Natural Environment Study

Interstate 5 North Coast Corridor Project
La Jolla Village Drive to Vandegrift Boulevard
San Diego, California
11-SD-5- KP 45.7 / 89.1 (PM 28.4 / 55.4)

EA 11-235800

June 2008

CALIFORNIA DEPARTMENT OF TRANSPORTATION

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STATE OF CALIFORNIA
Department of Transportation

Prepared By: ______________ Date: 6/15/08

Sue Scatolini, District Biologist
619-688-0191
California Department of Transportation
District 11/ San Diego

Approved By: ______________ Date: 6/15/08

Kim Smith, District Biologist
619-688-0220
California Department of Transportation
District 11/ San Diego

Approved By: Chris White Date: 6/15/08

Chris White, Chief Environmental Resources Studies
619-688-0184
California Department of Transportation
District 11/ San Diego

Errata Sheet:

I-5 North Coast Corridor Project Natural Environmental Study (NES)

(June 2008)

The I-5 North Coast Corridor project footprints have been refined since the Final Natural Environmental Study was completed, and now have reduced impacts to wetlands, waters of the U.S., and upland habitats. In addition, vegetation mapping has been updated where there were changes in vegetation communities along I-5 since preparation of the NES such as the restoration at San Dieguito Lagoon. Updated survey information for some sensitive species including the light-footed clapper rail, California gnatcatcher, wandering skipper, and Belding's savannah sparrow have been added. The new information is contained in the Supplemental Draft Environmental Document and the Final Environmental Document for the I-5 North Coast Corridor Project. The I-5 Genesee Interchange Project has been approved, permitted, and mitigation has already been completed at the southern end of the I-5 North Coast Corridor Project; therefore, impacts in this area were eliminated from the I-5 North Coast Corridor Project.

Summary

The California Department of Transportation (Caltrans) proposes to build the Interstate 5 (I-5) North Coast Corridor Project. The project proposes to add two high occupancy vehicle (HOV) lanes in each direction along the Interstate 5 (I-5) corridor between La Jolla Village Drive (Post Mile [PM] 28.4) and Vandergrift Boulevard (PM 55.4). One general purpose lane in each direction may also be added from Del Mar Heights Road to State Route 78. The project would also include interchange improvements and auxiliary lanes where needed and approximately four direct access ramps (DARs) to allow transit vehicles and carpoolers a transition point into the designated HOV lanes.

Four alternatives and the no build alternative were evaluated for this document. The four build alternatives are to add four HOV lanes, two in each direction, to the current eight general purpose lanes (8+4) or adding the four HOV lanes plus an additional general purpose lane in each direction (10+4). Each of these alternative configurations may either be constructed with a barrier separating the HOV from the general purpose lanes or with just a striped buffer separating the HOV lanes. Therefore, the alternatives are 8+4 with buffer, 8+4 with barrier, 10+4 with buffer, and 10+4 with barrier. The project proposes to replace the majority of the existing bridges on I-5 due to their age and the project scope. The bridge over Carmel Creek will not be changed, and the bridges over the San Dieguito River and San Luis Rey River will be widened, but not replaced. All other bridges over the lagoons will be replaced.

The I-5 North Coast Corridor Project will expand a north/south freeway in coastal San Diego County through a variety of habitats including crossing six coastal lagoons, one perennial river, and several small streams and drainages. In addition to all of the wetland habitats that the project crosses, there are sensitive upland habitats including coastal sage scrub, maritime succulent scrub, southern maritime chaparral, and coastal bluff scrub. All of the sensitive habitats support a variety of sensitive species including several listed species. The light-footed clapper rail (*Rallus longirostris levipes*), coastal California gnatcatcher (*Polioptila californica californica*), California least tern (*Sterna antillarum browni*), western snowy plover (*Charadrius alexandrinus nivosus*), brown pelican (*Pelecanus occidentalis*), Belding's savannah sparrow (*Passerculus sandwichensis beldingi*), and Del Mar manzanita (*Arctostaphylos glandulosa* ssp. *crassifolia*) are all federal and/or state listed species that occur within the project vicinity.

All four of the build alternatives follow the existing I-5 alignment. The barrier separated alternatives generally have a wider footprint due to the need for a shoulder on each side of the barrier and additional weaving room to get cars into and out of the HOV lanes. In general, the build alternative impacts increase from 8+4 buffer to 10+4 buffer to 8+4 barrier, and finally to 10+4 barrier having the largest impacts. The 8+4 with buffer alternative has the least permanent wetland habitat impacts with 9.88 ha (24.41 ac), while the 10+4 with barrier has the greatest impacts 13.1 ha (32.35 ac). Similar to the permanent wetland habitat impacts the 8+4 buffer alternative has the least Army Corps of Engineers (ACOE) jurisdictional waters of the U.S. impacts, 9.29 ha (22.97 ac) and the 10+4 barrier has the greatest impacts, 11.67 ha (28.86 ac).

Coastal sage scrub, maritime succulent scrub, baccharis scrub, and southern maritime chaparral are all sensitive upland habitats that are declining in abundance and many of these habitat types support sensitive and listed plant and wildlife species within the corridor. Permanent impacts to these sensitive habitats total 31.5 ha (77.8 ac) for the 8+4 with buffer, 32.9 ha (81.2 ac) for the 10+4 with buffer, 33.2 ha (81.9 ac) for the 8+4 with barrier, and 33.7 ha (83.2 acres) for the 10+4 with barrier alternative.

In addition to the wetland and upland habitats, subtidal eelgrass habitat in Batiquitos and Agua Hedionda Lagoons will be impacted. Eelgrass is considered a special aquatic habitat; permanent impacts for each of the alternatives range from 0.04 ha (0.1 ac) of eelgrass impacted by the 8+4 buffer to 0.1 ha (0.24 ac) impacted by the 10+4 barrier alternative.

Several listed threatened and endangered species will be impacted by the four build alternatives. Del Mar manzanita is the only listed plant species in the project limits. There is a potential for one to three individual plants to be impacted where they are growing along a brow ditch northwest of Del Mar Heights Road. One light-footed clapper rail location would be permanently impacted by the 10+4 with barrier alternative. One light-footed clapper rail location falls within the temporary impact footprint near Buena Vista Lagoon for all alternatives. There are several other localities of clapper rail that are near the project footprint, but will not be impacted by grading or clearing. Ten pairs and four individual California gnatcatchers will be permanently impacted by each of the four build alternatives. One to two pairs of California gnatcatchers will be impacted by temporary construction access. One individual Belding's savannah sparrow locality falls within the permanent impact footprint of all the alternatives, and one pair will also be permanently impacted by the8+4 with barrier and 10+4 with barrier alternatives. There are other Belding's savannah sparrow locations at most of the lagoons outside of the temporary and permanent impact footprints. Other listed species in the project area including the California least tern, western snowy plover, and brown pelican may occasionally forage within the impact area; however, they do not nest or roost within the impact footprints.

There is designated critical habitat for the least Bell's vireo and tidewater goby that occurs within the Study Area and proposed critical habitat for the California gnatcatcher occurs in several locations throughout the Study area. Critical habitat for the least Bell's vireo within the Study Area occurs along the San Luis Rey River near the I-5/SR 76 interchange. Critical habitat for the tidewater goby within the Study Area occurs at Agua Hedionda Lagoon. Proposed critical habitat for the California gnatcatcher occurs within coastal sage scrub around San Elijo Lagoon, Batiquitos Lagoon, Encina Creek, Lawrence Canyon, and near the Center City Golf Course in Oceanside. Critical habitat for these species will be impacted by the four build alternatives.

The coastal lagoons and streams also support a number of fish species. Northern anchovy (*Engraulis mordax*), Pacific sardine (*Sardinops sagax*), Pacific mackerel (*Scomber japonicus*), and the jack mackerel (*Trachurus symmetricus*) have a potential to occur in San Dieguito, San Elijo, Batiquitos, and Agua Hedionda Lagoons within the project limits. Essential Fish Habitat (EFH) for these species are protected by the Magnuson-Stevens Fishery Conservation and Management Act. These species are most likely to occur in the open water at Batiquitos and Agua Hedionda Lagoons that are continuously open to the ocean. Replacement and construction of the bridges in these lagoons and river may adversely affect EFH.

The steelhead trout (*Oncorhynchus mykiss*) was recently reported by California Department of Fish and Game (CDFG) personnel in the San Luis Rey River. Steelhead trout in southern California are listed as endangered. Widening of I-5 over the San Luis Rey River will require widening of the existing bridge. It is likely that at least one new column will be placed within the open water of the river. This will impact steelhead trout habitat; however, there will still be a relatively deep open water channel under I-5 after construction is completed. There should be no long term adverse effects to steelhead from this construction.

I-5 currently acts as a wildlife barrier to east-west movement. Each of the lagoons, rivers, and creeks and the surrounding upland habitat are potential corridors for wildlife to cross from east to west. Widening the freeway will not necessarily cut off these corridors; however, they may make existing crossings less attractive for use by wildlife. The new bridges at the lagoons are being designed with a bench at the abutment to facilitate wildlife movement as well as use by hikers. Corridors at locations where bridges will not be replaced, San Dieguito and San Luis Rey, should not be further constrained due to large areas for movement and minimal increases to bridge width.

Potential effects of noise on wildlife, particularly birds, were examined at the lagoons. I-5 currently has ambient noise levels in the mid 60 and low 70 average decibel 1 hour average (dBA Leq) range near the freeway. Future noise levels resulting from the proposed widening will generally increase noise levels by 2 to 3 dBA in most locations. This increase may have an effect on birds nesting in the vicinity.

A number of conservation measures are proposed to minimize the project impacts to sensitive habitats and species. Mitigation will be required for potential impacts to sensitive species and habitats that cannot be avoided. Due to the size of the project and the proximity to the coastal lagoons, mitigation will likely be a package of large scale restoration at a few locations that have not been restored to date and smaller projects along the other watersheds.

All of the resource agencies, ACOE, CDFG, National Marine Fisheries Service (NMFS), California Coastal Commission (CCC), Regional Water Quality Control Board (RWQCB) and U.S. Fish and Wildlife Service (USFWS) have taken part in the National Environmental Policy Act (NEPA) 404 process for early review and concurrence for this project. Permits will be required from each of these agencies, and the mitigation requirements for impacts to sensitive habitat and species will be negotiated with them.

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List of Acronyms

ac	acre
ACOE	U.S. Army Corps of Engineers
BMP	Best Management Practice
BVTAC	Buena Vista Technical Advisory Committee
C	Celsius
CCC	California Coastal Commission
CDFG	California Department of Fish and Game
CEQA	California Environmental Quality Act
CFP	California Fully Protected
cm	centimeter
CNDDB	California Natural Diversity Database
CNPS	California Native Plant Society
CSS	coastal sage scrub
CVREP	Carmel Valley River Enhancement Project
DARs	Direct access ramps
dBA	A-weighted decibels
ESA	Environmentally Sensitive Area
ESU	Evolutionarily Significant Unit
F	Fahrenheit
FE	Federally Endangered
FHWA	Federal Highway Administration
ft	foot/feet
g	grams
GIS	Geographical Information System
ha	hectare
HOV	high occupancy vehicle
I	Interstate
JPA	Joint Powers Authority
Leq	1- hour average noise level
km	Kilometer(s)

KP	Kilometer post
m	Meter(s)
MHCP	Multiple Habitat Conservation Plan
mi	Mile(s)
MSCP	Multiple Species Conservation Program
NAD	North American Datum
NCCP	Natural Community Conservation Planning
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service
PM	Post Mile
PPM	Pacific pocket mouse
RWQCB	Regional Water Quality Control Board
SCUBA	Self-Contained Underwater Breathing Apparatus
SC	State Species of Special Concern
SCE	Southern California Edison
SE	State Endangered
SONGS	San Onofre Nuclear Generating System
SR	State Route
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
WUS	Waters of the United States

Chapter 1 Introduction

The California Department of Transportation (Caltrans) proposes to construct the Interstate 5 (I-5) North Coast Corridor Project. The project proposes to add two high occupancy vehicle (HOV) lanes in each direction along the Interstate 5 (I-5) corridor between La Jolla Village Drive kilo-post (KP) 45.7 (post mile (PM) 28.4) and Vandergrift Boulevard KP 89.1 (PM 55.4) (Figure 1-1). One general purpose lane in each direction may also be added from Del Mar Heights Road to State Route 78. The project would also include interchange improvements and auxiliary lanes where needed and approximately four direct access ramps (DARs) to allow transit vehicles and carpoolers a transition point into the designated HOV lanes.

1.1 Project History

The project was initiated in early 2001 and studies began in 2002. Public scoping meetings have been held twice in each of the cities within the project corridor between March and June 2001 and between January and February 2004. The project begins in the City of San Diego and travels through the Cities of Del Mar, Solana Beach, Encinitas, Carlsbad, and Oceanside. The project was originally scoped as a 12+2 configuration, one HOV and two additional general purpose lanes in each direction. After completing additional traffic studies it was determined that two HOV lanes were required in each direction, instead of one. National Environmental Protection Act (NEPA) 404 meetings were initiated in November 2003 with the U.S. Army Corps of Engineers (ACOE), U.S. Fish and Wildlife Service (USFWS), U.S. Environmental Protection Agency (USEPA), National Marine Fisheries Service (NMFS), and Federal Highway Administration (FHWA) with cooperative State Resources Agencies also invited to the meetings including the California Coastal Commission (CCC), California Department of Fish and Game (CDFG), and Regional Water Quality Control Board (RWQCB). The NEPA 404 process allows for concurrence on the Purpose and Need, Alternative Selection, and early discussion of potential impacts and methods of avoiding these impacts. The NEPA 404 team has been meeting regularly since the beginning of the process. This project was also selected as one of the first projects for environmental streamlining.

1.2 Project Description

The proposed project begins at KP 45.7 (PM 28.4) on I-5 and continues north to KP 89.1 (PM 55.4) (Figure 1-1). The proposed project would include the addition of two HOV lanes in each direction to the existing facility. General-purpose lanes may also be added from Del Mar Heights Road to State Route 78. This project also proposes additional auxiliary lanes in areas with foreseeable operational needs such as transitional areas where there is a large amount of merging and lane changing.

Four direct access ramps (DARs) are proposed in the project corridor to provide direct connections for HOV traffic and regional transit vehicles to and from the median HOV lanes. These DARs would enhance HOV/transit freeway access and improve freeway operations on the general-purpose lanes. The DARs are proposed at key locations/interchanges for transit in each of the cities including Voight Avenue, Manchester Avenue, Cannon Road, and Oceanside Boulevard.

Four build alternatives and the no build are proposed for this project in the environmental review. The build alternatives are eight general purpose lanes plus four HOV lanes either separated by a striped buffer (8+4 buffer) or by a solid barrier (8+4 barrier), and ten general purpose lanes plus four HOV lanes either separated by a striped buffer (10+4 buffer) or by a solid barrier (10+4 barrier). All four alternatives are the same south of Del Mar Heights Road and north of the SR 78 interchange. Both of these areas will have two HOV lanes in each direction and no additional main lanes. South of the I-5/805 merge, the project will also add the missing connector ramps to and from I-5 and Sorrento Valley Boulevard.

The majority of the bridges and overpasses north of Del Mar Heights will be replaced as part of this project. The only I-5 bridge over a lagoon that will not be replaced is the San Dieguito River Bridge; this bridge will be widened.

Noise walls and pedestrian trails have been proposed as part of the project. Noise walls are often proposed on private property outside of the State right of way, to reduce the associated costs. A number of trails and other opportunities to connect open space and communities have been proposed as part of this project. The portions of the trails that are within the Caltrans right of way have been proposed to be built as part of the project with coordination with the local cities to complete the trail outside of the right of way.

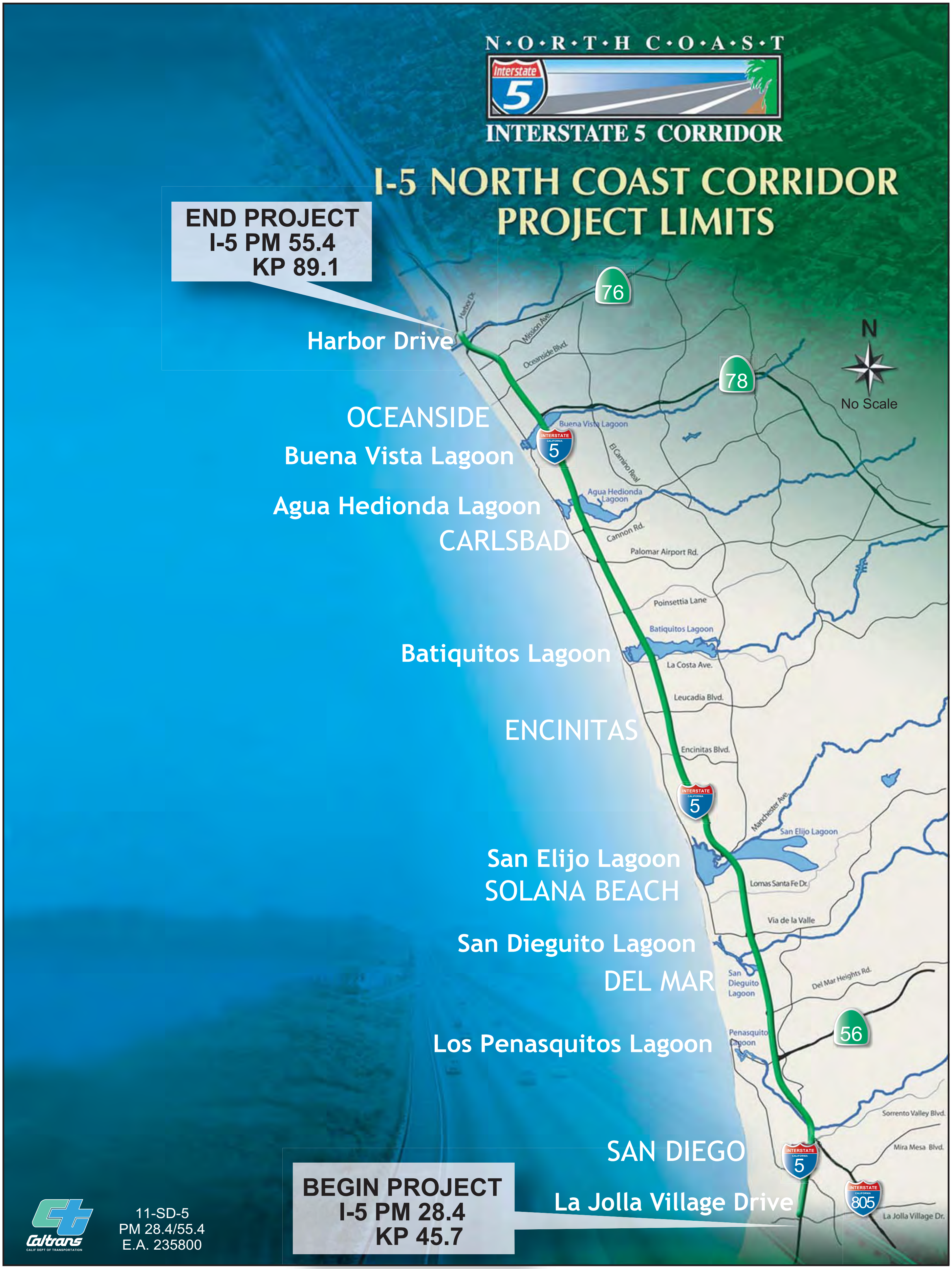

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EXHIBIT 1
PROJECT LOCATION MAP

Chapter 2. Study Methods

Prior to beginning field surveys, a search was made of the California Natural Diversity Database (CNDDB 2003) for the U.S. Geological Survey (USGS) Quadrangles along the project route to determine species that are known to occur in the vicinity. Biological reports for several of the lagoons and for other projects along the I-5 were also reviewed. A letter providing a listing of federally listed and proposed species that may occur in the project area was obtained from the USFWS (2005) (Appendix A).

The Biological Study Area for the project extended from I-5/La Jolla Village Drive at the southern end to Vandergrift Boulevard at the northern end, and extended out 152.4 meters (500 feet) from the edge of pavement on average. The Study Area was expanded around the lagoons and rivers or where there were large expanses of native habitats and was minimized where there was development immediately outside the right of way. Habitats were mapped for a total of approximately 1900 hectares (ha) (4714 acres) for this project.

General surveys consisted of walking through the area during daylight hours and identifying species by direct observation, vocalization, scat, and/or tracks. Emphasis was placed on plant and animal species listed by the state and federal agencies as threatened or endangered (Appendix A). Judgements about potential fauna within the project area were based on known range and habitat preferences of the species.

Botanical nomenclature follows Hickman (1993) with reference to Beauchamp (1986); plant community designations conform to Holland (1986) as modified by Holland and Keil (1990) and Weaver (1998); bird nomenclature follows the American Ornithologists' Union (1998) with reference to Unitt (2004); reptiles follow Stebbins (1985); and mammals follow Ingles (1965).

2.1. Studies Required

Based on the review of species with the potential to occur within the Study Area and the initial habitat assessment, protocol surveys for the following species were completed.

Coastal California gnatcatcher (*Polioptila californica californica*)
Light-footed clapper rail (*Rallus longirostris levipes*)
Least Bell's vireo (*Vireo bellii pusillus)*
Pacific pocket mouse (*Perognathus longimembris pacificus*)

Species that were the subject of focused surveys, but not protocol surveys included:

Belding's savannah sparrow (*Passerculus sandwichensis beldingi*)
California least tern (*Sterna antillarum browni*)
Western snowy plover (*Charadrius alexandrinus nivosus*)
Del Mar manzanita (*Arctostaphylos glandulosa* ssp. *crassifolia*)

Encinitas baccharis (*Baccharis vanessae*)

In addition to the listed species, marine surveys of three lagoons along I-5, San Elijo, Batiquitos, and Agua Hedionda, with the potential to support eelgrass were determined to be necessary. Eelgrass coverage, epibenthic invertebrate fauna, fish fauna, and water quality data were collected to determine potential impacts to special aquatic sites, aquatic resources, and determine whether there was Essential Fish Habitat in these lagoons. Buena Vista Lagoon is currently all freshwater with no potential for eelgrass or essential fish habitat. San Dieguito Lagoon was thoroughly studied by San Dieguito Joint Powers Authority (2000) for the large restoration project that began in late 2006; therefore, no further studies were deemed necessary at San Dieguito Lagoon. Methodology used during these surveys is given in Section 2.4.

2.2. Focused Wildlife Surveys

<u>Least Bell's Vireo (*Vireo bellii pusillus*)</u>

Focused surveys for the federally endangered least Bell's vireo were conducted using the methodology recommended by the USFWS (USFWS 2001). The methodology can be summarized as follows: under normal circumstances, all riparian areas and any other potential vireo habitats should be surveyed at least eight (8) times during the period from April 10 to July 31. All site visits should be conducted at least 10 days apart to maximize the detection of, for instance, late and early arrivals, females, particularly "non vocal" birds of both sexes, and nesting pairs. Surveys were conducted between dawn and 11:00 a.m. Surveys were not conducted during periods of excessive or abnormal cold, heat, wind, rain, or other inclement weather that individually or collectively may reduce the likelihood of detection. Surveyors did not survey more than 3 linear kilometers (1.86 miles) or more than 50 hectares (123.5 acres) of habitat on any given survey day. Although surveyors should generally station themselves in the best possible locations to hear or see vireos, care was taken not to disturb potential or actual vireo habitats and nests or the habitat of any sensitive or listed riparian species.

<u>Coastal California Gnatcatcher</u>

Focused surveys for the federally threatened coastal California gnatcatcher were conducted using the methodology recommended by the USFWS (USFWS 1997). Surveys were conducted between 0600 a.m. and 1200 p.m., avoiding periods of excessive or abnormal heat, wind, rain, fog, or other inclement weather; the observer walks slowly through the coastal sage scrub periodically playing a tape of male gnatcatcher vocalizations while listening and watching for responses of resident birds. Each patch of potential gnatcatcher habitat within or adjacent to the project area was surveyed. Three surveys of the coastal sage scrub onsite were performed at least one week apart to evaluate the presence/absence and use areas of the gnatcatcher. Qualified biologists permitted by the USFWS to survey for the gnatcatcher conducted the surveys. Sue Scatolini (TE-783928), Kim Miller (TE-802447), and Robert James (TE-003269) were the permitted biologists.

Light-footed Clapper Rail

Focused surveys for light-footed clapper rail were completed by Konecny Biological Services (KBS) in Buena Vista, Batiquitos, San Elijo, San Dieguito, and Los Peñasquitos Lagoons and the San Luis Rey River. Currently, the USFWS does not have a survey protocol for the light-footed clapper rail. Surveys were conducted following a methodology formulated by KBS in consultation with light-footed clapper rail researcher Richard Zembal, and approved by the USFWS. All potential light-footed clapper rail habitats within 167 meters (500-feet) of I-5, including off ramps and clover leaf structures were surveyed during spring 2003 at the San Luis Rey River, Buena Vista Lagoon, Batiquitos Lagoon, San Elijo Lagoon, and San Dieguito Lagoon. There was no potential habitat present at Agua Hedionda; therefore, no surveys for clapper rails were completed. Surveys at Los Peñasquitos Lagoon were completed in spring 2004. KBS also provided updated information from other surveys performed in 2005 and 2006.

Five focused light-footed clapper rail surveys were conducted at each location. Three surveys were conducted at dusk and two were conducted at dawn. Each dawn and dusk survey lasted approximately 2.5 hours at each location. Dawn surveys were conducted from pre-dawn to no later than two hours after sunrise. Dusk surveys were initiated no more that two hours before sunset.

The surveys were conducted by stopping at stations around the survey site and listening for vocalizing light-footed clapper rails. If rails were not detected passively, a call-prompt (clappering) or tape-recorded vocalization was played at 30-second intervals. A response was listened for before proceeding to the next survey station.

Pacific Pocket Mouse

The entire project study area was surveyed by car to determine where suitable habitat to support Pacific pocket mouse (PPM) may occur (Appendix B). Areas with potentially suitable habitat were visited and inspected for signs of rodent activity (burrows, scats, trails, dusting areas, foot prints, tail-drags). The scats of heteromyids are particularly distinct and diagnostic for the different-sized species, and were noted where found. Some soil samples were collected and compared to a reference sample from areas that are inhabited by PPM, based on these samples and vegetation types, areas were mapped for high, medium, and low probability of suitability for the mice. Permitted personnel completed protocol level trapping at the five sites with the highest probability to support PPM (Appendix B). Protocol requires that traplines be set at least five nights in the habitat that is most likely to support PPM. Traps were set and baited with parakeet seed at sundown and checked at midnight and before dawn. All captured animals were then identified, aged, and sexed, and then immediately released at their capture locations. All trapping was completed in May and June of 2003 by URS under USFWS Take Permit No. PRT-775869 (Appendix B).

Belding's Savannah Sparrow

Focused surveys for Belding's savannah sparrow (*Passerculus sandwichensis beldingi*) were conducted in Los Peñasquitos, San Dieguito, San Elijo, Batiquitos, Agua Hedionda, and Buena

Vista Lagoons in and around areas where appropriate pickleweed salt marsh habitat occurred. Surveys were completed early in the morning to no more than 3 hours after sunrise between late March through June. Territorial individuals were identified through singing, scolding, extended perching with presumed mates, nest-building, feeding young, and aerial chases (Zembal et al. 1988). Territories and whether the birds were single males or paired were mapped on aerial photography and later transferred to geographical information system (GIS). In addition, Belding savannah sparrow territories noted during light-footed clapper rail and general biological surveys were also mapped. Data was also received from the CDFG for locations within Buena Vista Lagoon.

Southwestern Willow Flycatcher

Appropriate habitat for the southwestern willow flycatcher was limited within the study area. A migrating willow flycatcher was heard during a general survey at I-5 and the San Luis Rey River; however, subsequent visits in the third survey period did not relocate this species. In addition, anectodal information from some lagoon area surveys was used to provide further information on where this species has been detected near I-5.

2.3. Personnel and Survey Dates

Due to the extensive nature of the project and the required surveys, a list of each separate survey date and personnel is not provided here. Protocol survey personnel and dates completed by consultants are provided with the separate species reports (Appendices B, C, and F), and a summary table of survey information from Caltrans personnel and Konecny Biological Services is provided below (Table 2-1). Much of the data for the area around San Elijo Lagoon was extracted from the NES for the Manchester I-5 (EDAW 2004) interchange project and those survey dates are not included in this table.

Table 2-1. Survey Dates and Personnel

Date	Survey Personnel	Survey Activity
2/7/2003	Sue Scatolini Nicole Shorey	General
2/10/2003	Sue Scatolini Matt Guilliams Nicole Shorey	General
2/10/2003	Sue Scatolini Matt Guilliams Nicole Shorey	California Gnatcatcher
2/24/2003	Sue Scatolini Matt Guilliams	General
2/24/2003	Sue Scatolini Matt Guilliams	California Gnatcatcher
2/26/2003	Sue Scatolini Matt Guilliams	General
3/3/2003	Sue Scatolini Matt Guilliams	General
3/3/2003	Sue Scatolini Matt Guilliams	California Gnatcatcher
3/5/2003	Sue Scatolini Matt Guilliams	General
3/5/2003	John Konecny	Clapper Rail
3/6/2003	John Konecny	Clapper Rail
3/7/2003	Sue Scatolini Matt Guilliams	General
3/7/2003	John Konecny	Clapper Rail
3/8/2003	John Konecny	Clapper Rail
3/12/2003	Sue Scatolini Matt Guilliams	General
3/12/2003	Sue Scatolini Matt Guilliams	California Gnatcatcher
3/12/2003	Sue Scatolini Matt Guilliams	California Gnatcatcher
3/14/2003	John Konecny	Clapper Rail
3/19/2003	John Konecny	Clapper Rail
3/20/2203	John Konecny	Clapper Rail
3/24/2003	Sue Scatolini Matt Guilliams	General
3/24/2003	John Konecny	Clapper Rail
3/26/2003	John Konecny	Clapper Rail
3/26/2003	Sue Scatolini Matt Guilliams	California Gnatcatcher
3/27/2003	John Konecny	Clapper Rail
4/8/2003	John Konecny	Clapper Rail
4/9/2003	John Konecny	Clapper Rail
4/10/2003	John Konecny	Clapper Rail
4/11/2203	John Konecny	Clapper Rail
4/12/2003	John Konecny	Clapper Rail
4/17/2003	Sue Scatolini Kim Miller	Least Bell's Vireo
4/21/2003	Sue Scatolini Matt Guilliams	General
4/23/2003	Sue Scatolini Matt Guilliams	California Gnatcatcher
4/26/2003	John Konecny	Clapper Rail
4/28/2006	John Konecny	Clapper Rail
4/28/2003	Sue Scatolini Matt Guilliams	General
4/30/2003	Sue Scatolini Matt Guilliams Kim Miller	Least Bell's Vireo
5/2/2003	Sue Scatolini Matt Guilliams	California Gnatcatcher
5/2/2003	Sue Scatolini Matt Guilliams	California Gnatcatcher
5/5/2003	Sue Scatolini Matt Guilliams	California Gnatcatcher
5/5/2003	Bob James Russ Williams Scott Quinnell	California Gnatcatcher
5/5/2003	John Konecny	Clapper Rail
5/6/2003	John Konecny	Clapper Rail
5/8/2003	John Konecny	Clapper Rail
5/9/2003	John Konecny	Clapper Rail
5/10/2003	John Konecny	Clapper Rail

5/12/2003	Bob James Russ Williams Scott Quinnell	California Gnatcatcher
5/12/2003	Sue Scatolini Karen Drewe Kedest Ketsela	California Gnatcatcher
5/20/2003	John Konecny	Clapper Rail
5/21/2003	John Konecny	Clapper Rail
5/22/2003	John Konecny	Clapper Rail
6/9/2003	Sue Scatolini Matt Guilliams	California Gnatcatcher
6/9/2003	Sue Scatolini Matt Guilliams	Least Bell's Vireo
6/23/2003	Sue Scatolini Debbie Waldecker	Least Bell's Vireo
6/27/2003	Sue Scatolini Matt Guilliams Nicole Shorey	California Gnatcatcher
7/3/2003	Sue Scatolini Kim Miller	Least Bell's Vireo
7/8/2003	Sue Scatolini Nicole Shorey	California Gnatcatcher
7/8/2003	Sue Scatolini Nicole Shorey	California Gnatcatcher
7/8/2003	Sue Scatolini Nicole Shorey	California Gnatcatcher
7/14/2003	Sue Scatolini Debbie Waldecker	Least Bell's Vireo
7/24/2003	Sue Scatolini Nicole Shorey	Least Bell's Vireo
7/25/2003	Bob James Russ Williams Karen Drewe	California Gnatcatcher
7/28/2003	Sue Scatolini Debbie Waldecker	California Gnatcatcher
7/28/2003	Sue Scatolini Debbie Waldecker	California Gnatcatcher
7/31/2003	Nicole Shorey Matt Guilliams	Least Bell's Vireo

8/4/2003	Sue Scatolini Bob James Barbara Marquez Melissa Olson Russ Williams	California Gnatcatcher
8/11/2003	Sue Scatolini Bob James Barbara Marquez Melissa Olson Scott Quinnell	California Gnatcatcher
8/14/2003	Sue Scatolini Debbie Waldecker	California Gnatcatcher
8/26/2003	Bob James Barbara Marquez Melissa Olson Russ Williams	California Gnatcatcher
1/20/2004	Sue Scatolini Kim Miller	Belding's Savannah Sp.
3/8/2004	Sue Scatolini Rich Burg	California Gnatcatcher
4/22/2004	Sue Scatolini Kim Miller	Wetland Delineation
4/22/2004	Sue Scatolini Kim Miller	Least Bell's Vireo
4/24/2004 5/2/2004 5/4/2004	John Konecny John Konecny Sue Scatolini Debbie Waldecker	Clapper Rail Clapper Rail General
5/4/2004	Sue Scatolini Debbie Waldecker	Least Bell's Vireo
5/9/2004 5/17/2004	John Konecny Sue Scatolini Kim Miller	Clapper Rail Least Bell's Vireo
5/21/2004 6/1/2004	John Konecny Sue Scatolini Debbie Waldecker	Clapper Rail Least Bell's Vireo
6/6/2004	John Konecny	Clapper Rail
6/8/2004	Sue Scatolini Kim Miller	Wetland Delineation

6/10/2004	Sue Scatolini Rich Burg	Least Bell's Vireo
6/22/2004	Sue Scatolini Rich Burg	Least Bell's Vireo
6/24/2004	Sue Scatolini Kim Miller	SWWFL SLR
6/30/2004	Sue Scatolini Kim Miller	SWWFL SLR
7/8/2004	Sue Scatolini Kim Miller	SWWFL SLR
7/13/2004	Sue Scatolini Rich Burg	Least Bell's Vireo
7/22/2004	Sue Scatolini Kim Miller	Least Bell's Vireo
3/2/2005	Sue Scatolini Kim Miller	California Gnatcatcher
3/15/2005	Sue Scatolini Rich Burg Arianne Glagola Melissa Williams Scott Quinnell	California Gnatcatcher
4/5/2005	Sue Scatolini Kim Miller	Belding's Savannah Sp.
4/15/2005	Sue Scatolini Kim Miller	Belding's Savannah Sp.
6/9/2005	Sue Scatolini Arianne Glagola Melissa Williams Scott Quinnell	California Gnatcatcher
6/9/2005	Bob James Kedest Ketsela Barbara Marquez	California Gnatcatcher
4/26/2005	Sue Scatolini Bob James Kedest Ketsela Melissa Williams Scott Quinnell	California Gnatcatcher
5/13/2005	Sue Scatolini Kim Miller	Belding's Savannah Sp.
6/8/2005	Sue Scatolini Kim Miller	Belding's Savannah Sp.
6/25/2005	Bob James Arianne Glagola Melissa Williams	California Gnatcatcher
6/27/2005	Sue Scatolini Kim Miller	Rare Plant Mapping
7/22/2005	Sue Scatolini Arianne Glagola Bob James Scott Quinnell	California Gnatcatcher
10/18/2005	Sue Scatolini Debbie Waldecker	Vegetation Mapping
7/17/2006	Sue Scatolini Arianne Glagola	California Gnatcatcher
6/13/2007	Sue Scatolini Rush Abrams	California Gnatcatcher

2.4 Marine Resources Surveys

The marine resource investigation included an inventory and assessment of the eelgrass habitat within the sampling areas of each study location, and collection of fish and epibenthic macroinvertebrate data (Merkel and Assoc. 2006). Water quality data were collected at each sampling area to characterize the environmental conditions during fish and invertebrate sampling. The field investigations were conducted by Merkel and Associates biologists Rachel A. Woodfield, Robert C. Mooney, Julia H. Coates, and Seth J. Jones on April 26, 2006, at Batiquitos Lagoon; on May 7, 2006, at San Elijo Lagoon; and on May 18, 2006, at Agua Hedionda Lagoon. The sampling methodologies are described below. The full report produced by Merkel and Associates is provided in Appendix C.

Eelgrass Surveys

During initial site reviews, eelgrass was not found within the San Elijo Lagoon study area and formal mapping surveys were not conducted. Salinities within the sampling area of San Elijo Lagoon are presently and typically well below the range suitable to support eelgrass.

Within the sampling areas of Agua Hedionda Lagoon and Batiquitos Lagoon, eelgrass coverage was quantified using a side-scan SONAR methodology with an integrated differential global positioning system. Data were collected aboard a small vessel using a side-scan SONAR operating at 600 kHz and scanning out 20 m (66 feet [ft]) on both the starboard and port channels for a 40-m (132-ft) wide swath. Transect spacing ensured that adequate overlap was obtained between adjacent side-scan swaths. All data were collected in latitude and longitude using the North American Datum of 1983 in feet (NAD 83). Following completion of the surveys, sonar traces were mosaiced together and geographically registered. Using GIS (ArcView© 3.2a), eelgrass was digitized as a theme over an aerial image for each study location and the areal coverage calculated from the theme.

A self-contained underwater breathing apparatus (SCUBA) diver measured eelgrass leaf shoot density by counting shoots within 1/16 square meter (m^2) (0.67 square foot) quadrats. Eelgrass shoot density was measured at 20 randomly selected sites within the surveyed eelgrass beds at each of the two lagoons supporting eelgrass. All eelgrass surveys were conducted in accordance with the Southern California Eelgrass Mitigation Policy (NMFS 1991).

Fisheries

The fish sampling at each study location was intended to characterize the fish community occurring within the sampling area, particularly in the immediate vicinity of the I-5 bridge. Sampling was conducted using a beach seine and an otter trawl.

The beach seine consists of a 15-m x 1.8-m (49.2-ft x 5.9-ft) net with a 1.8-m x 1.8-m x 1.8-m (5.9-ft x 5.9-ft x 5.9-ft) bag in the center. The seine has 1.2-centimeter (cm) (0.5-inch [in]) mesh in the wings and 0.6-cm (0.2-in) mesh in the bag. It was utilized to sample alongshore waters between the bottom and surface in depths of 0 to 1 m (3.3 ft). The seine was positioned parallel to shore 11 to 18 m (36 to 59 ft) from the water's edge, depending on bottom contours. The seine was held in place for 3 minutes and then walked slowly to shore. Four replicate beach seine hauls were collected at Batiquitos Lagoon and Agua Hedionda Lagoon.

At San Elijo Lagoon, use of a smaller beach seine was more appropriate. This small seine consists of a 4.6-m x 1.2-m (15.1-ft x 3.9-ft) net with 0.3-cm (0.1-in) mesh. In areas that had a gradually sloping shoreline (such as under the I-5 bridge), the seine was positioned perpendicular to the shore and held in place by one person standing at the edge of the water and a second person standing in the water. The seine was walked parallel to the shoreline, then pivoted and walked in toward the shore. In the channels to the west of the bridge, the seine was used parallel to shore and lifted out at the vegetation on the channel bank. Eight replicate beach seine hauls were done at San Elijo Lagoon.

The otter trawl consists of a 3.2-m (10.5-ft) trawl with 0.8-cm (0.3-in) mesh in the body and 0.6-cm (0.2-in) mesh in the cod end. The otter trawl was deployed at offshore sampling locations using a small vessel traveling between 1.5 and 2 knots along transects ranging in length from 100 to 230 m (328 to 754 ft), as the sampling areas dictated. The trawl was used to sample primarily demersal offshore fish at each lagoon sampling area. Four replicate hauls were collected at Agua Hedionda Lagoon and at Batiquitos Lagoon. Otter trawls were not used at San Elijo Lagoon due to the inaccessibility of the site by boat.

Data collected for fish caught in each haul included identification of each species captured, as well as fish count and mass, by species. IDS Ecological Survey®, an ecological information management program, was used to manage relational data from the surveys. Standardizing for the area of each replicate by equipment type, the mean density (individuals/m^2) and biomass (g/m^2) of each species was calculated. Although the presented data include density and biomass calculations, this investigation was not intended to provide comprehensive fish population data, rather to characterize the fish community diversity and relative abundance at each lagoon.

<u>Epibenthic Macroinvertebrates</u>

All macroinvertebrates captured during fish sampling described in the previous section were collected, identified to the lowest taxonomic level possible, counted, and weighed. Standardizing for the area of each replicate by equipment type, the mean density and biomass of each taxa were calculated. Due to the tremendous spatial variability of these species in the lagoon, and the non-targeted methodology employed to sample them, collected data are intended to generate a list of species that occur in the project area, rather than to provide definitive density and biomass data on the populations.

<u>Water Quality</u>

At each study location, physical water quality parameters were measured coincident with the biological sampling described above. Data were collected at three locations: under the centerline of the I-5 bridge, 122 m (400 feet) to the east of the bridge centerline, and 122 m (400 feet) to the west of the bridge centerline. A Hydrolab Quanta® multi-probe, calibrated in accordance with manufacturer specifications, was used to collect depth temperature, pH, dissolved oxygen, turbidity, and salinity data. Readings were taken at the bottom and top of the water column. Where the water column was greater than 2 m (6.5 ft) in depth, readings were also taken at a mid-depth between the bottom and surface.

2.5 Wetland Delineation

Potential areas of jurisdiction were identified by reviewing the project maps for creeks, drainages, and low areas and by observation of vegetation type in the field. Each area of potential jurisdiction was then evaluated using the methodology in the Corps of Engineers Wetland Delineation Manual (ACOE 1987). The routine determination for areas equal to or less than 5 acres was used. The wetland delineations were completed between 2003 and 2006, before the Arid West Guidelines were adopted. If no wetland vegetation was present, the site was then evaluated for the extent of non-wetland waters of the US as defined by ACOE regulations. CDFG and CCC jurisdiction was based on the extent of the vegetation communities and high water levels or banks of drainages in non-vegetated areas. Field work was performed by Sue Scatolini, Kim Miller, and Richard Burg (Table 1). Soils information is from the Soil Survey, San Diego Area, California (US Department of Agriculture 1973). CDFG and CCC jurisdiction includes all ACOE jurisdictional wetlands and extends to the outer limits of the canopy of hydrophytic vegetation within or adjacent to a stream; or to the top of a stream bank for those instances were either vegetation was absent or the stream bank extended beyond the limits of the wetland vegetation.

Hydrophytic vegetation, hydrology, and hydric soils are all required to be present for an area to be considered a wetland by the ACOE. Hydrophytic vegetation is determined by the percentage of dominant plant species that are considered Facultative (FAC), Facultative Wetland (FACW), and Obligate (OBL) in an area (Cowardin et al. 1979). If more than 50 percent of the dominant species are listed as FAC, FACW, and/or OBL, then an area has hydrophytic vegetation.

Hydrology is defined as all of the hydrological characteristics of an area that is periodically inundated or has saturated soils during the growing season (ACOE 1987). Some hydrologic characteristics are drainage patterns, saturated soils, inundation, sediment deposits, drift lines, and water marks. These characteristics indicate that an area has wetland hydrology.

Hydric soils are those that are saturated, flooded, or ponded long enough during the growing season to develop anaerobic conditions that favor growth of hydrophytic vegetation (ACOE 1987). Hydric soils are determined by digging a soil pit and examining the soil for color, chroma, hue, reducing characteristics, and anaerobic characteristics that would indicate that the soils are hydric.

The ACOE methodology was used to determine when all three characteristics were present and therefore, a wetland was present. If one or more of the characteristics were not present then the area was examined for presence of State wetlands and non-wetland waters of the U.S.

2.6 Agency Coordination and Professional Contacts

Due to the extensive nature of wetland impacts within this 28-mile stretch of I-5, the project initiated federal and state agency early coordination under the NEPA 404 process. Beginning in

November 2003, representatives from the ACOE, USFWS, USEPA, FHWA, NMFS, CDFG, RWQCB, and CCC met with Caltrans for regular discussions concerning all aspects of this project. In addition to coordination with the regulatory agencies, Caltrans has also met with the different Lagoon Foundations and other organizations with an interest in resources along the coast. Caltrans is also participating with the task forces for restoration of San Elijo Lagoon and Buena Vista Lagoon to ensure that the I-5 project does not interfere with the restoration plans and if possible enhances the planned restoration efforts.

2.7. Limitations That May Influence Results

Due to the large, complex nature of this project, all surveys cannot be completed for all species every year until the project is constructed. Therefore, surveys are being updated routinely every other year or more often, when feasible. Trapping for PPM is labor-intensive work and only the most likely sites to support this species were the subject of focused protocol trapping. However, information from other state and federal agencies, the Lagoon Foundations, and non-protocol surveys were used to enhance the data obtained by Caltrans and consultant surveys.

Chapter 3. Results: Environmental Setting

3.1 Description of the Existing Biological and Physical Conditions

The proposed project is located within the coastal zone in mid- to northern San Diego County. The climate in this area is Mediterranean, moderated by a strong marine influence. The average annual temperature is 62° F (34.4° C). The annual rainfall average for coastal San Diego County is between 20.5 and 30.8 cm (8 and 12 in). The soils in the project area consists mostly of sandy or loamy clays that are derived from unconsolidated marine sandstones and shales (Bowman 1973). Several canyons intersect I-5 along the project. Adjacent land uses include industrial and commercial development, development for housing, agriculture, open space, and utility easements. The project spans six coastal lagoons (Los Peñasquitos, San Dieguito, San Elijo, Batiquitos, Agua Hedionda, and Buena Vista Lagoons) and the San Luis Rey River in San Diego County.

