	0

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	1098	590	590	0	-	0
Stage 1	590	-	-	-	-	-
Stage 2	508	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	235	508	985	-	-	-
Stage 1	554	-	-	-	-	-
Stage 2	604	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	235	508	985	-	-	-
Mov Cap-2 Maneuver	235	-	-	-	-	-
Stage 1	554	-	-	-	-	-
Stage 2	604	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	0	0	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	985	-	-	-	-
HCM Lane V/C Ratio	-	-	-	-	-
HCM Control Delay (s)	0	-	0	-	-
HCM Lane LOS	A	-	A	-	-
HCM 95th %tile Q(veh)	0	-	-	-	-

1: Deer Valley Road & Tour Way

Intersection	
Int Delay, s/veh	0

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	Y			↰	↱	
Traffic Vol, veh/h	0	0	0	167	274	0
Future Vol, veh/h	0	0	0	167	274	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	0	0	182	298	0

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	480	298	298	0	-	0
Stage 1	298	-	-	-	-	-
Stage 2	182	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	545	741	1263	-	-	-
Stage 1	753	-	-	-	-	-
Stage 2	849	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	545	741	1263	-	-	-
Mov Cap-2 Maneuver	545	-	-	-	-	-
Stage 1	753	-	-	-	-	-
Stage 2	849	-	-	-	-	-

Approach	EB		NB		SB
HCM Control Delay, s	0		0		0
HCM LOS	A				

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1263	-	-	-	-
HCM Lane V/C Ratio	-	-	-	-	-
HCM Control Delay (s)	0	-	0	-	-
HCM Lane LOS	A	-	A	-	-
HCM 95th %tile Q(veh)	0	-	-	-	-

Intersection	
Int Delay, s/veh	0

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	Y			↰	↱	
Traffic Vol, veh/h	1	1	1	422	504	1
Future Vol, veh/h	1	1	1	422	504	1
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	94	94	94	94	94	94
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	1	1	1	449	536	1

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	988	537	537	0	-	0
Stage 1	537	-	-	-	-	-
Stage 2	451	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	274	544	1031	-	-	-
Stage 1	586	-	-	-	-	-
Stage 2	642	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	274	544	1031	-	-	-
Mov Cap-2 Maneuver	274	-	-	-	-	-
Stage 1	585	-	-	-	-	-
Stage 2	642	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	14.9	0	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1031	-	364	-	-
HCM Lane V/C Ratio	0.001	-	0.006	-	-
HCM Control Delay (s)	8.5	0	14.9	-	-
HCM Lane LOS	A	A	B	-	-
HCM 95th %tile Q(veh)	0	-	0	-	-

Intersection	
Int Delay, s/veh	0.2

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	Y			↰	↱	
Traffic Vol, veh/h	5	7	7	472	549	6
Future Vol, veh/h	5	7	7	472	549	6
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	93	93	93	93	93	93
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	5	8	8	508	590	6

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	1117	593	596	0	-	0
Stage 1	593	-	-	-	-	-
Stage 2	524	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	229	506	980	-	-	-
Stage 1	552	-	-	-	-	-
Stage 2	594	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	226	506	980	-	-	-
Mov Cap-2 Maneuver	226	-	-	-	-	-
Stage 1	546	-	-	-	-	-
Stage 2	594	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	16.2	0.1	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	980	-	334	-	-
HCM Lane V/C Ratio	0.008	-	0.039	-	-
HCM Control Delay (s)	8.7	0	16.2	-	-
HCM Lane LOS	A	A	C	-	-
HCM 95th %tile Q(veh)	0	-	0.1	-	-

Intersection	
Int Delay, s/veh	1.7

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	Y			↰	↱	
Traffic Vol, veh/h	24	30	37	167	274	30
Future Vol, veh/h	24	30	37	167	274	30
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	26	33	40	182	298	33

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	577	315	331	0	-	0
Stage 1	315	-	-	-	-	-
Stage 2	262	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	478	725	1228	-	-	-
Stage 1	740	-	-	-	-	-
Stage 2	782	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	461	725	1228	-	-	-
Mov Cap-2 Maneuver	461	-	-	-	-	-
Stage 1	713	-	-	-	-	-
Stage 2	782	-	-	-	-	-

Approach	EB		NB		SB	
HCM Control Delay, s	11.9		1.5		0	
HCM LOS	B					

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1228	-	578	-	-
HCM Lane V/C Ratio	0.033	-	0.102	-	-
HCM Control Delay (s)	8	0	11.9	-	-
HCM Lane LOS	A	A	B	-	-
HCM 95th %tile Q(veh)	0.1	-	0.3	-	-

Intersection	
Int Delay, s/veh	0

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	Y			↰	↱	
Traffic Vol, veh/h	0	0	0	583	593	0
Future Vol, veh/h	0	0	0	583	593	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	94	94	94	94	94	94
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	0	0	620	631	0

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	1251	631	631	0	-	0
Stage 1	631	-	-	-	-	-
Stage 2	620	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	190	481	951	-	-	-
Stage 1	530	-	-	-	-	-
Stage 2	536	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	190	481	951	-	-	-
Mov Cap-2 Maneuver	190	-	-	-	-	-
Stage 1	530	-	-	-	-	-
Stage 2	536	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	0	0	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	951	-	-	-	-
HCM Lane V/C Ratio	-	-	-	-	-
HCM Control Delay (s)	0	-	0	-	-
HCM Lane LOS	A	-	A	-	-
HCM 95th %tile Q(veh)	0	-	-	-	-