3.2 Vegetation Communities Within the Study Area

A total of 30 plant communities, with eight occurring in both disturbed and undisturbed condition, were identified within the Study Area. In addition, there were several communities with little or no vegetation that support wildlife including mud flat, salt flat, open water, and unvegetated or other waters of the U.S. A general description of each community and a description of its occurrence within the Study Area are provided below. A list of plant species observed within the Study Area is included in Appendix D. Maps of the vegetation communities overlaid on 2003 aerial are provided in Figures 3-1a to 3-1n. Because the four alternatives are very similar in footprint, the largest permanent impact alternative footprint of the 10+4 with barrier is the only alternative shown.

Upland Habitats

<u>Diegan Coastal Sage Scrub</u>. This vegetation type was once widespread in coastal southern California, and now it occurs in patches from Los Angeles into Baja California. Habitat loss has been estimated as high as 70 to 90 percent (Westman 1981). This plant community is composed of a variety of low, soft aromatic shrubs dominated by drought-deciduous species such as California sagebrush (*Artemisia californica*), flat-top buckwheat (*Eriogonum fasciculatum* var. *fasciculatum*), white sage (*Salvia apiana*), and black sage (*Salvia mellifera*). Typically, there are also scattered evergreen shrubs including lemonadeberry (*Rhus integrifolia*), laurel sumac (*Malosma laurina*), and toyon (*Heteromeles arbutifolia*). The understory is diverse and includes a rich variety of annual forbs, and both annual and perennial grasses. Coastal sage scrub (CSS) habitat supports a variety of rare plant and animal species (e.g., coastal California gnatcatcher). It is the current focus of conservation efforts by the State of California through Natural Community Conservation Planning (NCCP), which includes, in San Diego County, the Multiple Species Conservation Program (MSCP) and Multiple Habitat Conservation Plan (MHCP).

CSS habitat occurs on cut and fill slopes primarily in the southern half of the Study Area around most of the lagoons and rivers. CSS within the Study Area is generally dominated by California sagebrush, flat-topped buckwheat, and California sunflower (*Encelia californica*) with lemonadeberry and laurel sumac shrubs.

The disturbed form of this habitat within the Study Area is comprised of the same dominant species listed above with nonnative annual grasses, and nonnative broadleaf species such as Russian thistle (*Salsola tragus*), acacia (*Acacia* spp.), mustard (*Brassica* spp.), and horseweed (*Conyza canadensis*). Disturbed CSS generally has less overall cover than CSS. Additional openings in the habitat result from the weedy species in this community.

Maritime Succulent Scrub. This community occurs on dry, south-facing slopes and coastal bluffs from Torrey Pines to El Rosario, Baja California. Maritime succulent scrub is dominated by a combination of coastal sage scrub dominants mixed with succulents and cacti and some endemic species (e.g., Del Mar manzanita). Typical species found in this community include California sagebrush, Shaw's agave (*Agave shawii*), California sunflower, coast barrel cactus (*Ferocactus viridescens*), coastal prickly pear (*Opuntia littoralis*), and coastal cholla (*Cylindropuntia prolifera*).

Maritime succulent scrub occurs primarily on the west side of I-5 near Batiquitos Lagoon. The slopes are dominated by California sagebrush, coastal cholla, coast barrel cactus, fishhook cactus (*Mammillaria dioica*), and California sunflower.

Coastal Bluff Scrub. Coastal bluff scrub is a plant community made up primarily of low, prostrate plants that are wind pruned by sea breezes. Dominant plants in this community are primarily woody and/or succulent (Holland 1986). Species commonly found in this community include sea dahlia (*Coreopsis maritima*), live forevers (*Dudleya* spp.), lemonadeberry, and prickly pear. Coastal bluff scrub occurs in a few locations on the slopes adjacent to I-5 north of San Elijo Lagoon.

Baccharis Scrub. Baccharis scrub is a form of sage scrub dominated by coyote brush (*Baccharis pilularis*). This habitat is found in low lying areas, often adjacent to drainages. This community is found adjacent to the drainage north of Genesee Avenue. Disturbed Baccharis scrub is also found along this drainage and is dominated by coyote brush and pampas grass above the channel at the southern end of this drainage.

Southern Maritime Chaparral. Southern maritime chaparral occurs in small patches within the Study Area. It mostly occurs outside of the Caltrans right of way. Its distribution within the project limits is patchy, its found on the northbound and southbound freeway slopes at Del Mar Heights Road, on some areas outside the right of way on the southbound slopes south of San Elijo Lagoon, and on some smaller patches on the northbound slopes north of Manchester Avenue along northbound I-5. This community is dominated by wart-stemmed ceanothus (*Ceanothus verrucosus*) and thick-leaved Eastwood's manzanita (*Arctostaphylos glandulosa* ssp.

crassifolia). Other species found in this community include: chamise (*Adenostoma fasciculata*), spicebush (*Cneordium dumosum*), summer holly (*Comarostaphylos diversifolia*), sea dahlia (*Coreopsis maritima*), Del Mar sand aster (*Lessingia filaginifolia* var. *filaginifolia*), toyon (*Heteromeles arbutifolia*), Torrey pine (*Pinus torreyana*), Nuttall's scrub oak (*Quercus dumosa*), and laurel sumac.

Some areas of southern maritime chaparral are disturbed and have large openings that are bare or vegetated with nonnative species. Many of the disturbed areas occur along trails or near development. Nonnative species found in disturbed southern maritime chaparral include African fountain grass (*Pennisetum setaceum*), Austrailian saltbush (*Atriplex semibaccata*), crystalline iceplant (*Mesembryanthemum* spp.), and ice plant (*Carpobrotus edulis*).

<u>Coastal Sage –Chaparral Scrub</u>. Coastal sage – chaparral scrub is a mixture of the dominant species in coastal sage scrub and chaparral communities. Dominant plant species that occur in this community include chamise, coastal sagebrush, lilac (*Ceanothus* spp.), black sage, and poison oak (*Toxicodendron diversilobum*) (Holland 1986). Coastal sage – chaparral occurs on a slope east of Marine View Avenue south of Loma Santa Fe exit and east of I-5.

<u>Coast Live Oak Woodland</u>. Coast live oak woodland consists primarily of coast live oak (*Quercus agrifolia*) and Engelmann oak (*Quercus englemannii*) with several associated understory species including poison oak (*Toxicodendron diversilobum*), skunk brush (*Rhus trilobata*), scrub oak, and toyon (*Heteromeles arbutifolia*). The herb layer consists of western ragweed (*Ambrosia psilostachya*), Douglas mugwort (*Artemisia douglasiana*), foxtail chess (*Bromus madritensis* ssp. *rubens*), soft chess (*Bromus hordeaceus*), ripgut grass (*Bromus diandrus*) and slender wild oat (*Avena barbata*).

Coast live oak woodland only occurs on the slopes above Jefferson Street south of Buena Vista Lagoon. The habitat is comprised of coast live oaks with nonnative grasses in the understory.

<u>Native Grassland</u>. Native grassland in southern California is characterized by a moderate cover of native bunchgrasses with native forbs and usually a smaller component of nonnative grasses and broadleaf species. Native grassland in the Study Area is either dominated by purple needlegrass (*Nassella pulchra*) with giant wild rye (*Leymus condensatus*) and blue wild rye (*Elymus glaucus*), with nonnative grasses and forbs within the community. Native grassland occurs on both the northbound and southbound slopes of I-5 north of Genessee Avenue.

<u>Nonnative Grassland</u>. Nonnative grassland consists of dense-to-sparse cover of nonnative annual grasses, often associated with species of showy-flowered, native annual forbs, especially in years of high rainfall. This vegetation community is a disturbance-related community most often found in old fields or openings in native scrub habitats that occur on fine-textured, usually clay soils. These soils are moist or even waterlogged during the winter rainy season and very dry during the summer and fall. Typical grasses found within the Study Area include wild oat (*Avena* sp.), soft chess (*Bromus hordeaceus*), African fountain grass, veldt grass (*Ehrharta*

calycina), red brome, and ripgut grass. Invasive species such as fennel (*Foeniculum vulgare*) and mustard are often associated with this vegetative community as a lesser component. Nonnative grassland occurs in various locations along the cut slopes throughout the corridor. Nonnative grassland is often found where ornamental vegetation has been degraded or grasses such as African fountain grass were planted as ornamental vegetation.

Nonnative Woodland. Nonnative woodland is a community comprised of nonnative trees including eucalyptus (*Eucalyptus* spp.), pine trees (*Pinus* spp.), pepper trees (*Schinus* spp.), and others. This community is dominated by trees and does not include areas with a few trees interspersed with other herbaceous and shrubby plants. This habitat is generally dominated with Eucalyptus groves along I-5. Nonnative woodland is found on the fringes around the lagoons, and in various areas throughout the corridor.

Bare Ground. The bare ground designation is either bare or sparsely vegetated areas with weedy invasive species and a few native shrubs due to disturbance or shading. Many of these areas are utility easement roads and/or hiking trails. These areas are found adjacent to I-5 along the entire corridor. Plant species commonly found in these sparse areas include foxtail chess, mustard, slender wild oat, and horseweed.

Disturbed Habitat. These areas are any lands where agricultural practices, construction, or other land-clearing activities have significantly altered the native vegetation; species composition and site conditions are not characteristic of the disturbed phase of one of the plant associations within the Study Area. Such habitat, which is dominated by non-native annuals and perennial broadleaf species, is typically found in vacant lots, roadsides, construction staging areas, and abandoned fields. Typical species found in this community include mustards, filaree (*Erodium* spp.), Russian thistle, tumbleweed (*Amaranthus albus*), sweet fennel, horseweed, crown daisy (*Chysanthemum coronarium*), and often degraded broadleaf ornamental plants such as ice plant, acacia (*Acacia* spp.), and myoporum (*Myoporum laetum*). This habitat occurs throughout the Study Area.

Agriculture. Agriculture within the Study Area encompasses active and fallow fruit and avocado groves, flower fields, and crop fields. These areas are disturbed and do not usually contain any native vegetation. Some nonnative grassland was associated with fallow agricultural fields in the Study Area.

Ornamental. Ornamental habitat is dominated by nonnative ornamental species. Ornamental species commonly found in this habitat along I-5 include ice plant, acacia, oleander (*Nerium oleander*), bougainvillea (*Bougainvillea* sp.), and scattered nonnative trees. This community is found within Caltrans right of way, particularly within interchanges and narrow slopes of the freeway.

Developed. Developed areas are lands that have been permanently altered by human activities. These areas include roads, buildings, and other areas where the land has been altered to such a state that natural vegetation cannot become reestablished. Developed areas occur adjacent to the right of way along most of the project alignment.

Wetland / Waters of the U.S.

Wetland communities are shown in Figures 3-1a through 3-1 n. ACOE jurisdictional areas are discussed in section 3.9.

Southern Willow Scrub. This community consists of dense, broadleaf, winter-deciduous riparian thickets dominated by willows (*Salix* spp.) and mulefat (*Baccharis salicifolia*) with scattered emergent cottonwood (*Populus fremonti*) and western sycamore (*Platanus racemosa*). Formerly extensive in coastal southern California, southern willow scrub is now estimated as reduced by 95 to 97 percent (Faber *et al.* 1989) and 61 percent in San Diego County (Oberbauer 1991). Riparian habitats support more bird species than any other habitat type in California, more than 140 species (Faber *et al.* 1989). The ACOE, CDFG, CCC, and RWQCB regulate impacts to these wetland communities. Southern willow scrub occurs along Carmel Creek, the San Luis Rey River, and some of the drainages upstream of the lagoons.

Disturbed southern willow scrub occurs in many of the small drainages and on the edges of larger expanses of habitat within the Study Area. Disturbed southern willow scrub is dominated by willows; however, there are several other weedy species that are also prominent in the habitat. Weedy species often found in disturbed southern willow scrub in the Study Area include giant reed (*Arundo donax*), tamarisk (*Tamarix* spp.), fan palms (*Washingtonia robusta*), castor bean (*Ricinius communis*), cocklebur (*Xanthium strumarium*), and fennel.

Mulefat Scrub. This vegetation type is completely dominated by mulefat, a tall (ca. 2 to 4 m [6.5 to 13.1 ft]), perennial shrub. Very few other species are associated with this vegetation community. Mulefat scrub is an early successional community following periodic disturbance (Holland, 1986). Repeated flooding of water channels allows the survival of this habitat type. Mulefat scrub occurs along the perimeter of San Elijo and San Dieguito Lagoons.

Disturbed mulefat scrub occurs in some of the small creeks and drainages and around the edges of larger expanses of undisturbed habitat. Disturbed mulefat scrub is primarily mulefat with weedy species such as Brazilian pepper tree (*Schinus terebinthifolius*), ice plant, eucalyptus, acacia, and castor bean.

Freshwater Marsh. Freshwater marsh is dominated by perennial, emergent monocots 1.3 to 2 meters tall (4.26 to 6.56 feet). Uniform stands of bulrushes (*Scirpus* spp.) or cattails (*Typha* spp.) often characterize this habitat. The soil in freshwater marshes is permanently saturated year-round with water and can support a high diversity of native and nonnative plant species. Freshwater marsh is found sporadically throughout the wetlands within the Study Area with the largest expanses in Buena Vista Lagoon.

Disturbed freshwater marshes are areas that have been invaded by nonnative weedy species that have become a prominent portion of the community. Nonnative species found in this habitat include myoporum, eucalyptus, Brazilian pepper tree, and small patches of giant reed. Disturbed freshwater marsh is found primarily in small drainages adjacent to I-5.

Southern Willow Scrub/Freshwater Marsh. Southern willow scrub/freshwater marsh is a mosaic of freshwater marsh species and willows. This habitat is found along Carmel Creek at the western end of the Carmel Valley Restoration and Enhancement Project (CVREP).

Southern Arroyo Willow Woodland. Southern arroyo willow woodland is composed of larger willows than southern willow scrub. Arroyo willows (*Salix lasiolepis*) are the dominant species in this community with mulefat, desert wild grape (*Vitus girdiana*), and goldenbush in the understory. This habitat occurs around the margins of San Elijo Lagoon where there is an influx of freshwater.

Disturbed southern arroyo woodland is also found along the western portion of Manchester Avenue at the boundary of San Elijo Lagoon. Nonnative invasive species found in this habitat include ice plant, date palm (*Phoenix dactylifera*), giant reed, and castor bean.

Coastal Brackish Marsh. Coastal brackish marsh is characterized by halophytic species such as pickleweed (*Salicornia virginica*), saltgrass (*Distichlis spicata*), alkali heath (*Frankenia grandiflora*), and freshwater species such as cattail and bulrushes. Many species depend on this community for nesting and foraging habitat. This community occurs at the Los Peñasquitos, San Dieguito, San Elijo, Batiquitos, and Buena Vista Lagoons as well as Encinas Creek.

Disturbed coastal brackish marsh is found around the margins of the lagoons where the marsh has been disturbed by human activities or natural phenomenon. Nonnative species found in disturbed coastal brackish marsh include myoporum, Brazilian pepper tree, ice plant, and acacia.

Southern Coastal Salt Marsh. These areas are typically flooded during high tides or strong winter storms. Most plants in this community are low-growing, salt-tolerant succulents called halophytes. Among the common dominant species are pickleweed, alkali heath, and saltgrass, with cordgrass (*Spartina foliosa*), salty susan (*Jaumea carnosa*), and estuary sea-blite (*Suaeda esteroa*). Coastal salt marsh vegetation is very important for wildlife. Several rare and endangered species of birds (e.g., light-footed clapper rail, Belding's savannah sparrow) and plants are dependent upon it for survival. The remaining areas of this community represent only a small remnant of what originally existed in San Diego County. Coastal salt marsh is found in and around the coastal lagoons including Los Peñasquitos, San Dieguito, San Elijo, Batiquitos, and Agua Hedionda.

Disturbed salt marsh/brackish marsh is present along the eastern right of way edge at the toe of fill slope in the San Dieguito River Valley and along the margins of salt marsh habitat in the other lagoons. The disturbed salt marsh is found along the drainage ditch at the toe of the slope and is interspersed with weedy species and some more brackish water species. Disturbed salt marsh/brackish marsh onsite is dominated by alkali heath, pickleweed, bull tule (*Scirpus robustus*), saltgrass, tamarisk, and cocklebur (*Xanthium strumarium* var. *canadense*). This habitat occurs at the edge of the right of way where erosion from drainage structures has washed sediment down the slope.

Salt Marsh Transition. Salt marsh transition is not a recognized vegetation community by Holland (1986); however, there is no community type that fits those areas between the southern coastal salt marsh and coastal sage scrub communities where there is no tidal influence, but plants are salt tolerant. Salt marsh transition along I-5 is dominated by a combination of species including pickleweed, goldenbush, four-wing saltbush, alkali heath, and broom baccharis (*Baccharis sarothroides*). Vegetation in this community is often sparsely distributed with salt pan areas in between plants. Salt marsh transition is found primarily around San Dieguito and Batiquitos Lagoon where the land begins to slope up away from the lagoon.

Arundo Scrub. Arundo scrub is a monotypic stand of giant reed. Giant reed is an invasive weed that grows in large thickets. Arundo scrub is found in scattered clumps along the I-5 and occurs in extensive stands at Buena Vista Lagoon and the San Luis Rey River.

Drainage Ditch. Drainage ditch habitat has small patches of distributed freshwater marsh and weedy species found in either lined or earthen drainage ditches along I-5. These are all man-made ditches, some of which are jurisdictional wetlands and some just convey runoff to storm drains. The drainage ditches are primarily unvegetated with patches of cattails, sedges, rushes, or weedy species such as castor bean and cocklebur.

Disturbed Wetland. Disturbed wetlands are communities that exhibit hydrology, soils, and vegetation; however, the species found onsite are a combination of weedy, nonnative and native species that do not resemble the other wetland habitats. Species commonly found in disturbed wetlands along the I-5 include fan palm (*Washingtonia robusta*), water cress (*Rorripa nasturtium-aquaticum*), willow herb (*Epilobium* spp.), curly dock (*Rumex crispus*), evening primrose (*Oenothera elata hookeri*), and sedges. Disturbed wetland is found in several drainages parallel to I-5 including the east side of I-5 south of the San Dieguito River, east of I-5 and north of Santa Fe, east of I-5 south of Palomar Airport Road, and at Loma Alta Creek.

Mud Flat. Mud flat habitat is unvegetated and occurs in the low to mid intertidal areas around each of the tidal lagoons. Although mudflat is unvegetated it is important habitat for many invertebrates and is foraging habitat for many shorebirds.

Salt Flat. Salt flat is similar to mud flat habitat in that it is primarily unvegetated; however this habitat is found usually at or above the high tide level. Salt flats or pannes form a hard crust that does not allow plants to grow. These areas can provide habitat for ground nesting birds such as California least terns (*Sterna antillarum browni*), western snowy plovers (*Charadrius alexandrinus nivosus*), and killdeer (*Charadrius mongolus*).

Open Water. Open water habitat is deeper water that is unvegetated or may have subtidal vegetation such as eelgrass. Open water habitat is considered jurisdictional waters of the U.S., but is not considered a wetland because it does not support a plant community. Eelgrass beds are considered special aquatic sites (see subtidal habitats below). Open water habitat is important foraging and resting areas for many bird species and also provides important fish and invertebrate habitat. Open water can be found in all the coastal lagoons and in the larger rivers flowing under I-5.

3.3 Subtidal Habitats

Subtidal portions of the lagoons within the Study Area were surveyed in 2006 for current eelgrass and possible toxic algae (*Caulerpa taxifolia*) distributions for purposes of identifying potential impacts. However, pre-construction/post-construction surveys will be required to make the final determination of impact to eelgrass. Pre and post construction surveys and construction monitoring will likely be required in the lagoons to monitor for toxic algae.

San Dieguito Lagoon. San Dieguito Lagoon was thoroughly studied for the large restoration project that began in late 2006. No eelgrass was found during these studies, and none is expected to occur in the future due to lack of tidal flushing and scour in the main channel of the San Dieguito River (JPA 2000).

San Elijo Lagoon. At present, no eelgrass occurs within the San Elijo Lagoon I-5 Study Area (Merkel and Assoc. 2006, Appendix C). Salinities within the sampling area of San Elijo Lagoon are currently, and typically, well below the range suitable to support eelgrass. If future restoration efforts are implemented, circulation and bathymetry may be altered such that the sampling area could support eelgrass. However, at the present time, the conditions at the site are not expected to support eelgrass.

Batiquitos Lagoon. A total of 1.02 hectares (2.52 acres) of eelgrass was mapped within the Batiquitos Lagoon sampling area in April 2006 (Figure 3-2a). To the west of the I-5 bridge, extensive eelgrass occurred on the north shore of the lagoon, with a more narrow fringing bed occurring on the south shore. To the east of the bridge, a small bed occurred immediately north of the bridge, but did not extend farther north due to the elevation of that area. The eelgrass mapped on the southern shore was the western edge of a continuous bed that extended 1.5 km (0.9 mile) farther east in the lagoon. The eelgrass appeared healthy, of tall stature, and generally free from epiphytes. The mean leaf shoot density in the eelgrass beds was 368 $\pm$ 101 shoots/m^2. Eelgrass does not grow in the channel leading up to, under, or past the bridge due to depth and high current velocities. However, eelgrass beds fringing the shoals surrounding the deeper channels are extremely dense compared to beds found in most systems of southern California. This high density is believed to be related to higher current velocities and ideal light environments.

The distribution of eelgrass mapped during the April 2006 survey is typical of this area of Batiquitos Lagoon, although in prior years eelgrass has been more extensive to the west of the bridge in the central basin (M&A unpublished data). A total of 1.62 hectares (4.00 acres) of the sampling area has supported eelgrass in September of 1999, 2001, 2003, and 2005. Eelgrass distribution patterns within Batiquitos Lagoon are influenced by a number of factors, including maintenance dredging near the lagoon mouth; sedimentation in the lagoon; and variable fluvial and oceanic influences including storm-derived sediments and turbidity, nutrient influx, and red tide. In addition, eelgrass within Batiquitos Lagoon was introduced through habitat restoration in October 1997.

During the course of the eelgrass surveys, no occurrences of the non-native, invasive seaweed *Caulerpa taxifolia* were detected within the sampling area. There is no record of this seaweed occurring at Batiquitos Lagoon in the past, although the lagoon is considered to be "at-risk" due to its proximity to residential areas, the input of storm drains, and the presence of eelgrass.

Agua Hedionda Lagoon. A total of 0.35 hectare (0.86 acre) of eelgrass was detected within the Agua Hedionda Lagoon sampling area in May 2006 (Figure 3-2b). The eelgrass was primarily restricted to fringing shoreline beds along the shore of both the east and central basin of the lagoon. The eelgrass appeared healthy, of moderate stature, and generally free from epiphytes. The mean leaf shoot density in the eelgrass beds was 243 ± 103 shoots/m^2.

The present distribution of eelgrass covered approximately 10 percent of the area that has been known to support eelgrass during surveys conducted in recent years (M&A 2001, 2002b, 2003, 2004). In September 2003, the area investigated in the present survey supported a total of 3.36 hectares (8.31 acres) of eelgrass (Figure 3-2b). There was a large-scale dieback of eelgrass that occurred in 2005 in Agua Hedionda Lagoon, and the eelgrass has not yet recovered to the distribution of prior years (M&A 2006a). Therefore, it should be assumed that the present distribution of eelgrass is significantly more restricted than it will likely be in coming years.

A large infestation of the non-native, invasive seaweed *Caulerpa taxifolia* was discovered growing in Agua Hedionda Lagoon in 2000. A portion of the infestation occurred within the sampling area of the present study. Successful eradication efforts have been under way since 2000 and *C. taxifolia* is now eradicated from Agua Hedionda Lagoon (M&A 2006b).

Buena Vista Lagoon. Buena Vista Lagoon is currently freshwater on both sides of I-5 with no eelgrass habitat present. Toxic algae is also not anticipated in this habitat.

3.4 Wildlife Within the Study Area

The Study Area has a diverse assemblage of wildlife species that use a wide variety of habitats. Many migratory birds use the lagoons as they travel along the Pacific Flyway, as well as resident species such as the light-footed clapper rail and the Belding Savannah sparrow. Many species of waterfowl, shorebirds, and marsh species can be found within the lagoon habitats. Some of the more common species observed include great blue heron (*Ardea herodias*), great egret (*Casmerodius albus*), snowy egret (*Egretta thula*), willet (*Catoptrophorus semipalmatus*), red-winged blackbird (*Agelaius phoeniceus*), American coot (*Fulica americana*), northern pintail (*Anas acuta*), American widgeon (*Anas americana*), black-necked stilt (*Himantopus mexicanus*), and many others. Cliff swallows (*Hirundo pyrrhonota*), northern rough-winged swallows (*Stelgidopteryx serripennis*), and white-throated swifts (*Aeronautes saxatalis*) have also been observed nesting within or on several of the bridges, primarily over the lagoons. No sign of bats was observed at any of the lagoon bridges. A complete list of species observed during field surveys is provided in Appendix E.

Several other bird species were observed around the margins of the lagoons in southern willow scrub, including the yellow warbler (*Dendroica petechia*), Nuttall's woodpecker (*Picoides nuttallii*), song sparrow (*Melospiza melodia*), common yellowthroat (*Geothlypis trichas*), black-headed grosbeak (*Pheucticus melanocephalus*), and lesser goldfinch (*Carduelis psaltria*). The amount of riparian habitat in and around the lagoons is limited; however, there are several creeks and the San Luis Rey River within the project study area that support many of these species.

The coastal sage scrub and other upland habitats particularly around the lagoons also support a diverse group of reptiles, birds, and mammals. Mammals that were commonly detected within the study area include striped skunk (*Mephitis mephitis*), raccoon (*Procyon lotor*), mule deer (*Odocoileus hemionus*), coyote (*Canis latrans*), California ground squirrel (*Spermophilus beecheyi*), Botta's pocket gopher (*Thomomys bottae*), desert cottontail (*Sylvilagus audubonii*), and many small rodents. Reptiles observed during field surveys include the western fence lizard (*Sceloporus occidentalis*), side-blotched lizard (*Uta stansburiana*), orange-throated whiptail (*Cnemidophorus hyperythrus beldingi*), southern Pacific rattlesnake (*Crotalus viridis*), and one San Diego horned lizard (*Phrynosoma coronatum blainvillei*). Commonly observed upland bird species include coastal California gnatcatcher, bushtit (*Psaltriparus minimus*), wrentit (*Chamaea fasciata*), house finch (*Carpodacus mexicanus*), mourning dove (*Zenaida macroura*), red-tailed hawk (*Buteo jamaicensis*), white-tailed kite (*Elanus leucurus majusculus*), northern harrier (*Circus cyaneus*), osprey (*Pandion haliaetus*), California towhee (*Pipilo crissalis*), and Anna's hummingbird (*Calypte anna*).

3.5 Fisheries

<u>San Dieguito Lagoon</u>. Fish fauna in San Dieguito Lagoon changes seasonally based on river flows, condition of the lagoon mouth, and salinity. Historical information on fish abundance for San Dieguito Lagoon comes from reports by Carpelan (1960), Greenwald (1984), PSBS (1979), and MEC (1993). Fish species caught in San Dieguito Lagoon in the past include, California killifish (*Fundulus parvipinnis*), mosquitofish (*Gambusia affinis*), striped mullet (*Mugil cephalus*), topsmelt (*Atherinops affinis*), longjaw mudsucker (*Gillichthys mirabilis*), pipefish (*Syngathus* spp.), California corbina (*Menticirrhus undulatus*), jacksmelt (*Atherinopsis californiensis*), and grunion (*Leuresthes tenuis*). Topsmelt are one of the most abundant species in most of the fish sampling completed in the lagoon.

<u>San Elijo Lagoon</u>. No fish were captured in the seining at San Elijo Lagoon, although the water quality measurements taken at the time of the sampling indicated suitable temperature, salinity, and dissolved oxygen conditions to support a freshwater or euryhaline fish community (Appendix C). This may be due to a patchy or sparse distribution of fish in the sampling area. A single dead common carp (*Cyprinus carpio*) was noted within the sampling area.

The shallower channels within the San Elijo Lagoon sampling area are subject to variations in temperature and salinity throughout the year related to seasonal input of freshwater and intermittent oceanic tidal influence. It is likely that hardy estuarine species such as California killifish, staghorn sculpin (*Leptocottus armatus*), longjaw mudsucker, striped mullet, and some gobies are present in the sampling area at various times of the year. In addition, ubiquitous mosquitofish are likely to be found on a regular basis within the sampling area. Finally, it is expected that there will be an intermittent occurrence of freshwater species brought into the sampling area by upstream freshwater input such as sunfish (*Lepomis* spp.), largemouth bass (*Micropterus salmoides*), and bullhead (*Ameiurus* spp.). A list of fish previously noted in prior studies at San Elijo Lagoon is presented in Appendix C to this document. The only coast pelagic fish covered under essential fish habitat that has a potential to occur at San Elijo Lagoon is the northern anchovy (See Section 4.4).

<u>Batiquitos Lagoon</u>. A total of 12 species of fish were captured in the otter trawl and beach seine used at Batiquitos Lagoon (Appendix C). The most abundant of the 10 fish species captured in the beach seine was shiner surfperch (*Cymatogaster aggregata*). This species is commonly associated with eelgrass, through which all of the beach seines were pulled. The next most abundant were the silversides: topsmelt (*Atherinops affinis*) and California grunion (*Leuresthes tenuis*). Small numbers of diamond turbot (*Hypsopsetta guttulata*), staghorn sculpin, and California corbina (*Menticirrhus undulatus*) were also captured alongshore. A single arrow goby (*Clevelandia ios*), bay pipefish (*Syngnathus leptorhynchus*), shadow goby (*Quietula y-cauda*), and striped mullet (*Mugil cephalus*) were also captured in the beach seine samples. With a total of 190 fish captured in the beach seine, the mean density of fish was 0.19 individuals/m^2. The mean biomass of fish captured near the shore using a beach seine was 4.32 g/m^2. A relatively large mullet and two corbina accounted for 89 percent of the total weight captured in the beach seine (Appendix C).

It was not possible to complete the fourth otter trawl transect located to the east of I-5 due to the unusual density of the eelgrass in the sampling area. Four attempts were made to deploy and retrieve the otter trawl in this area; however, the dense eelgrass prevented it from traveling properly along the bottom. As a result, no fish were captured in the otter trawl in this area (Appendix C).

Three species of fish were captured offshore by the otter trawl including the round stingray (*Urobatis halleri*), California halibut (*Paralichthys californicus*), and diamond turbot. These bottom dwelling species are common in both the unvegetated and eelgrass habitats within the lagoon. With a total of 18 fish captured in the otter trawl, the mean density of offshore fish was 0.02 individuals/m^2. Although the fish captured offshore in the otter trawl accounted for only 9 percent of the total fish captured in the Batiquitos Lagoon survey area, they made up 65 percent of the total weight, due in great part to the capture of two large California halibut. The mean biomass of fish captured offshore in the otter trawl was 9.19 g/m^2.

The I-5 survey area is located between the central and eastern basins of Batiquitos Lagoon, approximately half way between Station 3 and Station 4 of the post-restoration Batiquitos Lagoon Long-term Biological Monitoring Program (M&A 2002a). As a result, it can reasonably be expected that this area will support some use by fish species collected from these two stations throughout the monitoring program. Collectively, Stations 3 and 4 of the Batiquitos Long-term Monitoring Program have yielded 58 species of fish (M&A 2002a). Those that are anticipated to likely occur within the sampling area of Batiquitos Lagoon are indicated in bold type. Coast pelagic fish covered under essential fish habitat, northern anchovy, jack mackerel and Pacific sardine, are likely to occur in the Study Area of Batiquitos Lagoon (Appendix C).

<u>Agua Hedionda Lagoon</u>. The fish sampling efforts captured a total of 14 species of fish in the otter trawl and beach seine (Appendix C) The most abundant of the 11 fish species captured in the alongshore community, sampled by the beach seine, were topsmelt, followed by shiner surfperch. Also commonly captured were giant kelpfish (*Heterostichus rostratus*), bay pipefish, and staghorn sculpin. California halibut, spotted sand bass (*Paralabrax maculatofasciatus*), diamond turbot, and black surfperch (*Embiotoca jacksoni*) were captured in low numbers, with a single dwarf surfperch (*Micrometrus minimus*) also being captured. Three non-native yellowfin goby (*Acanthogobius flavimanus*) were also captured. With 1,751 fish captured in the beach seine, the mean density of fish was 2.31 individuals/m^2, driven primarily by the large number of topsmelt captured (1,308 of the total). Alongshore fish weights generally tracked abundance (Appendix C), although 11 spotted sand bass were the second heaviest portion of the total weight. The mean biomass of fish captured alongshore in the beach seine was 16.97 g/m^2.

Fish captured offshore by the otter trawl represented a total of seven species. Most abundant were California halibut and shiner surfperch, with low numbers of spotted sand bass, diamond turbot, and speckled sanddab (*Citharichthys stigmaeus*). Single individual specklefin midshipman (*Porichthys myriaster*) and yellowfin croaker (*Umbrina roncador*) were also captured in the otter trawl. With 52 fish captured in the otter trawl, the mean density of offshore fish was 0.02 individuals/m^2. Although the fish captured offshore in the otter trawl accounted for only 3 percent of the fish captured in the Agua Hedionda Lagoon survey area, they made up 30 percent of the total weight, due to the capture of comparatively large California halibut, diamond turbot, and spotted sand bass (Appendix C). The mean biomass of fish captured offshore in the otter trawl was 2.26 g/m^2.

The fish captured in the sampling area at Agua Hedionda Lagoon (within 122 m of the bridge centerline) are typical of the fish communities commonly observed in the region's coastal lagoons. It is likely that as the eelgrass recovers in the coming years, fish diversity and abundance may also increase. Those that are anticipated to likely occur within the sampling area of Agua Hedionda Lagoon are indicated in bold type. Coast pelagic fish covered under essential fish habitat, northern anchovy, jack mackerel and Pacific sardine, possibly occur in the Study Area of Agua Hedionda.

3.6 Epibenthic Macroinvertebrates

San Elijo Lagoon. No epibenthic macroinvertebrates were captured in the seines during the fish sampling at San Elijo Lagoon. The lack of macroinvertebrate collection is not unexpected considering the conditions of the site. Within the freshwater aquatic environments of southern California, the most common macroinvertebrates collected in seines are various insect larvae and the introduced crayfish (*Procambarus clarki*). However, in estuarine environments with variable salinity conditions, crayfish populations are typically low and aquatic insect larvae are generally less common in such areas as well. For similar reasons, marine macroinvertebrate species are poorly represented in very low salinity environments such as the sampling area at the present time.

Batiquitos Lagoon. A total of five macroinvertebrate taxa were collected in the fish sampling at Batiquitos Lagoon (Appendix C). All were gastropods: California bubble snail (*Bulla gouldiana*), California cone snail (*Conus californicus*), mud nassa (*Nassarius tegula*), navanax (*Navanax inermis*), and guilded turban snail (*Tegula aureotincta*). All were single individuals except for two California cone snails captured in an otter trawl sample.

The epibenthic macroinvertebrate fauna was somewhat surprising in that it lacked small crustaceans, which have been typically collected in similar net hauls within the lagoon during the course of the post-restoration monitoring program (M&A 2002a). While not detected during this present survey, a number of typically occurring invertebrates have been documented to occur on a regular basis within the I-5 survey area. These include the California sea hare (*Aplysia californica*), speckled scallop (*Argopecten aequisulcatus*), California green shrimp (*Hippolyte californiensis*), hermit crab (*Pagurus hirsutiusculus*), and shore crab (*Hemigrapsus oregonensis*).

Agua Hedionda Lagoon. A total of five macroinvertebrates taxa were captured in the fish sampling at Agua Hedionda Lagoon (Appendix C). Four gastropods were captured: California bubble snail, California cone snail, mud nassa, and guilded turban snail. The California bubble snail was caught in the highest number, with a mean density of 0.204 and 0.238 individuals/m^2 in the otter trawl and beach seine, respectively, and a mean biomass of 0.288 and 0.442 g/m^2 in the otter trawl and beach seine, respectively. The other snails were captured in low numbers, between 0 and 5 per replicate.

One crustacean was captured: the bay shrimp (*Crangon franciscorum*). The bay shrimp were captured only in the beach seine, with a mean density of 0.218 individuals/m^2 and a mean biomass of 0.022 g/m^2.

These species represent a portion of the typical macroinvertebrate community found in the region's coastal lagoons. Additional species of crustacean and gastropod likely occur, as well as various species of bivalve, echinoderm, and cnidarian. Species observed within the sampling area between 2000 and 2005 have included navanx, California sea hare, speckled scallop, armored sea star (*Astropecten armatus*), white urchin (*Lytechinus anamesus*), and fairy palm hydroid (*Corymorpha palma*).

3.7 Sensitive Species Known to Occur in the Study Area

A summary of listed and proposed species with the potential to occur within the project vicinity was developed from a list from the USFWS (Table 3-1). Listed sensitive species that may occur within the study area and non-listed sensitive species that were found within the Study Area are discussed below.

Table 3-1. Listed and Proposed Species Observed or with the Potential to Occur in the Project Area.

Common Name	Scientific name	Status (Federal/State)
San Diego thornmint	*Acanthomintha ilicifolia*	T / E
San Diego ambrosia	*Ambrosia pumila*	E /
Del Mar manzanita	*Arctostaphylos glandulosa ssp. crassifolia*	E /
coastal dunes milk-vetch	*Astragalus tener var. titi*	E / E
Encinitas baccharis	*Baccharis vanessae*	E / E
thread-leaved brodiaea	*Brodiaea filifolia*	T /
Orcutt'spineflower	*Chorizanthe orcuttiana*	E / E
San Diego button celery	*Eryngium aristulatum var. parishii*	E / E
Orcutt's hazardia	*Hazardia orcuttii*	C /
willowy monardella	*Monardella linoides ssp. viminea*	E / E
Spreading navarretia	*Navarretia fossalis*	T /
California Orcutt grass	*Orcuttia californica*	E / E
San Diego mesa mint	*Pogogyne abramsii*	E / E
Tidewater goby	*Eucyclobobius newberryi*	E /
San Diego fairy shrimp	*Branchinecta sandiegonensis*	E /
Riverside fairy shrimp	*Streptocephalus woottoni*	E /
Brown pelican	*Pelecanus occidentalis*	E / E
least Bell's vireo	*Vireo bellii pusillus*	E / E
southwestern willow flycatcher	*Empidonax trailli extimus*	E / E
coastal California gnatcatcher	*Polioptila californica californica*	T / SC
light-footed clapper rail	*Rallus longirostris levipes*	E / E
California least tern	*Sterna antillarum browni*	E / E
western snowy plover	*Charadrius alexandrinus nivosus*	T / SC

Belding's savannah sparrow	*Passerculus sandwichensis beldingi*	/ E
Pacific pocket mouse	*Perognathus longimembris pacificus*	E / SC

T = Threatened; E = Endangered; SC = Species of Special Concern

Sensitive Plants

The section below discusses sensitive plant species observed within the Study Area and listed plant species with the potential to occur in the Study Area. Sensitive plant species observed within the Study Area are shown on Figures (3-3a-3-3f).

Adolphia californica Wats CNPS List 2
California adolphia
Rhamnaceae (buckthorn family)

The California adolphia is a deciduous shrub that occurs in chaparral, coastal sage scrub, and in clay soils in valley and foothill grasslands. It flowers from December through April and is threatened by development and grazing. Adolphia was found on both sides of the slopes of I-5 near San Elijo Lagoon (Figures 3-3a-f).

Arctostaphylos glandulosa Eastw. ssp. *crassifolia* (Jeps.) Wells FE
Del Mar manzanita CNPS List 1B
Ericaeae (heath family)

This plant is restricted to San Diego County and northern Baja California. This species is a fire-adapted shrub restricted to sandstone terraces and bluffs, and is associated with a subtype of chaparral known as southern maritime chaparral. About 25 populations exist in San Diego County, including nearby areas at Del Mar and the Torrey Pines State Reserve. Del Mar manzanita is a federally listed endangered species and is considered endangered by the California Native Plant Society (CNPS). In the Study Area, approximately 70 plants were observed at the top of the slopes on both sides of I-5, just north of Del Mar Heights Road to Birmingham Drive (Figure 3-3a-f).

Atriplex pacifica Nelson CNPS List1B
south coast saltscale
Chenopodieae (goosefoot family)

South coast saltscale is a rare plant found in coastal southern California and the Channel Islands between 0 and 140 m (0 and 450 ft). This species occurs in coastal bluff scrub, playas, coastal sage scrub, and coastal sand dunes. It is an annual herbaceous species that blooms from March through October. Approximately 100 individuals were observed along a dirt road northwest of the I-5 Manchester interchange (Figure 3-3a-f).

Centromadia parryi (E. Greene) spp. *australis* (Keck) B.G. Baldwin CNPS List 1B
southern tarplant
Asteraceae (sunflower family)

Southern tarplant is a rare plant found on the margins of marshes, grasslands, and vernal pools. It blooms from May to November. This species is threatened by development. Southern tarplant occurs along the dirt access road east of I-5 and north of the San Dieguito River (Figure 3-3a-f).

Chaenactis glabriuscula DC var. *orcuttiana* (E. Greene) H.M. Hall CNPS List1B
Orcutt's pincushion
Asteraceae (sunflower family)

Orcutt's pincushion is a rare, annual herb that is found in coastal dunes and coastal bluff scrub between 3 and 100 m elevation (10 and 328 ft). This species occurs in coastal southern California and is threatened by coastal development. Approximately 4,700 individuals were observed within the study area around San Elijo Lagoon on both sides of I-5 (Figure 3-3a-f).

Comarostaphylis diversiloba (Parry) Greene ssp. *diversiloba* CNPS List 1B
summer holly
Ericaceae (heath family)

Summer holly is an evergreen shrub found in chaparral communities from Orange County to Baja California. It flowers April through June. It is threatened by development and gravel mining. Summer holly was observed south of San Elijo Lagoon on the southbound slopes of I-5 (Figure 3-3a-f)

Coreopsis maritima (Nutt.) Hook.f CNPS List 2
sea dahlia
Asteraceae (sunflower family)

Sea dahlia is a perennial herbaceous plant found in coastal bluff scrub and coastal sage scrub in San Diego County and Baja California. This species is considered rare and threatened by coastal development. It flowers between March and May. Approximately 389 individual sea dahlia plants were observed in the Study Area primarily north of Manchester Avenue on both sides of I-5 (Figure 3-3a-f).

Ferocactus viridescens (T. & G.) Britt. & Rose CNPS List 2
San Diego barrel cactus
Cactaceae (cactus family)

The San Diego barrel cactus is found in chaparral, coastal sage scrub, valley and foothill grasslands and in areas around vernal pools. It is a stem succulent scrub that flowers from May through June. It is seriously threatened by urbanization, off-road vehicles, and horticultural collecting. San Diego barrel cactus were found on the slopes northwest of the I-5/Genessee interchange, on the slopes on both sides of I-5 near San Elijo Lagoon, and west of I-5 on the northern slopes of Batiquitos Lagoon (Figures 3-3a-f).

Lessingia filaginifolia var. *linifolia* Hall CNPS List 1B
Del Mar Mesa sand aster
Asteraceae (sunflower family)

This plant is endemic to San Diego County, and is generally associated with coastal sage scrub or chaparral on sandstone substrates. This species is found between Carlsbad and San Diego Bay on the coast. Del Mar sand aster was proposed for federal listing as threatened (58 Federal Register 51302), but the proposed rule was withdrawn based on information indicating that this species is no longer recognized as taxonomically distinct (61 Federal Register 52402 (USFWS 1996). Regardless of the current taxonomic treatment, the CNPS still designates it as rare, threatened, or endangered. Over 2,000 individuals were observed within the study area between Del Mar Heights Road and Birmingham Avenue Exit along the upper slopes on both sides of I-5 (Figures 3-3a-f).

Pinus torreyana Carr. ssp. *torreyana* CNPS List 1B
Torrey pine
Pinaceae (pine family)

The Torrey pine is an evergreen tree found in sandstone soils in coastal coniferous forest, and chaparral communities in San Diego County. It is in cultivation; native plants probably number <9000 (Hickson 1993). It is threatened by development. There are planted Torrey pines along much of the I-5. Some of the Torrey pines near San Elijo Lagoon may be native occurrences (Figure 3-3a-f).

Quercus dumosa Nutt. CNPS List 1B
Nuttall's scrub oak
Fagaceae (oak family)

The species occurs sporadically in coastal chaparral and sage scrub communities with a relatively open canopy. This species is considered to have a limited number and is restricted to coastal California communities. Nuttall's scrub oak is considered rare within the region by the CNPS. In the Study Area, several plants were observed at the top of the north and southbound slopes, just north of Del Mar Heights Road and on the upper slopes near San Elijo Lagoon (Figures 3-3a-f).

Suaeda esteroa W. Ferren & S. Whitmore CNPS List 1B
Estuary seablite
Chenodiaceae (goosefoot family)

Estuary seablite occurs from Santa Barbara County south to Baja California. It is found in coastal salt marshes and blooms from July through October. This species was found in the high salt marsh around San Dieguito, Batiquitos, and Agua Hedionda Lagoons.

Acanothomintha ilicifolia FE/SE
San Diego thornmint CNPS List 1B
Lamiaceae (mint family)

The San Diego thorn-mint is a small annual herb found in broken clay soils within grassy openings in chaparral, coastal sage scrub, and vernal pool communities in San Diego County and northern Baja California (Reiser 1994). This species flowers from April to May. The microhabitat associated with this species is quite distinctive and was not detected during surveys. It is therefore unlikely that this species occurs in the vicinity of the project. None was seen during surveys for this report. No impacts to this species are anticipated.

Ambrosia pumilla (Nutt.) Gray FE
San Diego ambrosia CNPS List 1B
Asteraceae (sunflower family)

The San Diego ambrosia is a rhizomatous perennial herb that flowers June through September. This species is federally listed as endangered. It is found in chaparral, coastal scrub, valley and foothill grassland, and vernal pool communities in coastal San Diego County, western Riverside County, and northern Baja California (CNPS 2001). It is often found in disturbed areas within these communities. Many occurrences within the SAn Diego County have been extirpated. This species is seriously threatened by development. No San Diego ambrosia was observed during any surveys conducted for the I-5 project, and there are no locations recorded in the CNDDB within the Study Area. The closest recorded occurrence of this species is 4 km (2.5 miles) east of I-5 along State Route (SR) 76 (CNDDB 2006).

Astragalus tener var. *titi* (Eastw.) Bareby FE/SE
Coastal dunes milk-vetch CNPS List 1B
Fabaceae (pea family)
The coastal dunes milk-vetch is an annual herb that flowers March through May. It inhabits coastal dunes and sandy areas in coastal bluff scrub in Monterey, Los Angeles and San Diego Counties. Only three extant populations are known; those in San Diego County have not been since the 1970's. There are no coastal dunes within the project limits. No impacts to this species are anticipated.

Baccharis vanessae Beauchamp FT/SE
Encinitas baccharis CNPS List 1B
Asteraceae(sunflower family)

Encinitas baccharis is a perennial broom-like, dioecious shrub. This species is endemic to San Diego County, occurring locally in chaparral along the coast from Encinitas to Mira Mesa. This species is federally listed as threatened and state listed as endangered. This species was not observed and would have been identified if it occurred within the project area. The closest known occurrence is approximately 375 m (1230 ft) east of the I-5 near Encinitas Boulevard (CNDDB 2006).

Brodiaea filifolia Wats. FT/SE
thread-leaved brodiaea CNPS List 1B
Liliaceae (lily family)

The thread-leaved brodiaea is a bulbiferous perennial herb found in coastal sage scrub, cismontane woodland, valley and foothill grasslands, and in clay soils in vernal pools. This species is federal and state listed as endangered. It is seriously threatened residential development, agriculture, and vehicles damaging plants. No thread-leaved brodiaea were observed during surveys conducted for the project. The closest known location is approximately 3 km (1.86 miles) east of I-5 near SR 78. This species is not expected to occur within the project limits.

Chorizanthe orcuttiana Parryi FE/SE
Orcutt's spineflower CNPS List 1B
Polygonaceae (buckwheat family)

Orcutt's spineflower is an annual herb found in chaparral, coastal coniferous forest, and coastal scrub communities from Del Mar to Point Loma, San Diego County (Hickman 1993). It flowers March through April. Most historical habitat has been urbanized. The last known habitat has been developed. It is presumed extinct (Hickman 1993). This species was not observed during surveys and habitats within the project limits are likely too disturbed to support this species. Therefore, this species is not expected to occur within the project limits.

Eryngium aristulatum var. parishii Jepson FE/SE
San Diego button celery CNPS List 1B
Apiaceae (carrot family)

San Diego button-celery is an herbaceous annual or perennial plant in the parsley family (Apiaceae). This species is federally listed as endangered (58 Federal Register 41384) and is state listed as endangered. This taxon is associated with clay bottom vernal pools. San Diego button-celery is found in Riverside and San Diego counties, and in Baja California, Mexico (Skinner and Pavlik 1994). In San Diego County, the species is found on Camp Pendleton, Carlsbad, San Marcos, Miramar Naval Air Station, Clairemont Mesa, and Otay Mesa (Beauchamp 1986; USFWS 1993; Ogden and Dudek 1994). There are no vernal pools in the Study Area; therefore, the San Diego button celery is not expected to occur within the project limits.

Hazardia orcuttii (Gray) Greene
Orcutt's hazardia — CNPS List 1B
Asteraceae (sunflower family)

Orcutt's hazardia is an evergreen shrub found in chaparral and coastal scrub communitites. It flowers August through October. It is known from only one occurrence in California from Lux Canyon in San Diego County. This species was not observed during surveys and would have been identified if it occurred within the project area.

Monardella linoides ssp. *viminea* (Greene) Abrams — FE/SE
Willowy monardella — CNPS List 1B
Lamiaceae (mint family)

The willowy monardella is a perennial herb that inhabits coastal coniferous forest, chaparral, riparian forest, riparian scrub, and riparian woodland communities. It flowers June through August. It is threatened by road improvements, vehicles, non-native plants, and urbanization. This species was not observed during surveys and would have been identified if it occurred within the project area.

Navarretia fossalis Moran — FT/
Spreading navarretia — CNPS List 1B
Polemoniaceae (phlox family)

Prostrate navarretia is federally listed as threatened and is considered rare by the CNPS. It is a spring-blooming annual plant (April-June). This species typically occurs below 450 m (1475 ft) elevation. It is primarily found in vernal pools, although it occasionally occurs in ditches or other artificial depressions. Prostrate navarretia occurs in western Riverside and southwestern San Diego counties, and in northwestern Baja California, Mexico (Skinner and Pavlik 1994). Historically, prostrate navarretia occurred in relatively few of the San Diego County vernal pools. In San Diego County, this species is found in Carlsbad, San Marcos, Ramona, and Otay Mesa. It is not expected to occur in the Study Area due to a lack of suitable habitat.

Orcuttia californica Vasey — FE/SE
California Orcutt grass — CNPS List 1B
Poaceae (grass family)

California orcutt grass is federally and state endangered. It is found in vernal pools and slump ponds of the coastal mesas (Beauchamp, 1986). It can be found in Los Angeles, Riverside and

San Diego County, as well as Baja California, Mexico. It was not observed during our surveys. It is not expected to occur in the Study Area due to a lack of suitable habitat.

Pogogyne abramsii Howell FE/SE
San Diego mesa mint CNPS List 1B
Lamiaceae (mint family)

San Diego Mesa mint is an annual aromatic herb in the mint family. This species is federally listed as endangered (43 Federal Register 44812) and is state listed as endangered. San Diego Mesa mint is endemic to San Diego County. This spring-blooming (April-June) annual plant is restricted to vernal pools on mesa tops. Its distribution is centered on the mesas north of San Diego, including Miramar Naval Air Station, Tierrasanta, and Kearny Mesa. San Diego mesa mint is not expected to occur in the Study Area due to a lack of suitable habitat.

Sensitive Wildlife

Sensitive wildlife observations are shown in Figures 3-4a through 3-4g. Figures depict locations of sensitive wildlife with the permanent impact footprint of the 10+4 with barrier alternative. Critical habitat for listed species is described in Section 3.7.

Pacific pocket mouse FE/SC
Perognathus longimembris pacificus

The Pacific pocket mouse is a Federal endangered species and a CDFG Species of Special Concern. The Pacific pocket mouse is the smallest subspecies of the little pocket mouse (*Perognathus longimembris*) and one of the smallest rodents in the world. Its length from nose to tail can be up to 131 mm (5.24 inches) and it weighs 7 to 9 grams (0.25 to 0.32 ounces). The Pacific pocket mouse is mostly brown (various shades of), free from bristles or spines, and whitish below. Body color varies within geographical locations. It is an endemic species to the southern California coast from Los Angeles County to near the Mexico-San Diego border. The extant range of the Pacific pocket mouse is restricted to San Mateo State Park, Camp Pendleton, and Dana Point. Its habitat requirements are fine-grain and sandy substrates in coastal sage scrub; however, in San Diego County they have also been found in open patches of ground surrounded by weeds.

Protocol live-trapping for the Pacific pocket mouse conducted for 5 nights was completed in 5 locations within the Study Area within the highest quality habitat near San Dieguito and San Elijo Lagoons in 2003 (Appendix B). No pocket mice were caught during the trapping effort. No pocket mice are expected to occur within the project limits.

Light-footed clapper rail FE/SE and CFP
Rallus longirostris levipes

The light-footed clapper rail occurred historically along the southern California coast from Santa Barbara County south to San Quintin, Baja California. Populations have declined due to limited distribution and destruction/degradation of coastal salt marsh habitat. About 253 pairs were reported in 2000, 90 percent of these were reported in just three wetland areas: Anaheim Bay and Newport Bay (Orange County) and Tijuana Estuary (San Diego County). Light-footed clapper rails are typically found in salt marshes dominated by cordgrass, but can also be found in habitats dominated by cattail (*Typha* spp.) and sedges (*Scirpus* spp.) (Unitt 2004). Nesting occurs from mid-March to the beginning of July.

Focused surveys for the light-footed clapper rail were completed along the San Luis Rey River, Buena Vista Lagoon, Batiquitos Lagoon, San Elijo Lagoon, and San Dieguito Lagoon in 2003, and in Los Peñasquitos Lagoon in 2004 within 152 m (500 feet) of the existing I-5. Light-footed clapper rails were detected within 152 m (500 feet) of I-5 in Buena Vista and San Elijo Lagoons (Figures 3-4a-h). One pair was observed in the northwestern quadrant of Buena Vista Lagoon and a single and two more pairs were observed by Zembal (2003) further east of I-5. Two single males and one pair were detected in San Elijo Lagoon east of I-5 in the marsh adjacent to the I-5 fill slope. No clapper rails were observed in Los Peñasquitos Lagoon within 500 feet of I-5. However, two pairs of rails and a single male rail were detected south of the survey area and north of the City of San Diego's pump station. In 2005, during separate surveys at Batiquitos Lagoon, clapper rails were observed adjacent to the park and ride at La Costa and on the north shore of the east basin (Zembal/Konecny pers comm.).

California least tern FE/SE and CFP
Sterna antillarum browni

The California least tern historically nested on coastal beaches from Monterey County to Cabo San Lucas, Baja California. However, substantial population declines have been documented in the last 50 years. From the late 1970s to 2003, through management of the species, the San Diego County least tern population has increased from about 500 pairs to 4000 pairs (Unitt 2004). California least terns are migratory and return to San Diego in early April to breed and raise young before leaving in mid-September. The San Dieguito Ecological Reserve has a colony managed by the California Department of Fish and Game. There are also known nesting areas for least terns in San Elijo and Batiquitos Lagoons. The breeding areas are outside of the grading limits; however, some foraging habitat may be impacted during construction. California least terns were observed foraging in San Elijo and Batiquitos Lagoon within the Study Area in 2003 (Figure 3-4a-h).

Western snowy plover FT/SC
Charadrius alexandrinus nivosus

The Pacific coast population of the western snowy plover was listed as federally threatened on April 5, 1993. Western snowy plovers forage on both the dry sand of the upper beach and along the wet sand at the beach-surf interface (Zeiner et al. 1990). In Orange and San Diego counties, the snowy plover is a common winter migrant and winter visitor and a fairly common localized breeding resident (Unitt 1984). The species is declining because of development and degradation of feeding and nesting habitat, increased human disturbance at nest sites, vehicular destruction of nests, and increased predation by introduced predator populations. The snowy plover is known to occur in some of the coastal lagoons; however, there is no nesting area within the project footprint. Some foraging habitat for this species may be impacted by this project at Batiquitos and Agua Hedionda Lagoons.

Coastal California gnatcatcher FT/SC
Polioptila californica californica

This species is listed as threatened by the USFWS (1993) and is a CDFG Species of Special Concern. It is a non-migratory resident whose range covers the coastal plains of southern California and northern Baja California. In San Diego County, it occurs in coastal lowlands generally below 600 m (1968 ft) and is an obligate resident of coastal sage scrub. However, it is able to utilize other vegetation types such as chaparral and riparian habitats for portions of its territory (Unitt 1984). The decline of the coastal California gnatcatcher is attributed to the loss and fragmentation of CSS due to urban and agricultural development.

California gnatcatchers were generally found along the fill slopes and a few cut slopes adjacent to the lagoons and in a few adjacent canyons with coastal sage scrub habitat (Figure 3-4a-h). Table 3-2 lists the number of pairs and individual California gnatcatchers identified by general area within the larger Study Area for I-5.

Table 3-2. Coastal California Gnatcatchers Identified within the Study Area

Location	# of California gnatcatchers identified 2003 surveys	#of California gnatcatchers identified 2005 surveys
Genessee North		6 undetermined status**
San Dieguito SW	3 P+1 J, 1 J dispersing, 1 SM	4P+1J, 1 SM
San Dieguito NW	1 SM dispersing 2/10/03	--
San Elijo Lagoon	3 P, 2 SM	5P+1J, 2 SM*
Manchester East	2 P+1J, 1 SM	1P+1J, 2 SM
Manchester West	2 SMs	NS
Batiquitos East	1 P	1P

Batiquitos West	2 P+2 J, 1 SM	1P+2 J
Brooks Street	2P+2J,	NS
Lawrence Canyon	2 P	NS

P = Pair
J = Juvenile
SM = Single male
NS = Not surveyed in 2005
*in 2007 survey one SM location now has a pair
** 6 locations of California gnatcatchers were identified by surveys for the I-5 Genessee Interchange Project.

Least Bell's vireo FE/SE
Vireo bellii pusillus

The least Bell's vireo was once widespread from Tehama County in northern California to northwestern Baja California. This migratory species nests in willows, also using a variety of other shrub and tree species for nest placement. Declines have occurred due to habitat loss and fragmentation, and nest parasitism by the brown-headed cowbird (*Molothrus ater*). Recent population numbers have trended upward. Two vireo territories were detected in the willow woodland east of I-5 near the San Dieguito River; however, they are outside the main Study Area. Protocol surveys for least Bell's vireo along Moonlight Creek in Encinitas were negative in both 2003 and 2004. Least Bell's vireo were detected during California gnatcatcher protocol surveys near Brooks Street and Lawrence Canyon in Oceanside in small patches of riparian habitat (Figures 3-4a-h). The vireos were over 130 m (426 ft) and 225 m (738 ft) from I-5.

Belding's savannah sparrow SE
Passerculus sandwichensis beldingi

The Belding's savannah sparrow is resident to coastal salt marshes from Santa Barbara County to northern Baja California. In 2006, 32 coastal salt marshes were surveyed and 3,139 breeding territories were identified (Zembal et al. 2006). Surveys within the I-5 Study Area, within Belding's savannah sparrow habitat were completed during the spring of 2005 and reported sightings during light-footed clapper rail were also noted. In addition, the CDFG provided the results of their surveys for Belding's savannah sparrows at Buena Vista Lagoon for 2005. Belding savannah sparrows were found at San Dieguito, San Elijo, Batiquitos, and Buena Vista Lagoons (Figures 3-4a-h). Additional surveys were completed at San Dieguito in 2006 that identified more Belding's savannah sparrows in the northeastern portion of the lagoon (Figures 3-4a-h).

Southwestern willow flycatcher FE/SE
Empidonax trailli extimus

The southwestern willow flycatcher is listed as State and federally endangered; on July 22, 1997 the USFWS designated critical habitat for the subspecies. This subspecies is an uncommon spring and fall migrant and a very rare summer resident. It is found among trees or large shrubs throughout San Diego County. Nesting is restricted to willow thickets in riparian woodland; the local breeding population in San Diego County is now extremely small. Its diet consists of berries, insects and some seeds. It feeds by hovering and gleaning and nests are commonly parasitized by brown-headed cowbirds. Willow flycatchers arrive in southern California later in the spring than do other breeding migratory passerines. They usually arrive about mid-May, but individuals have been documented as early as the first part of May (Unitt 1984). Surveys for the southwestern willow flycatcher were completed in the riparian habitat in the San Luis Rey River after a willow flycatcher was heard vocalizing during a wetland survey on June 8th, 2004 (Figures 3-4a-h). However, subsequent surveys did not detect the southwestern willow flycatcher again. It is likely that the bird detected was was either a willow or southwestern willow flycatcher migrating through the area at the time. No other suitable habitat is present within the Study Area. The San Elijo Lagoon Conservancy has records of migrant southwestern willow flycatchers at San Elijo Lagoon outside the Study Area.

California brown pelican FE/SE
Pelecanus occidentalis californicus

The California brown pelican was officially listed as endangered by the USFWS on October 13, 1970 and by CDFG on June 27, 1971. Brown pelicans occur in marine habitats along the Pacific, Atlantic, and Gulf coasts in North America and range south to Central and South America. The species is usually found within 20 km of shore, but regularly occurs up to 175 km offshore (Zeiner et al. 1990). The California subspecies nests on islands off the coast of southern California, south along the coast of Baja California and the Gulf of California, to Guerrero Mexico (CDFG 1991). Nesting in California occurs in colonies on the Channel Islands and Coronado Islands (Garrett and Dunn 1981). California brown pelicans were observed foraging and resting within the lagoons within the Study Area.

Tidewater Goby FE/SC
Eucyclogobius newberryi

The tidewater goby is listed as endangered by the USFWS and is a California Species of Special Concern. This small, nondescript fish is endemic to coastal lagoons and lower stream reaches in brackish to fresh, slow moving to still, but not stagnant water. The substrate usually consists of sand and mud, with abundant emergent and submerged vegetation. It feeds on aquatic insects and small crustaceans (Moyle, 1976). The tidewater goby is thought to be a good indicator of the health of small lagoon ecosystems because of their sensitivity to habitat degradation through fresh water supply diversion, pollution, and siltation that often accompanies urban development. Its low mobility, restricted habitat, and short lifespan make it vulnerable to destruction by human disturbance (Swift et al. 1989). Decline of this species is probably due to the effects of lowering and eliminating flows in lower reaches of coastal streams; water pollution, particularly by sewage; and filling and channelization of streams. In San Diego County, the tidewater goby has historically been recorded from San Mateo Creek; San Onofre Creek; Las Pulgas Creek; Aqua

Hedionda, and Buena Vista Lagoons. No tidewater gobies were observed during fisheries surveys at San Elijo, Batiquitos, and Agua Hedionda Lagoons; however, there is a potential for them to occur within the Study Area. The greatest potential for tidewater goby in the Study Area is within Agua Hedionda Lagoon. Due to the tidal weir at Buena Vista Lagoon, the tidewater goby is not anticipated within this lagoon. Culverts at the mouth of the San Luis Rey River currently limit the potential for tidewater goby to occur within the San Luis Rey River. There is a project underway to remove the culverts that limit ocean access to the San Luis Rey River.

Southern Steelhead Trout – Southern ESU FE/SC
Oncorhynchus mykiss

Steelhead trout were historically found from Alaska to Baja California, Mexico; southern steelhead trout used coastal drainages from south of San Francisco Bay to Baja California. Urbanization and alteration of the streams from the headwaters to the coast are the major factors affecting the steelhead populations. Water diversions, riparian habitat loss, sediment loads within the streams and introduced predators are also threats to the steelhead.

The NMFS listed the southern steelhead trout (within the southern California steelhead evolutionarily significant unit [ESU]) as endangered under the federal Endangered Species Act (ESA) on August 18, 1997 (NMFS 1997). Malibu Creek was the southernmost extent of the listed steelhead population in 1997. NMFS proposed to extend the range of the endangered steelhead to include the population in San Mateo Creek. Steelhead trout were discovered in San Mateo Creek in 1999 (CDFG 2000). In 2002, the range of the southern California steelhead evolutionarily significant unit (ESU) was extended to Baja, Mexico (NMFS 2002). In May 2007, a steelhead trout was reported by CDFG personnel in the lower San Luis Rey River (**email Mark Cappeli**). Currently, the mouth of the San Luis Rey River is obstructed by a series of culverts under the Pacific Street crossing; however, there is a project underway to bridge Pacific Street over the San Luis Rey allowing for easier access by both steelhead trout and tidewater goby.

Table 3-3 provides information on sensitive species that may occur or were observed within the Study Area during surveys. The table lists the species, whether were observed or not, and their potential to occur within the Study Area. Notable sensitive species observed onsite are discussed below.

The white-tailed kite (*Elanus caeruleus*), a California Fully Protected (CFP) Species (Fish and Game Code Section 3511) and State Species of Species Concern, was occasionally observed foraging over the Study Area, usually over the agricultural fields. No nest sites were observed or are known in the Study Area.

The following California Species of Special Concern (SC) occur in the Study Area:

Orange-throated whiptail lizard	*Cnemidophorus hyperythrus beldingi*
San Diego horned lizard	*Phrynosoma coronatum blainvillei*
White-faced ibis	*Plegadis chihi*
Double-crested cormorant	*Phalacrocorax auritus*
Northern harrier	*Circus cyaneus*
Osprey	*Pandion haliaetus*
Cooper's hawk	*Accipiter cooperii*
Horned lark	*Eremophila alpestris actia*
Yellow warbler	*Dendroica petechia*

3.8 Wildlife Corridors

Wildlife corridors connect large patches of natural open space that allow for the immigration and emigration of wildlife. Such movement assures the continual sharing of genetic information that helps maintain genetic diversity and reduces the probability of extinction through random events. Animals such as mule deer (*Odocoileus hemionus*), coyotes (*Canis latrans*), and mountain lions (*Felis concolor*) require large expanses of land. For these species, corridors provide a link between habitat patches increasing the area available for dispersal, foraging and breeding. For smaller animals, the corridor itself may provide the habitat needed to sustain viable populations.

Within the Study Area, the lagoons and habitats surrounding the lagoons are considered important linkages for wildlife movement. In addition to the lagoons, the San Luis Rey River is also a major wildlife corridor. The MSCP names Peñasquitos Lagoon and San Dieguito Lagoon as key Biological Core and Linkage Areas and they are identified in regional conservation plans as either preserved or an area targeted for conservation. I-5 itself is a barrier to wildlife movement. However, the existing bridges over the lagoons do provide limited crossings on the abutments. During I-5 surveys, mule deer and their sign were primarily observed west of I-5 near Genessee and along Carmel Creek leading to Peñasquitos Lagoon. Coyote scat was observed near all lagoons and in coastal sage scrub throughout the corridor. Although no mountain lion or bobcat scat or tracks were observed, they are known to occur in habitats around the lagoons. Design and construction of this project should be completed in a way that either enhances or does not impact core movement areas.

Table 3-3. Sensitive Species Known to Occur within the Project Vicinity

Scientific Name	Common Name	Status	General Habitat Description	Habitat Present/ Absent within the SA[2]	Rationale
Sensitive Plants					
Acanthomintha ilicifolia	San Diego thorn-mint	FT, SE, CNPS: 1B	In openings within chaparral, coastal sage scrub, valley and foothill grasslands, and vernal pools, in distinctive crumbly, cracked heavy clay soils. Blooms April-June.	Present	Low to moderate probability to occur within the SA. Suitable habitat type, and closest known population is 1,200 m (3,397 ft) north of the SA in Lux Canyon. Not detected during April and May surveys, which coincided with this species' traditional flowering period.
Adolphia californica	**California adolphia**	CNPS: 2	Chaparral, coastal sage scrub, valley and foothill grasslands, and clay soils. Blooms December-May.	Present	Present within the SA. Individuals were observed within the SAge scrub habitats north of San Elijo Lagoon.
Agave shawii	**Shaw's agave**	CNPS: 2	Coastal sage scrub, maritime succulent scrub, and southern coastal bluff scrub. Blooms September-May.	Present	Several individuals were observed immediately adjacent to the SA, east of I-5 and south of San Elijo Lagoon, but these individuals were transplanted into this area and do not represent a natural occurrence. No native occurrences identified within the SA.
Ambrosia pumila	San Diego ambrosia	FE, CNPS: 1B	Clay soils in disturbed areas. Chaparral, coastal sage scrub, valley and foothill grasslands, vernal pools, dry creek beds, and floodplains. Blooms May-September.	Present	Low probability to occur within the SA. Low amount of appropriate habitat within the SA and no known populations within the vicinity of the SA. This species was not detected during surveys, which coincided with this species' traditional flowering period.
Aphanisma blitoides	Aphanisma	CNPS 1B	Coastal bluff scrub, coastal dunes, and coastal scrub. Blooms: April - May	Present	Low probability to occur within the SA. Small amount of appropriate habitat, needs more sandy soils.
Arctostaphylos glandulosa* ssp. *crassifolia	**Del Mar manzanita**	FE, CNPS: 1B	Open sandy maritime chaparral with eroding sandstone. Blooms December-April.	Present	Present within the SA. Individuals observed in the southern maritime chaparral along the slopes between Del Mar Heights and San Dieguito and in the vicinity of San Elijo Lagoon.

Astragalus tener var. *titi*	Coastal dunes milk-vetch	FE, SE, CNPS: 1B	Sandy coastal bluff scrub, coastal prairie, and coastal sand dunes. Blooms March-May	Present	Low probability to occur within the SA. Low amount of appropriate habitat within the SA. This species was not detected during surveys, which coincided with this species' traditional flowering period.
Atriplex pacifica	**South coast saltscale**	CNPS: 1B	Coastal bluff scrub, playas, coastal sage scrub, and coastal sand dunes. Blooms March-October.	Present	Approximately 100 individuals of this species were observed within the SA, northwest of the Manchester/I-5 interchange along a dirt road.
Atriplex serenana var. davidsonii	Davidson's saltscale	CNPS 1B	Coastal bluff scrub, coastal scrub. Blooms: May-October	Present	Low probability to occur in the SA. Mostly in coastal bluff scrub, that is rare within the SA. Not observed during surveys, Which coincided with the species flowering period.
Baccharis vanessae	Encinitas baccharis	FT, SE, CNPS:1B	Low-growing southern maritime chaparral. Blooms August-November.	Present	Low to moderate probability to occur within the SA. Appropriate habitat within the SA near the lagoons. Not observed during surveys, which coincided with this species' traditional flowering period.
Berberis nevinii	**Nevin's barberry**	SE, CNPS List 1B	Chaparral, cismontane woodland, coastal scrub communities and riparian scrub communities. Blooms: March-April	Present	Two large Nevin's barberry shrubs were identified west of I-5 and north of Encinitas Blvd. Plants are in a row near ornamental shrubs and were likely planted. They are not natural occurrences.
Bergerocactus emoryi	Golden-spined cereus	CNPS: 2	Sandy soils of coastal sage scrub and chaparral. Blooms May-June.	Present	Not expected to occur within the SA. Appropriate habitat occurs within portions of the SA. Not observed during surveys, which would have detected this species if present.
Brodiaea filifolia	Thread-leaved brodiaea	FT, SE, CNPS:1B	Open chaparral, coastal sage scrub, valley and foothill grasslands, vernal pools, playas, and clay soils. Blooms March-June.	Present	Low probability to occur within the SA. No known populations in the immediate vicinity of the SA. Appropriate habitat present within portions of the SA. Not detected during surveys, which coincided with this species' traditional flowering period.

Brodiaea orcuttii	Orcutt's brodiaea	CNPS: 1B	Closed-cone coniferous forest, chaparral, cismontane woodland, meadows, seeps, valley and foothill grasslands, and vernal pools. Blooms May-July.	Absent	Not expected to occur within the SA. Appropriate habitat (vernal pools, mesic grasslands) does not occur within the SA. Not detected during surveys, which coincided with this species' traditional flowering period.
Ceanothus cyaneus	Lakeside ceanothus	CNPS: 1B	Closed-cone coniferous forest, chaparral	Present	Not expected to occur within the SA. Although chaparral exists, this species would have been detected during surveys if present.
Ceanothus verrucosus	**Wart-stemmed ceanothus**	CNPS: 2	Coastal chaparral Blooms December-April.	Present	Present within the SA. Observed in the southern maritime chaparral north and south of San Elijo Lagoon. Also, known from slopes between Del Mar Heights and San Dieguito and around Batiquitos Lagoon.
Centromadia parryi* ssp. *australis	**Southern tarplant**	CNPS: 1B	Margins of marshes and swamps, valley and foothill grasslands, and vernal pools. Blooms May-November.	Present	Present within the SA on the northeastern side of San Dieguito River along the dirt access road outside of the right of way.
Centromadia pungens ssp. laevis	Smooth tarplant	CNPS: 1B	Valley and foothill grassland, chenopod scrub, meadows, playas, riparian woodland. Blooms May-August	Absent	Little or no appropriate habitat for this species occurs within the SA. Not expected to occur and was not detected during the traditional flowering period.
Chaenactis glabriuscula* var. *orcuttiana	**Orcutt's pincushion**	CNPS: 1B	Coastal bluff scrub (sandy), coastal dunes. Blooms January-August.	Present	Present within the SA. Orcutt's pincushion was a common sensitive plant observed within the SA near San Elijo Lagoon. Populations were observed in undisturbed habitats as well as disturbed areas such as along the cut/fill slopes of I-5 and alongside trails in the scrub and chaparral habitats.

Chorizanthe orcuttiana	Orcutt's spineflower	FE, SE, CNPS: 1B	Sandy soils of maritime chaparral, coastal sage scrub, closed-cone coniferous forest. Blooms March-May.	Present	Low probability to occur within the SA. Potential habitat occurs in the southern maritime chaparral; however, most of this habitat, though in relatively good condition, may be too disturbed for this species, which seems to be very sensitive to minor disturbances. Not observed during surveys, which coincided with this species' traditional flowering period.
Chorizanthe polygonoides var. *longispina*	Long-spined spineflower	CNPS: 1B	Coastal sage scrub, chaparral, meadows, seeps, valley and foothill grasslands. Blooms April-July.	Present	Moderate probability to occur within the SA. Potential habitat occurs in the southern maritime chaparral. This species was not observed during surveys, which coincided with this species' traditional flowering period.
Comarostaphylis diversifolia* ssp. *diversifolia	**Summer holly**	CNPS: 1B	Mesic north-facing slopes in southern maritime chaparral and steep drainages. Blooms April-June.	Present	Present within the SA. Two individuals were observed within the southern maritime chaparral near San Elijo Lagoon.
Coreopsis maritima	**Sea dahlia**	CNPS: 2	Coastal sage scrub and sandstone cliffs of coastal bluff scrub. Blooms March-May.	Present	Present within the SA. Approximately 389 individuals of this species were observed within the coastal bluff scrub and coastal sage scrub habitats north of San Elijo Lagoon.
Dudleya blochmaniae spp. Blochmaniae	Blochman's dudleya	CNPS: 1B	Coastal scrub, coastal bluff scrub, valley and foothill grassland. Blooms: May -June.	Present	Low probability to occur within the SA. Occurs mostly on coastal bluffs. None observed during surveys.
Dudleya brevifolia	Short-leaved dudleya	SE, CNPS: 1B	Open areas of chamise chaparral or Torrey pine forest on Torrey sandstone formations. Blooms from April-June.	Present	Low probability to occur within the SA. Though appropriate habitat for this species occurs within the SA (southern maritime chaparral), this species is only known from several locations in and around Torrey Pines State Reserve. This species was not observed during surveys, which coincided with this species' traditional flowering period.

Dudleya variegata	Variegated dudleya	CNPS: 1B	Isolated rocky substrates in valley and foothill grasslands. Openings in chaparral, coastal sage scrub, and vernal pools. Blooms May-June.	Present	Low potential to occur in the SA. No known populations of this species are within the immediate vicinity of the SA. This species was not observed during surveys, which coincided with this species' traditional flowering period.
Dudleya viscida	Sticky dudleya	CNPS: 1B	Steep, north-facing slopes in chaparral and coastal sage scrub usually on exposed gabbroic rock. Blooms May-June.	Present	Low to moderate potential to occur. This species was not observed during surveys, which coincided with this species' traditional flowering period. This species is known from east of I-5 and south of the San Luis Rey river on northfacing slopes.
Eryngium aristulatum var. *parishii*	San Diego button celery	FE, SE, CNPS: 1B	Redding gravelly loams of vernal pools. Blooms April-June.	Absent	Not expected to occur within the SA. This species was not observed during surveys, which coincided with this species' traditional flowering period, and appropriate habitat does not occur within the SA.
Euphorbia misera	Cliff spurge	CNPS: 2	Rocky soils of coastal sage scrub and coastal bluff scrub. Blooms December-August.	Present	Moderate probability to occur within the SA. Appropriate habitat occurs near the coastal lagoons. A few individuals were observed outside the SA near San Elijo Lagoon.
Ferocactus viridescens	**San Diego barrel cactus**	CNPS: 2	Coastal sage scrub, chaparral, valley and foothill grasslands, and vernal pools. Blooms May-June.	Present	Present within the SA. A number of individuals were observed on the slopes north of San Elijo Lagoon and on the northwestern slopes of Batiquitos Lagoon.
Geothallus tuberosus	Campbell's liverwort	CNPS: 1B	Vernal Pools, mesic soils, coastal scrub	Absent	Low potential to occur within the SA. Known from vernal pools and clay soils that do not occur within the SA.
Hazardia orcuttii	Orcutt's hazardia	CNPS: 1B	Clay soils of chaparral and coastal sage scrub. Blooms August-October.	Present	Low probability to occur within the SA. Only one U.S. population reported, located approximately 2,500 m (8,202 ft) northeast of the project area in Encinitas. Not detected during field surveys.
Isocoma menziesii var. *decumbens*	Decumbent goldenbush	CNPS: 1B	Disturbed sandy or clay soils in coastal sage scrub, chaparral, and grasslands. Blooms April-November.	Present	Low probability to occur within the SA. Appropriate habitat occurs within the SA. This species was not observed during field surveys.

Iva hayesiana	San Diego marsh-elder	CNPS: 2	Creeks or intermittent streambeds, playas, marshes, and swamps. Blooms April-September.	Present	Low probability to occur naturally within the SA. This species potentially could occur within the wetland habitats of the SA. This species was planted along I-5 at SR 56, not observed in the remainder of the SA during the surveys.
Lasthenia glabrata ssp. *coulteri*	Coulter's goldfields	CNPS: 1B	Coastal salt marshes and swamps, playas, and vernal pools. Blooms February-June.	Present	Moderate probability to occur within the SA. Appropriate habitat occurs within the SA, but this species is not known from the vicinity of the SA. Not detected onsite during surveys, which coincided with this species' traditional flowering period.
Lepidium virginicum var. robinsonii	Robinson's pepper-grass	CNPS: 1B	Chaparral and coastal sage scrub. Blooms January -July	Present	Moderate probability to occur within the SA. Appropriate habitat occurs within the SA, but this species is not known from the vicinity of the SA. Not detected onsite during surveys, which coincided with this species' traditional flowering period.
Lessingia filaginifolia var. *incana*	San Diego sand aster	CNPS: 1B	Sandy opening in chaparral, coastal sage scrub, and coastal bluff scrub. Blooms June-September.	Present	Low probability to occur within the SA. Though appropriate habitat occurs within the SA, this species range is generally south of the SA. This species was not observed during surveys, which coincided with this species' traditional flowering period.
Lessingia filaginifolia* var. *linifolia	**Del Mar Mesa sand aster**	CNPS: 1B	Sandy open areas of maritime chaparral, coastal sage scrub, and coastal bluff scrub. Blooms May-September.	Present	Present within the SA. Approximately 1,462 individuals of this species were observed during the surveys. This species was observed throughout the upland areas of the SA, between Del Mar Heights and Birmingham interchanges.

Lotus nuttallianus	Nuttall's lotus	CNPS: 1B	Sandy soils of coastal dunes and coastal sage scrub. Blooms March-June.	Present	Low probability to occur within the SA. Appropriate habitat occurs along the sandy areas of sage scrub immediately adjacent to the lagoons and the San Luis Rey River. This species was not observed during surveys, which coincided with this species' traditional flowering period.
Monardella linoides ssp. viminea	Willowy monardella	FE, SE, CNPS: 1B	Chaparral, riparian forest, woodland, and scrub. Blooms June-August	Present	Low probability to occur within the SA. Small amounts of appropriate habitat occur within the SA. There are no known populations in or around the SA. This species was not observed during surveys.
Muilla clevelandii	San Diego goldenstar	CNPS: 1B	Open chaparral, coastal sage scrub, valley and foothill grasslands, vernal pools, and clay soils. Blooms in May.	Present	Low probability to occur within the SA. Small amounts of appropriate habitat occur within the SA. This species was not observed during surveys.
Myosurus minimus	Little mousetail	CNPS: 3	Alkali soils of valley and foothill grasslands, and vernal pools. Blooms March-June.	Absent	Not expected to occur within the SA. This species was not observed during the surveys. No appropriate habitat for this species occurs within the SA.
Navarretia fossalis	Spreading navarretia	FT, CNPS: 1B	Vernal pools. Blooms April-June.	Absent	Not expected to occur within the SA. This species was not observed during the surveys. No appropriate habitat for this species occurs within the SA.
Nemacaulis denudata var. *denudata*	Coast woolly-heads	CNPS: 1B	Coastal sand dunes. Blooms April-September.	Present	Low to moderate probability to occur within the SA. Historical population known from San Elijo Lagoon. This species has the potential for occurrence in sandy areas adjacent to San Elijo Lagoon but these areas are well disturbed. This species was not observed during surveys.
Orcuttia californica	California orcutt grass	FE, SE, CNPS: 1B	Vernal pools. Blooms April-August.	Absent	Not expected to occur within the SA. This species was not observed during the surveys, which coincided with this species' traditional flowering period. No suitable habitat for this species occurs within the SA.

Pinus torreyana* ssp. *torreyana	**Torrey pine**	CNPS: 1B	Chaparral and closed cone forests on sandstone.	Present	Present within the SA. Several individuals were observed within the SA. Most of the individuals of this species have been planted along I-5 as ornamentals. These individuals are not considered sensitive because they do not represent a natural population or exist in a natural community.
Pogogyne abramsii	San Diego mesa mint	FE, SE, CNPS: 1B	Redding cobbly loams of vernal pools. Blooms April-July.	Absent	Not expected to occur within the SA. This species was not observed during the surveys. No appropriate habitat for this species occurs within the SA.
Quercus dumosa	**Nuttall's scrub oak**	CNPS: 1B	Sandy clay loam of closed-cone coniferous forest, chaparral, and coastal sage scrub. Blooms February-April.	Present	Present within the SA. Multiple individuals were observed in southern maritime chaparral habitats near San Elijo Lagoon, between Del Mar Heights and San Dieguito Lagoon, and in Encinitas.
Suaeda esteroa	**Estuary seablite**	CNPS: 1B	Coastal salt marsh. Blooms: July-October	Present	Present within the SA. Multiple individuals observed in the coastal salt marsh in San Dieguito, Batiquitos, and Agua Hedionda Lagoons.
Sensitive Wildlife					
Branchinecta sandiegonensis	San Diego fairy shrimp	FE	Restricted to vernal pools.	Absent	Species does not occur within the SA due to lack of vernal pool habitat.
Streptocephalus woottoni	Riverside fairy shrimp	FE	Restricted to deep vernal pools with long periods of inundation.	Absent	Species does not occur within the SA due to lack of vernal pool habitat.
Panoquina errans	Salt marsh skipper butterfly	MHCP	Restricted to salt marsh and salt panne habitats	Present	High probability to occur within the SA. The MHCP states that salt marsh and salt panne habitats are occupied within Encinitas and that the species is associated with nearly all coastal lagoons in San Diego County.
Euphydryas editha quino	Quino checkerspot butterfly	FE	Restricted to open grassland and sunny openings within shrubland habitats of Riverside and San Diego Counties, where its distribution is defined primarily by that of its larval host plants, Plantago erecta and Castilleja exserta.	Absent	Not expected to occur within the SA due to insufficient cover of the species' larval host plant.

Eucyclogobius newberryi	Tidewater Goby	FE, SC	Endemic to coastal lagoons and lower stream reaches in brackish to fresh, slow moving to still, but not stagnant water. The substrate usually consists of sand and mud, with abundant emergent and submerged vegetation.	Present	Low potential to occur in the San Luis Rey River and Agua Hedionda based on appropriate habitat. There is critical habitat at Agua Hedionda Lagoon. Not known from these areas for several years.
Scaphiopus hammondii	Western spadefoot toad	SC	Prefers sandy or gravelly soil in grasslands, open chaparral, and pine-oak woodlands. Breeds in vernal pools and ephemeral ponds.	Absent	Not expected to occur within the SA due to lack of breeding habitat.
Bufo californicus	Arroyo toad	FE, SC, SP	Prefers sandy or gravelly soil in grasslands, open chaparral, and pine-oak woodlands. Breeds in quiet streams with gravel or cobble substrate.	Absent	Not expected to occur within the SA due to lack of breeding habitat, and distance of upland wintering habitats relative to known breeding locations. The closest known locations to the project are on the San Luis Rey River several miles inland from I-5.
Clemmys marmorata pallida	Southwestern pond turtle	SC	Inhabits permanent or nearly permanent bodies of water and requires basking sites such as partially submerged logs, vegetation mats, or open mud banks.	Present	Low probability to occur within the SA due to limited specific habitat requirements and historical location data for the region.
Phrynosoma coronatum blainvillei	**San Diego horned lizard**	SC	Prefers friable, rocky, or shallow sandy soils in coastal sage scrub, and chaparral in arid and semiarid climates.	Present	At least one individual caught near Del Mar Heights Road during small mammal trapping. More likely to occur within the SA.
Eumeces skiltonianus interparietalis	**Coronado Island skink**	SC	Prefers mesic pockets within habitats including coastal sage scrub, chaparral, oak woodlands, pinon-juniper, and riparian woodlands.	Present	At least one individual observed at southern end of Study Area near the 5/805 merge. Others potentially throughout the SA.

Cnemidophorus hyperythrus	**Orange-throated whiptail**	SC, SP	Prefers washes and other sandy areas with patches of brush and rocks for cover. Habitats include low-elevation coastal sage scrub, chaparral, and valley-foothill hardwood forests.	Present	Present within the SA. Observed during general wildlife surveys in coastal sage scrub .
Anniella pulchra pulchra	Silvery legless lizard	SC	Prefers beaches, chaparral, and pine-oak woodland, and near sycamores, cottonwoods, and oaks that grow on stream terraces. Requires moderately deep sand for protective cover.	Present	Low to moderate probability to occur within the SA. County Parks stated that silvery legless lizards have been identified at San Elijo Lagoon; however, they are found in sandy soils near highway 101.
Thamnophis hammondii	**Two-striped garter snake**	SC	Occurs in or near permanent fresh water, usually along streams with rocky beds bordered by willow and other riparian vegetation.	Present	Present within the SA. Observed during general wildlife surveys near San Dieguito River.
Crotalus ruber ruber	Northern red diamond rattlesnake	SC	Found in chaparral, coastal sage scrub, along creek banks, and in rock outcrops or piles of debris. This subspecies prefers dense vegetation in rocky areas with a supply of burrowing rodents for prey.	Present	Low probability to occur within the SA based on historical location data from the region and limited suitable habitat within the survey area.
Pelecanus erythrorhynchos	**American white pelican**	SC	Inhabits lakes, ponds, and coastal waters.	Present	Present within the SA. Observed in San Elijo, Batiquitos, and Buena Vista lagoons during general wildlife surveys
Pelecanus occidentalis californicus	**California brown pelican**	FE, SE, SFP	Nests on offshore islands. Occurs on coastal saltwater and on the open ocean, particularly within a few kilometers of shore.	Present	Present within the SA. Observed in San Dieguito, San Elijo, Batiquitos, Agua Hedionda, and Buena Vista lagoons during general wildlife surveys.
Phalacrocorax auritus	**Double-crested cormorant**	SC	Found near fresh and saltwater near coastline, inshore waters, beaches, inland rivers, and lakes.	Present	Present within the SA. Observed in lagoons during general wildlife surveys.

Ixobrychus exilis	**Least bittern**	SC	Inhabits fresh and brackish water marshes, usually near open water sources, and desert riparian habitats.	Present	Present within the SA, observed in San Dieguito and by SELC during focused 2002 wildlife surveys.
Ardea herodias	**Great blue heron**	SC	Found in fresh and saltwater emergent wetlands and estuaries. Less common along rivers, in croplands, pastures, and foothill ponds.	Present	Present within the SA. Observed in lagoons during general wildlife surveys. Some nesting habitat may be present at San Elijo Lagoon.
Casmerodius albus	**Great egret**	SC	Common to freshwater and saltwater marshes, swampy woods, ponds, lagoons, estuaries, mangroves, streams, lakes, and ponds.	Present	Present within the SA. Observed in lagoons during general wildlife surveys
Plegadis chihi	White-faced ibis	SC	Inhabits marsh habitats in the lower river valleys of San Diego County.	Present	Moderate to high probability to occur within the SA because species observed adjacent to survey area by SELC during focused 2002 wildlife surveys.
Pandion haliaetus	**Osprey**	SC	Prefers the coast and lakes in the coastal lowlands and rarely lakes in the foothills and mountain areas.	Present	Present within the SA. Observed at Batiquitos and San Dieguito lagoons.
Elanus leucurus majusculus	**White-tailed kite**	SFP	Inhabits riparian or oak woodland adjacent to grassland or open fields where it hunts rodents.	Present	Present within the SA. Observed at San Dieguito and San Elijo lagoons during general wildlife surveys.
Haliaeetus leucocephalus	Bald eagle	SE, BEPA	Inhabits lakes, rivers, marshes, and seacoasts.	Present	Not expected to occur within the SA due to limited amount of suitable habitat.
Circus cyaneus	**Northern harrier**	SC	Occurs throughout San Diego County in grasslands and agricultural fields during migration and in winter.	Present	Present within the SA. Observed at San Dieguito Lagoon.
Accipiter striatus	**Sharp-shinned hawk**	SC	Occupies woodlands and a variety of habitats surrounding those wooded areas, and requires a certain amount of dense cover.	Present	Present within the SA. Observed during general wildlife surveys.

Accipiter cooperii	**Cooper's hawk**	SC	Uncommon migrant and winter visitor to woodlands, parks, and residential areas.	Present	Present within the SA. Observed during general wildlife surveys.
Aquila chrysaetos	Golden eagle	BEPA, SC	Uncommon resident forages over grassland and broken chaparral or sage scrub.	Present	Low probability to occur within the SA because suitable habitat is very limited.
Falco peregrinus anatum	American peregrine falcon	SE, SFP	Often observed along or near the coast, especially around mudflats, shores, or ponds where large numbers of water birds congregate. Occasionally seen further inland on the coastal slopes.	Present	High potential to occur within the SA during the winter based on the presence of suitable habitat and historical location data for the region.
Laterallus jamaicensis coturniculus	California black rail	ST, SFP	Resident of salt, brackish, and freshwater emergent wetlands.	Present	Low probability to occur within the SA based on historical location data.
Rallus longirostris levipes	**Light-footed clapper rail**	FE, SE, SFP	Occurs in salt, brackish and freshwater marshes with dense grass-like vegetation. Requires dense vegetation for nesting and/or escape cover.	Present	Present within the SA. Observed in and adjacent to the SA at Buena Vista, San Elijo, Batiquitos, and Los Penasquitos Lagoons.
Charadrius alexandrinus nivosus	**Western snowy plover**	FT, SC	Can be found on sandy beaches on marine and estuarine shores, salt pond levees, and the shores of large alkali lakes. Requires sandy or gravelly soils for nesting.	Present	Known to be nesting outside the SA at Batiquitos Lagoon and may forage within the SA.
Numenius americanus	**Long-billed curlew**	SC,	Can be found on sandy beaches on marine and estuarine shores, salt pond levees, and the shores of large alkali lakes. Requires sandy or gravelly soils for nesting.	Present	Present within the SA. Observed during general wildlife surveys feeding in mudflats within the lagoons.
Sterna antillarum browni	**California least tern**	FE, SE, SFP	Breeds on bare or sparsely vegetated flat sandy beaches, alkali flats, land fills, or paved areas.	Present	Known to nest adjacent to the SA in San Elijo, Batiquitos, and San Dieguito lagoons. Observed foraging within the SA.