HCM 6th TWSC
1: Deer Valley Road & Tour Way

Intersection	
Int Delay, s/veh	0

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↰↱			↰↑	↑↱	
Traffic Vol, veh/h	0	0	0	674	620	0
Future Vol, veh/h	0	0	0	674	620	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	93	93	93	93	93	93
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	0	0	725	667	0

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	1392	667	667	0	-	0
Stage 1	667	-	-	-	-	-
Stage 2	725	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	156	459	923	-	-	-
Stage 1	510	-	-	-	-	-
Stage 2	479	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	156	459	923	-	-	-
Mov Cap-2 Maneuver	156	-	-	-	-	-
Stage 1	510	-	-	-	-	-
Stage 2	479	-	-	-	-	-

Approach	EB		NB		SB
HCM Control Delay, s	0		0		0
HCM LOS	A				

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	923	-	-	-	-
HCM Lane V/C Ratio	-	-	-	-	-
HCM Control Delay (s)	0	-	0	-	-
HCM Lane LOS	A	-	A	-	-
HCM 95th %tile Q(veh)	0	-	-	-	-

Intersection	
Int Delay, s/veh	0

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	Y			↰	↱	
Traffic Vol, veh/h	0	0	0	247	311	0
Future Vol, veh/h	0	0	0	247	311	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	0	0	268	338	0

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	606	338	338	0	-	0
Stage 1	338	-	-	-	-	-
Stage 2	268	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	460	704	1221	-	-	-
Stage 1	722	-	-	-	-	-
Stage 2	777	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	460	704	1221	-	-	-
Mov Cap-2 Maneuver	460	-	-	-	-	-
Stage 1	722	-	-	-	-	-
Stage 2	777	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	0	0	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1221	-	-	-	-
HCM Lane V/C Ratio	-	-	-	-	-
HCM Control Delay (s)	0	-	0	-	-
HCM Lane LOS	A	-	A	-	-
HCM 95th %tile Q(veh)	0	-	-	-	-

1: Deer Valley Road & Tour Way

Intersection	
Int Delay, s/veh	0

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↰↱			↰↑	↑↱	
Traffic Vol, veh/h	1	1	1	583	593	1
Future Vol, veh/h	1	1	1	583	593	1
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	94	94	94	94	94	94
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	1	1	1	620	631	1

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	1254	632	632	0	-	0
Stage 1	632	-	-	-	-	-
Stage 2	622	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	190	480	951	-	-	-
Stage 1	530	-	-	-	-	-
Stage 2	535	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	190	480	951	-	-	-
Mov Cap-2 Maneuver	190	-	-	-	-	-
Stage 1	529	-	-	-	-	-
Stage 2	535	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	18.3	0	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	951	-	272	-	-
HCM Lane V/C Ratio	0.001	-	0.008	-	-
HCM Control Delay (s)	8.8	0	18.3	-	-
HCM Lane LOS	A	A	C	-	-
HCM 95th %tile Q(veh)	0	-	0	-	-

Intersection	
Int Delay, s/veh	0.2

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	Y			↰	↱	
Traffic Vol, veh/h	5	7	7	674	620	6
Future Vol, veh/h	5	7	7	674	620	6
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	93	93	93	93	93	93
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	5	8	8	725	667	6

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	1411	670	673	0	-	0
Stage 1	670	-	-	-	-	-
Stage 2	741	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	152	457	918	-	-	-
Stage 1	509	-	-	-	-	-
Stage 2	471	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	150	457	918	-	-	-
Mov Cap-2 Maneuver	150	-	-	-	-	-
Stage 1	501	-	-	-	-	-
Stage 2	471	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	20.4	0.1	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	918	-	247	-	-
HCM Lane V/C Ratio	0.008	-	0.052	-	-
HCM Control Delay (s)	9	0	20.4	-	-
HCM Lane LOS	A	A	C	-	-
HCM 95th %tile Q(veh)	0	-	0.2	-	-

Intersection	
Int Delay, s/veh	1.5

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	Y			↰	↱	
Traffic Vol, veh/h	24	30	37	247	311	30
Future Vol, veh/h	24	30	37	247	311	30
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	26	33	40	268	338	33

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	703	355	371	0	-	0
Stage 1	355	-	-	-	-	-
Stage 2	348	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	404	689	1188	-	-	-
Stage 1	710	-	-	-	-	-
Stage 2	715	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	388	689	1188	-	-	-
Mov Cap-2 Maneuver	388	-	-	-	-	-
Stage 1	682	-	-	-	-	-
Stage 2	715	-	-	-	-	-

Approach	EB		NB		SB
HCM Control Delay, s	12.9		1.1		0
HCM LOS	B				

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1188	-	512	-	-
HCM Lane V/C Ratio	0.034	-	0.115	-	-
HCM Control Delay (s)	8.1	0	12.9	-	-
HCM Lane LOS	A	A	B	-	-
HCM 95th %tile Q(veh)	0.1	-	0.4	-	-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MPH