Speotyto cunicularia	Burrowing owl	SC	Occurs in open, dry annual or perennial grasslands, and deserts and scrublands with low-growing vegetation. Utilizes the burrows of other animals.	Absent	Not expected to occur within the SA because area lacks suitable burrow and foraging habitat. Would likely have been observed if present within the SA.
Empidonax traillii extimus	Southwestern willow flycatcher	FE, SE	Typically nests in riparian woodlands that are marshy or at water's edge.	Present	Low probability to breed within the SA due to lack of habitat; however, migrants were observed immediately outside of the SA near San Elijo Lagoon and San Luis Rey River bridge.
Eremophila alpestris actia	**California horned lark**	SC	Inhabits sandy ocean or bay shores, grasslands, and open scrublands and woodlands with low, sparse vegetation.	Present	Present on revegetating slopes of the new Auxiliary lane on the northbound side of I-5, south of San Dieguito River.
Campylorhynchus brunneicapillus couesi	Coastal cactus wren	SC	Occurs in coastal sage scrub with tall Opuntia cactus for nesting and roosting.	Absent	Not expected to occur within the SA because it lacks large stands of Opuntia cactus.
Polioptila californica californica	**Coastal California gnatcatcher**	FT, SC	A permanent resident of coastal sage scrub in arid washes, mesas, and slopes.	Present	Present within the SA on fill slopes and some cut slopes near San Dieguito, San Elijo, and Batiquitos Lagoons and east of I-5 in Oceanside.
Lanius ludovicianus	**Loggerhead shrike**	FSC, SC	Inhabits agricultural lands, desert wash, desert scrub, grasslands, and beaches with scattered bushes. Requires open ground for foraging, preferably near scattered bushes and low trees that provide nest sites and perches.	Present	Present within the SA. Observed at the Racetrack View Mitigation Site west of I-5. High probability to occur in other areas based on historical location data f and presence of suitable habitat within the SA.
Vireo bellii pusillus	**Least Bell's vireo**	FE, SE,	Summer resident of low riparian growth in the vicinity of water or in dry river bottoms. Nests are placed along the margins of bushes, usually Salix, Baccharis, or Prosopis.	Present	Present within the SA as a migrant,, and adjacent to San Dieguito Marsh, in the western portion of San Elijo Lagoon and near Brooks Street Bridge

Dendroica petechia	**Yellow warbler**	SC	Occupies marshes, swamps, streamside groves, willow thickets, open woodlands with thickets, orchards, gardens, and open mangroves.	Present	Present within the SA. Observed during general wildlife surveys in riparian areas.
Icteria virens	Yellow-breasted chat	SC	The breeding population is confined to riparian woodlands in the coastal lowlands.	Present	Moderate to high probability to occur within the SA because riparian woodland habitat is limited.
Aimophila ruficeps canescens	**Southern California rufous-crowned sparrow**	SC	Uncommon to fairly common localized resident of sage scrub on steep rocky slopes.	Present	Present within the SA. Observed during general wildlife surveys at San Dieguito Lagoon.
Amphispiza belli belli	Bell's sage sparrow	SC	Coastal sage scrub and open chaparral habitats.	Present	Low to moderate probability to occur within the SA due to lack of dense sage scrub and open chaparral habitats.
Passerculus sandwichensis beldingi	**Belding's savannah sparrow**	SE	Restricted to salt marsh, mudflats, and low coastal strand vegetation.	Present	Present within the SA. Observed at most of the lagoons.
Passerculus sandwichensis rostratus	Large-billed savannah sparrow	SC	Inhabits coastal marshes and beaches.	Present	Moderate to high probability to occur within the SA based on historical location data for the area and presence of suitable habitat.
Agelaius tricolor	Tricolored blackbird	SC	Localized resident; nests in large, dense colonies in freshwater marsh; forages in agricultural areas, lakeshores and damp lawns.	Present	Moderate probability to occur within the SA due to presence of suitable habitat and based on historical location data.
Lepus californicus bennettii	San Diego black-tailed jackrabbit	SC	Habitats include coastal sage scrub, chaparral, and grasslands.	Present	Moderate potential to occur within the SA based on historical location data and presence of suitable habitat.
Perognathus longimembris pacificus	Pacific pocket mouse	FE, SC	Occurs on fine, sandy soils within 4 to 6 kilometers (2 to 4 miles) of the Pacific Ocean.	Present	Habitat suitability study done; some moderately suitable habitat, but no Pacific pocket mouse were identified during trapping studies.
Perognathus fallax fallax	**Northwestern San Diego pocket mouse**	SC	Habitats include coastal sage scrub, chaparral, oak woodlands, and annual grasslands.	Present	Present within the SA. Captured during trapping studies on the slopes south of San Dieguito Lagoon, and around San Elijo Lagoon.

Chaetodipus californicus femoralis	Dulzura California pocket mouse	SC	Coastal scrub, chamise-redshank and montane chaparral, sagebrush, annual grassland, and hardwood habitats.	Present	Moderate probability to occur within the SA because suitable habitat is present. None trapped during Pacific pocket mouse surveys.
Dipodomys stephensi	Stephens' kangaroo rat	FE, ST	Native to open grasslands and sparse coastal sage scrub where it burrows and feeds primarily on seeds. Requires soils with low clay content for burrowing.	Absent	Not expected to occur within the SA. Slopes with open coastal sage scrub within the SA typically have compacted soils that discourage burrowing by small mammals. None trapped during Pacific pocket mouse surveys.
Neotoma lepida intermedia	**San Diego desert woodrat**	SC	Occupies rocky habitats in association with chaparral and coastal sage scrub.	Present	Present within the SA. Captured during trapping studies south of San Dieguito Lagoon.

Bold indicates presence within Study Area (SA)

[1]Status Key

FE	Federally endangered
FT	Federally threatened
BEPA	Federal Bald Eagle Protection Act
SE	State of California endangered
ST	State of California threatened
SFP	State of California fully protected
SP	State of California protected
SC	State of California Species of Concern
MHCP	San Diego County Multiple Habitat Conservation Program covered species
CNPS: 1B	California Native Plant Society List 1B species (considered rare, threatened, or endangered in California and elsewhere)
CNPS: 2	California Native Plant Society List 2 species (considered rare, threatened, or endangered in California, but more common elsewhere)

[2]Specific Habitat

Present	General habitat is present and species may be present
Absent	No further work needed

3.9 Jurisdictional Wetland Areas

The wetland habitats described above in Section 3.2 are based on those in Holland (1986) and plant species composition. There are a few communities that are either unvegetated or do not match descriptions in Holland (1986); therefore, these communities are based on descriptive characteristics. Within those plant communities may also be areas that are designated by regulation as jurisdictional by the ACOE and/or the CDFG and the CCC. The ACOE regulates wetlands as defined in the ACOE Wetlands Delineation Manual (ACOE 1987) and waters of the US as defined in the Regulatory Programs of the ACOE; Final Rule (Fed Reg 1986). ACOE jurisdictional wetlands must have hydrophytic vegetation, hydrology, and hydric soils. By ACOE definition wetlands are:

> "Those areas that 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 the saturated soil conditions."

Waters of the U.S. include natural drainages up to the limit of the ordinary high water mark, which is defined as the:

> "line on the shore established by the fluctuations of water and indicated by physical characteristics such as 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."

By definition all ACOE jurisdiction wetlands are waters of the U.S. However, not all waters of the U.S are considered wetlands; therefore, non-wetland ACOE jurisdictional areas are identified as other waters of the U.S.

The CDFG only requires one of the three criteria that the ACOE requires in the definition of a wetland. Pursuant to CDFG Code 1602 a streambed alteration agreement is needed for projects which will:

> divert, obstruct, or change the natural flow or the bed, channel, or bank of any river, stream, or lake designated by the department in which there is at any time an existing fish or wildlife resource or from which these resources derive benefit, use material from the streambeds designated by the department, or result in the disposal or deposition of debris, waste, or other material containing crumbled, flaked, or ground pavement where it can pass into any river, stream, or lake designated by the department."

This generally includes all natural drainages, including any adjacent riparian habitat, but usually does not cover isolated wetlands.

The CCC defines wetlands similar to the CDFG. CCC Administative Regulations (Section 13577(b)) further define a wetland as:

> Wetlands are lands where the water table is at, near, or above the land surface long enough to promote the formation of hydric soils or to support the growth of hydrophytes, and shall also include those types of wetlands where vegetation is lacking and soil is poorly developed or absent as a result of frequent or drastic fluctuations of surface water levels, wave action, water flow, turbidity or high concentrations of salt or other substance in the substrate. Such wetlands can be recognized by the presence of surface water or saturated substrate at some time during each year and their location within, or adjacent to, vegetated wetlands or deepwater habitats.

There are CDFG, CCC, and ACOE jurisdictional wetlands throughout the Study Area. CDFG and CCC wetlands are identified by habitat type, which are shown in Figures 3-1a-n. ACOE jurisdiction wetlands and other waters of the U.S. are shown in Figures 3-5a-k. The lagoons and their fringing habitats, rivers, creeks, and drainages are considered wetlands by one, two or all three of the agencies. CCC and CDFG jurisdiction wetlands were primarily mapped based on habitats, while ACOE jurisdiction wetlands were delineated based on the 1987 Manual (ACOE 1987).

3.10. Designated and Proposed Critical Habitat Within or Near the Study Area

Critical habitat for the least Bell's vireo and tidewater goby, as well as proposed critical habitat for the California gnatcatcher occurs within the Study Area (Figures 3-6a-d). Critial habitat for the Riverside fairy shrimp occurs outside the Study Area, northwest of Batiquitos Lagoon. Western snowy plover proposed critical habitat occurs outside the Study Area at Batiquitos Lagoon. Critical habitat for the least Bell's vireo within the Study Area occurs along the San Luis Rey River near the I-5/SR 76 interchange. Critical habitat for the tidewater goby within the Study Area occurs at Agua Hedionda Lagoon. Proposed critical habitat for the California gnatcatcher occurs within coastal sage scrub around San Elijo Lagoon, Batiquitos Lagoon, Encina Creek, Lawrence Canyon, and near the Center City Golf Course in Oceanside. Critical habitat for the southwestern willow flycatcher includes the San Dieguito River, downstream of the Interstate 15 Bridge to I-5 near the Pacific Ocean. Although the Study Area is extends to the north by the San Dieguito River, it is not within the project area. Therefore, no critical habitat for the southern willow flycatcher exists within the project limits (Figures 3-6a-d).

3.11 Invasive Species

The slopes of I-5 have varying amounts of invasive species growing on them including pampas grass, ice plant, African fountain grass, and annual species. Recently African veldt grass and onion weed (*Asphodelus fistulosus*) have become increasing problems as they spread along the right of way. African veldt grass has become a dominant species on the slopes of I-5 between

Del Mar Heights Road and Birmingham Drive. They are spreading into the habitats around the lagoons as well.

Tamarisk, arundo, castor bean, and fennel are common invasive species within the wetland habitats within the corridor. There are groups working to control these species particularly in the lagoons; however, they are persistent invasive species.

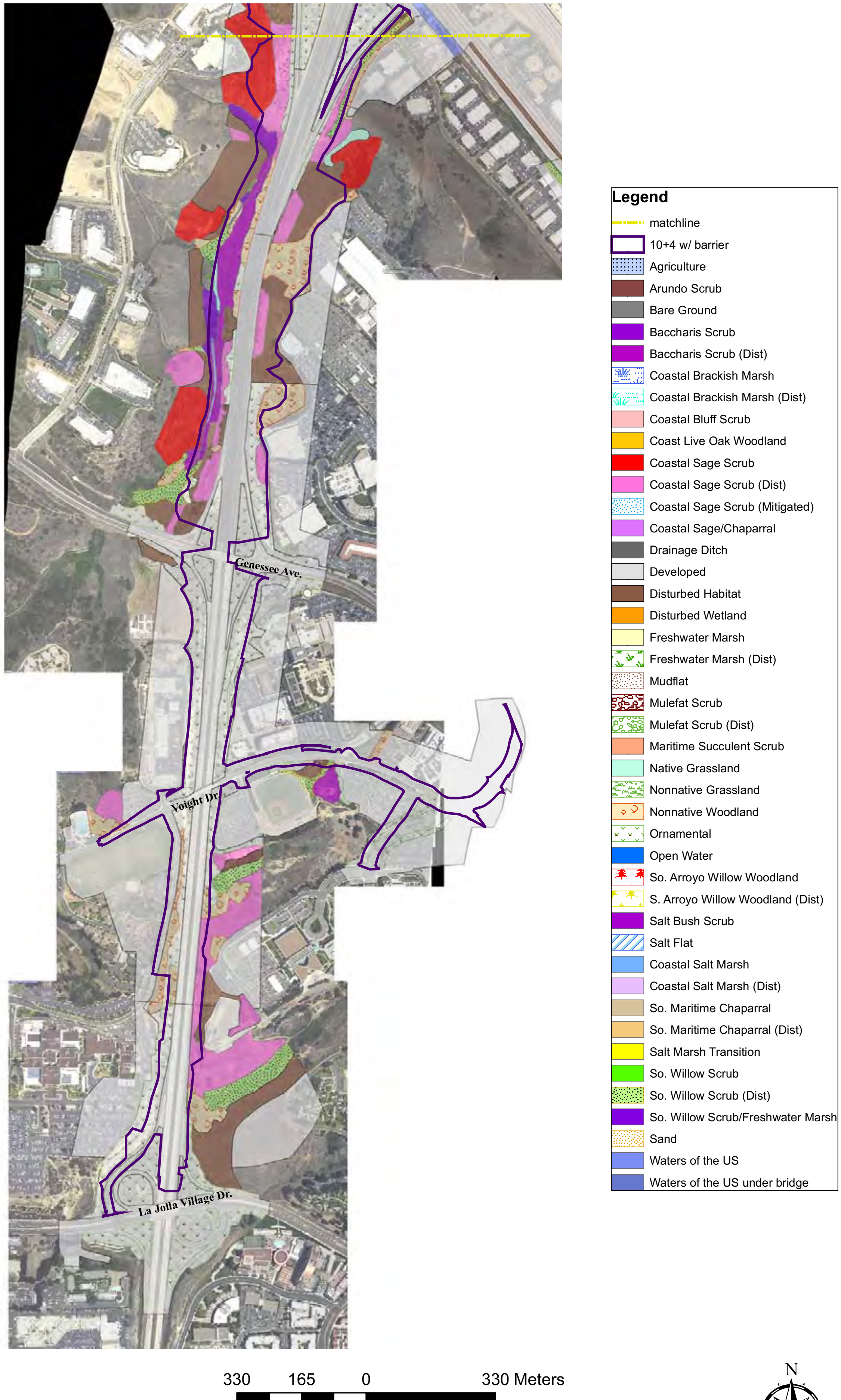

Figure 3-1a. Vegetation Communities along the I-5 North Coast Corridor with 10+4 with Barrier Permanent Impact Footprint

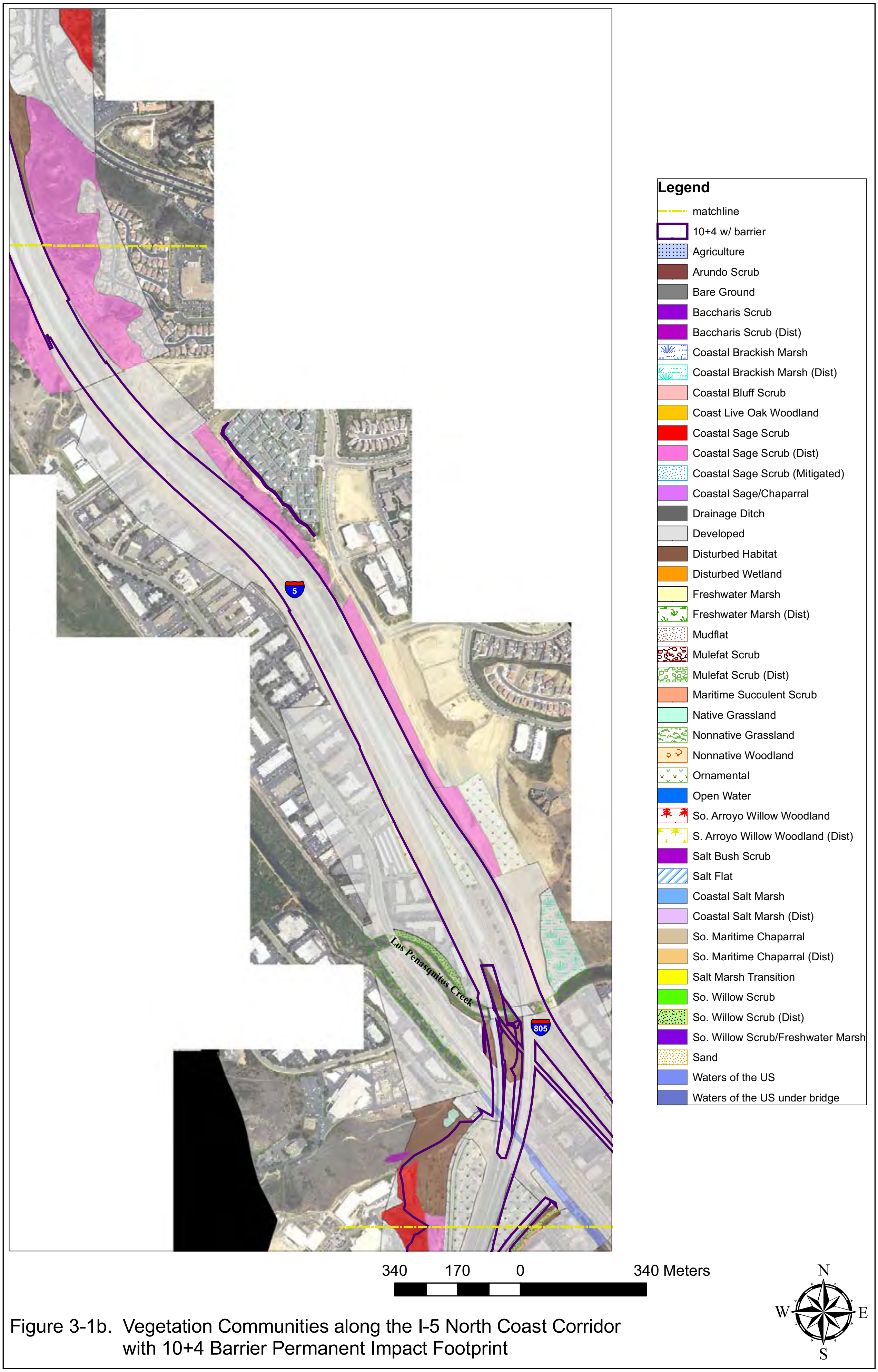

Figure 3-1b. Vegetation Communities along the I-5 North Coast Corridor with 10+4 Barrier Permanent Impact Footprint

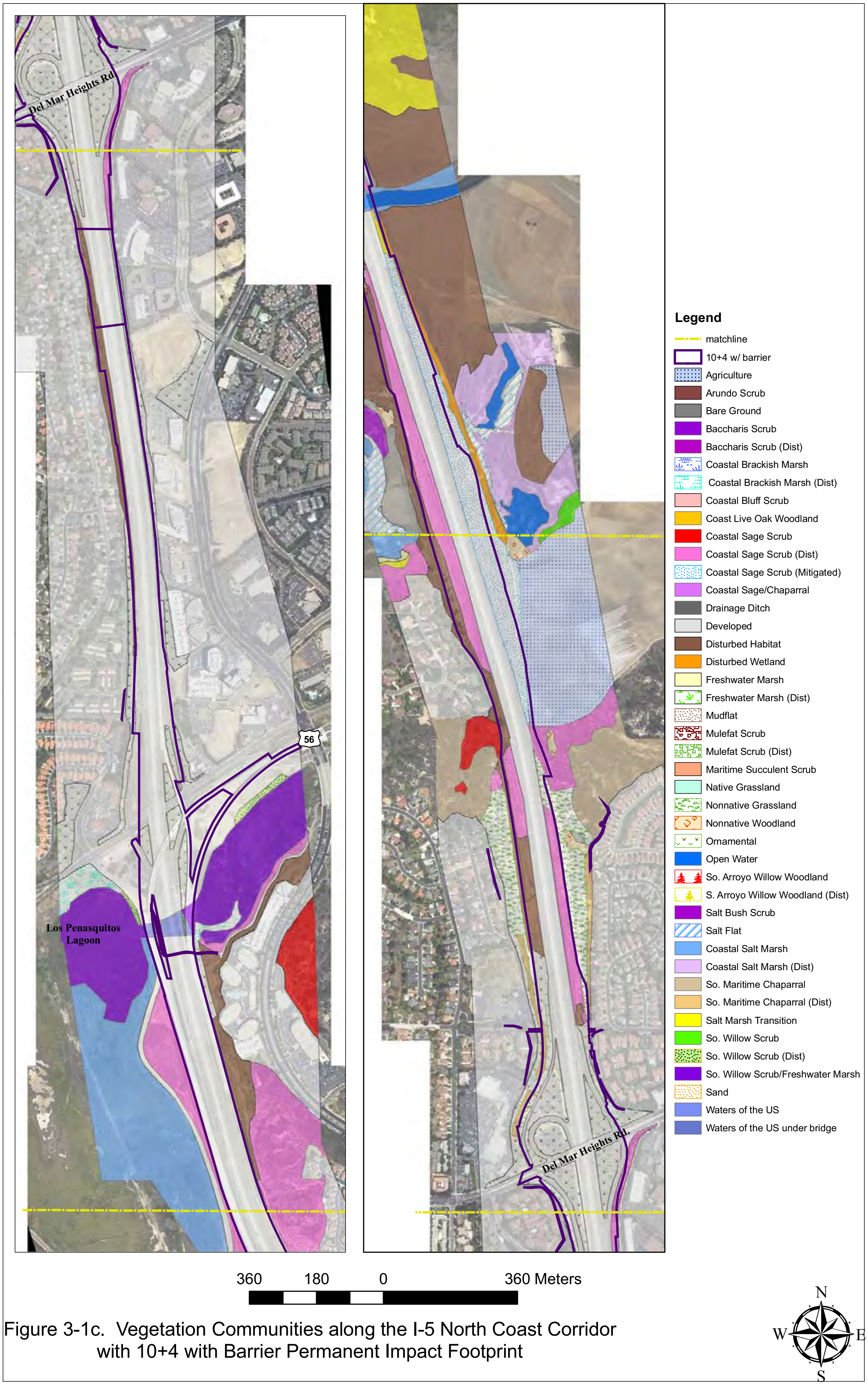

Figure 3-1c. Vegetation Communities along the I-5 North Coast Corridor with 10+4 with Barrier Permanent Impact Footprint

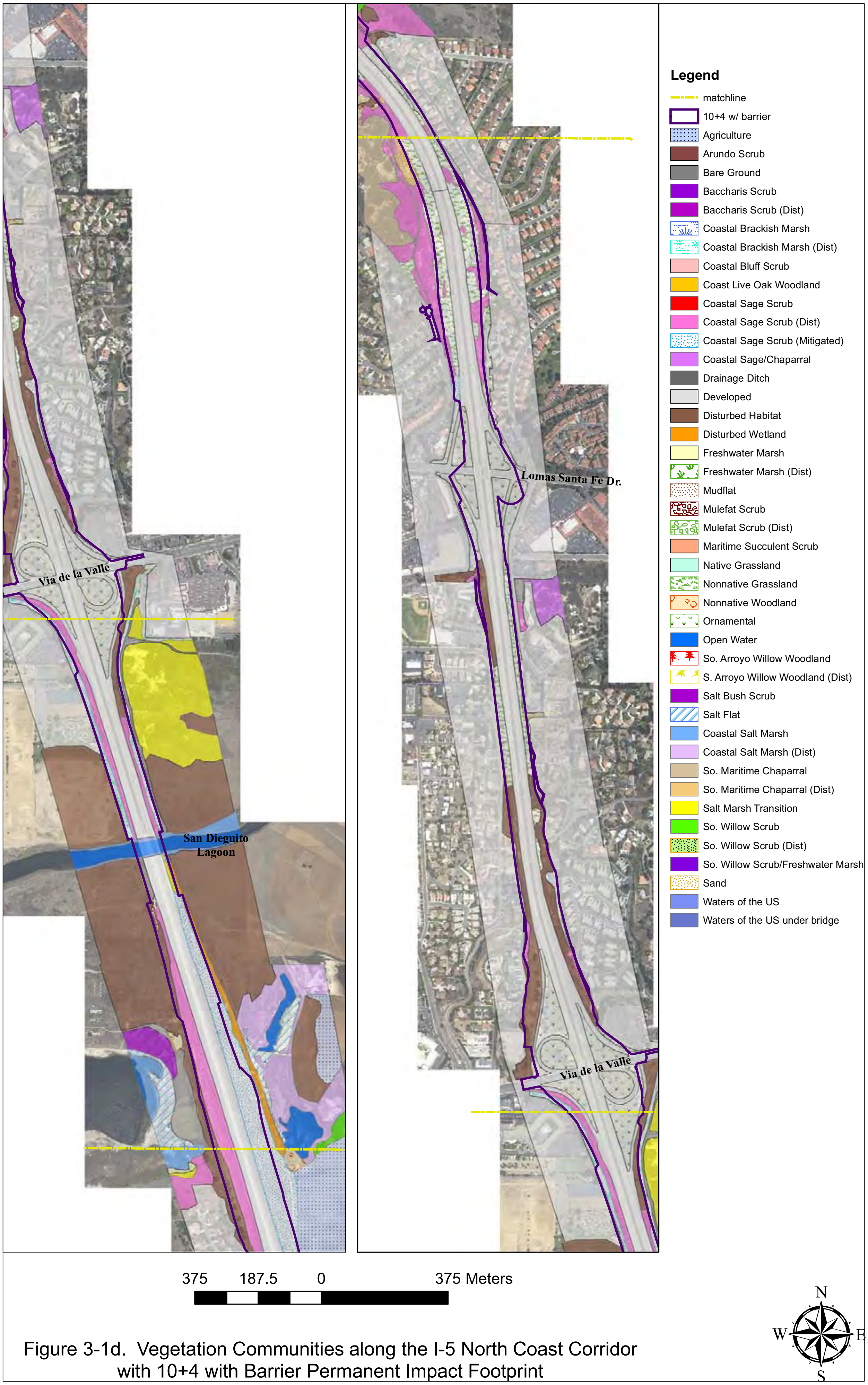

Figure 3-1d. Vegetation Communities along the I-5 North Coast Corridor with 10+4 with Barrier Permanent Impact Footprint

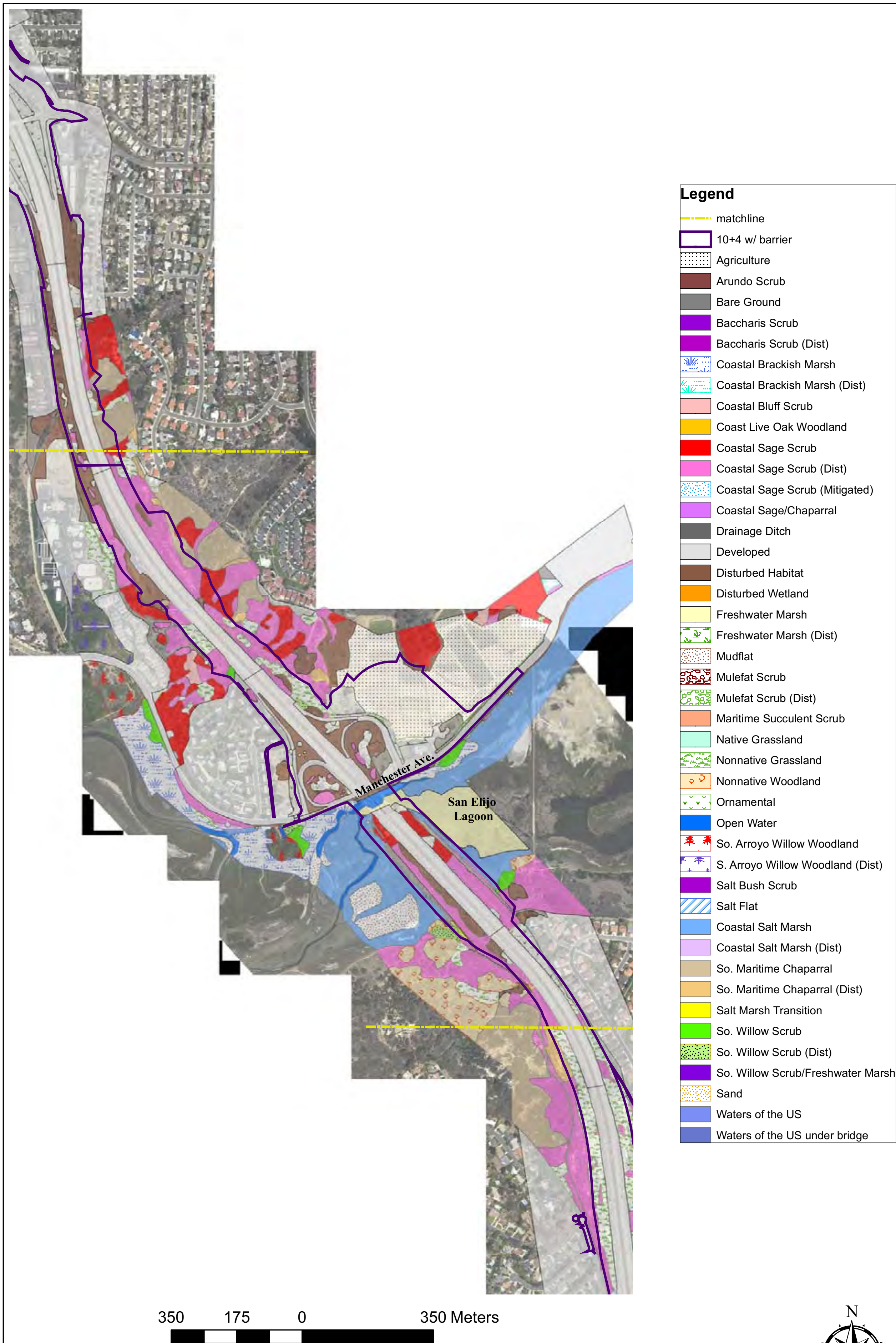

Figure 3-1e. Vegetation Communities along the I-5 North Coast Corridor with 10+4 with Barrier Permanent Impact Footprint

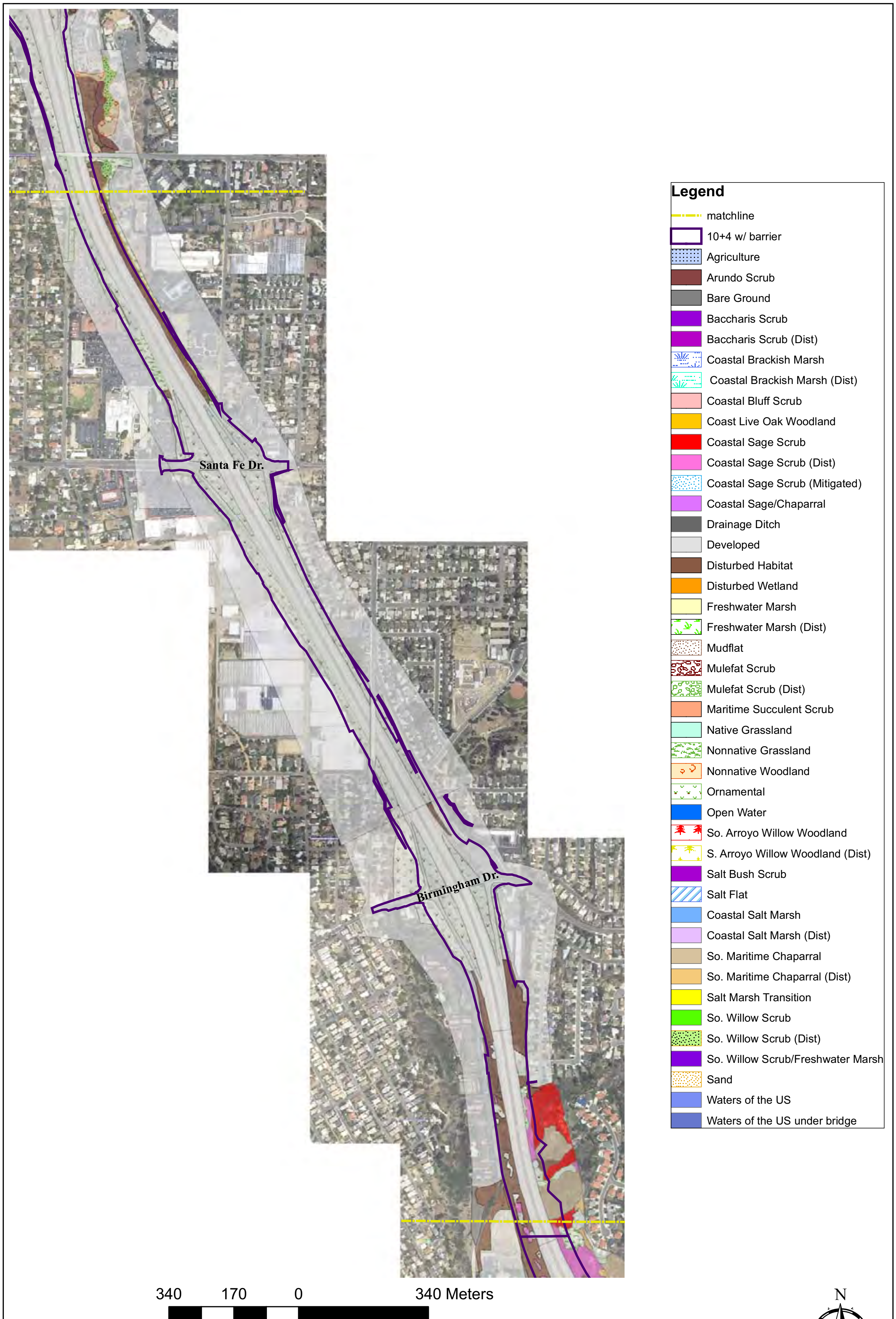

Figure 3-1f. Vegetation Communities along the I-5 North Coast Corridor
With 10+4 with Barrier Permanent Impact Footprint

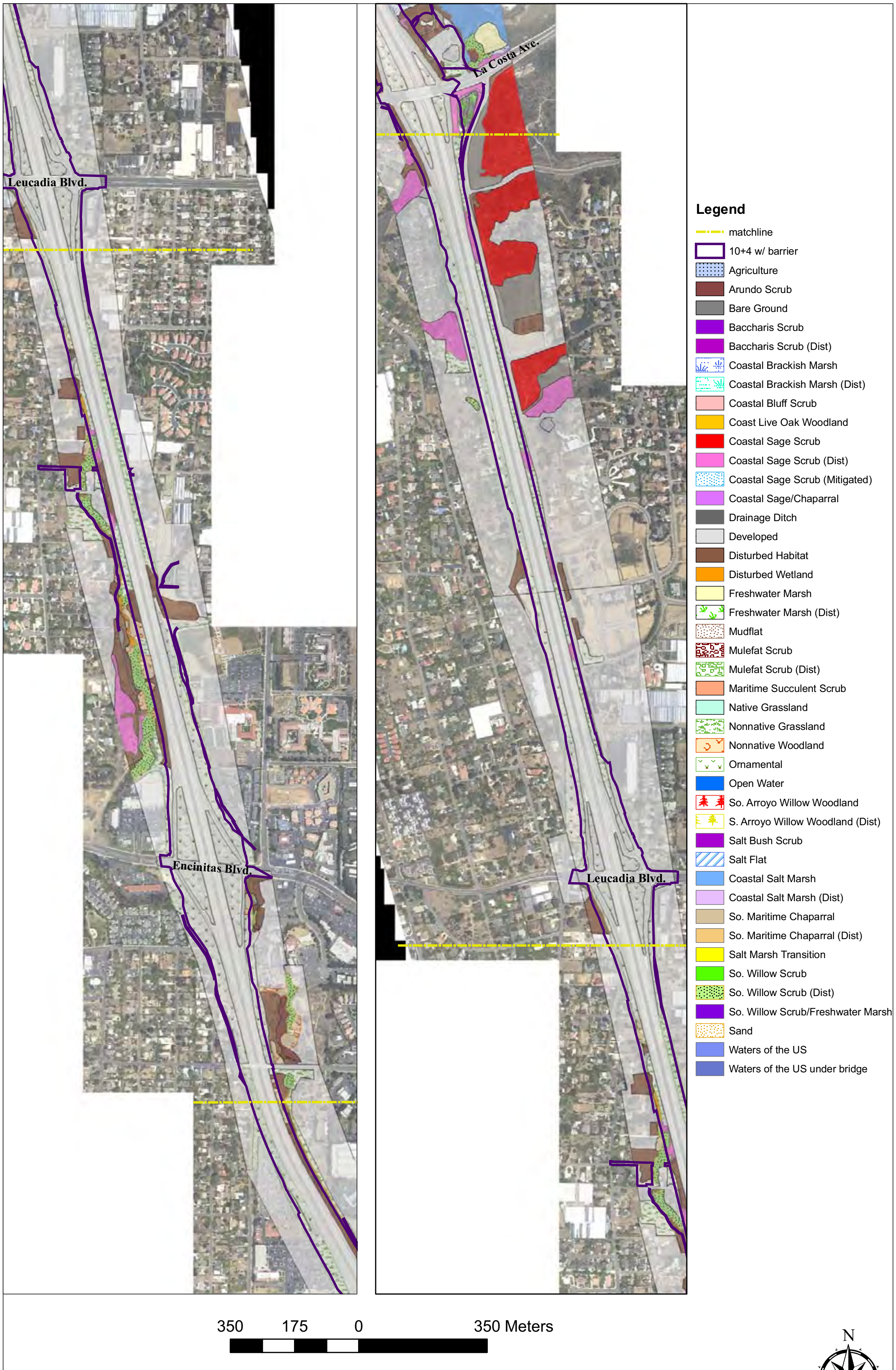

Figure 3-1g Vegetation Communities along the I-5 North Coast Corridor with 10+4 with Barrier Permanent Impact Footprint

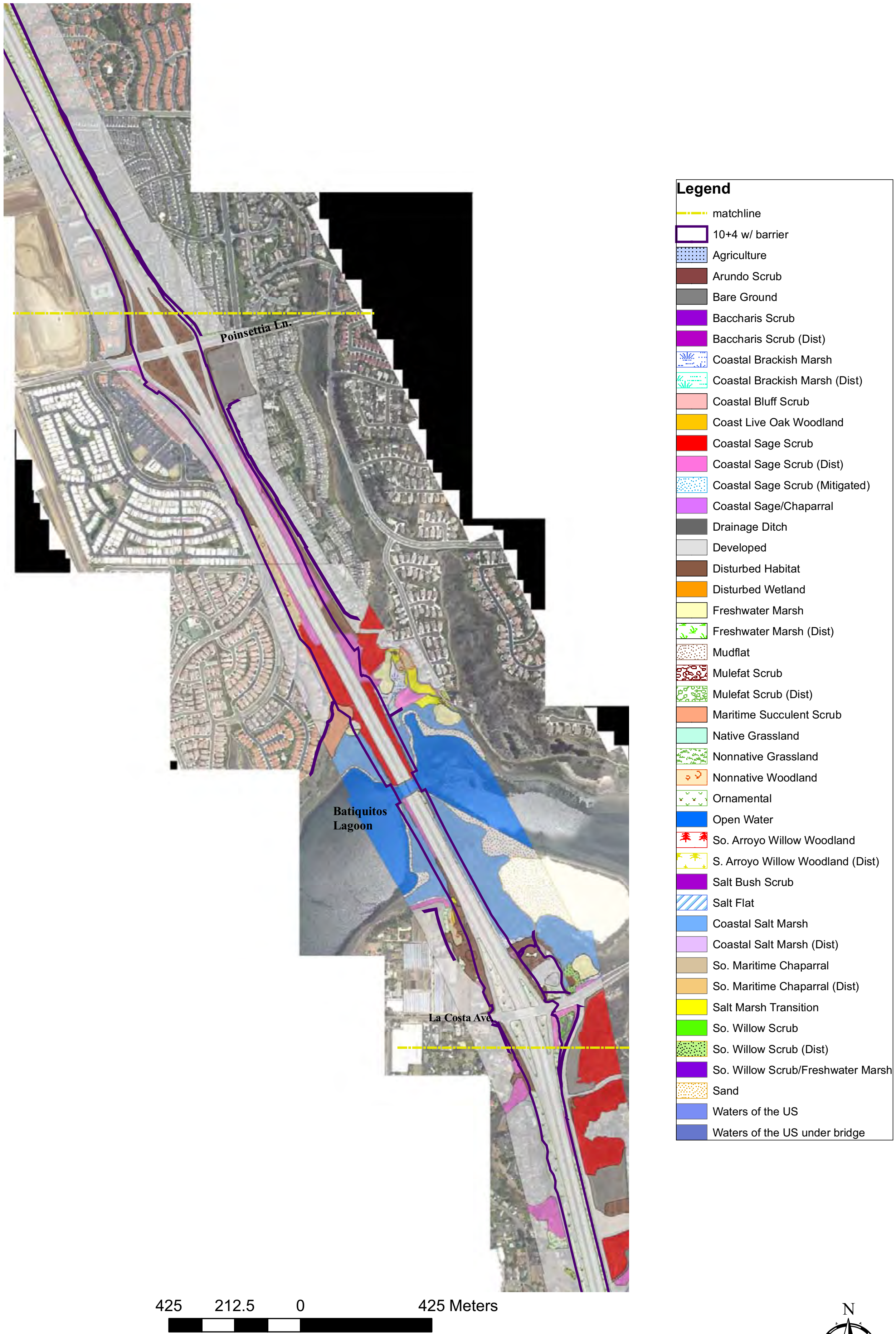

Figure 3-1h. Vegetation Communities along the I-5 North Coast Corridor with 10+4 with Barrier Permanent Impact Footprint

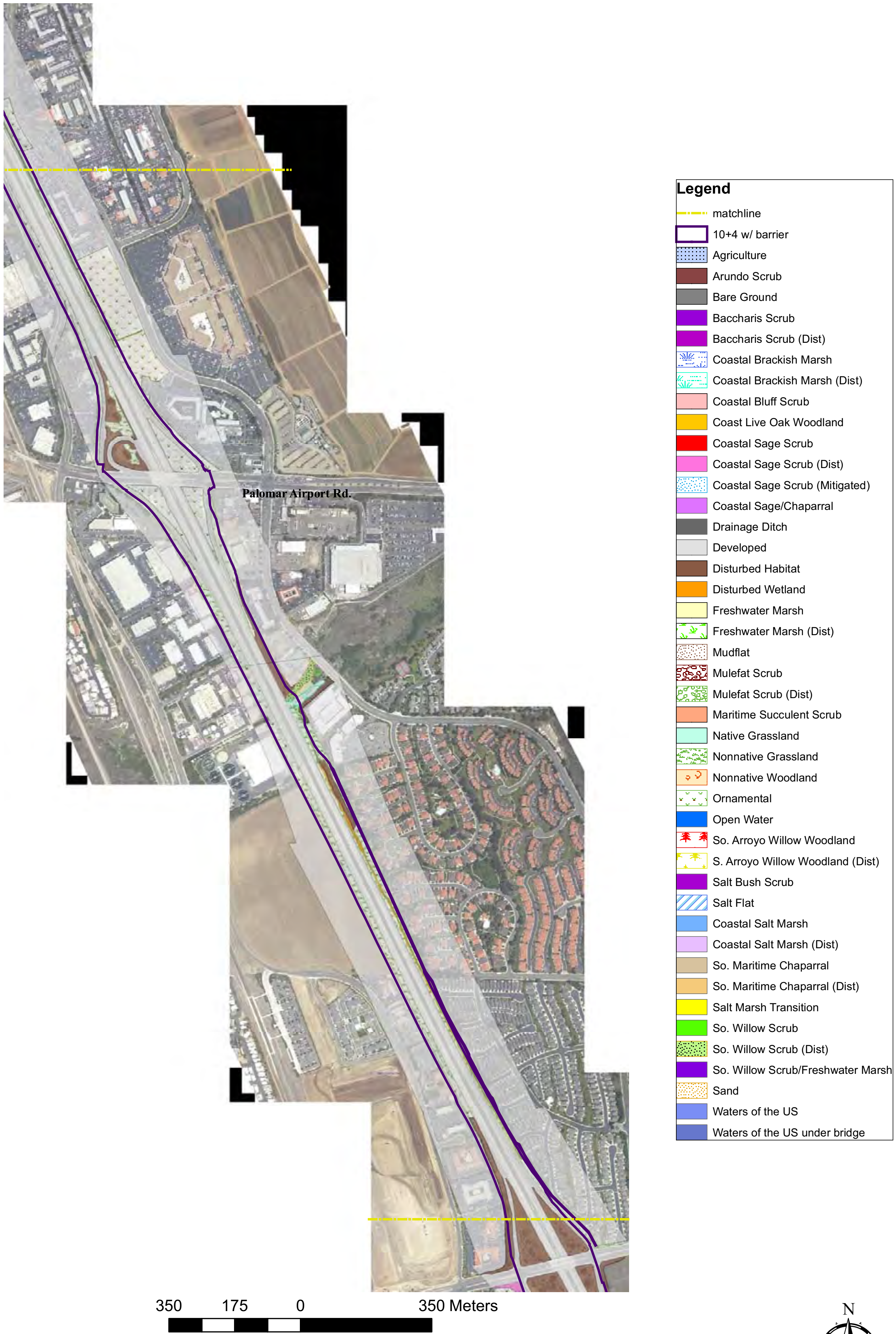

Figure 3-1i. Vegetation Communities along the I-5 North Coast Corridor with 10+4 with Barrier Permanent Impact Footprint

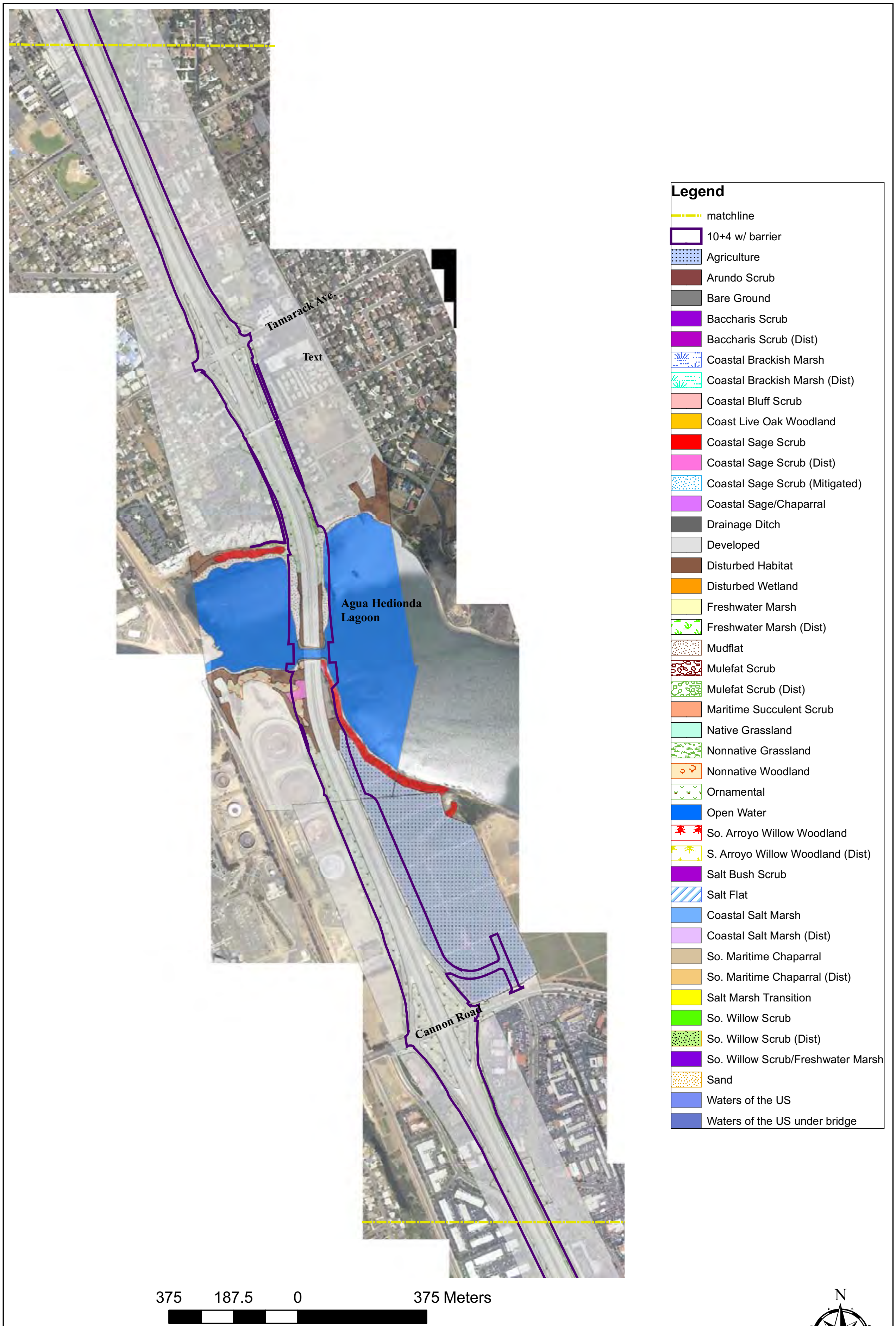

Figure 3-1j. Vegetation Communities along the I-5 North Coast Corridor with 10+4 with Barrier Permanent Impact Footprint

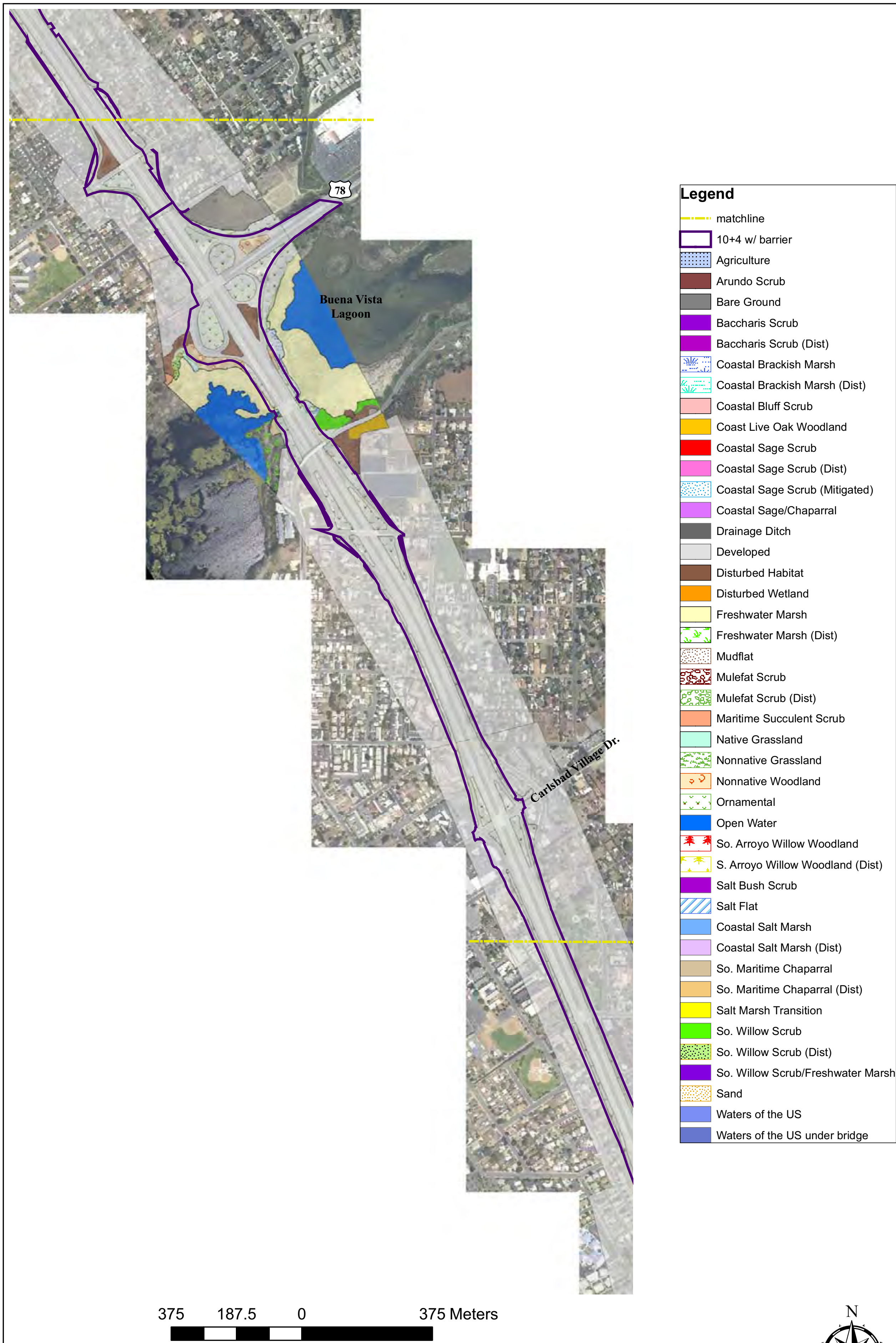

Figure 3-1k. Vegetation Communities along the I-5 North Coast Corridor with 10+4 with Barrier Permanent Impact Footprint

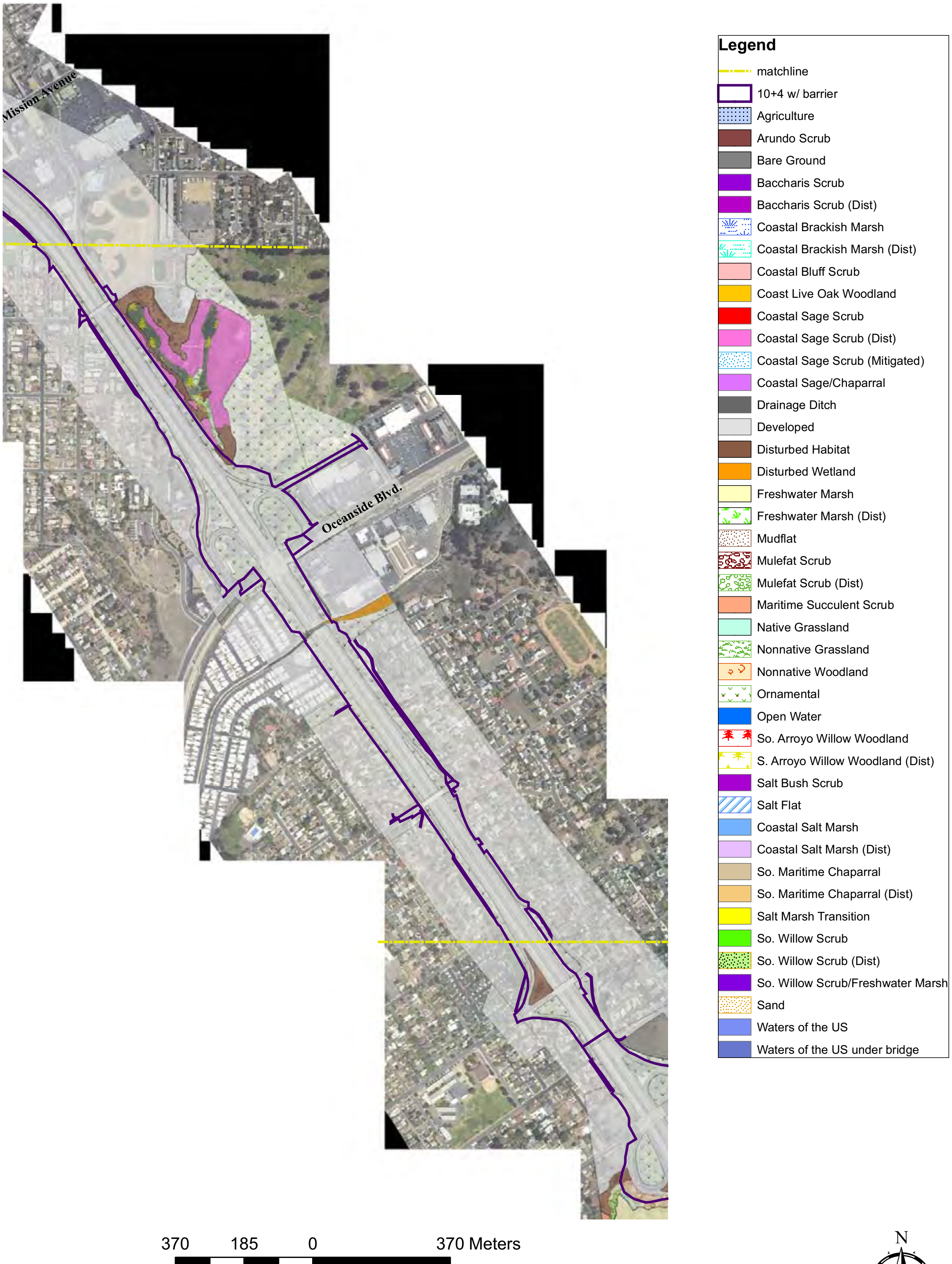

Figure 3-1l. Vegetation Communities along the I-5 North Coast Corridor
with 10+4 with Barrier Permanent Impact Footprint

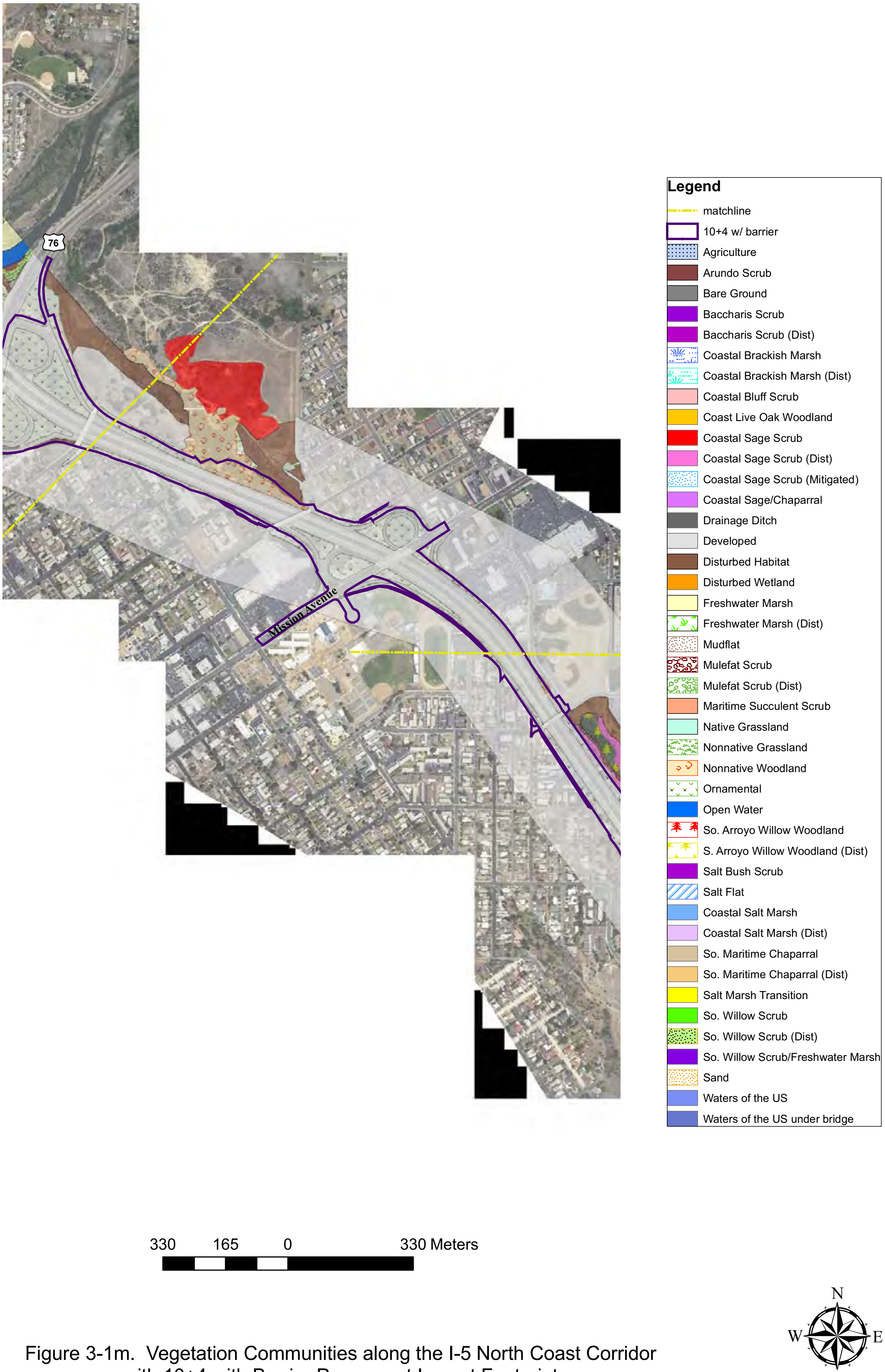

Figure 3-1m. Vegetation Communities along the I-5 North Coast Corridor with 10+4 with Barrier Permanent Impact Footprint

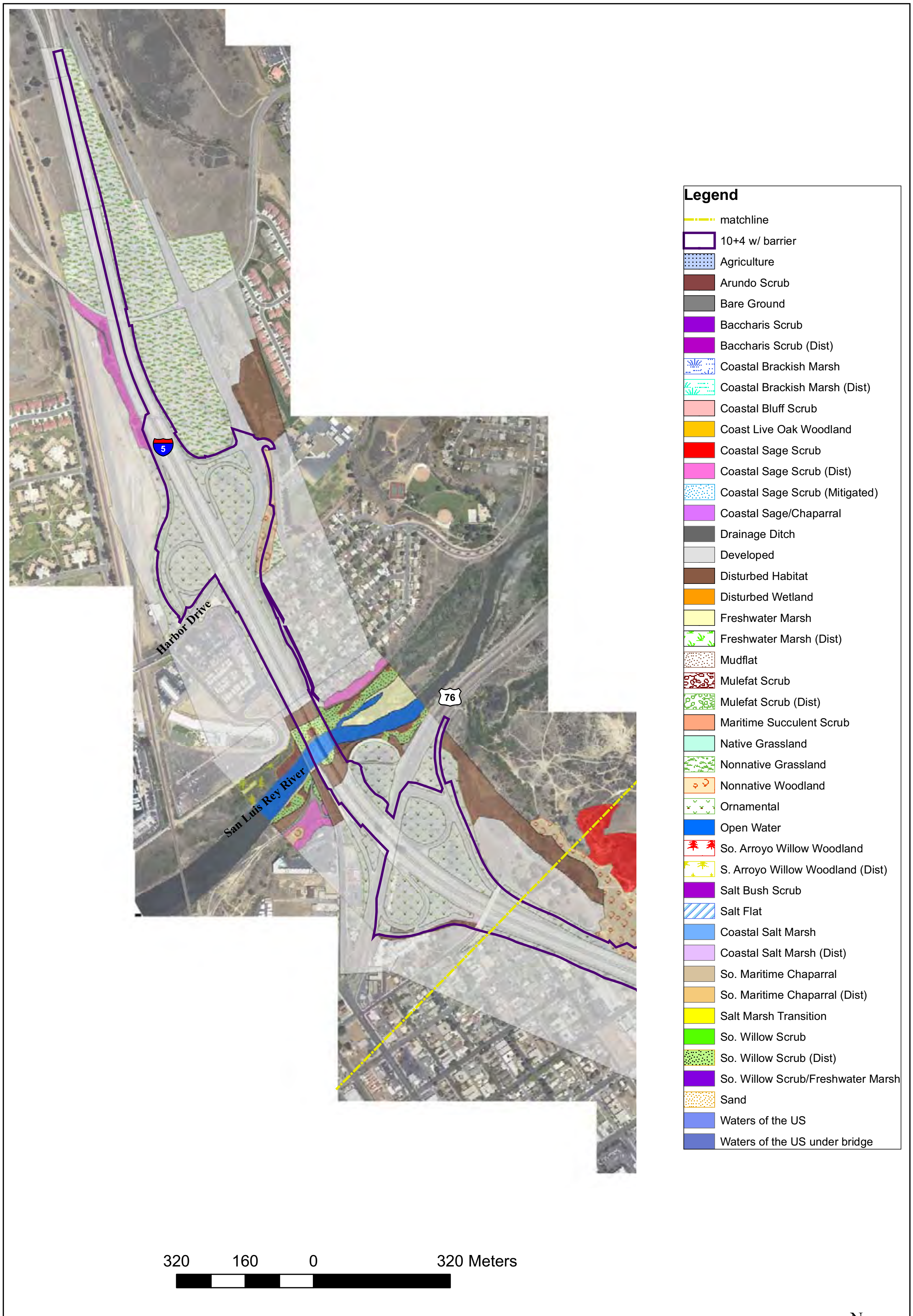

Figure 3-1n. Vegetation Communities along the I-5 North Coast Corridor
with 10+4 with Barrier Permanent Impact Footprint

Figure 3-2a. Batiquitos Eelgrass Coverage with 10+4 with Barrier Permanent Impact Footprint

Figure 3-2b. Agua Hedionda Eelgrass Coverage with 10+4 with Barrier Permanent Impact Footprint

Legend

10+4 w/barrier

Rare Plant Points

Common Name

- Adolphia
- Del Mar Manzanita
- South coast saltscale
- wart-stemmed ceanothus
- Orcutt's pincushion
- Summer holly
- Sea dahlia
- Coast barrel cactus
- Del Mar sand aster
- Torrey pine
- Nuttall's scrub oak

Rare plant

Common Name

- Adolphia californica
- Coast barrel cactus
- Del Mar manzanita
- Del Mar sand aster
- Nuttall's scrub oak
- Orcutt's pincushion
- Sea dahlia
- South coast saltscale
- Torrey pine
- wart-stemmed ceanothus

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Figure 3-3a. Sensitive Plant Locations in the I-5 Study Area with 10+4 with Barrier Permanent Impact Footprint

Figure 3-3b. Sensitive Plant Locations in the I-5 Study Area with 10+4 with Barrier Permanent Impact Footprint

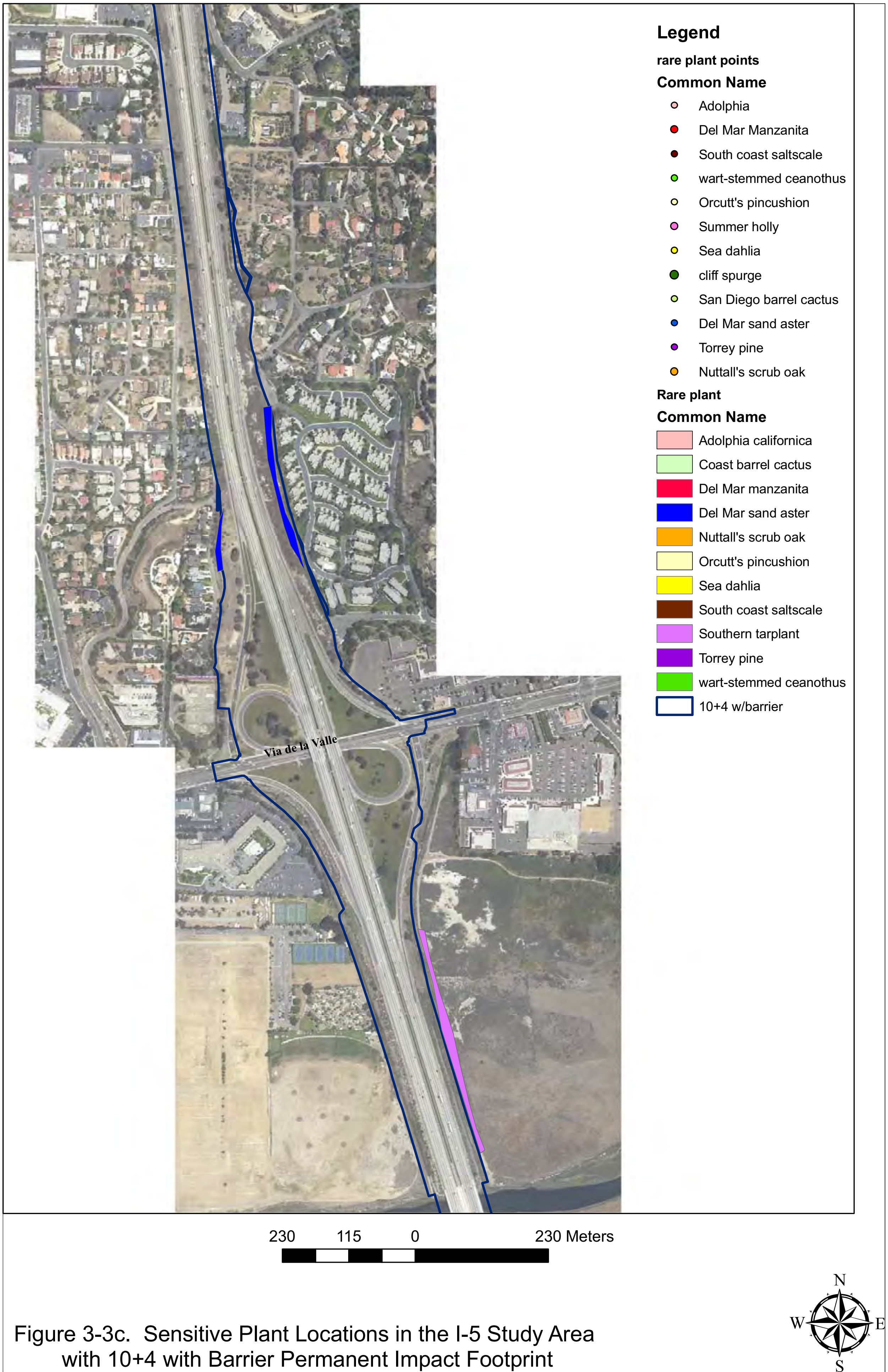

Figure 3-3c. Sensitive Plant Locations in the I-5 Study Area with 10+4 with Barrier Permanent Impact Footprint

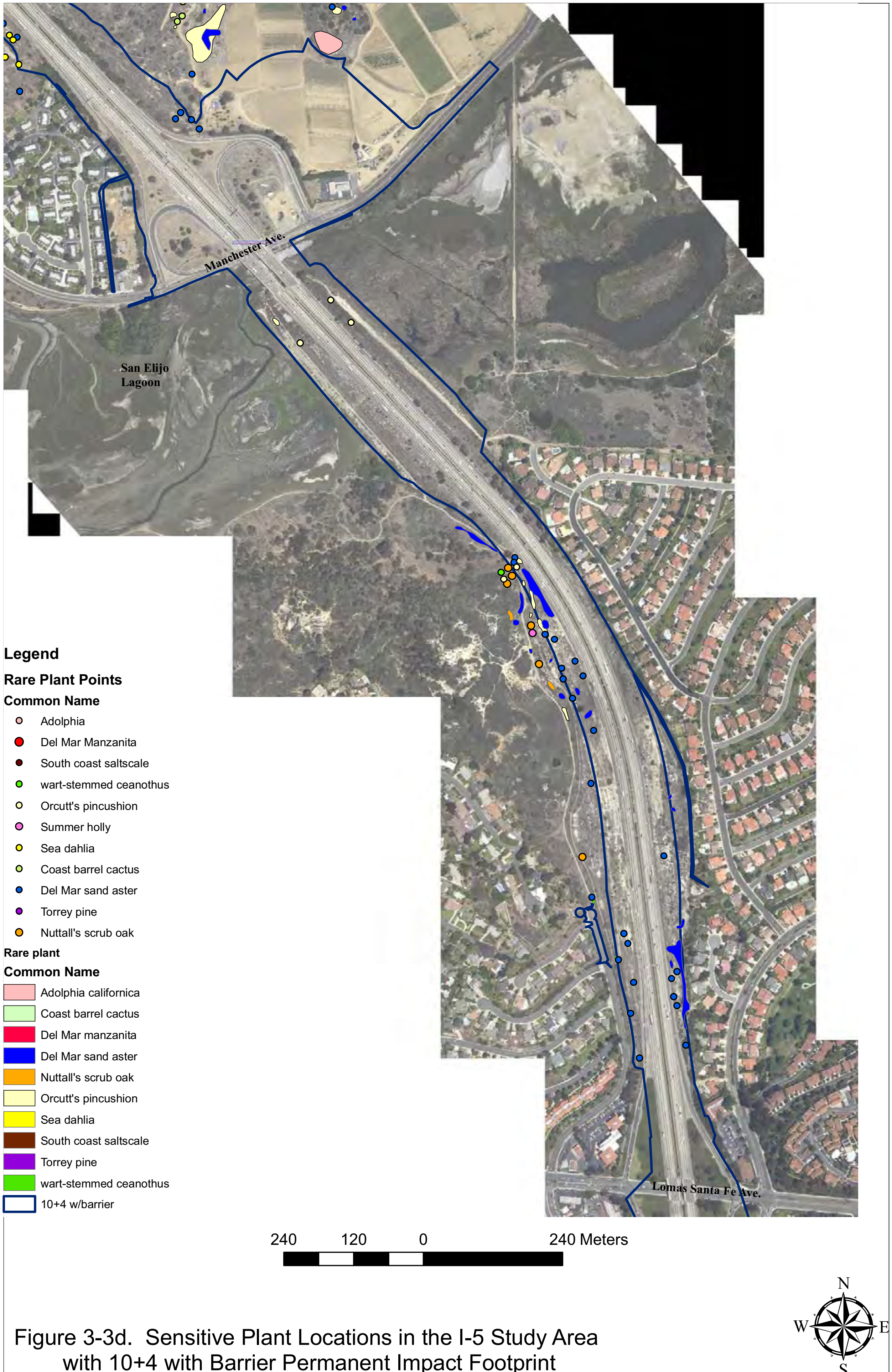

Figure 3-3d. Sensitive Plant Locations in the I-5 Study Area with 10+4 with Barrier Permanent Impact Footprint

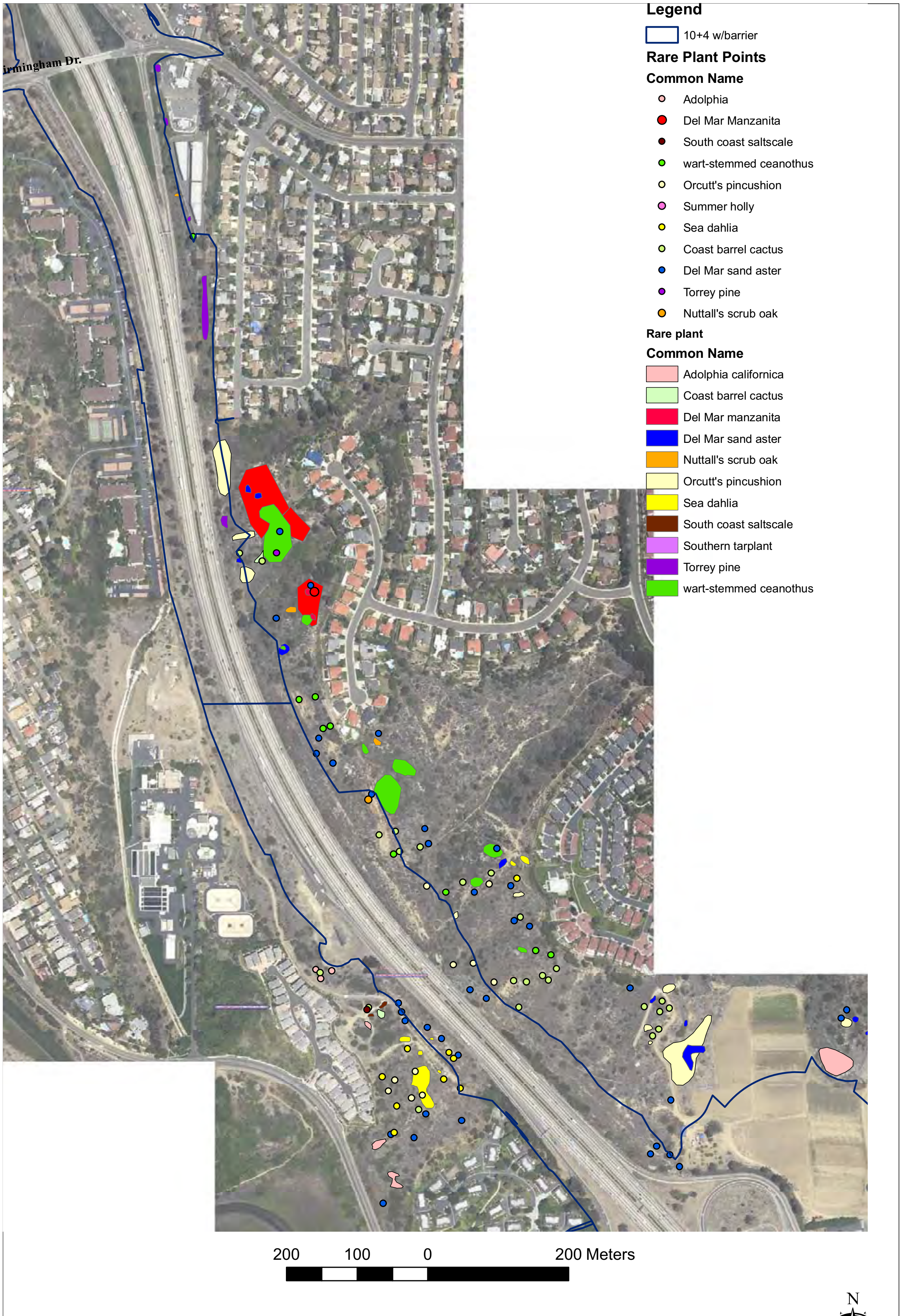

Figure 3-3e. Sensitive Plant Locations in the I-5 Study Area with 10+4 with Barrier Permanent Impact Footprint

Figure 3-3f. Sensitive Plant Locations in the I-5 Study Area with 10+4 with Barrier Permanent Impact Footprint

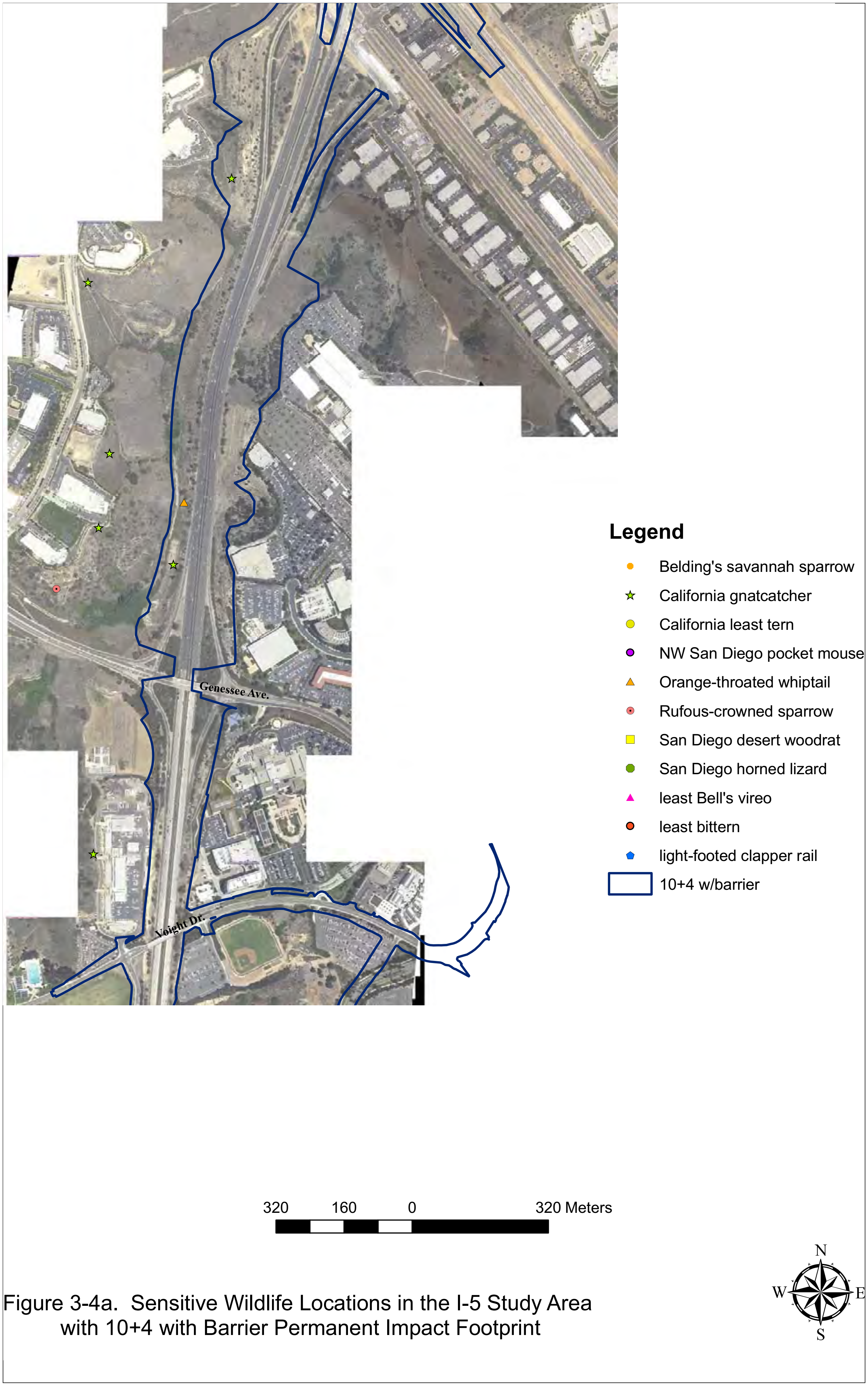

Figure 3-4a. Sensitive Wildlife Locations in the I-5 Study Area with 10+4 with Barrier Permanent Impact Footprint

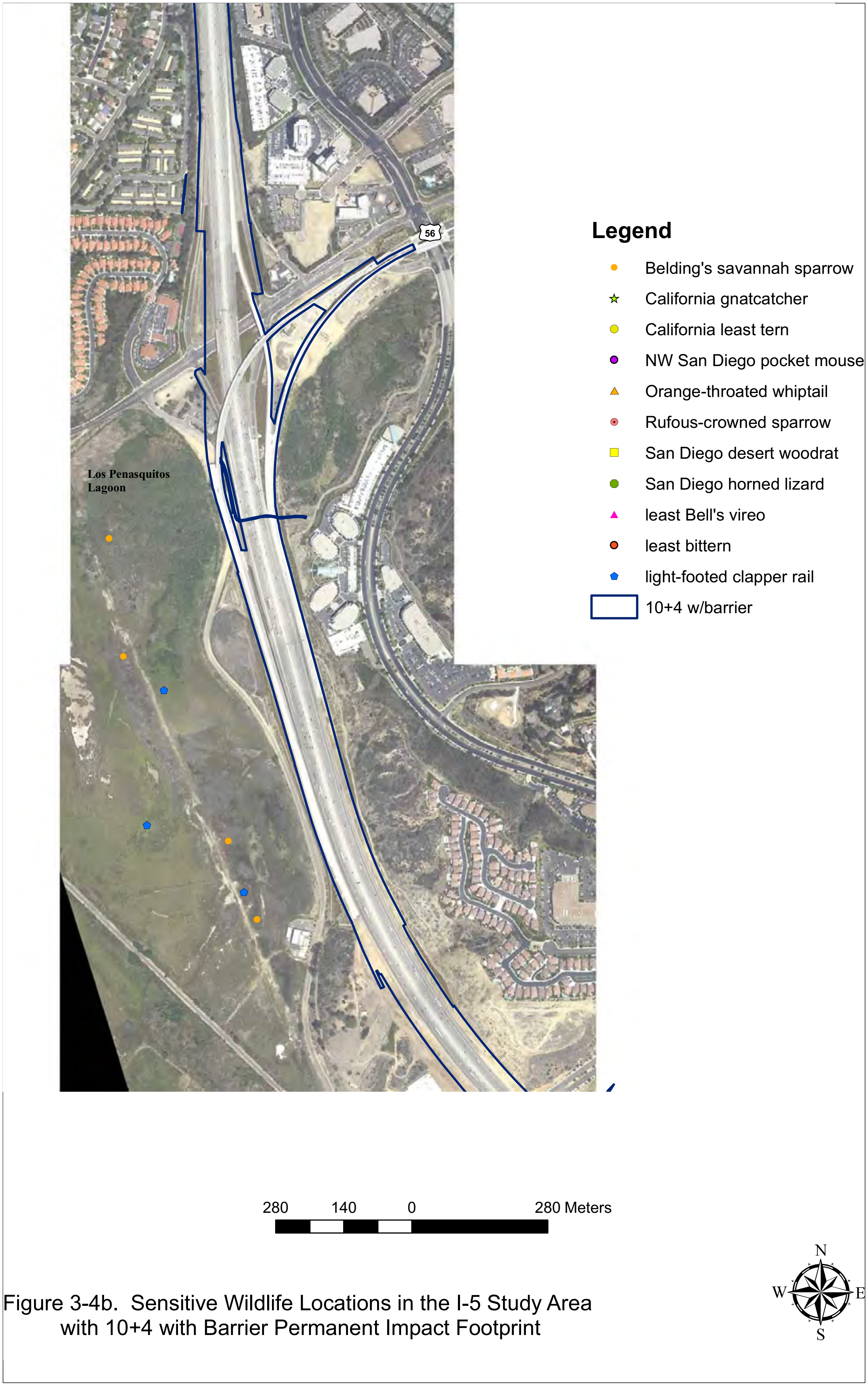

Figure 3-4b. Sensitive Wildlife Locations in the I-5 Study Area with 10+4 with Barrier Permanent Impact Footprint

Figure 3-4c. Sensitive Wildlife Locations in the I-5 Study Area with 10+4 with Barrier Permanent Impact Footprint

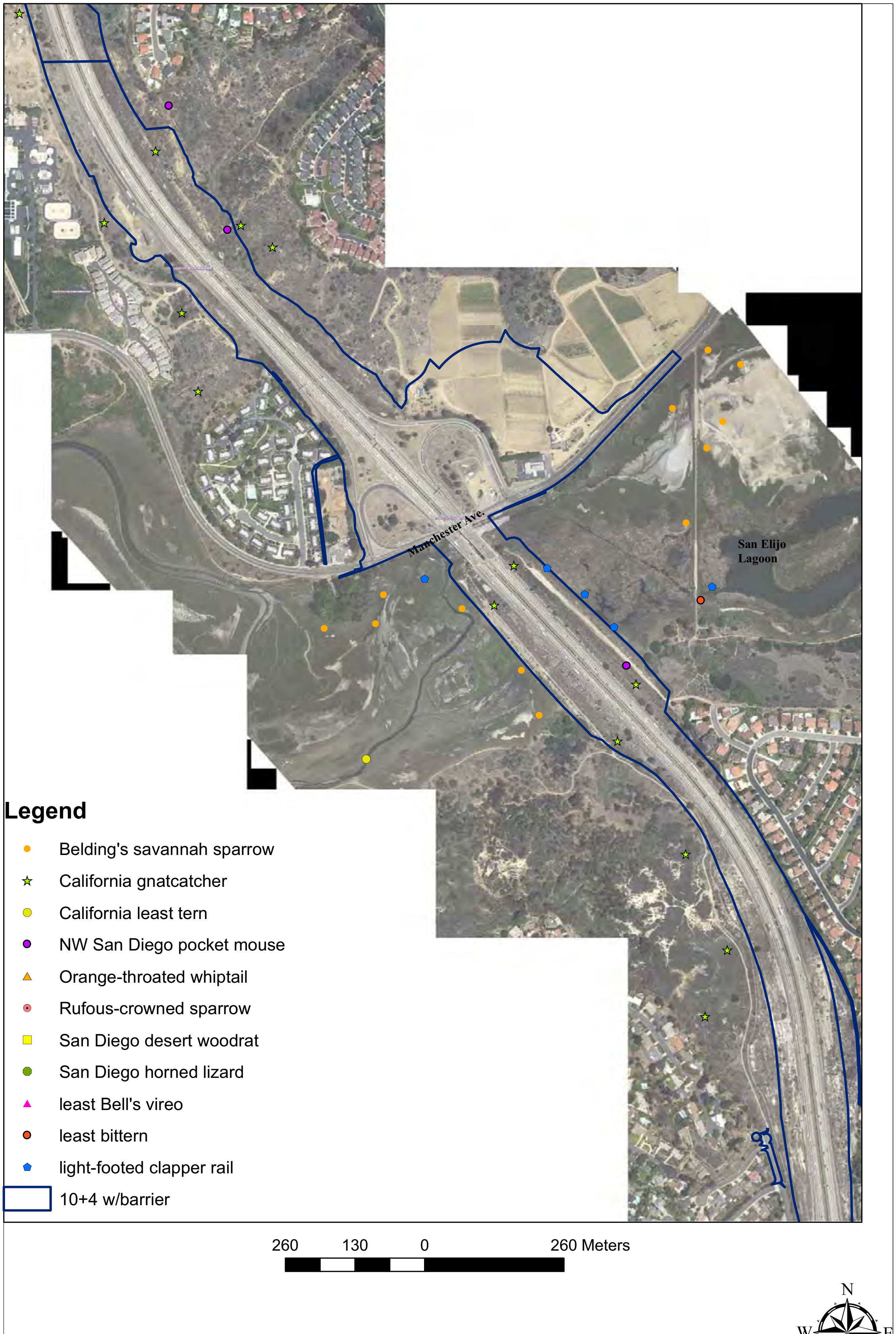

Figure 3-4d. Sensitive Wildlife Locations in the I-5 Study Area with 10+4 with Barrier Permanent Impact Footprint

Figure 3-4e. Sensitive Wildlife Locations in the I-5 Study Area with 10+4 with Barrier Permanent Impact Footprint

Figure 3-4f. Sensitive Wildlife Locations in the I-5 Study Area with 10+4 with Barrier Permanent Impact Footprint

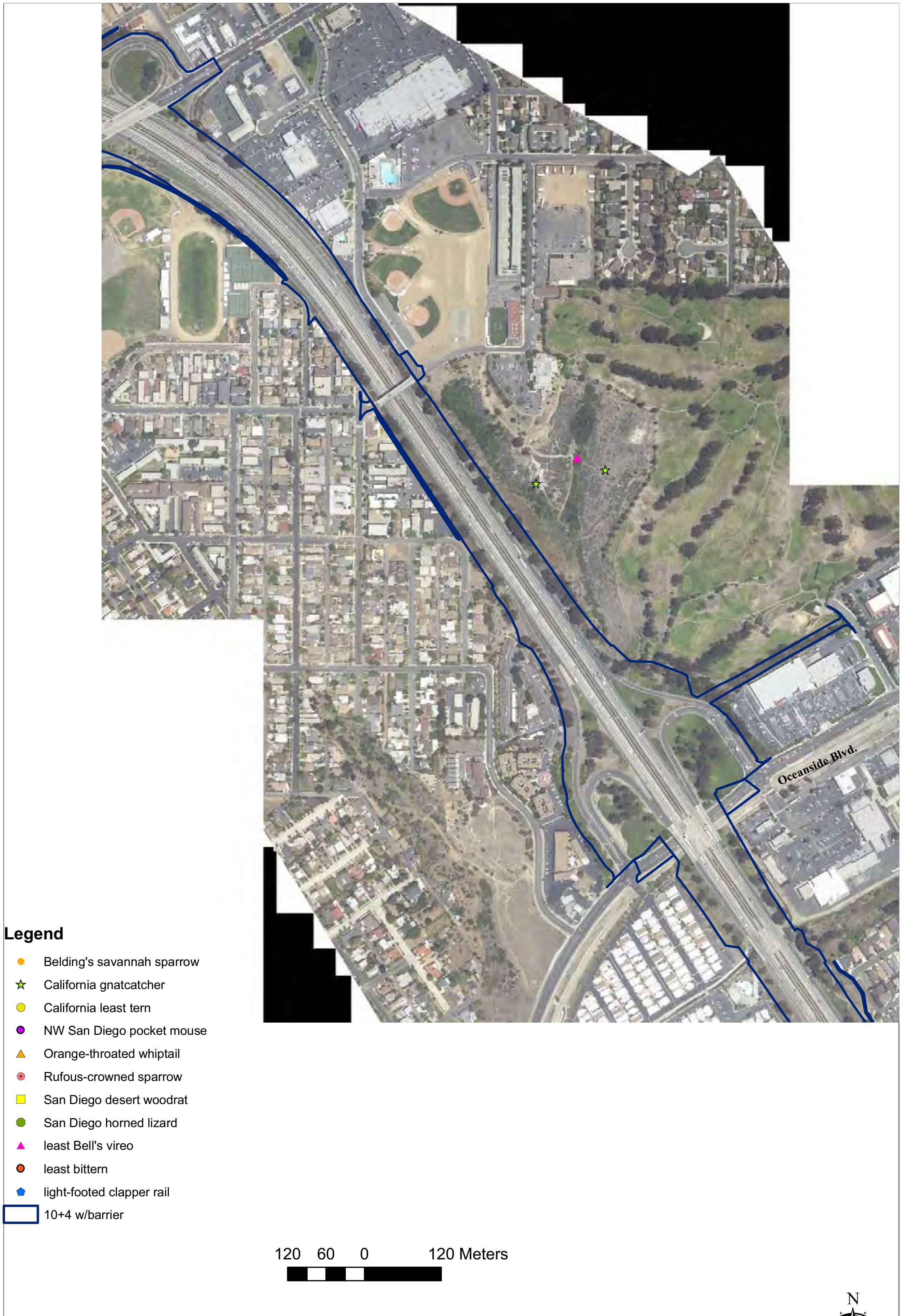

Figure 3-4g. Sensitive Wildlife Locations in the I-5 Study Area with 10+4 with Barrier Permanent Impact Footprint

Figure 3-4h. Sensitive Wildlife Locations in the I-5 Study Area with 10+4 with Barrier Permanent Impact Footprint

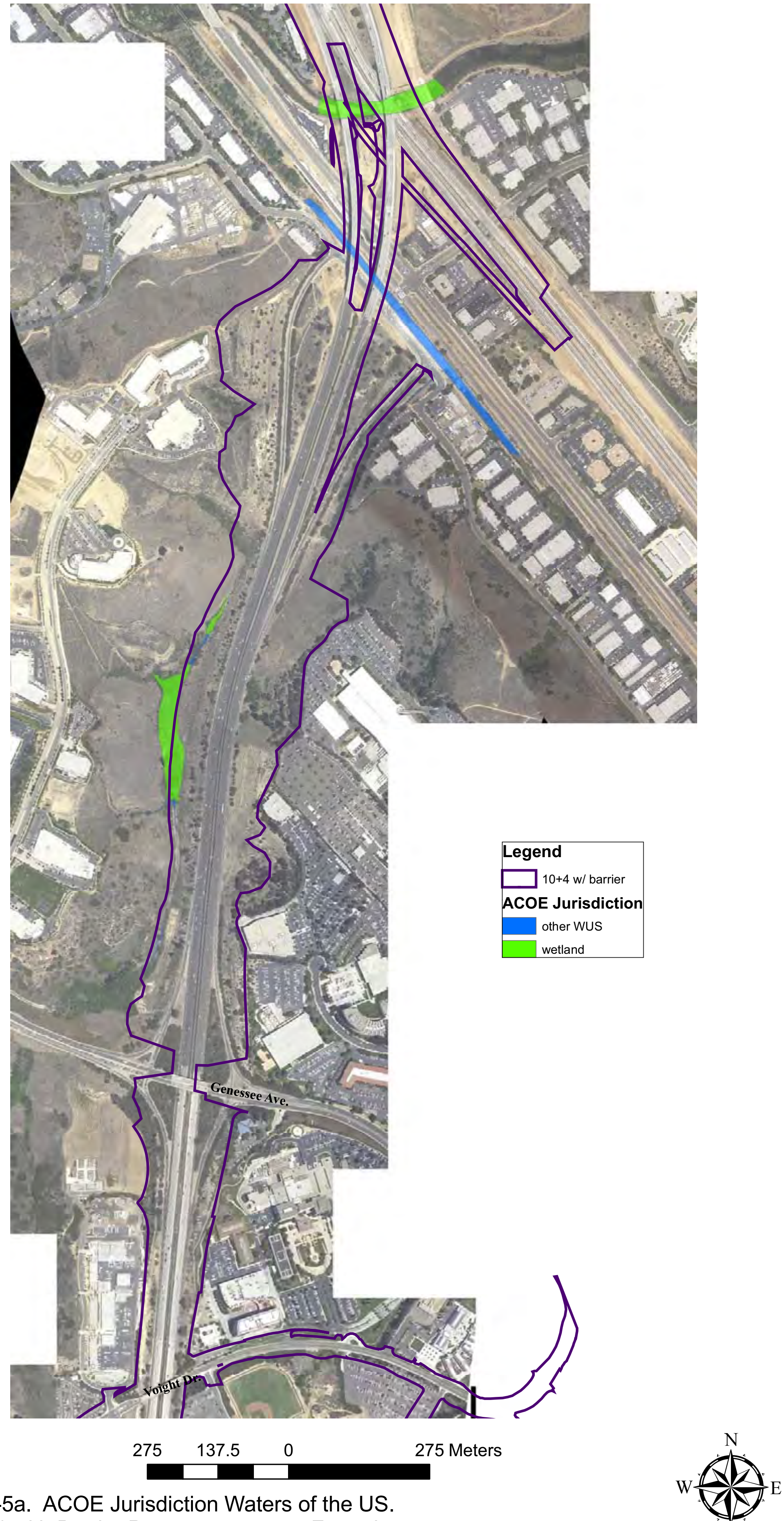

Figure 3-5a. ACOE Jurisdiction Waters of the US.
with 10+4 with Barrier Permanent Impact Footprint

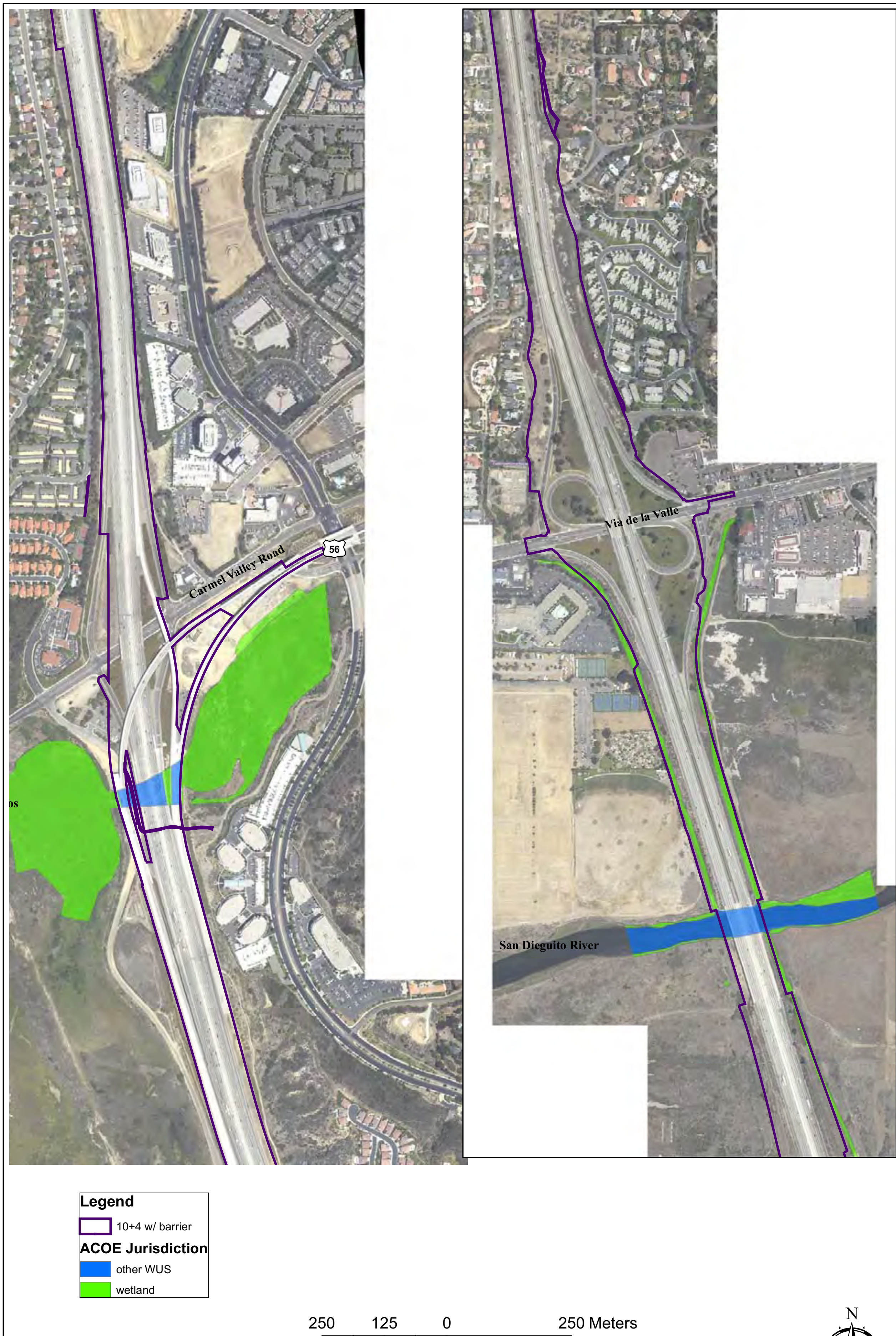

Figure 3-5b. ACOE Jurisdiction Waters of the US. with 10+4 with Barrier Permanent Impact Footprint

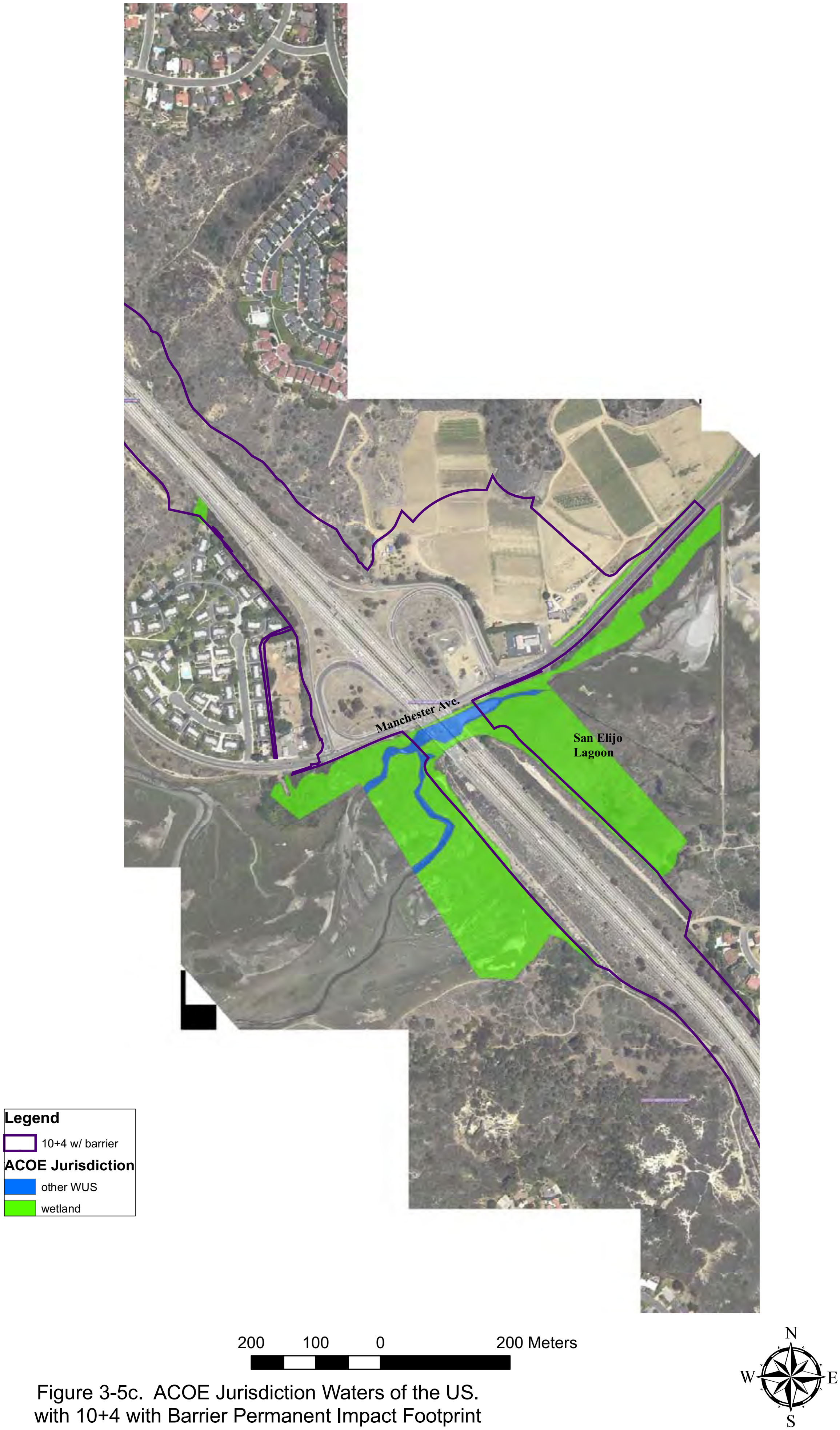

Figure 3-5c. ACOE Jurisdiction Waters of the US.
with 10+4 with Barrier Permanent Impact Footprint

Figure 3-5d. ACOE Jurisdiction Waters of the US.
with 10+4 with Barrier Permanent Impact Footprint

Figure 3-5e. ACOE Jurisdiction Waters of the US.
with 10+4 with Barrier Permanent Impact Footprint

Figure 3-5f. ACOE Jurisdiction Waters of the US.
with 10+4 with Barrier Permanent Impact Footprint

Figure 3-5g. ACOE Jurisdiction Waters of the US. with 10+4 with Barrier Permanent Impact Footprint

Figure 3-5h. ACOE Jurisdiction Waters of the US. with 10+4 with Barrier Permanent Impact Footprint

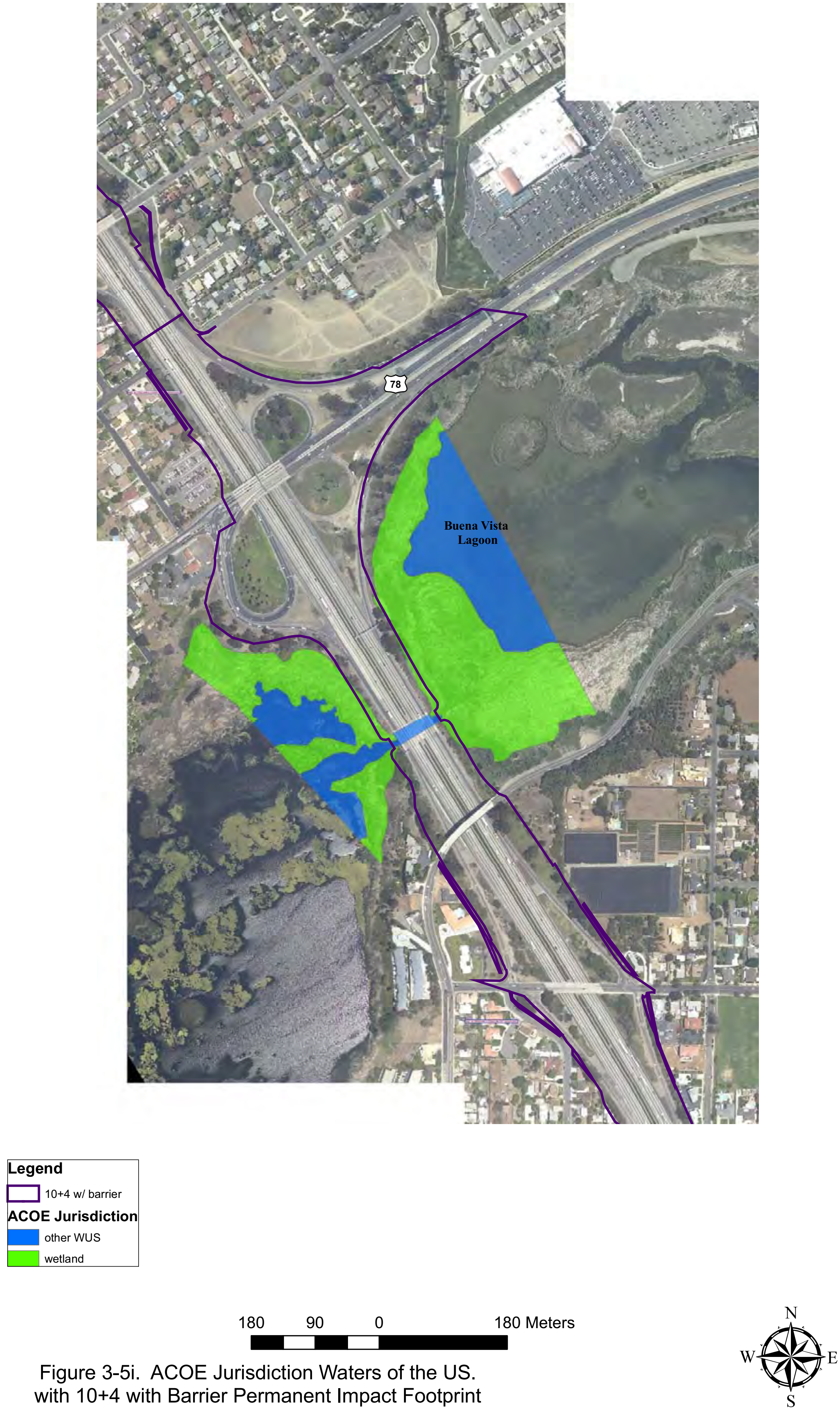

Figure 3-5i. ACOE Jurisdiction Waters of the US.
with 10+4 with Barrier Permanent Impact Footprint

Figure 3-5j. ACOE Jurisdiction Waters of the US. with 10+4 with Barrier Permanent Impact Footprint

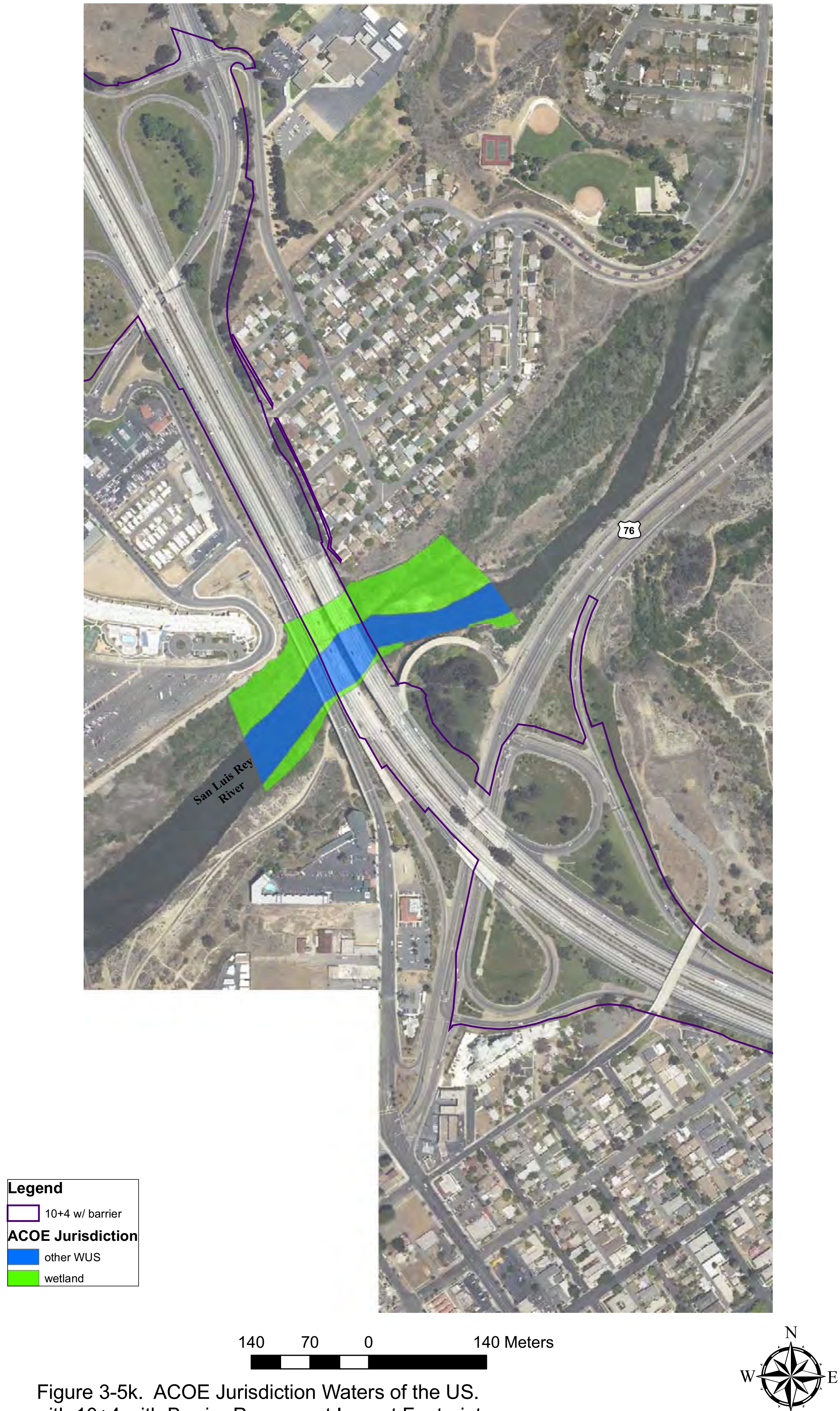

Figure 3-5k. ACOE Jurisdiction Waters of the US.
with 10+4 with Barrier Permanent Impact Footprint

Figure 3-6a. Critical Habitat within the I-5 Study Area with 10+4 with Barrier Permanent Impact Footprint

Figure 3-6b. Critical Habitat within the I-5 Study Area with 10+4 with Barrier Permanent Impact Footprint

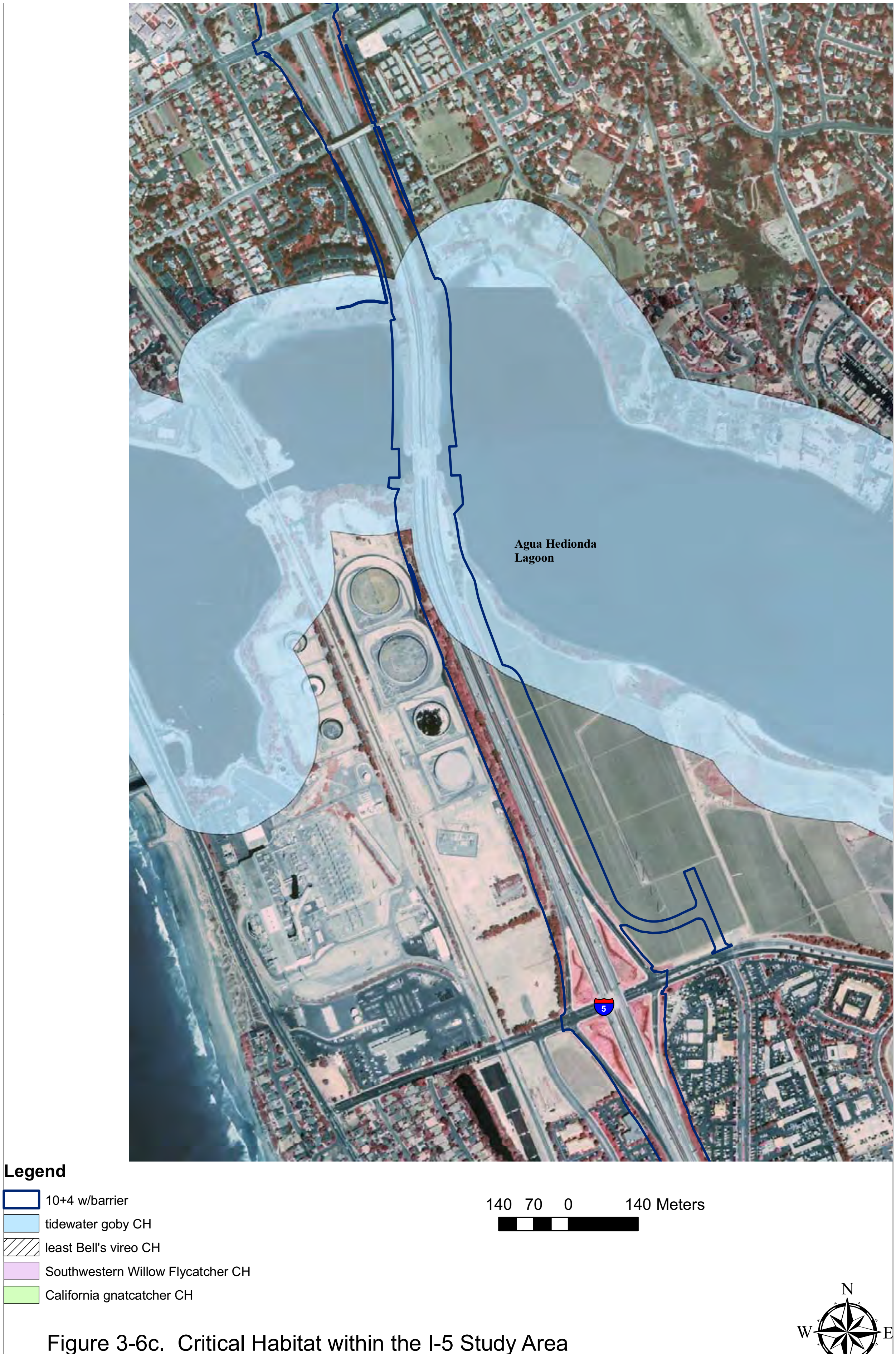

Figure 3-6c. Critical Habitat within the I-5 Study Area with 10+4 with Barrier Permanent Impact Footprint

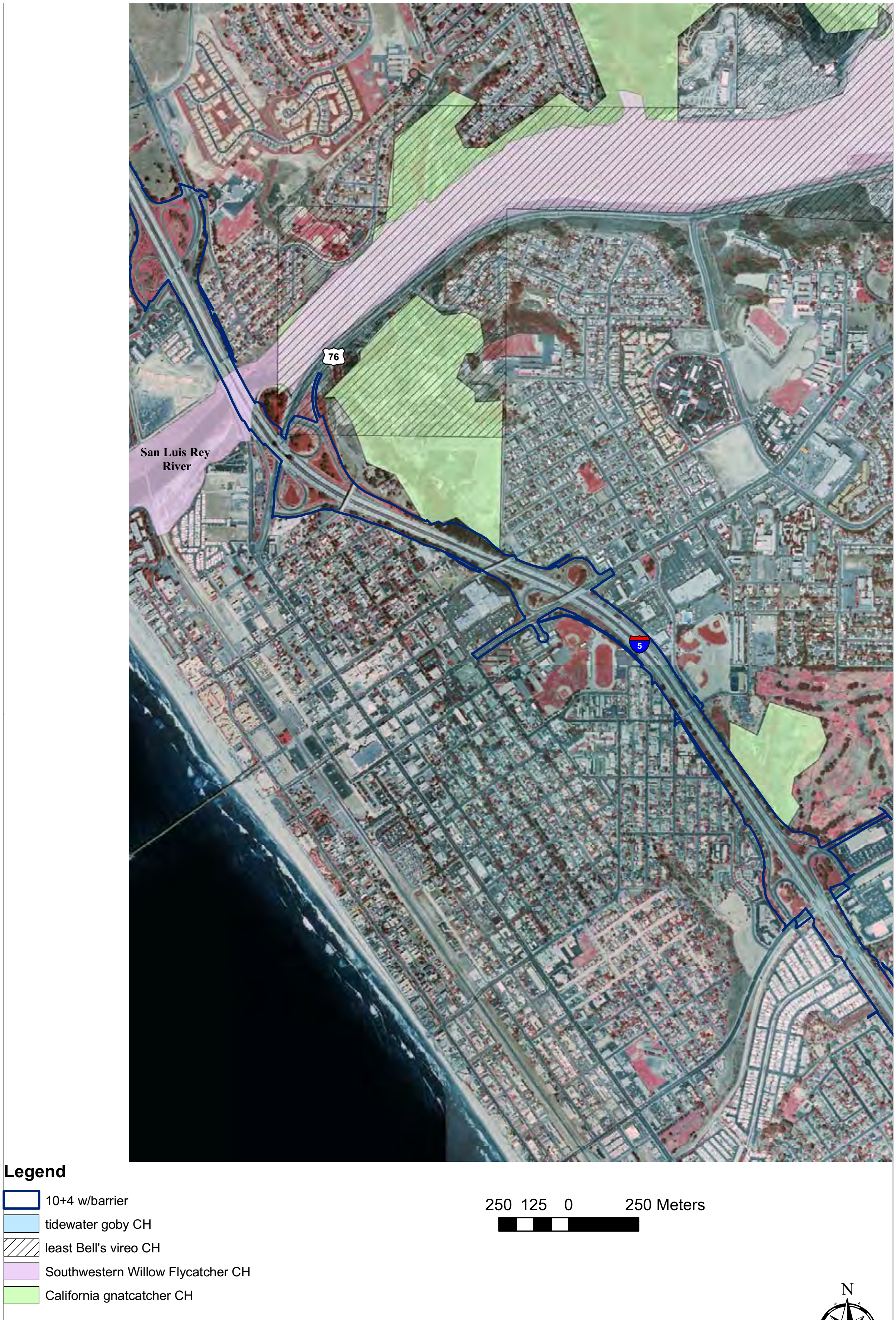

Figure 3-6d. Critical Habitat within the I-5 Study Area with 10+4 with Barrier Permanent Impact Footprint

Chapter 4. Results: Biological Resources, Discussion of Impacts and Mitigation

There are four proposed build alternatives and the no build alternative for this project. Each of the build alternatives includes four HOV lanes, two in each direction, and auxiliary lanes between most of the exits. The differences between the alternatives include either eight or ten general purpose lanes, and a buffer or a barrier between the general purpose lanes and the four HOV lanes. The 8+4 and 10+4 with barrier alternatives have larger footprints than the buffer alternatives because of the need for a shoulder on each side of the barrier, as well as, the additional width needed for weaving cars into and out of the barrier separated lanes. In general, the 8+4 with buffer paved area is 69 m (226.3 ft) wide, 10+4 with buffer is 76.2 m (250 ft) wide, 8+4 with barrier is 77.4 m (253.9 ft) wide and the 10+4 with barrier is 83.4 m (273.6 ft) wide. The impacts to all habitats associated with the four alternatives are described below.

Permanent impacts to biological resources for each of the build alternatives were determined to be those within the boundary of the cut and fill slopes, retaining walls, and/or paved areas. Although the cut and fill slopes will be revegetated, the length of time for construction and large areas to be graded were determined to qualify as a permanent impact to biological resources. In some areas with retaining walls, the impact footprint is the same due to retaining walls of differing heights. The impacts for the bridges include the entire structure, not just the permanent impacts from the columns. The permanent impacts from the bridge columns are not available at this time; therefore the permanent impact calculated is a conservative estimate. Temporary construction impacts were identified as those areas outside of the permanent impact required for equipment access and staging to complete construction. Temporary impact areas within native habitats will be revegetated.

4.1 Natural Communities

The habitats that will be impacted are separated into upland and wetland habitats based on the CDFG and CCC definitions of wetlands using the most conservative definition. The 8+4 with buffer alternative has the least total impacts of the four alternatives and generally has lower habitat impacts than the other alternatives. The exact configuration of the alternative determines where the impacts are. Therefore, when a retaining wall is placed at a different location on the slope or there is room to cut a slope without a wall, then the alternative with the least pavement may have a greater impact within a particular area. Based on permanent impact footprint and total impacts the 8+4 with buffer has the least impacts (512.7 ha/1266.33 ac), then 10+4 with buffer (525.8 ha/1298.7 ac), then 8+4 with barrier (535.1 ha/1321.66 ac), and finally the greatest impacts result from the 10+4 with barrier alternative (539.3 ha/1332.0 ac) (Table 4-1 and Figures 3-1a-n). Numbers in all impact tables were calculated in acres and converted and rounded to the nearest 100th to hectares.

Table 4-1. Permanent Impacts to Habitats for the Four Build Alternatives

	8+4 Buffer	8+4 Buffer	10+4 Buffer	10+4 Buffer	8+4 Barrier	8+4 Barrier	10+4 Barrier	10+4 Barrier
WETLANDS HABITATS	Hectares	Acres	Hectares	Acres	Hectares	Acres	Hectares	Acres
Arundo Scrub	0.09	0.23	0.09	0.23	0.09	0.21	0.09	0.22
Coastal Brackish Marsh	0.35	0.85	0.35	0.86	0.39	0.96	0.40	0.99
Coastal Brackish Marsh (D)	1.08	2.66	1.15	2.85	0.90	2.23	1.29	3.18
Drainage Ditch	0.52	1.30	0.55	1.36	0.55	1.36	0.60	1.49
Disturbed Wetland	0.69	1.70	0.71	1.76	0.74	1.82	0.86	2.13
Freshwater Marsh	0.30	0.74	0.34	0.85	0.38	0.93	0.50	1.22
Freshwater Marsh (D)	0.52	1.28	0.52	1.28	0.52	1.28	0.57	1.41
Mud Flat	0.75	1.85	0.87	2.16	0.93	2.29	0.98	2.42
Mulefat Scrub	0.09	0.23	0.09	0.23	0.09	0.23	0.09	0.23
Open Water	1.70	4.21	2.04	5.04	2.37	5.86	2.38	5.87
Salt Flat	0.01	0.02	0.01	0.02	0.01	0.02	0.01	0.02
So. Coastal Salt Marsh	1.39	3.43	1.65	4.07	2.14	5.30	2.67	6.58
Salt Marsh Transition	0.12	0.29	0.14	0.35	0.17	0.42	0.18	0.44
Southern Willow Scrub	0.05	0.12	0.06	0.14	0.07	0.17	0.07	0.18
Southern Willow Scrub (D)	0.94	2.33	0.93	2.30	0.95	2.35	0.99	2.46
So. willow scrub/Freshwater Marsh	0.44	1.08	0.44	1.08	0.44	1.08	0.44	1.08
Other Waters of the US (WUS)	0.38	0.93	0.38	0.93	0.38	0.93	0.38	0.94
WUS under existing Bridge**	0.47	1.16	0.47	1.16	0.47	1.16	0.61	1.50
UPLAND								
Agriculture	7.33	18.12	7.37	18.21	7.35	18.16	7.57	18.71
Baccharis scrub	0.26	0.64	0.26	0.64	0.26	0.64	0.26	0.64
Baccharis scrub(D)	2.27	5.62	2.27	5.62	2.27	5.62	2.27	5.62
Bare Ground	1.78	4.39	2.22	5.48	2.31	5.72	2.26	5.58
CSS	5.14	12.70	5.31	13.11	5.39	13.31	5.44	13.43
CSS(D)	22.99	56.79	24.13	59.61	24.21	59.80	24.64	60.87
CSS(D) Already mitigated*	2.66	6.56	2.80	6.92	4.13	10.20	5.51	13.60
Developed	310.88	767.88	312.58	772.08	316.18	780.97	316.31	781.29
Disturbed Habitat	33.03	81.58	33.96	83.87	35.08	86.64	35.59	87.91
Maritime Succulent Scrub	0.08	0.19	0.08	0.19	0.13	0.32	0.15	0.36
Native grassland	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Nonnative grassland	13.02	32.17	15.52	38.33	15.88	39.22	15.81	39.04
Nonnative Woodland	6.73	16.61	6.82	16.84	7.13	17.61	7.28	17.99
Ornamental	95.86	236.78	100.84	249.07	102.28	252.64	102.18	252.39
So. Maritime Chaparral	0.64	1.57	0.63	1.55	0.71	1.75	0.73	1.80
So. Maritime Chaparral (D)	0.13	0.33	0.20	0.50	0.19	0.46	0.19	0.47

	8+4 Buffer	8+4 Buffer	10+4 Buffer	10+4 Buffer	8+4 Barrier	8+4 Barrier	10+4 Barrier	10+4 Barrier
Wetland Habitats	9.88	24.41	10.80	26.67	11.58	28.61	13.10	32.35
Upland Habitats	502.80	1241.92	514.98	1272.01	523.50	1293.05	526.19	1299.69
Total	512.68	1266.33	525.78	1298.67	535.08	1321.66	539.29	1332.04

Impacts were calculated in acres and converted and rounded off to hectares.

(D) = Disturbed, So. = Southern, Chap = Chaparral

* CSS already mitigated by the Del Mar Auxiliary Lane Project

** WUS already shaded and impacted with columns of the existing freeway bridge

Wetland habitat impacts associated with each of the alternatives include impacts at the six lagoons, as well as the San Luis Rey River, Loma Alta Creek, Encina Creek, Cottonwood Creek, and numerous small lined and unlined drainage ditches that run parallel to I-5. All drainage ditches, arundo scrub, and salt marsh transition habitats are included in the wetland habitats of the State. Impacts to ACOE jurisdictional habitat are discussed below. The majority of the impacts to wetlands are associated with widening at the lagoons. Impacts to southern coastal salt marsh, coastal brackish marsh, coastal brackish marsh (disturbed), mud flat, and open water are primarily related to impacts at the lagoons. The 8+4 with buffer alternative has the least permanent wetland habitat impacts with 9.88 ha (24.41 ac), while the 10+4 with barrier has the greatest impacts to wetland habitat with 13.1 ha (32.35 ac) (Table 4-1).

Permanent upland impacts associated with the four alternatives range from 502.8 ha (1241.92 ac) to 526.2 (1299.7 ac); however, these numbers include developed areas, including the existing freeway lanes. Vegetated upland habitat for the alternatives ranges from 191.9 ha (477.0 ac) for the 8+4 with buffer, to 202.4 ha (499.93 ac) for the 10+4 buffer, to 207.3 ha (512.1 ac) for the 8+4 with barrier, to the highest impacts for the 10+4 with barrier, 209.9 ha (518.4 ac) (Table 4-1). Of the vegetated habitat within each alternative, less than 20 percent is sensitive habitat or habitat used for nesting and foraging by sensitive species. Agriculture, bare ground, developed, disturbed habitat, and ornamental habitats have all been altered to a great extent by human activities so that they provide low quality wildlife habitat. Nonnative woodland is a low-medium quality habitat, but can be used by raptors, songbirds, and other species for nesting and foraging. Nonnative grassland habitat provides foraging habitat for raptors and mammals and impacts require mitigation under several regional conservation plans. Permanent impacts to nonnative grassland range from 13.02 ha (32.17 ac) for the 8+4 with buffer alternative to 15.81 ha (39.04 ac) for the 10+4 with barrier alternative (Table 4-1). Coastal sage scrub, maritime succulent scrub, baccharis scrub, and southern maritime chaparral are all sensitive habitats that are declining in abundance and also many areas support sensitive and listed plant and wildlife species in the corridor.

The I-5 northbound fill slope between Del Mar Heights Road and the San Dieguito River was impacted in 2001 during construction of an auxiliary lane. Impacts to the CSS on the slope were mitigated offsite and permits and the consultation for this project were granted with the agreement that the slope would be temporarily revegetated with coastal sage scrub until the final I-5 North Coast Project construction was completed. After construction of the I-5 North Coast Project, this slope will be permanently revegetated with CSS; therefore, this slope has been already mitigated. Impacts to these sensitive upland habitats minus that which has already been mitigated total 31.5 ha (77.8 ac) for the 8+4 with buffer, 32.9 ha (81.2 ac) for the 10+4 with buffer, 33.2 ha (81.9 ac) for the 8+4 with barrier, and 33.7 ha (83.2 acres) for the 10+4 with barrier alternative (Table 4-1). The majority of the sensitive habitat impacted is coastal sage scrub, and the majority of that habitat is disturbed.

Temporary impacts are those areas outside the permanent footprint that will be needed to get access to the slopes and bridges to complete construction. The temporary impact areas are based on general access needs and right of way available. The final construction access areas will be refined as the construction details are known. Temporary construction impacts will range from 101.8 ha (251.52 ac) for the 10+4 barrier alternative to 114.1 ha (281.8 ac) for the 8+4 buffer alternative (Table 4-2). There is additional area for overall temporary impacts for the 8+4 buffer, because the smaller footprint is less constrained than the 10+4 barrier. The majority of the impacts are a result of temporary impacts to non-sensitive habitats.

Table 4-2. Temporary Impacts to Habitats for the Four Build Alternatives

	8+4 Buffer	8+4 Buffer	10+4 Buffer	10+4 Buffer	8+4 Barrier	8+4 Barrier	10+4 Barrier	10+4 Barrier
WETLAND	HA	Acres	HA	Acres	HA	Acres	HA	Acres
Arundo Scrub	0.14	0.36	0.14	0.36	0.14	0.35	0.15	0.37
Coastal Brackish Marsh	0.41	1.02	0.50	1.23	0.46	1.14	0.45	1.11
Coastal Brackish Marsh (D)	0.81	2.00	0.73	1.82	1.08	2.68	0.62	1.53
Drainage Ditch	0.30	0.73	0.27	0.67	0.30	0.75	0.22	0.54
Disturbed Wetland	0.31	0.77	0.31	0.77	0.39	0.95	0.25	0.62
Freshwater Marsh	0.70	1.73	0.90	2.23	0.87	2.14	0.85	2.11
Freshwater Marsh (D)	0.22	0.54	0.24	0.60	0.24	0.60	0.29	0.71
Mud Flat	0.20	0.50	0.18	0.45	0.15	0.38	0.10	0.26
Mulefat Scrub	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Open Water	1.53	3.77	1.46	3.60	1.44	3.56	1.47	3.64
Salt Flat	0.00	0.01	0.04	0.10	0.04	0.10	0.04	0.10
S. Coastal Salt Marsh	1.43	3.53	2.35	5.79	1.87	4.63	1.37	3.37
Salt Marsh Transition	0.08	0.19	0.07	0.17	0.18	0.44	0.05	0.12
Southern Willow Scrub	0.07	0.18	0.09	0.22	0.07	0.19	0.07	0.18
So. Willow Scrub (D)	0.74	1.84	0.81	2.00	0.82	2.04	0.78	1.92
Southern willow scrub/Freshwater Marsh	0.16	0.38	0.16	0.38	0.16	0.38	0.16	0.38
Other Waters of the U.S.	0.01	0.03	0.01	0.03	0.01	0.03	0.02	0.06
WUS under existing Bridge**	0.02	0.04	0.02	0.04	0.02	0.04	0.02	0.04

	8+4 Buffer	8+4 Buffer	10+4 Buffer	10+4 Buffer	8+4 Barrier	8+4 Barrier	10+4 Barrier	10+4 Barrier
UPLAND								
Agriculture	1.92	4.74	1.83	4.53	1.88	4.64	1.83	4.52
Baccharis scrub	0.04	0.10	0.04	0.10	0.04	0.10	0.04	0.10
Baccharis scrub(D)	0.07	0.18	0.07	0.18	0.07	0.18	0.07	0.18
Bare Ground	0.97	2.40	0.72	1.78	1.02	2.52	0.69	1.70
CSS	1.20	2.96	1.33	3.28	1.27	3.14	1.22	3.02
CSS(D)	5.95	14.70	5.10	12.59	5.08	12.55	4.68	11.55
CSS(D) Already mitigated*	2.23	5.50	2.09	5.16	1.30	3.22	0.60	1.48
Developed	39.78	98.27	39.74	98.16	41.41	102.28	40.84	100.87
Disturbed Habitat	12.34	30.47	11.54	28.50	11.07	27.34	9.95	24.57
Maritime Succulent Scrub	0.13	0.32	0.36	0.89	0.31	0.77	0.29	0.72
Native grassland	0.02	0.05	0.02	0.05	0.02	0.05	0.02	0.05
Nonnative grassland	7.57	18.70	5.41	13.37	5.03	12.43	5.16	12.75
Nonnative Woodland	1.93	4.76	1.84	4.54	1.59	3.92	1.48	3.65
Ornamental	31.83	78.63	27.90	68.92	27.05	66.82	27.19	67.15
So. Maritime Chaparral	0.17	0.43	0.19	0.46	0.17	0.41	0.12	0.29
So. Maritime Chap (D)	0.81	2.00	0.74	1.83	0.76	1.88	0.75	1.86
Wetland Habitats	7.13	17.61	8.28	20.45	8.26	20.39	6.91	17.06
Upland	106.96	264.20	98.93	244.35	98.07	242.24	94.92	234.46
Total	114.09	281.81	107.21	264.80	106.33	262.63	101.83	251.52

Impacts were calculated in acres and converted and rounded off to hectares.

(D) = Disturbed, So. = Southern, Chap = Chaparral

* CSS already mitigated by the Del Mar Auxiliary Lane Project

** WUS = Waters of the U.S. already shaded and impacted with columns of the existing freeway bridge

Temporary impacts to wetland habitat will result primarily at the lagoons and rivers, where access will be needed to construct/replace the bridges. Temporary impacts to wetland habitats range from 6.9 ha (17.1 ac) for the 10+4 barrier alternative to 8.3 ha (20.5 ac) for the 10+4 buffer (Table 4-2). Temporary impacts to sensitive upland habitats described above range from 7.2 ha (17.8 ac) for the 10+4 barrier to a high of 8.4 ha (20.7 ac) for the 8+4 with buffer alternative (Table 4-2). All areas temporarily impacted during construction will be restored and revegetated following construction.

4.2 Wetlands and Jurisdictional Habitats

State of California jurisdictional wetlands were delineated by habitat type. Both the CCC and CDFG have similar definitions and although the jurisdictions of the two agencies are not the same, the overall acreage covered by either of the agencies or both is conservatively identified by the wetland habitats described above. The ACOE requires three criteria for their determination of jurisdictional wetlands. In addition, the ACOE also takes jurisdiction of all waters of the U.S. including both wetlands and non-wetland waters. Table 4-3 describes the permanent and temporary impacts to ACOE jurisdictional wetlands and other waters of the U.S. (WUS) (Figures

4.2-1a-k). Similar to the permanent wetland habitat impacts the 8+4 buffer alternative has the least impacts, 9.29 ha (22.97 ac), and the 10+4 barrier has the greatest impacts 11.67 ha (28.86 ac) (Table 4-3). The majority of wetland habitat within the project area is ACOE jurisdictional, as well as state wetlands. Temporary impacts to ACOE jurisdiction WUS also follow the same pattern as the State wetlands with the least impacts from the 10+4 with barrier alternative and the greatest from the 10+4 with buffer alternative. There should be opportunity to minimize some of the temporary impacts in these alternatives as bridge design continues.

Table 4-3 Permanent and Temporary Impacts to ACOE Jurisdictional WUS

	8+4 buffer		10+4 buffer		8+4 barrier		10+4 barrier	
Permanent	ha	acres	ha	acres	ha	acres	ha	acres
other WUS	4.28	10.58	4.78	11.82	5.18	12.79	5.25	12.95
wetland	5.01	12.39	5.29	13.07	5.65	13.95	6.44	15.90
Total	9.29	22.97	10.07	24.89	10.82	26.74	11.68	28.86
Temporary								
other WUS	1.92	4.74	1.80	4.46	1.77	4.38	1.74	4.30
wetland	3.68	9.10	4.70	11.60	4.53	11.20	3.74	9.25
Total	5.60	13.84	6.50	16.05	6.31	15.58	5.49	13.55

During the NEPA 404 meetings with the resource agencies, the ACOE has expressed an interest in the amount of impacts to jurisdictional habitat by watershed. The permanent impacts by watershed are listed in Table 4-4. There is little difference in the amounts of impacts for each of the alternatives in many of the watersheds. The footprint is the same in the San Clemente, Peñasquitos, Loma Alta, and San Luis Rey watersheds (Table 4-4). The greatest lagoon impacts are to Agua Hedionda and Batiquitos due to the narrow fill under the current I-5 alignment and the closer proximity of WUS to the roadway (Table 4-4).

Table 4-4. Permanent Impacts to ACOE Jurisdictional WUS by Watershed

Watershed	**Type**	**8+4buffer**		**10+4buffer**		**8+4barrier**		**10+4barrier**	
		ha	acres	ha	acres	ha	acres	ha	acres
San Clemente	other WUS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Wetland	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Peñasquitos	other WUS	0.87	2.14	0.87	2.14	0.87	2.14	0.87	2.14
	Wetland	0.89	2.20	0.89	2.20	0.89	2.20	0.89	2.20
San Dieguito	other WUS	0.43	1.05	0.44	1.09	0.46	1.13	0.47	1.17
	Wetland	1.00	2.46	1.06	2.61	0.92	2.28	1.27	3.14
San Elijo	other WUS	0.24	0.60	0.26	0.64	0.27	0.66	0.28	0.70
	Wetland	0.48	1.18	0.63	1.55	0.70	1.74	0.96	2.37

Watershed	Type	8+4buffer		10+4buffer		8+4barrier		10+4barrier	
		ha	acres	ha	acres	ha	acres	ha	acres
Cottonwood Creek	other WUS	0.01	0.03	0.01	0.03	0.01	0.03	0.01	0.04
	Wetland	0.10	0.26	0.11	0.27	0.09	0.23	0.15	0.38
Batiquitos	other WUS	0.39	0.97	0.42	1.05	0.49	1.21	0.45	1.11
	Wetland	1.46	3.60	1.50	3.71	1.95	4.81	2.05	5.06
Encina	other WUS	0.03	0.08	0.04	0.10	0.04	0.11	0.05	0.13
	Wetland	0.57	1.42	0.59	1.46	0.58	1.44	0.60	1.49
Agua Hedionda	other WUS	1.75	4.32	2.17	5.36	2.48	6.12	2.54	6.28
	Wetland	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Buena Vista	other WUS	0.12	0.30	0.12	0.30	0.12	0.30	0.12	0.30
	Wetland	0.23	0.57	0.23	0.57	0.23	0.57	0.23	0.57
Loma Alta	other WUS	0.10	0.26	0.10	0.26	0.10	0.26	0.10	0.26
	Wetland	0.01	0.03	0.01	0.03	0.01	0.03	0.01	0.03
San Luis Rey	other WUS	0.34	0.84	0.34	0.84	0.34	0.84	0.34	0.84
	Wetland	0.26	0.65	0.26	0.65	0.26	0.65	0.26	0.65
Total		9.30	22.97	10.08	24.89	10.83	26.74	11.68	28.86
	other WUS	4.28	10.58	4.78	11.82	5.18	12.79	5.24	12.95
	Wetland	5.01	12.39	5.29	13.07	5.65	13.95	6.44	15.90

4.3 Eelgrass

Eelgrass is considered a special aquatic site and is found in the open water or other WUS areas of Batiquitos and Agua Hedionda Lagoon. The ultimate impacts to eelgrass will have to be determined by the amount of eelgrass onsite during preconstruction surveys and post construction surveys. The values below represent the eelgrass identified during surveys completed in 2006 and provide an indication to the relative amounts of eelgrass that are likely to be encountered during construction (Table 4-5 and Figures 3-2a-b). There is more open water and less fringing marsh near the I-5 in Agua Hedionda and therefore, there is more eelgrass likely to be impacted. Permanent impacts for each of the alternatives range from 0.04 ha (0.1 ac) of eelgrass impacted by the 8+4 buffer to 0.1 ha (0.24 ac) impacted by the 10+4 barrier alternative. Temporary impacts are similar for all alternatives at approximately 0.1 ha (0.25 ac) of eelgrass impacted.

Table 4-5. Permanent and Temporary Impacts to Eelgrass by Alternative

	8+4 buffer		10+4 buffer		8+4 barrier		10+4 barrier	
Permanent Impacts	ha	acres	ha	acres	ha	acres	ha	acres
Agua Hedionda	0.03	0.08	0.05	0.13	0.08	0.20	0.09	0.22
Batiquitos	0.01	0.01	0.01	0.02	0.01	0.03	0.01	0.02
Total	0.04	0.10	0.06	0.15	0.09	0.23	0.10	0.24
Temporary Impacts								
Agua Hedionda	0.04	0.10	0.04	0.10	0.04	0.09	0.04	0.10
Batiquitos	0.06	0.15	0.06	0.16	0.06	0.15	0.06	0.16
Total	0.10	0.25	0.10	0.26	0.10	0.24	0.10	0.26

4.4 Essential Fish Habitat

Essential Fish Habitat (EFH) is identified in the Magnuson-Stevens Fishery Conservation and Management Act as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." EFH has been identified for four groups of fish; Pacific salmon, Pacific groundfish, coastal pelagic species, and highly migratory species. The Pacific salmon group does not include steelhead, which are protected by the Endangered Species Act. The coastal pelagic species group includes northern anchovy (*Engraulis mordax*), Pacific sardine (*Sardinops sagax*), Pacific mackerel (*Scomber japonicus*), and the jack mackerel (*Trachurus symmetricus*). Although not captured during eelgrass and fish sampling in the lagoons, northern anchovy, Pacific sardine, and jack mackerel have a potential to occur in San Dieguito, San Elijo, Batiquitos, and Agua Hedionda Lagoons within the Study Area. They are most likely to occur in the open water at Batiquitos and Agua Hedionda Lagoons that are continuously open to the ocean. The open water in all these lagoons and potentially in the San Luis Rey River, provides EFH. Replacement and construction of the bridges in these lagoons and river may adversely affect EFH. The construction of new bridges pilings, fill placed along the abutments, and demolition of the bridges to be replaced could have direct impacts to EFH. Shading by the wider bridges and increased runoff from the wider roadway could have indirect impacts to EFH. During construction of the bridges false work and some kind of work platform may be used and this could have a temporary impact to EFH. Conservation measures will be developed to minimize these impacts and will be discussed in the subsequent mitigation section.

4.5 Special Status Plant Species

Each of the alternatives will have similar impacts to sensitive plant species. Del Mar manzanita, a federally listed endangered species, will only be impacted by the 10+4 with barrier alternative. Approximately three individuals would be impacted by this alternative. The alignments of the other three alternatives were able to be adjusted to avoid permanently impacting the Del Mar manzanita plants; however, the current temporary impact maps do indicate 1 to 3 individual plants will be impacted. During final design, the temporary impact area may be able to be modified to avoid these endangered plants. Several individuals of different sensitive species listed by the CNPS and/or federal or state species of concern will be impacted by each of the alternatives. Del Mar sand aster, coastal scrub oak, Orcutt's pincushion, sea dahlia, wart-stemmed ceanothus, coast barrel cactus, southern tarplant, and torrey pine will be impacted by each of the alternative (Table 4-6).

Table 4-6. Sensitive Plant Species Impacted by Each Alternative

Species	8+4 buffer	10+4 buffer	8+4 barrier	10+4 barrier
Del Mar manzanita	0 (3)	0 (1)	0 (1)	3
Coast barrel cactus	3	0	9	9
Coastal scrub oak	6	5	5	5
Del Mar sand aster	466	471	471	519
Orcutt's pincushion	652	1222	979	1312
Sea dahlia	17	18	19	18
Southern tarplant	10	10	10	10
Torrey pine	3	3	4	3
Wart-stemmed ceanothus	0	4	0	10

() indicates temporary impacts

Due to the varying amounts of fill and exact alignment of each alternative, the numbers of sensitive plants differs for each of the alternatives, not necessarily in reference to the amount of habitat impacted. Other than the federally endangered Del Mar manzanita and large numbers of Del Mar sand aster and Orcutt's pincushion, impacts to other sensitive plants are few. The majority of these species could potentially be salvaged or mitigated by planting in an offsite preserve. Del Mar sand aster seed was successfully collected for the Del Mar Auxiliary Lane project and reseeded on the Racetrack View mitigation site where it has grown and thrived.

4.6 Special Status Animal Species Occurrences

The footprints for each of the alternatives are relatively similar; therefore, permanent impacts to sensitive animal species for each alternative are almost the same (Table 4-7).

Table 4-7. Threatened and Endangered Animal Species Impacted by the Four Alternatives

Species	8+4 w/ buffer	10+4 w/ buffer	8+4 w/ barrier	10+4 w/ barrier
Light-footed clapper rail	No perm. impacts 1 temporary impact at BV	No perm. impacts 1 temporary impact at BV	No perm. impacts 1 temporary impact at BV	1 indiv perm. impact at SE 1 temporary impact at BV
Coastal California gnatcatcher – Permanent CAGN-temporary	Gen = 2 SD = 4 pairs, 1 dj SE = 5 pairs Bat = 1 pair, 1 indiv. Bat = 1 pair	Gen = 2 SD = 4 pairs, 1 dj SE = 5 pairs Bat = 1 pair, 1 indiv. SD = 1 pair Bat= 1 pair	Gen = 2 SD = 4 pairs, 1 dj SE = 5 pairs Bat = 1 pair, 1 indiv. SD = 1 pair Bat= 1 pair	Gen = 2 SD = 4 pairs, 1 dj SE = 5 pairs Bat = 1 pair, 1 indiv. SD = 1 pair Bat= 1 pair
Belding's savannah sparrow	Bat = 1 indiv	Bat = 1 indiv 1 pair temporary impact at Bat.	Bat = 1 pair, 1 ind	Bat = 1 pair, 1 indiv

Bat = Batiquitos Lagoon/slopes
SD = San Dieguito Lagoon
SE = San Elijo Lagoon
dj = dispersing juvenile
BV = Buena Vista Lagoon
Perm = permanent
Indiv = individual

Birds

Light-footed clapper rail. The location of one individual clapper rail at San Elijo Lagoon will be impacted by the 10+4 with barrier alternative (Figures 3-4 a-h). All three clapper rail locations at San Elijo Lagoon are immediately beyond the temporary impact areas for the other three alternatives within the freshwater marsh habitat (Table 4-7). Very little of the freshwater marsh habitat where the clapper rails live is impacted. The proximity to the construction may cause the clapper rails to move further from I-5 into the more dense freshwater marsh habitat. There is also one clapper rail location on the northwestern corner of Batiquitos Lagoon that is close to but not within the temporary and permanent footprints. There are also two pairs of light-footed clapper rails detected in Buena Vista Lagoon. One of the pairs, within the northwestern quadrant of I-5 and SR 78 will be temporarily impacted by all four alternatives (Figure 3-4a-h).

Coastal California gnatcatcher. The California gnatcatcher occurs on most of the fill slopes with coastal sage scrub, and some of the cut slopes within the Study Area. Due to territory sizes and the similarity in the footprints for the different alternatives, a similar number of California gnatcatchers will be impacted by each alternative. Fourteen California gnatcatcher locations have been identified with all or a portion of their territory within the permanent impact footprint of the project. Each of the successively larger footprints will incrementally impact more coastal sage scrub habitat. Two California gnatcatcher locations were identified on the slopes north of Genessee Avenue the status of these birds is undetermined. Four pairs and one dispersing juvenile were identified at San Dieguito Lagoon, and five pairs were identified at San Elijo Lagoon. An additional pair and a single male were identified at Batiquitos Lagoon. One pair of California gnatcatchers at Batiquitos Lagoon will also be temporarily impacted by all four alternatives and another pair at San Dieguito Lagoon will be temporarily impacted by all but the 8+4 with buffer alternative. There are additional California gnatcatchers in several locations adjacent to the project footprint of each alternative; however, it is unlikely that any habitat or their territories will be directly disturbed.

<u>Belding's savannah sparrow</u>. There are Belding's savannah sparrows in San Dieguito, San Elijo, Batiquitos, and Buena Vista Lagoons. Only one individual Belding's savannah sparrow was detected within the permanent impact footprint for all of the alternatives at Batiquitos Lagoon (Figures 3-4a-h). Another pair was identified at Batiquitos that falls within the permanent impact footprint for the 8+4 with barrier and 10+4 with barrier alternatives. The temporary impact area of the 10+4 with buffer alternative will temporarily impact a pair at Batiquitos. Two pairs were within 30.5 m (100 feet) of the temporary impact project footprints at San Elijo Lagoon. . Buena Vista and San Dieguito Lagoons have relatively large populations of Belding's savannah sparrows; however, most were identified several hundred feet from the project footprint.

California least terns, western snowy plovers, and brown pelicans were all identified foraging within the lagoons at certain times of the year. No nesting areas for any of these three species will be directly impacted. However, there are least tern nesting areas relatively close to where construction will be completed at San Dieguito and Batiquitos Lagoons. Construction noise and activities may affect birds nesting at these sites.

Least Bell's vireo and southwestern willow flycatcher were identified within the Study Area; however, no nesting areas will be impacted by this project. Some southern willow scrub habitat that may be used by these species as they migrate through to their nesting grounds will be impacted. Approximately 0.98 to 1.06 ha (2.42 to 2.64 ac) of southern willow scrub and disturbed southern willow scrub will be impacted by the different alignments (Table 4-1). The majority of this habitat is disturbed and in small patches unlikely to be used by these two species.

Rufous-crowned sparrows and least bitterns were observed on or near the fill slopes of I-5 near San Dieguito Lagoon. These areas are within the permanent impact footprint for all four alternatives. Conservation measures discussed in Section 4.11 will minimize impacts to these species.

Many bird species that migrate along the Pacific flyway use the lagoons to stop over and forage. Several of these bird species are considered sensitive at their breeding grounds, but not necessarily along their migration routes. Construction along the I-5 will result in an incremental loss of foraging habitat along the freeways; however, it will not impact these birds nesting grounds.

Mammals

The federally endangered Pacific pocket mouse was not detected during trapping studies completed within appropriate habitat in the Study Area. The habitat quality within the Study Area was of low to medium quality. The most likely areas to support Pacific pocket mice were trapped to identify their presence. No impacts to Pacific pocket mice are anticipated, because the mice were not detected in the Study Area.

The San Diego desert woodrat and northwestern San Diego pocket mouse were both caught during trapping studies conducted for the Pacific Pocket mouse within the Study Area. Both species are State Species of Special Concern. The San Diego desert woodrat was found near San Dieguito Lagoon south of the agricultural fields and east of I-5 in Overlook Park. The northwestern San Diego pocket mouse was found at upland habitat southeast of I-5 and San Dieguito Lagoon, and at all but one of the trapping locations at San Elijo Lagoon (Figure). Two locations of San Diego pocket mouse near San Elijo Lagoon will be impacted by all of the alignments. None of the woodrat locations lie within the project footprint.

Reptiles

The San Diego horned lizard and orange-throated whiptail lizard were observed during field surveys conducted in coastal sage scrub habitat. These species are considered Species of Special Concern by the State of California. Any impacts to coastal sage scrub, southern maritime chaparral, and or maritime succulent scrub have the potential to impact these lizard species as well.

Fish

The steelhead trout was recently reported by CDFG personnel in the San Luis Rey River. Steelhead were also reported historically in the San Dieguito River, however, no recent sightings of steelhead have been reported in San Dieguito, and the dam at Lake Hodges has effectively restricted access to any of the former spawning grounds. Although the mouth of the San Luis Rey River currently limits access to the ocean for steelhead because of the culverts under Pacific Street, there is a planned project to bridge this road over the river and allow for enhanced connection to the ocean. Widening of I-5 over the San Luis Rey River will require widening the existing bridge. It is likely that at least one new column will be placed within the open water of the river. This will impact steelhead trout habitat; however, there will still be a relatively deep open water channel under I-5 after construction is completed. There should be no long term adverse effects to steelhead from construction of this project. Conservation measures are proposed in Section 4.9 to minimize any temporary impacts to steelhead trout during construction.

4.7 Critical Habitat

Designated critical habitat for the tidewater goby, southwestern willow flycatcher, and least Bell's vireo, and proposed critical habitat for the California gnatcatcher all fall within the project footprint of the four alternatives (Figures 3-6a-d). Critical habitat coverages are inclusive of all types of habitats including the existing freeway and other development. None of the least Bell's vireo critical habitat falls within riparian habitat in the project footprint, rather the coverage includes existing SR 76 and some ornamental plantings. The majority of the San Luis Rey River is considered critical habitat for the southwestern willow flycatcher. The four alternatives are the same in this area and permanently impact 1.1 ha (2.8 acres) of southwestern willow flycatcher critical habitat (Figure 3-6a-d). However, much of this critical habitat impact area is a bridge over the San Luis Rey River that will cause some shading, but the habitat will be present. Tidewater goby critical habitat will be impacted in the open water areas of Aqua Hedionda Lagoon, approximately 1.70 ha (4.21 ac) for the 8+4 with buffer, 2.04 ha (5.04 ac) for the 10+4 with buffer, 2.37 ha (5.86 ac) for the 8+4 with barrier, and 2.38 ha (5.87 ac) for the 10+4 with barrier alternative. Coverage for the proposed critical habitat for the California gnatcatcher includes the freeway, the lagoons, and other habitats that do not support primary constituent elements (Figures 3-6a-d). To determine permanent impacts to critical habitat for the California gnatcatcher, only those upland habitats with the primary constituent elements were counted, including approximately 13.0 ha (32.1 acres) for the 8+4 with buffer, 14.6 ha (36.1 ac) for the 10+4 with buffer, 14.8 ha (36.6 ac) for the 8+4 with barrier, and 15.0 ha (37.1 ac) for the 10+4 with barrier alternative.

4.8 Wildlife Corridors

I-5 currently acts as a wildlife barrier to east-west movement. Each of the lagoons, rivers, and creeks and the surrounding upland habitat are potential corridors for wildlife to cross from east to west. Widening the freeway will not necessarily cut off these corridors; however, they may make existing crossings less attractive for use by wildlife. Studies have found that wildlife, especially large mammals, use wildlife crossings/corridors that are wider as the length of travel increases. Most of the existing lagoon bridges have steep, narrow abutments that are used by wildlife. The new bridges at the lagoons are being designed with a bench at the abutment to facilitate wildlife movement as well as use by hikers. Although wildlife avoid people, the wildlife will generally be using the trails under the bridges at night and the hikers will generally be using the trails during the day. Corridors at locations where bridges will not be replaced, San Dieguito and San Luis Rey should not be further constrained due to large areas for movement and minimal increases to bridge width.

4.9 Noise Effects on Wildlife

Increased levels of noise have the potential to affect behavioral and physiological responses in noise sensitive wildlife receptors. Adverse responses to increased noise may include hearing loss or the temporary masking of vocalizations used in communication during the breeding season, nest abandonment, and decreased predator awareness, thereby resulting in a decrease in the reproductive and overall fitness of certain animal species (Fletcher 1980, 1990). Increased noise from roadway traffic has the potential to create a situation of long-term hearing loss in wildlife species, while the periodic, point-source noise impacts typically associated with construction activities would result in short-term effects to wildlife species.

A study of the ambient noise and predicted noise levels after completion of the project was completed for each lagoon (Appendix F). The noise levels for the four alternatives are considered to be similar, so the noise is based on the 10+4 with buffer for future noise levels (Appendix F).

Bird species utilize sound, in the form of a variety of vocalizations (e.g., mating calls, contact notes, etc.), throughout their daily activities and, therefore, are the focus of the potential effects analysis of this study. Bird species associated with the Study Area include the California least tern, western snowy plover, least Bell's vireo, light-footed clapper rail, southwestern willow flycatcher, and Belding's savannah sparrow, all species associated with the wetland/riparian areas within and adjacent to the coastal lagoons along the I-5 corridor. This analysis also addresses potential effects to the coastal California gnatcatcher, an upland bird species, in suitable habitat that occurs between the I-5 corridor and the coastal lagoons.

Construction noise is considered a direct impact to wildlife. Long term increases in noise from the completed project may adversely affect wildlife species and, therefore, could be considered an indirect affect to sensitive wildlife species. The study corridor is already relatively noisy due to the eight lanes of traffic on I-5 and local traffic throughout the corridor. Ambient noise levels in the lagoons vary with distance from the freeway and elevation below the freeway. Fill slopes are not as loud as cut slopes, but traffic noise is still apparent. Ambient noise ranges from as high as 84 dBA (A-weighted decibels) Leq (1-hour average) on the slopes next to the main lanes at San Elijo Lagoon, to the mid 60s in the lagoon. The 60 dBA point is approximately 152.4 m (500 ft) from the freeway.

There is no single standard or threshold for determining significant noise effects on all bird species. Prior studies that have indicated a possible noise effects threshold for certain species of songbirds have not been scientifically shown to be valid for those species addressed in this report. Therefore, the existing ambient noise levels within the Study Area were compared to the predicted noise levels associated with the proposed future vehicle traffic over the five coastal lagoons along the I-5 corridor. No noise thresholds were used to determine the potential for effects of noise on special status bird species.

Existing noise levels and the modeled noise levels along the corridor are shown in Table 4-8. Appendix F describes the location of the measurements, environmental conditions at the time, measurement duration, comments and observations, the measured noise levels, and adjustments to the measured noise levels to normalize them to the loudest hour.

Table 4-8 Modeled and Measured Existing Traffic Noise Levels

Receptor Number	Existing Measured Noise Levels (dBA L_{eq})[1]	Existing Modeled Noise Levels (dBA L_{eq})	Difference
San Dieguito Lagoon			
1	64	64	0
2	61	61	0
3	66	66	0
San Elijo Lagoon			
4	64	64	0
5	67	67	0
6	66	66	0
7	60	60	0
Batiquitos Lagoon			
8	63	64	1
9	62	62	0
10	64	64	1
Agua Hedionda Lagoon			
11	59	59	0
12	61	62	1
13	59	61	2
14	57	59	2
Buena Vista Lagoon			
15	62	63	1
16	61	63	2
17	52	53	1

[1] Noise levels measured outside the loudest hour have been adjusted to reflect the loudest hour. A table of adjustments has been included in Appendix A.

Future Operations

Noise Sources and Noise Levels

Future 2035 noise levels were modeled using the maximum level of service (LOS) C capacity assumptions under the 10+4 lane configuration. No other future conditions were modeled as this condition would represent the typical noisiest anticipated scenario. As shown in Table 4-9, future noise level increases during the noisiest hour, from existing to future build traffic levels, at most receptor points would be 1 to 3 dBA L_{eq}. Two exceptions to this occur at Receptor 10 in Batiquitos Lagoon and Receptor 5 in San Elijo Lagoon. Receptor 10 would increase by 4 dBA L_{eq} due to the loss of a noise shadow resulting from topographic features. Receptor 5 would decrease by 1 dBA L_{eq} due to the widening of I-5, which would increase the width of the freeway creating a noise shadow immediately adjacent to the roadway due to steep topography.

Potential Effects

Potential noise effects associated with the future expansion of the I-5 corridor over the lagoons were determined by calculating the relative noise difference between the predicted future noise and the existing traffic noise contours modeled on field data measurements (Figures 4-1a-e). The potential effects of traffic noise on noise sensitive wildlife receptors are addressed for each lagoon.

It should be noted that under existing conditions, noise in excess of 70 dBA occurs over various amounts of wetland and upland habitats that either support, or have the potential to support, special status bird species at the five coastal lagoons within the Study Area as shown in Figures x through y. Although population numbers have undergone natural fluctuations over the years, these species continue to forage, nest, breed, and otherwise consistently occur within suitable habitat during the breeding season in areas subjected to a wide range of noise levels.

Table 4-9. Modeled Future Traffic Noise Levels

Receptor Number	Existing Noise Levels (dBA L_{eq})	Future Noise Levels (dBA L_{eq})	Difference
San Dieguito Lagoon			
1	64	66	2
2	61	63	2
3	66	68	2
San Elijo Lagoon			
4	64	65	1
5	67	66	-1
6	66	67	1
7	60	61	1
Batiquitos Lagoon			
8	64	66	2
9	62	65	3
10	64	68	4
Agua Hedionda Lagoon			
11	59	62	3
12	62	64	2
13	61	64	3
14	59	61	2
Buena Vista Lagoon			
15	63	64	1
16	63	64	1
17	53	55	2

San Dieguito Lagoon

As shown in Table 4-9, the sampling location at San Dieguito Lagoon with the loudest existing noise level was 66 dBA L_{eq}, with a predicted future noise level at that location of 68 dBA L_{eq}, indicating an anticipated increase of 2 dBA. This 2 dBA increase was predicted at all three noise sampling locations, and the noise modeling predictions indicate that similar increases would occur across the entire open lagoon area, typically ranging between 2 to 3 dBA (Figure 4-1a). Within the Study Area, a majority of the documented locations of the Belding's savannah sparrows east of I-5 (6 of 10) and coastal California gnatcatcher (8 of 11) west of I-5, occur within the existing 66 dBA L_{eq} noise contour. The Belding's savannah sparrow population west of I-5 occurs in between the existing 56 and 62 dBA L_{eq} contour, and is not subject to the relatively higher noise levels on the eastern side, due primarily to the distribution of suitable habitat and naturally sound-attenuating geographic features of the landscape. However, the predicted relative noise increase for these individuals is also approximately 2 dBA.

Although a healthy human ear can barely perceive changes on the order of 3 dBA, it is unclear what level is perceptible to bird species in general, and it is even less clear as to what is discernible to the target species of this study. However, the bird species within the San Dieguito Lagoon are expected to be exposed to an increase of 2 dBA throughout the entire Study Area, but the relative effects are likely to vary, due to the nonlinear scale in which noise is measured. An increase from 66 to 68 dBA L_{eq} requires a relatively greater amount of acoustic energy, than an increase from 56 to 58 dBA L_{eq}. As such, the birds within the future 66 dBA L_{eq} noise contour may be affected to a greater degree than the rest of the populations of these species in the lagoon.

<u>San Elijo Lagoon</u>

Similar to the situation at San Dieguito Lagoon, the proposed future expansion of the I-5 corridor across San Elijo Lagoon would result in a relative increase in traffic-related noise over the entire lagoon of approximately 2 dBA L_{eq} (Figure 4-1b). The increase (and in one case, a decrease) of predicted future noise by 1 dBA for the noise sampling locations shown for San Elijo Lagoon in Table 4-9 is representative of the variables associated with the sampling locations, such as the anticipated noise shielding effect of the future widened portion of I-5 across the lagoon, and does not reflect the overall results of the model for the entire lagoon Study Area.

According to recent survey data provided by the San Elijo Lagoon Conservancy, as well as I-5 sampling, a total of 37 locations of Belding's savannah sparrows occur throughout the extent of San Elijo Lagoon shown in Figure 4-1b, and are dispersed broadly throughout suitable habitat within the lagoon. Only 4 of the 37 Belding's savannah sparrow locations are currently exposed to noise levels of 66 dBA L_{eq}, or greater (i.e., within areas subject to projected future noise levels of 68 dBA L_{eq}, or greater).

Similarly, the known population of light-footed clapper rail within the San Elijo Lagoon is dispersed throughout the suitable patches of habitat across the lagoon. A total of 4 of the 9 clapper rail locations documented within the extent of the lagoon shown in Figure 8 occur within areas currently exposed to noise levels of 66 dBA L_{eq}, or greater (i.e., within areas subject to projected future noise levels of 68 dBA L_{eq}, or greater).

The documented population of the coastal California gnatcatcher within the Study Area consists of 18 locations along the slopes immediately adjacent to the I-5 corridor. The predictive noise model indicates that 17 of the 18 locations occur in areas currently exposed to 66 dBA L_{eq}, or greater (i.e., within areas subject to projected future noise levels of 68 dBA L_{eq}, or greater) (Figure 4-1b). Some of these California gnatcatcher locations will be permanently impacted by construction of I-5.

For similar reasons as those discussed in the analysis of San Dieguito Lagoon, the birds that would be exposed to an increase of 2 dBA (within the 66 dBA L_{eq} contour), may be more likely to be adversely affected than those individuals experiencing a 2 dBA noise increase in relatively quieter portions of the lagoon.

Batiquitos Lagoon

Special status species data are relatively sparse for Batiquitos Lagoon, compared to San Dieguito and San Elijo lagoons. The documented special status species locations for Batiquitos Lagoon are all relatively close to the I-5 corridor and fall within or adjacent to the existing 66 dBA L_{eq} noise contour (Figure 4-1c). Known sensitive species data for the lagoon includes 1 record of the light-footed clapper rail, 2 locations of Belding's savannah sparrow, and 6 locations of the coastal California gnatcatcher. As with the previous lagoon traffic noise analyzed, the future traffic noise is predicted to be 2 dBA higher, in general, across the entire lagoon. However, future noise was predicted to increase by 4 dBA at one sampling location, due to the anticipated loss of a noise shadow associated with the proposed build-out of I-5 across the lagoon.

The least tern nesting area east of I-5 will experience an increase of 2 dBA across the nesting area. The ambient noise at the nesting area ranges from 58 to 64 dBA from the eastern to the western edge. Least terns nesting on the western end of the nesting area may be more likely to be adversely affected than those further east.

Of all the lagoons analyzed for this study, Batiquitos Lagoon was unique in terms of having all known target species distributed within a relatively narrow set of noise contours. As such, there is a potential for adverse effects to occur to all of the special status bird species at their currently known locations within the lagoon.

Agua Hedionda Lagoon

No point location records of any of the special status bird species addressed in this study are known to occur within Agua Hedionda Lagoon. The predictive noise model indicates an increase to the current traffic noise associated with the expansion of I-5, similar to the other lagoons, with a general 2 dBA increase over a majority of Agua Hedionda Lagoon (Figure 4-1d). Portions of the lagoon would see increases ranging from 2 to 3 dBA (Table 4-9). As previously noted, due to the nonlinear nature of the dBA scale, an increase of 3 dBA approximates a doubling of the acoustic energy, regardless of what percent change is represented by the 3 dBA increase. Therefore, of all of the lagoons analyzed, Agua Hedionda Lagoon, the location with the fewest target species, should be exposed to the greatest relative increase in traffic noise.

Buena Vista Lagoon

Once the future widening of I-5 has been constructed, the increase in traffic volume in the vicinity of Buena Vista Lagoon is expected to result in a corresponding rise in traffic noise. Increased traffic noise would result in an increase in approximately 2 dBA across the lagoon (Figure 4-1e). Documented special status bird species within the Study Area of Buena Vista Lagoon includes 4 locations of the light-footed clapper rail (2 within the current 62 dBA L_{eq} noise contour, and 2 within the 56 dBA L_{eq} noise contour), and 8 locations of Belding’s savannah sparrow (all within, or in close proximity to, the 58 dBA L_{eq} noise contour). One of the light-footed clapper rail locations lies within the temporary impact footprint. The majority of the sensitive species are located a relatively long distance from the freeway, so they are less likely to be adversely affected by the 2 dBA L_{eq} increase in noise.

Other sensitive species whose habitat occurs within the lagoon habitat potentially affected by the increased traffic noise include the western snowy plover, and California least tern, that have the potential to forage over the open water of the lagoon and have been documented in the vicinity of the lagoon. However, it is not expected that these species would nest within the lagoon Study Area.

4.10 Invasive Species

There are already a number of aggressive invasive species both on the slopes of I-5 and in the wetland habitats. Construction of any of the build alternatives presents the opportunity for these exotic species to spread. The disturbance of ground during construction provides new ground for weeds to germinate. If minimization measures listed below are implemented and partnerships are formed with people working outside of the construction area, the growth of invasive species may be reduced. The no build alternative will not disturb any new ground; however, existing invasive species problems will likely become worse through time as species spread.

The construction of any of the build alternatives provides an opportunity to control some of the invasive species on the slopes of the project. Through careful handling of the soil and equipment that works the soil, the invasive plants currently within the impact area can be removed. Revegetation of the slopes will require maintenance to keep the weed species from reinvading the new slopes. Partnerships will be required with the lagoon foundations and land owners to simultaneously work to eradicate similar invasive species outside of the impact areas.

There are several invasive weed species already growing within the right of way along I-5. Special care will be taken when transporting, use and disposing of soils with invasive weed seeds. All heavy equipment will be washed and cleaned of debris prior to entering a lagoon area, to minimize spread of invasive weeds.

4.11 Cumulative Impacts

The proposed project is located along the I-5 coastal corridor, which includes a variety of sensitive resources including coastal lagoons, maritime upland habitats, coastal sage scrub, and several endangered species. The corridor is highly developed with the coastal cities of San Diego, Del Mar, Solana Beach, Encinitas, Carlsbad, and Oceanside. Development west of I-5 is essentially built to capacity with redevelopment projects as the standard practice. East of I-5 development continues rapidly with development adjacent to I-5 nearing capacity, and increasing further inland. The areas around the lagoons, and Peñasquitos Canyon in the south and Camp Pendleton to the north are the main areas of open space left in the corridor. The natural community resource study area (RSA) is considered coastal San Diego County between El Camino Real and the Pacific Ocean.

Development over time throughout the coastal region has reduced the amount of native habitat and species in the region. This development has also limited the ability to expand habitat around the lagoons and large open space areas. However, there is currently a large effort to restore salt marsh habitat around San Dieguito Lagoon, and there are plans to restore San Elijo and Buena Vista Lagoons.

The regional decline in native habitats and the plant and wildlife species they support has resulted in County-wide conservation efforts. The San Diego MSCP was developed as a regional plan to provide for the long-term preservation of sensitive plant and animal species and natural vegetation within the metropolitan water district of San Diego, while allowing for continued economic development within the region. Subsequently, the Multiple Habitat Conservation Program (MHCP) and the north county MSCP have been developed for portions of San Diego County that were not covered under the San Diego MSCP.

Past development along the I-5 corridor has impacted all of the watersheds and lagoons in San Diego County. Construction of the railroad and Pacific Coast Highway resulted in causeways across the coastal lagoons limiting tidal influences and forcing flows through one area in the late 1800s and early 1900s. The original construction of I-5 in the 1960s further impacted the wetlands of the lagoons and constrained the hydraulics with placement of fill and bridges over the lagoons east of the railroad bridges. Some of the planned restoration projects for San Elijo and Buena Vista Lagoons plan to reduce tidal muting and enhance flows and wetland habitats in the lagoons.

Widening of I-5 will permanently impact up to 13.10 ha (32.35 acres) of wetland habitats and several sensitive species associated with that habitat. This project will also impact up to 33.7 ha (83.2 acres) of sensitive upland habitats and associated species.

There are two large foreseeable future projects within the corridor that include the Los Angeles to San Diego (LOSSAN) double tracking of the railroad, and building the missing connector ramps at I-5 and SR 78 near Buena Vista Lagoon. Both of these projects have the potential to incrementally impact additional wetland habitats and sensitive species. The I-5/SR 78 interchange project intends to build structures over the wetland habitat at Buena Vista Lagoon; however, wetlands will still be impacted by bridge columns. There have been discussions concerning using the LOSSAN project to build longer railroad bridges and remove some of the fill within these coastal lagoons. There is a programmatic environmental document for the LOSSAN project; however, there is no design information for either project to determine levels of impact.

The I-5 North Coast Corridor project will have an incremental contribution of up to 13.1 ha (32.35 acres) of wetland loss and 33.7 ha (83.2 acres) of sensitive upland loss. The project will also impact territories of the California gnatcatcher, light-footed clapper rail, and Belding's savannah sparrow within the already constrained habitats in the corridor. The incremental impacts to each individual watershed are small; however, over the entire project the impacts would result in a cumulatively considerable contribution to the corridors natural communities and sensitive species prior to mitigation. Mitigation measures are discussed below.

4.12 Mitigation

Avoidance and Minimization Measures

Locations of the endangered Del Mar manzanita have been identified and avoided to the maximum extent practicable. Some of the Del Mar manzanita individuals are growing immediately adjacent to brow ditches that will require reconstruction for proper slope drainage and in those areas the plants could not be avoided. There may be opportunities to avoid impacting some of the sensitive plants during final project design and when determining temporary construction access.

Permanent impacts to CSS have been minimized where possible along the right of way by construction of retaining walls and minimizing the grading behind the walls. There may be temporary impacts due to construction access in these areas; however, the CSS will be restored when construction is completed.

Since I-5 already crosses six coastal lagoons, wetland impacts could not be completely avoided. Several design alternatives were examined to minimize fill placed in the lagoons, including using retaining walls and steeper fills than 2:1. However, due to liquefaction of soils in the lagoons and the need for very deep footings, retaining walls were impractical. The sandy soils within the vicinity of the lagoons would not support steeper fill slopes. Although impacts to the lagoons cannot be avoided, there are ongoing studies of the hydrology in the lagoons and methods to enhance water flow under the bridges that will be used during the bridge design. In addition, Caltrans is working currently with the groups planning restoration of San Elijo Lagoon and Buena Vista Lagoon to incorporate the needs of that restoration into our bridge design. This could result in longer bridges over these lagoons; however, these studies are not yet completed. Therefore, the current bridge lengths and worse case impacts are examined in this document.

Conservation Measures

The following are proposed measures to minimize impacts to sensitive habitats and species during construction.

All habitats outside the permanent and temporary construction limits shall be designated as Environmentally Sensitive Areas (ESAs) on project maps. ESAs shall be temporarily fenced during construction with orange plastic snow fence. No access will be allowed within the ESAs.

All native vegetation and nonnative shrubs and trees within the impact areas will be removed outside of the breeding season (Februrary 15 to August 31) to avoid impacts to any nesting birds, if possible. Otherwise, a qualified biologist will thoroughly survey all vegetation prior to removal to ensure there are no nesting birds onsite. If nesting birds are identified onsite, vegetation removal will be delayed until the chicks have fledged or the nest has failed.

All pile driving near the lagoons will be completed outside the bird breeding season (February 15-August 31) to minimize construction noise impacts to bird species around the lagoons.

Construction will not occur in more than two lagoons at any one time to minimize impacts to birds migrating along the Pacific flyway.

All debris from the replacement of old bridges or construction of new bridges will be contained, so that it does not fall into rivers and lagoons.

There are several invasive weed species already growing within the right of way along I-5. Special care will be taken when transporting, use and disposing of soils with invasive weed seeds. All heavy equipment will be washed and cleaned of debris prior to entering a lagoon area, to minimize spread of invasive weeds.

A channel large enough for fish passage will be kept open throughout construction within the San Luis Rey River and all of the lagoons.

A qualified biologist will be made available for both the pre-construction and construction phases to review grading plans, address protection of sensitive biological resources, and monitor ongoing work. The biologist shall be familiar with the habitats, plants, and wildlife of the Project area, and maintain communications with the resident engineer, to ensure that issues relating to biological resources are appropriately and lawfully managed.

Detention basins will be placed in many of the loop ramps, and bioswales will be placed on many of the slopes to treat runoff from the freeway.

Appropriate best management practices (BMPs) will be used to control erosion and sedimentation. No sediment or debris will be allowed to enter the creeks, rivers, or lagoons.

Exclusion devices will be installed on bridge drain holes and ledges during the non-breeding season (September 1 through February 15) to stop swallows, swifts, and any other birds from nesting on or within bridges to be demolished.

Cut slopes will be revegetated with native upland habitats with similar composition to those within the Study Area. Fill slopes and areas adjacent to wetlands and drainages will be revegetated with appropriate native upland and wetland non-invasive species. The revegetated areas will have temporary irrigation and be planted with native container plants and seeds selected by the biologist. There will be at least three years of plant establishment/ maintenance on these slopes to control invasive weeds. Bioswales and detention basins will be planted with appropriate native species as determined by the biologist and storm water personnel. Slopes adjacent to developed urban areas will be vegetated with native and drought tolerant non-invasive species selected by the biologist and landscape architect. Interchanges located in urban areas will be landscaped with native or ornamental non-invasive species.

Duff from areas with CSS, maritime succulent scrub, and maritime chaparral will be saved to aid in revegetating slopes will native habitats.

All temporary impact areas will be revegetated and restored to pre-existing conditions.

Fueling of construction equipment shall only occur at a designated area at a distance greater than 30 meters (98.4 ft) from drainages/lagoons, and associated plant communities to preclude adverse water quality impacts. Fuel cans and fueling of tools will take place outside the drainages.

Lighting used at night for construction will be shielded away from ESAs.

Dust generated by proposed operations will be controlled with BMPs.

Compensatory Mitigation Measures

Due to the length of the project, the sensitive habitats it transverses, and the sensitive species that live along the corridor, there are extensive impacts that could not be avoided. Compensatory mitigation measures will be used to mitigate for the unavoidable impacts. Possible mitigation ratios and compensatory mitigation have not been agreed upon by the resource agencies at this time. However, the following identifies potential mitigation that has been identified to offset impacts associated with the I-5 North Coast Project.

Opportunities for compensatory mitigation have been reviewed in all the watersheds along the I-5 corridor. To the extent practicable, some compensatory mitigation will be completed in each watershed; however, there may be more opportunities in some watersheds versus those where extensive restoration projects have already taken place. Coastal sage scrub occupied by California gnatcatcher will be a priority for acquisition and restoration of coastal lagoon habitats is a focus for wetland mitigation.

Regionally significant mitigation in the I-5 corridor has been discussed with the resource agencies. Large restoration projects have already been completed at Batiquitos and Agua Hedionda Lagoons and a large project is currently underway in San Dieguito Lagoon. San Elijo and Buena Vista Lagoons are the two lagoons within the project limits where large scale restoration plans are underway. Caltrans has been working with the Cities and resource agencies to help move these restoration projects forward by assisting in the planning and helping to fund some of the technical studies. Caltrans has discussed a plant with the USFWS that would put together a package to implement the restoration of San Elijo Lagoon, Buena Vista Lagoon, and also restore USFWS refuge lands at the salt works in San Diego Bay to mitigate for transportation projects along the coastal corridor.

In addition to the regionally significant lagoon mitigation Caltrans is funding a study to optimize the I-5 bridges for water exchange on either side of I-5. A team of scientists has been put together to examine all aspects of lagoon tidal and freshwater hydrology and propose bridge designs that would minimize tidal muting east of I-5 and lead to the possible enhancement of the existing wetlands. The objective of the study is to formulate and evaluate hydraulically more efficient bridge design concepts that maximize wetland habitat. By reducing tidal muting with new hydrodynamic optimized I-5 waterway designs, increased tidal inundation can be achieved in the wetlands east of I-5, resulting in an increase in inter-tidal wetland habitat. This study is in its beginning stages; however, the result could enhance wetland habitat and water quality within the lagoons, especially east of I-5.

Proposed mitigation within each of the watersheds is discussed below.

<u>Los Peñasquitos Lagoon</u>. Impacts to the lagoon are minimal and construction of a new bridge at Sorrento Valley Road, in place of the culvert by the interchange of I-5 and SR 56 should enhance flows through the lagoon and facilitate wildlife crossing under the I-5. There are impacts to this watershed from the expansion of I-5 just north of Genesee Avenue and for the bridge over Penasquitos Creek by the merge with I-805. Caltrans is still looking for mitigation opportunities within this watershed.

San Dieguito Lagoon. Southern California Edison (SCE) started a large restoration project in San Dieguito Lagoon in 2006. They are creating approximately 60.8 ha (150 ac) of tidal wetlands to mitigate for offshore impacts resulting from the warm water outfall at the San Onofre Nuclear Generating System (SONGS).

Caltrans in cooperation with the San Dieguito River Valley Joint Powers Authority is proposing to implement creation of approximately 17 ha (42 ac) of coastal salt marsh adjacent to the SCE restoration project in San Dieguito Lagoon. In addition to the 17 ha (42 ac) of coastal salt marsh created, approximately 7 ha (17.2 ac) of upland habitat would be created along the berms around the wetland and in a native grassland floodplain area adjacent to the wetland. Approximately 1.1 ha (2.73 ac) of the created coastal salt marsh habitat would be used by the JPA for mitigating impacts from their trail system and treatment wetlands. The remainder of the created coastal salt marsh and upland habitat would be used as mitigation for the I-5 North Coast Corridor Project. The proposed plan has already been reviewed and found to be hydraulically compatible with the larger restoration project in San Dieguito Lagoon.

Caltrans, the City of Del Mar, and the San Dieguito River Valley Land Conservancy (SDRVLC) either own or are buying several small parcels of land along Racetrack View Drive and the San Dieguito River. These parcels currently on fill vegetated with ice plant with salt marsh habitat at the rivers edge. Caltrans is working to partner with the City of Del Mar and the utility company to move the utilities off of this habitat. This would be a major undertaking. Caltrans would then create saltmarsh habitat on the approximately 2.0 acres of fill habitat. The property would be turned over to the SDRVLC for management in perpetuity.

In addition, Caltrans has purchased approximately 23.1 acres of former tomato fields immediately east of I-5 and south of San Dieguito Lagoon. The area is currently vegetated with weedy species and some coyote brush. Approximately 5 acres of this parcel is proposed for a detention basin or water quality treatment area and the remaining 18.1 acres would be used to create southern maritime chaparral and coastal sage scrub.

San Elijo Lagoon. San Elijo Lagoon is one of the last lagoons within northern San Diego County that has not yet had a major restoration project. Currently, the City of Encinitas, ACOE, USFWS, CDFG, County of San Diego, and the San Elijo Lagoon Conservancy are working to complete a draft Environmental Impact Report for restoration of the lagoon. This includes restoration of the hydrological regime and the marsh habitat that is being converted from mudflats and low marsh to middle and high marsh. Caltrans has participated with the City of Encinitas and the ACOE to determine what is the optimal bridge opening at I-5. Therefore, the I-5 bridge over San Elijo Lagoon will likely be lengthened, which will create some wetland habitat.

Caltrans is also considering out of kind mitigation, such as building a new inlet on Pacific Coast Highway 101, south of restaurant row in Cardiff. This is a large construction project that could ultimately facilitate the restoration of many acres of marsh and help to ensure its continued functioning. Although this would not create a large quantity of wetlands, the restoration project would help enhance all lagoon functions and decrease tidal muting effects. Caltrans has already funded hydraulic studies to facilitate the development of the restoration documents. This large regional restoration project would greatly enhance coastal lagoon habitat, in particular mud flats, which are relatively rare within the region. Without the restoration project the lagoon will continue to fill in from sedimentation and wetland habitat will be lost.

In addition, upland slopes around the proposed DAR at Manchester will be planted with CSS to mitigate for upland impacts.

Cottonwood Creek. There is a small creek that flows intermittently above and below ground through Encinitas between San Elijo and Batiquitos Lagoons. Cottonwood Creek Park was recently created west of I-5, restoring the creek to an aboveground channel between I-5 and the ocean. Moonlight Creek is a small tributary that primarily carries urban runoff from both sides of the freeway parallel to I-5 and immediately west of I-5 where it enters Cottonwood Creek at the park. There is some riparian habitat along this drainage, but the habitat is also disturbed with giant reed, pepper trees, nasturtium (*Tropaeolum majus*), ice plant, and eucalyptus trees. This creek could be restored, as could the slopes which are a mixture of disturbed CSS and ornamental plants. Restoration of this area with a walking trail along the sewer easement has been identified in the Draft North Coast Community Enhancement Plan by Caltrans landscape architecture and by the City of Encinitas as a preferred option. Approximately 3.5 acres of riparian habitat and 5.0 acres of CSS could be restored in this area.

Batiquitos Lagoon. A large restoration project was completed in Batiquitos Lagoon in the 1990s by the Port of Los Angeles to mitigate for impacts at the port. Maintenance dredging and monitoring of created least tern nesting sites were part of the restoration. No large scale mitigation opportunities have been identified at this lagoon, but several parcels for preservation of upland CSS have been identified, and some small parcels along the edge of the lagoon have been identified for purchase and preservation as permanent open space. The regional mitigation opportunities at San Elijo and Buena Vista would contribute to losses in this system, in addition to the modified bridge design which could enhance water quality and possibly create more intertidal habitat.

Encina Creek. Encina Creek is a small constricted creek with no lagoon at the outfall to the ocean. The creek flows through culverts under I-5 and through the Encina Sewer Treatment Plant west of I-5. Immediately east of I-5 the creek is heavily disturbed with invasive plant species, trash, and poor water quality. Upstream of I-5 a few mitigation projects have been completed already. There may be additional opportunities to remove exotic species and restore habitat throughout Encina Creek.

Agua Hedionda Lagoon. A large dredging project was completed in 1998/1999 that created an average depth of 2.4 to 3.4 m (8 to 11 feet), and extensive eelgrass planting was completed in the dredged areas. This lagoon is primarily a deep water lagoon with little fringing wetland habitat.

Agua Hedionda was the location of a large project to eradicate *Caulerpa* toxic algae that was first discovered in 2002. It was thought to be eradicated by 2006, but monitoring continues.

Caltrans is has identified two areas for purchase that were proposed for development on the eastern side of the lagoon. These properties are a combination of disturbed coastal sage scrub, salt marsh, and disturbed habitat along the northern shore of the eastern basin. Approximately 21.1 acres of habitat has been identified for acquisition. Mitigation on this site would be a combination of creation of some salt marsh and coastal sage scrub habitat and preservation of the remaining habitat. Some of the coastal sage scrub habitat is currently occupied by the threatened coastal California gnatcatcher.

<u>Buena Vista Lagoon</u>. The Buena Vista Lagoon Foundation and Technical Advisory Committee (BVTAC) have proposed options to either keep the lagoon all freshwater, to have a mix of salt and freshwater habitat, or open up tidal flushing to convert Buena Vista Lagoon to all saltwater. Currently the BVTAC is pursuing the proposal to convert Buena Vista Lagoon to all saltwater habitat. This will require modifying the inlet from the ocean, a modified bridge at I-5 and other restoration. To accomplish any restoration requires the potential purchase of a number of privately held parcels within and on the perimeter of the lagoon. Caltrans is currently working with the CDFG and the BVTAC to identify these parcels and is looking into purchasing them. This mitigation would help the overall health of the lagoons and coastal systems without large acres of creation.

Caltrans has been meeting with the owners of a 3.9 acre parcel in the western basin, west of highway 1 where a resort has been proposed. The existing parcel is primarily disturbed habitat and some wetland that can be restored. Purchase of this parcel would be key to limiting additional development adjacent to the lagoon.

<u>Loma Alta Creek</u>. Loma Alta Creek is a very disturbed constricted creek that flows parallel to Oceanside Boulevard in a developed portion of Oceanside. West of I-5 the creek is channelized where it flows through a trailer park to an industrial area prior to reaching the ocean through a highly constricted culvert. The portion through the trailer park is within concrete channel with little area for restoration. However, west of the trailer park the creek is in an earthen channel surrounded by industrial businesses. There may be an opportunity in this portion of the creek to greatly enhance the wetland habitat and water quality before the water empties into the Pacific Ocean.

<u>San Luis Rey River</u>. The San Luis Rey River near I-5 is a large open water channel with primarily freshwater marsh and arundo scrub along the banks. Two projects proposed for the area, Coast Highway Seismic Retrofit and the new Pacific Street Bridge have already proposed restoration of the wetlands along the banks of the river through exotic removal and revegetation with natives. Mitigation for impacts at the San Luis Rey River will be completed by debiting credits from the Pilgrim Creek Mitigation Bank.

Compensatory mitigation for upland habitats will likely encompass a mixture of creation of new CSS habitat and purchase of parcels of high quality habitat near the lagoons for preservation. Several parcels have been identified around the lagoons for potential purchase for upland mitigation. All of the mitigation ratios, and potential options will continue to be discussed with the resource agencies to determine the most appropriate selection of options to mitigate impacts from this project.

Figure 4-1a
Noise Measurement Locations and Noise Contours
San Dieguito Lagoon

Path: P:\2006\06080071 I-5 No Coast Existing Conditions Noise Rpt\5GIS\Mxd\DRAFTReivew\20060914\San Dieguito_noise.mxd, 09/19/06, AugelloP

Source: AirPhotoUSA 2006, EDAW survey 2006, San Elijo Lagoon Conservancy, 2002

Figure 4-1b
Noise Measurement Locations and Noise Contours
San Elijo Lagoon

Path: P:\2006\06080071 I-5 No Coast Existing Conditions Noise Rpt\5GIS\Mxd\DRAFTReivew\20060914\SE_noise.mxd, 09/19/06, AugelloP

Figure 4-1c
Noise Measurement Locations and Noise Contours
Batiquitos Lagoon

Path: P:\2006\06080071 I-5 No Coast Existing Conditions Noise Rpt\5GIS\Mxd\DRAFTReivew\20060914\Batiquitos_noise.mxd, 09/19/06, AugelloP

Source: AirPhotoUSA 2006, EDAW survey 2006

N S W E

600 300 0 600 Feet

Scale: 1:7,200; 1 inch = 600 feet

Figure 4-1d
Noise Measurement Locations and Noise Contours
Agua Hedionda Lagoon

Path: P:\2006\06080071 I-5 No Coast Existing Conditions Noise Rpt\5GIS\Mxd\DRAFTReivew\20060914\AH_noise.mxd, 09/19/06, AugelloP

Source: AirPhotoUSA 2006, EDAW survey 2006

N
W
E
S

600 300 0 600 Feet

Scale: 1:7,200; 1 inch = 600 feet

Figure 4-1e
Noise Measurement Locations and Noise Contours
Buena Vista Lagoon

Chapter 5. Results: Permits and Technical Studies for Special Laws or Conditions

The NEPA /404 MOA was initiated for this project in November 2003 due to the amount of wetland and other sensitive resource impacts associated with this project. As part of this process the federal resources agencies, ACOE, NMFS, USFWS, USEPA, and FHWA have been involved from the start reviewing and approving the purpose and need, alternative selection, and potential mitigation options. Bimonthly meetings have been held with all the federal agencies as well as the state regulatory agencies, CDFG, CCC, and the RWQCB. All agencies were regularly appraised of the project progress.

5.1 Regulatory Requirements

Federal

Endangered Species Act of 1973 (16 U.S.C. 15-31-1544, as amended). Provides for the conservation of ecosystems upon which threatened and endangered species of fish, wildlife, and plants depend, both through Federal action and by encouraging the establishment of State programs.

Executive Order 11990, Protection of Wetlands, May 24, 1977. This order directs Federal agencies to avoid short and long-term adverse impacts associated with the destruction or modification of wetlands whenever there is a practicable alternative.

Executive Order, Invasive Species, February 3, 1999. Directs Federal agencies to expand and coordinate their efforts to combat the introduction and spread of plants and animals not native to the United States.

Federal Water Pollution Control Act ("Clean Water Act") (33 U.S.C. 1251-1376, as amended). Section 404 of the CWA authorized the U.S. Army Corps of Engineers to issue permits for the discharge of dredged or fill material into navigable waters and Waters of the United States.

Migratory Bird Treaty Act of 1918 (MBTA) (16 U.S.C. 703-712, as amended). Established a Federal prohibition, unless permitted by regulations, to pursue, hunt, take, capture, kill, attempt to take, capture or kill, possess any migratory bird, or any part, nest, or egg of any such bird.

National Environmental Policy Act of 1969 (NEPA) (42 U.S.C. 4321-4347, as amended). NEPA requires that all Federal agencies prepare detailed environmental impact statements for every recommendation or report on proposals for legislation and other major Federal actions significantly affecting the quality of the human environment.

Essential Fish Habitat (EFH) Coordination. (50 CFR 600.905-930) under the Magnuson-Stevens Fisheries Conservation and Management Act. This act mandates that Federal agencies must consult with the Secretary of Commerce on all activities or proposed activities that may adversely affect EFH.

State

California Environmental Quality Act (CEQA). This act establishes State policy to prevent significant, avoidable damage to the environment by requiring project changes by the use of alternatives or mitigation measures.

California Endangered Species Act (Fish and Game Code §2050 et seq.). CESA mandates that State agencies should not approve projects which would jeopardize the continued existence of threatened or endangered species if reasonable and prudent alternatives are available that would avoid jeopardy.

Fish and Game Code §1600. This section requires State agencies to notify the Department of Fish and Game prior to any project that would divert, obstruct, or change the natural flow or bed, channel or bank of any river, stream or lake.

Native Plant Protection Act (Fish and Game Code §§1900-1913). This act requires State agencies to use their authorities to carry out programs to conserve endangered and rare native plants.

California Coastal Act. This act requires protection of coastal resources through permit approval for development within the coastal zone.

5.2 Agency Consultation Summary

The NEPA 404 federal agency coordination process was initiated in 2003. This process calls for early coordination with federal agencies on larger projects that will impact over five acres of wetlands. In addition to the federal agencies, state resource agencies including the CDFG, RWQCB, and CCC were invited to these meetings to get their input on the purpose and need, alternatives selection, and to keep all of the agencies apprised of the project features. Some preliminary information on the resources within the corridor, potential impacts, and project features have been sent to the various agencies throughout the process.

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Appendix A

Species List, Fish and Wildlife Service 2007

Listed Endangered, Threatened and Proposed Species
that may occur in the vicinity of Interstate 5
in San Diego County, California

Common Name	Scientific Name	Status
BIRDS		
western snowy plover	*Charadrius alexandrinus nivosus*	T, CH
southwestern willow flycatcher	*Empidonax traillii extimus*	E, CH
brown pelican	*Pelecanus occidentalis*	E
coastal California gnatcatcher	*Polioptila californica californica*	T*, CH
light-footed clapper rail	*Rallus longirostris levipes*	E
California least tern	*Sternula (Sterna) antillarum browni*	E
least Bell's vireo	*Vireo bellii pusillus*	E, CH
FISH		
tidewater goby	*Eucyclogobius newberryi*	E, CH
CRUSTACEANS		
San Diego fairy shrimp	*Branchinecta sandiegonensis*	E, pCH
Riverside fairy shrimp	*Streptocephalus woottoni*	E, CH
PLANTS		
San Diego thornmint	*Acanthomintha ilicifolia*	T, pCH
San Diego ambrosia	*Ambrosia pumila*	E
Del Mar manzanita	*Arctostaphylos glandulosa* ssp. *crassifolia*	E
coastal dunes milk-*vetch*	*Astragalus tener* var. *titi*	E
Encinitas baccharis	*Baccharis vanessae*	T
thread-leaved brodiaea	*Brodiaea filifolia*	T, CH
Orcutt's spineflower	*Chorizanthe orcuttiana*	E
San Diego button-celery	*Eryngium aristulatum* var. *parishii*	E
Orcutt's hazardia	*Hazardia orcuttii*	C
willowy monardella	*Monardella linoides* ssp. *viminea*	E, CH
spreading navarretia	*Navarretia fossalis*	T, CH
California Orcutt grass	*Orcuttia californica*	E
San Diego mesa mint	*Pogogyne abramsii*	E

T=Threatened
T*=Proposed DPS
E=Endangered
pCH=Proposed Critical Habitat
C=Federal candidate species
CH=Critical Habitat

Appendix B

I-5 Widening Project Pacific Pocket Mouse Habitat Analysis and Trapping Program San Diego County, California (URS 2003)

FOCUSED BIOLOGICAL STUDY

INTERSTATE 5 WIDENING PROJECT
PACIFIC POCKET MOUSE HABITAT
ANALYSIS AND TRAPPING PROGRAM
SAN DIEGO COUNTY, CALIFORNIA

PREPARED FOR

CALTRANS

URS PROJECT NO. 26814226.00030

JUNE 30, 2003

FOCUSED BIOLOGICAL STUDY

INTERSTATE 5 WIDENING PROJECT BETWEEN OCEANSIDE BOULEVARD AND DEL MAR HEIGHTS BOULEVARD PACIFIC POCKET MOUSE HABITAT ANALYSIS AND TRAPPING PROGRAM SAN DIEGO COUNTY, CALIFORNIA

Prepared for

Caltrans District 11 Environmental Division
Department of Transportation
District 11, MS-46
P.O. Box 85406
San Diego, CA 92186-5406

URS Project No. 26814226.03000

Richard Dean Friesen, Ph. D
Senior Biologist

June 30, 2003

URS

1615 Murray Canyon Road, Suite 1000
San Diego, CA 92108-4314
619.294.9400 Fax: 619.293.7920

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ac	acres
ACOE	U.S. Army Corps of Engineers
CDFG	California Department of Fish and Game
Caltrans	California Department of Transportation
CSS	Coastal Sage Scrub Vegetation
ft	foot/feet
g	gram(s)
F	Fahrenheit
GPSC	global positioning system coordinate
ha	hectare(s)
km	kilometer(s)
KP	kilometer post
m	meter(s)
mi	mile(s)
oz	ounce(s)
PM	post mile
PPM	Pacific Pocket Mouse
ROW	right(s)-of-way
USDA	U.S. Department of Agriculture
USGS	U.S. Geological Survey
USFWS	U.S. Fish and Wildlife Service

This technical report summarizes the purpose, methods, and results of a focused habitat analysis and trapping program, conducted April to June 2003, for the federally endangered and State Species of Special Concern Pacific Pocket Mouse (PPM) (*Perognathus longimembris pacificus*) where it potentially occurs within the construction and buffer zones associated with the proposed Interstate 5 Widening Project (Project) between Del Mar Heights Road on the south end of the study area (KP 557.00) and Vandegrift Drive on the north end (KP 888.00), San Diego County, California, a distance of about 33 km (20.5 miles).

The trapping program was conducted under U.S Fish and Wildlife Service Take Permit No. PRT-775869, and a Memorandum of Understanding between the California Department of Fish and Game and URS Corporation. The protocol for trapping PPM specified in the permit requires a minimum of five nights of trapping, with trap lines placed in the areas judged to have the highest probability of capturing the PPM, if it is present in the biological study area. Accordingly, the habitat analysis was based on examination at open areas (undeveloped) with soils, vegetation, and physiognomy judged to be most similar to heteromyid suitable habitat, in general, and PPM habitat, in particular.

Five areas with the apparent highest probability of supporting populations of the PPM were trapped within the BSA, although the likelihood of the PPM being present at these sites was judged to be low.

No PPM was captured during the trapping program. In total, 339 rodents were captured, including eight species. Five traplines were set with 1,200 trap nights completed. The San Diego Pocket Mouse (*Chaetodipus fallax*), and "Bailey's" Pocket Mouse (*Chaetodipus* cf. *baileyi*) were captured in all traplines, except one (Trapline 2), which corroborates that the traplines were set in habitat physiognomically suitable for heteromyids. The absence of PPM captures on the traplines indicate that the animals (a) may never have been present, (b) may have been present but eliminated due to changes in their habitat from previous disturbances, (c) may not trappable due to their small size (6-11g), or (d) to behavioral factos. Because other pocket mice were trapped, and because individuals of the House Mouse (*Mus musculus*) and very young and small (7g) individuals of the Cactus Mouse (*Peromyscus eremicus*) were captured, we are confident that the PPM is not present in the areas trapped. The triggers on our traps have been modified to be especially sensitive for capturing animals as small as 5 g. Further, we believe that the PPM is absent within the BSA in the areas between the traplines documented in this report.

Additional traplines during subsequent fiscal years will be necessary to assess the remaining potential habitats patches identified during the initial phase of this study.

This report summarizes purpose, methods, and results of a focused habitat analysis and trapping program, conducted February to June 2003, for the federally endangered and State Species of Special Concern Pacific Pocket Mouse (PPM) (*Perognathus longimembris pacificus*) that potentially occurs within the construction and buffer zones associated with the proposed Interstate 5 Widening Project between Vandegrift Boulevard and Del Mar Heights Road, San Diego County, California, a distance of about 33 km (20.5 mi). The PPM is restricted to sandy substrates within open Coastal Sage Scrub and Non-native Grassland/Herbland habitats.

1.1 PROJECT DESCRIPTION

The Caltrans I-5 Widening Project is planned between Vandegrift Boulevard in Oceanside, at the south entrance of Camp Pendleton, and Del Mar Heights Road, within San Diego City limits (Figure 1). For purposes of the habitat analysis and trapping program in this report, the biological study area (BSA) consists of a 152 m (500 ft) buffer on each side of the existing freeway centerline. This study area incorporates the existing Caltrans right-of-way (ROW), which has a variable width along the roadway (depending upon slope primarily), and additional land outside the ROW, up to 152 m (500 ft) from the centerline. The land uses of the study area vary from natural open space, to commercial and residential developments, to agriculture, to industrial structures, to waste treatment plants, and to open brackish lagoons and mud flats.

Construction activities to build the additional lanes will be confined within the 152 m (500 ft) buffer zone, existing ROW, and, in some places, a minimally expanded ROW. The footprint of the lane being added on each side of the roadway will serve as the construction haul road.

1.2 PPM STUDIES REQUIRED ON WIDENING PROJECT

The PPM is a very small (about 5 to 10 g/0.2 to 0.35 oz) heteromyid rodent that historically inhabited sand dunes, sandy slopes, and sandy washes within 4 k (2.4 mi) of the Pacific Ocean between Marina Del Rey in Los Angeles County and the Mexican Border in San Diego County. Current populations are apparently restricted to sandy open areas within Coastal Sage Scrub vegetation. It has not been reported above 180 m (600 ft) elevation. It has been reported as patchily distributed along the coast, generally not abundantly where found, but sometimes abundantly in sandy bottoms (Bailey 1939).

Due apparently to development pressures on ocean front habitat in Southern California, many of the historic dunes and slopes associated with the coastal strand and large lagoons and washes near the ocean were converted to urban uses, and populations of the PPM were reduced to low levels, or eliminated, in most of these places. By 1972, the species' populations apparently had been eliminated from the known historic collection localities. After not being observed by mammalogists for several decades, a population of the PPM was rediscovered in 1993 at Dana Point Headlands in Coastal Sage Scrub (CSS) habitat. In 1995, two additional populations were discovered in CSS Non-native grassland habitat on Camp Pendleton. The first of these, the San Mateo Creek population, was located during environmental assessments of proposed alternative routes for the Foothill Transportation Corridor. The second population is located in CSS vegetation on the Oscar-1 Range on Camp Pendleton, north of the Santa Margarita River. Both of these populations are found within

SOURCE: AirPhoto USA (March 2002 Aerial).

BIOLOGICAL STUDY AREA

I-5 WIDENING PACIFIC POCKET MOUSE TRAPPING PROJECT

URS

6250 0 6250 12500 Feet

SCALE: 1" = 12,500' (1:150000)

CHECKED BY: RF	DATE: 6-27-03	FIG. NO:
PM: PM	PROJ. NO: 26814226.00030	1

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2.1 km (1.3 mi) of the coast in blocks of CSS habitats through which Interstate 5 was originally constructed and now passes.

In general, blocks of relatively undisturbed CSS habitat persist on Camp Pendleton because of the military policy to conserve native habitats that provide realistic training of personnel in natural terrain. South of Camp Pendleton, in the area covered by this study, urban development has displaced most large blocks of CSS habitat. Thus, the largest remaining patches of CSS within the BSA are found in relatively small patches on undeveloped (many undevelopable) slopes and around the edges of the five lagoons bisected by Interstate 5.

Some vegetation associations found in the BSA are native to the Southern California area (Holland 1983), while others are present due to past human disturbance and landscaping. Various open space portions of the project vicinity support Diegan Coastal Sage Scrub, disturbed Diegan Coastal Sage Scrub, Coastal Bluff Scrub, Southern Mixed Chaparral, and Non-native Grassland. The more urbanized open spaces within the BSA support patches of heavily disturbed vegetation, with ornamental plantings, disturbed Coastal Sage Scrub, and Non-native Grassland.

The proposed project is designed to add a single lane to Interstate 5 in both directions, which will require a general expansion of the existing Caltrans ROW into some of the remaining patches of CSS within the 142 m (500 ft) Buffer Zone. Some of these patches potentially support the PPM.

2.1 KNOWN POPULATIONS OF PPM IN THE BSA VICINITY

The PPM was known historically at four localities in San Diego County: San Onofre (specimens collected from 1903 to 1931); in the vicinity of the Santa Margarita River Estuary (specimens collected from 1931 to 1936); Los Peñasquitos Lagoon (specimens collected from 1933 to 1935); and Lower Tijuana River (specimens collected from 1894 to 1932). The PPM was not collected for several decades after these dates in San Diego County, although it was present in Orange County at Spyglass Hill from 1968 to 1971.

The known PPM populations occur on fine-grained, sandy or gravelly substrates within Coastal Sage Scrub growing on marine terraces, although they were formally known to inhabit coastal strand, coastal dunes, and river alluvium, as well. Additionally, the population in the Oscar-1 area of Camp Pendleton inhabit non-native grasslands and disturbed areas dominated by filaree (*Erodium* sp.) (USFWS 1998) They also utilize the friable soils of berms created during road maintenance in the Oscar-1 area. Records seem to indicate that the PPM is closely associated with loose or friable soils that permit burrowing. The three known populations of the PPM are all found on slopes facing the Pacific Ocean.

After a 20-year period without new records for this subspecies, in 1993, a population was re-discovered at Dana Point Headlands in Orange County, and two additional populations were subsequently discovered in 1995 on Camp Pendleton in San Diego County. These Camp Pendleton populations occupy sandy soils on ocean-facing slopes and terraces near the Pacific Ocean. The two populations on Camp Pendleton are found east of I-5, which separates these populations from the ocean to the west. The populations occupy CSS and Non-native Grassland/Herbland habitats.

The subspecies was historically found on sand dunes and sandy washes within several 4 k (2.5 mi) of the Pacific Ocean. It appears to be currently restricted to soils of fine-grain sands that contain only small amounts of clays and fines (USFWS 1998) and that support Open Coastal or Sage Scrub or Non-native Grassland habitats. Some patches of open space in the BSA for the I-5 Widening Project potentially are suitable for populations of the PPM.

2.2 USFWS-RECOMMENDED PPM RECEPTOR SITES

A Recovery Plan for the Pacific Pocket Mouse was prepared in 1998 (USFWS 1998). Recommendations in the Recovery Plan mandated several subsequent studies (Spencer et al 2000a, Spencer et. al. 2000b), including studies of Translocation Feasibility, Dispersal Characteristics, Laboratory Surrogacy, Field Surrogacy, and Translocation Receiver Sites.

The Translocation Site Study examined vegetation and soils near the BSA and other places that would potentially support the PPM. Potential coastal vegetation communities that could support PPM were ranked from high to low. Those with high ranking included coastal scrubs (Diegan Sage Scrub, Coastal Bluff Scrub, Maritime Succulent Scrub, Alluvial Fan Scrub, and Southern Foredunes) and grasslands (Native Perennial Grasslands, Non-native Annual Grasslands, and Ruderal Grasslands). All other natural habitats, as well as Agriculture, Developed, Disturbed, Rocklands, and Open Water, were considered to have low or no potential to support PPM.

In their analysis of the suitability of canyons in urbanized San Diego County (that presumably include the entire length of the current BSA), Spencer et al (2000b), indicate that the canyon habitats that were predicted to have PPM habitat, based on analysis of vegetation and soil maps in their GIS Model, were generally "highly disturbed, overrun by exotics species, subject to intense recreational activity, and fragmented by urban development." Many were isolated and small, and most had slopes that were considered to be too steep for PPM. In the discussion of their results on Camp Pendleton between San Onofre and Los Pulgas (north of the BSA for the Interstate 5 Widening Project), Spencer et al state that "Although sandy soils occur along the coastal mesa, soils and vegetation have been severely altered by construction of Interstate 5…" and other causes. Nevertheless, Figure 2 in Spencer (2000b), produced by a GIS Model, categorized some of the areas along the current I-5 Widening Project BSA as having high, moderate, or low probability to support PPM. Two general areas encompassing the I-5 Widening Project area were designated as higher priority areas for additional analysis by Spencer et al., including the Torrey Pines and Del Mar Mesa Field Evaluation Sites, but these priority areas cover many square miles beyond the current BSA.

Spencer et al. (2000b) conducted initial reconnaissance work in these two Field Evaluation Sites. The Torrey Pines site was predicted to be mostly of low PPM habitat quality by the GIS Model. Field biologists, however, did find scattered areas that appeared to be of high quality, with loosely packed sandy loam soils and small patches of open vegetation (but some as large as 10 acres) that might be suitable for PPM translocations. Much of the Del Mar Mesa Evaluation Site was rated in the field as moderate PPM habitat value. The few areas that did appear to be suitable habitat were very small and patchy.

2.2.1 Analysis Methods Potential PPM Habitat in the BSA

Several steps were taken to analyze the suitability to support the PPM within the open spaces in the BSA.

2.2.1.1 "Windshield" Survey of BSA

The entire study area was initially evaluated from the roadway to identify open space areas that appeared to support potential heteromyid habitats -- areas supporting Coastal Sage Scrub, Non-native Grasslands, or sandy washes were noted (Figure 2 in Appendix A). This "windshield survey" resulted in identification of 18 sites or patches supporting vegetation, topography, and soils most frequently associated with heteromyid rodents. Particular focus was placed on finding habitat patches that exhibited the apparent physiognomy of the known populations at Dana Point and on Camp Pendleton.

2.2.1.2 Inspection of Potentially Suitable Patches of Vegetation on Foot

The patches of potentially suitable habitat were each visited on foot by walking along the ROW, or by entering the patches from adjacent roadways, housing developments, or other access routes (such as washes). The soils were inspected for signs of rodent activity (burrows, scats, trails, dusting areas, foot prints, tail-drags). The scats of heteromyids are particularly distinct and diagnostic for the different-sized species, and were noted where found.

2.2.1.3 Screening-Level Soil Analysis

Several soils samples were collected at Dana Point (as a reference) and at selected sites with open, sandy areas in the BSA to determine their soil grain size compositions. The intent of this work was to determine whether soil profiles and grain composition in occupied habitat, such as at Dana Point, could be objectively differentiated from the sandy CSS patches in the BSA where compacted soils seemed to predominate. These samples were run through a standard mechanical sieve series (Table 1). See data in Appendix B.

The results did not appear to be useful because the grain sizes of the hard, compacted soils from the BSA (presumptively not suitable for PPM) apparently were not much different from those found elsewhere in occupied habitats. The soils were not tested for fines and clays using a specific gravity technique. Soils containing large amounts of clays and fines (<50% sand content and >73% silt) are generally avoided by heteromyids. Because additional effort was needed to thoroughly investigate this question, and because the Scope of Work for this project did not include such a program, the soil screening was not continued.

We mapped the soils and vegetation in the BSA (Figure 3 in Appendix C) that are considered by the Spencer (2000b) as suitable for the PPM, with high, medium, or low probabilities for suitability. The size of each of these polygons was measured. Each polygon was examined on aerial photographs (scale = 1:1000) to determine whether the soil surface has been developed upon, or remains in open space. Table 2 lists 17 polygons that seemed, from this analysis, to have potential for PPM habitat.

2.2.1.4 Selection of Trapping Areas and Trapping Methodology

Due to limitations in the time and funds available for trapping this fiscal year, only five traplines were selected and funded for this year. Along with the vegetation found in the BSA (Figure 3), which is described in more detail in Section 3 to follow, the locations for these traplines were selected in consideration of the screening process outlined above. The federal URS permit protocol for trapping requires that traplines are set for at least five nights in the habitat that is most likely to support the target species (PPM in this case). The five selected sites were generally chosen because of their physiognomy (Non-native Grasslands/Coastal Sage Scrub with open patches and edges, loose sandy soils, and some grasses and herbs, based on our experience working with heteromyids and the PPM over many years. The object was to trap the best areas that were most likely to support heteromyids, and presumably, the PPM. The locations of these five trapline sites are shown on Figure 2, and are shown in more detail in Figures 4 through 8 in Appendix D.

The traps were set and baited with parakeet seed at sundown. Traps were checked at midnight and before dawn, at which times all captured animals were identified, aged, and sexed, then immediately released at their capture locations. Traps were set in those microhabitats best suited for Pacific Pocket Mice. That is, traps were usually placed on sandy substrates in relatively open settings just under, or adjacent to, the shrub canopy. Conditions occasionally allowed for the placement of traps among a low growth of herbaceous and grassy vegetation.

Table 1
SOIL GRAIN SIZE ANALYSIS – DANA POINT HEADLANDS AND I-5 WIDENING SELECTED SITES

(See Appendix C for Data Sheets)

Sample Location	Mean Penetrometer kg/cm² N=7	Sieve Number	Cumulative. Mass Retained (g)	Total Specimen % Finer N'	Comments
DP 1	Not Recorded	4/325	0.0	100.0	Top duff layer removed from sample. Organics only on #10 sieve.
		10/180	.26	99.9	
		20/115	4.08	99.0	
		40/75	118.31	69.9	
		60/60	249.31	36.6	
		100/40	288.38	26.6	
		140/30	298.78	.24.0	
		200/20	306.16	22.1	
		Pan	306.78	N/A	
DP-2	2.5	4/325	0.0	100.00	Top duff layer removed from sample. Organics only on #10 sieve.
		10/180	.27	99.9	
		20/115	2.65	99.2	
		40/75	108.10	67.4	
		60/60	223.58	32.6	
		100/40	258.23	22.1	
		140/30	267.91	19.2	
		200/20	273.33	17.6	
		Pan	273.85	N/A	
DP-3	2.0	4/325	0.0	100.0	No substantial top duff. Organics only on # 10 sieve, and mostly organics on # 20 sieve. Soil had a thin crust (approximately 5 mm thick) of sand particles.
		10/180	.88	99.8	
		20/115	5.43	98.9	
		40/75	142.32	72.3	
		60/60	362.95	29.4	
		100/40	443.27	13.8	
		140/30	462.40	10.1	
		200/20	472.87	8.0	
		Pan	475.06	N/A	

Table 1
SOIL GRAIN SIZE ANALYSIS – DANA POINT HEADLANDS AND I-5 WIDENING SELECTED SITES
(continued)

Sample Location	Mean Penetrometer kg/cm² N=7	Sieve Number	Cumulative. Mass Retained (g)	Total Specimen % Finer N'	Comments
Northwest bluff of Batiquitos Lagoon, San Diego County. West side of I-5	3.5	4/325	0.0	100.00	Organics only on sieve #10 Soil at site compacted.
		10/180	.25	100.00	
		20/115	11.26	98.0	
		40/75	228.40	59.6	
		60/60	387.88	31.4	
		100/40	437.72	22.6	
		140/30	449.19	20.5	
		200/20	454.89	19.5	
		Pan	455.92	N/A	
South of viewpoint on the west side of I-5, near Manchester Avenue.	1.0	4/325	.79	99.8	10/180 and 20/115 have some organics. Soil at site compacted below sandy surface.
		10/180	2.83	99.3	
		20/115	23.70	94.4	
		40/75	110.91	73.6	
		60/60	279.67	33.5	
		100/40	365.70	13.1	
		140/30	388.52	7.7	
		200/20	398.46	5.3	
		Pan	400.11	N/R	
Terrace on Overlook Park, east of I-5	4.3	4/325	0.0	100.0	Soil at site compacted.
		10/180	6.09	98.7	
		20/115	76.18	83.9	
		40/75	235.05	50.5	
		60/60	346.08	27.1	
		100/40	397.11	16.3	
		140/30	417.11	12.1	
		200/20	428.21	9.8	
		Pan	429.13	N/R	

Table 1
SOIL GRAIN SIZE ANALYSIS – DANA POINT HEADLANDS AND I-5 WIDENING SELECTED SITES
(continued)

Sample Location	Mean Penetrometer kg/cm² N=7	Sieve Number	Cumulative. Mass Retained (g)	Total Specimen % Finer N'	Comments
Upper terrace ROW above lower terrace drain	Not Recorded	4/325	3.60	99.3	10/180 and 20/155 have some organics.
		10/180	6.21	98.8	
		20/115	23.11	95.7	
		40/75	121.84	77.2	
		60/60	286.64	46.3	
		100/40	414.15	22.4	
		140/30	445.94	16.4	
		200/20	466.71	12.5	
		Pan	473.83	N/R	

Table 2
SOIL POLYGONS IN UNDEVELOPED AREAS SUITABLE FOR PACIFIC POCKET MOUSE

(All Polygons Have Low or Very Low Probability for PPM)

Soil Polygon No.	Soil Type (Classification)	km Post	Approximate Hectares of the Polygon within BSA	Suitability for PPM	Comments (Based on 1:1000 scale aerial photo graphics)
1	CsD Corralitos loamy sand, 9 to 15 percent slopes.	557+00-565+00	23.02 Hectares (56.9 Acres)	Low	Small strip next to freeway with scrubby vegetation, heavily influenced by freeway construction.
2	CbC Carlsbad gravelly loamy sand, 5 to 9 percent slopes.	565+00-568+00	1.74 Hectares (4.3 Acres)	Low	Small area, part of Overlook Park. Has dense scrub with eroded terraces.
3	CsD Corralitos loamy sand, 9 to 15 percent slopes.	571+00-576+00	16.71 Hectares (41.3 Acres)	Very Low	Agriculture field extends to edge of freeway, except for small strip covered with dense shrubs on east side.
4	TuB Tujunga sand, 0 to 5 percent slopes.	585+00-593+00	8.05 Hectares (19.9 Acres)	Low	Dense patches of scrub with some open ground in upland area (North of polygon).
5	CsC Carlsbad-Urban land Complex, 2 to 9 percent slopes.	617+00-627+00	3.27 Hectares (8.1 Acres)	Low	San Elijo Lagoon County Park and Ecological Preserve. West side of I-5 and the south end has patches of scrub vegetation and open spaces.
6	CsD Corralitos loamy sand, 9 to 15 percent slopes.	625+00-630+00	13.45 Hectares (33.2 Acres)	Very Low	The west side of the polygon is scrubby with open areas.
7	CsC Carlsbad-Urban land Complex, 2 to 9 percent slopes	632+00-636+00	10.64 Hectares (26.3 Acres)	Low	Freeway interchange on south has a small fringe of scrubby habitat that extends from the north on east side. Also there is one small area of scrub on the west side between a housing development.

Table 2
SOIL POLYGONS IN UNDEVELOPED AREAS SUITABLE FOR PACIFIC POCKET MOUSE
(continued)

Soil Polygon No.	Soil Type (Classification)	km Post	Approximate Hectares of the Polygon within BSA	Suitability for PPM	Comments (Based on 1:1000 scale aerial photo graphics)
8	CsC Carlsbad-Urban land Complex, 2 to 9 percent slopes.	637+00- 653+00	23.30 Hectares (57.6 Acres)	Low	Opens areas with scrubby vegetation. Potential habitat on the west side of I-5 the slope of a hill remaining after cut during freeway construction.
9	LeD Las Flores loamy fine sand, 9 to 15 percent slopes.	854+00- 859+00	2.87 Hectares (7.1 Acres)	Very Low	Open space with scrubby vegetation.
10	CfB Chesterton fine sandy loam, 2 to 5 percent slopes	752+00- 757+00	21.08 Hectares (52.1 Acres)	Very Low	Small patches of scrubby vegetation east of Paseo Del Norte drive. West side of I-5 is primarily agriculture.
11	LeE Las Flores loamy fine sand, 15 to 30 percent slopes.	758+00- 761+00	.44 Hectares (1.1 Acres)	Very Low	Small patches of scrubby vegetation between urbanized areas.
12	MIE Marina loamy coarse sand, 9to 30 percent slopes.	665+00- 669+00	13.23 Hectares (32.7 Acres)	Very Low	Urbanized freeway interchange with landscaping. Small area on northeast side of I-5 may have some habitat potential (scrubby open soil).
13	CsC Carlsbad-Urban land Complex, 2 to 9 percent slopes.	677+00- 682+00	4.04 Hectares (10.0 Acres)	Low	Small extent of north finger of polygon supports scrubby vegetation next to landscape vegetation and urbanized development edge.
14	GaE Gaviota fine sandy loam, 9 to 30 percent slopes	708+00- 711+00	5.58 Hectares (13.8 Acres)	Very Low	Small area at northern extent that potentially supports PPM habitat.

Table 2
SOIL POLYGONS IN UNDEVELOPED AREAS SUITABLE FOR PACIFIC POCKET MOUSE
(continued)

Soil Polygon No.	Soil Type (Classification)	km Post	Approximate Hectares of the Polygon within BSA	Suitability for PPM	Comments (Based on 1:1000 scale aerial photo graphics)
15	GaF, RuG, LvF3 Gaviota fine sandy loam 30 to 50 percent slopes, Rough broken land, Loamy alluvial land-Huerhuero complex, 9 to 50 percent slopes.	712+00- 717+00	2.3 Hectares GaF (5.7 Acres)	Very Low	Numerous patches of soil with eroded, scrubby vegetation. Small potential for PPM.
16	CsD Corralitos loamy sand, 9 to 15 percent slopes.	719+00- 723+00	15.33 Hectares (37.9 Acres)	Very Low	Batiquitos Lagoon edges have low potential for PPM.
17	CsB Corralitos loamy sand, 0 to 5 percent slopes.	728+00- 732+00	5.94 Hectares (14.7 Acres)	Very Low	Southern part of the polygon has scrubby vegetation.

2.3 PERSONNEL AND SURVEY DATES

The habitat analysis and trapping studies were conducted by URS Corporation from February 2003 to 27 June 2003. The work was performed by Dr. Richard Dean Friesen, Senior Biologist and Principal Investigator, Mr. Phillip Richards, Staff Biologist; and Mr. Lincoln Hulse, Staff Biologist. All three biologists have conducted other trapping programs for other heteromyid species, including the PPM and are listed on the U.S. Fish and Wildlife Service (USFWS) and California Department of Fish and Game (CDFG) permits for live trapping the PPM (USFWS Permit No. PRT-775869; and CDFG Memorandum of Understanding, dated April 25, 2002).

2.4 AGENCY COORDINATION AND PROFESSIONAL CONTACTS

Overall coordination with the USFWS, CDFG, Cities, and other landowner agencies for the trapping program was conducted by Caltrans biologist, Sue Scatoloni prior to the field study. Dr. Friesen contacted Mr. Will Miller, USFWS biologists, prior to trapping, and URS issued a letter of intent for trapping to the USFWS on May 7, 2003. A copy of this coordination letter is included in Appendix E. Access to properties on San Elijo Lagoon County Park and Ecological Reserve were provided by Susan T. Welker, Supervising Park Ranger.

2.5 STUDY LIMITATIONS

The natural history of the PPM has not been well documented due to the small populations and to the small number of population studies conducted to date. The PPM apparently hibernates in underground nests from November to February. The USFWS trapping protocol generally allows trapping between mid-April and August each year. The PPM yearly activity periods above ground, however, may vary from year to year as judged by such activity in other subspecies of the species (USFWS 1998). There are relatively large annual swings in the number of animals captured on traplines at single desert localities in some subspecies. Since the PPM is found in particularly mild climes, its population levels may not be as affected by weather changes as in other subspecies.

Reports from traplines conducted this year (2003) by the USFWS on Camp Pendleton study grids indicate that PPM population levels there are higher than in the previous year (Pers. Comm., Robby Knight, 9 April 2003). This observation suggests that the probability of catching a PPM during the current trapping period is perhaps higher than during the previous several years.

Particularly cold seasonal weather often limits the time period that the PPM would be above ground (out of hibernation) Additionally, wet weather could limit above ground activity. During temperatures below 50° F or during rain, the collecting permits require that traplines not be set or else are closed down when these conditions occur. Table 3 presents temperature data on the traplines set in the BAS. During this study, trapping was delayed for several weeks until the temperatures were consistently over 50° F at night.

The 152 m (500 ft) buffer on each side of the roadway is generally adequate to avoid impacts on any PPM populations that may lie outside the construction zone. Burt and Grossenheider (1976) indicate, however, that some individuals of the species (not the PPM subspecies) (presumably in more arid habitats) may range as far as 305 m (1,000 ft) from their burrows during a single day. Kenagy (1973), in contrast, observed movements of less than 50 m (165 ft) in Owens Valley populations. The open spaces within the BSA that are continuous with other natural habitats outside the BSA generally are located on the edges of the lagoons. Overlook Park is an example, but this park is generally occupied by relatively dense Chaparral, mostly on a large terrace and escarpment. In some places, sandy soils have washed off this escarpment, coming to rest on the soil surfaces within the BSA. Trapline 1 was set in such an area.

Table 3
TRAPPING DATES AND WEATHER CONDITIONS FOR PPM TRAPPING

Trapline (see Figure ___ for location)	Date	Location	Personnel *	Weather Conditions	Weekly Temperature Ranges - Air At Breast Height, Air at Ground, Soil 6" Depth **
1	5/19/03 – 5/24/03	Del Mar, California (T14S, R4W, S 13 NE Quarter)	RDF, PCR, LRH	Clear to Partly Cloudy, no precipitation	54.0°F-64.0°F 56.0°F-66.0°F 65.0°F-71.0°F
2	6/2/03 – 6/7/03	Encinitas, California (T13S, R4W, S 35 SW Quarter)	RDF, PCR, LRH	Cloudy, no precipitation	60.0°F-68.0°F 61.0°F-63.0°F 64.0°F-68.0°F
3	6/9/03 – 6/14/03	Encinitas, California (T13S, R4W, S 36 NW Quarter)	RDF, PCR, LRH	Cloudy, no precipitation	69.0°F-57.0°F 61.0°F-67.0°F 62.0°F-72.0°F
4	6/6/03 – 6/21/03	Encinitas, California (T13S, R4W, S 26 SW Quarter)	RDF, PCR, LRH	Cloudy, no precipitation	57.0°F-68.0°F 61.0°F-66.0°F 64.0°F-72.0°F
5	6/6/03 – 6/21/03	Encinitas, California (T13S, R4W, S 26 NW Quarter)	RDF, PCR, LRH	Cloudy, no precipitation	57.0°F-68.0°F 61.0°F-66.0°F 64.0°F-72.0°F

* RDF = Richard D. Friesen; PCR = Phillip C. Richards; LRH = Lincoln R. Hulse

** Current, 24-hour maximum and 24-hour minimum temperatures were recorded at 6:00 pm, midnight, and 6:00 am

The BSA is situated in a highly urbanized corridor with varying topographical relief.

3.1 PHYSICAL CONDITIONS

Open spaces occur in scattered patches where development has not occurred or where landscape and topographic features were designed into construction of Interstate 5 and adjacent developments. Major open spaces with natural vegetation occur adjacent to Interstate 5 where it crosses five coastal lagoons: Buena Vista Lagoon, Agua Hedionda Lagoon, Batiquitos Lagoon, San Elijo Lagoon, and San Dieguito River and Lagoon. The edges of these lagoons near Interstate 5 generally support some Non-native Grasslands and Coastal Sage Scrub habitats with potential for the PPM.

Some potential for the PPM exists on the Caltrans ROW where cut-and-fill construction created open space areas that are occupied by CSS/Chaparral and grassland habitats. These areas, however, generally have compacted soils that do not provide typical soil conditions required or favored for burrowing by heteromyid rodents. Some of them, however, appear to otherwise (physiognomicaly) be suitable for heteromyids, and many have a veneer of sand that has accumulated from erosion on higher terraces.

Many patches of open space in the BSA have suitable-appearing habitat, but are so small that viable populations of PPM would not likely have survived, if they were previously present prior to construction of the freeway. The home range size of other *Perognathus longimembris* subspecies appear to be in the order of 0.12 to 5.4 hectares (0.30 to 2.2 ac) for each individual in suitable, occupied habitat, depending upon where and when the studies were conducted (USFWS 1998).

Generally, the lower areas of the BSA have been developed into housing and commercial neighborhoods, except for areas immediately adjacent to the lagoons. The southern end of the BSA is more hilly, with urban developments considerably set back from the freeway. The Caltrans ROWs are generally wider in these areas than in the central and northern parts of the BSA, and, accordingly, generally are covered with larger patches of natural vegetation. A Coastal Sage Scrub vegetation palette apparently was used to stabilize and re-vegetate most of the Caltrans ROWs. Such areas are often patchily vegetated, with large open areas. In flat areas on such cut or filled surfaces, a layer of sand tends to accumulate, creating a habitat that superficially appears suitable for heteromyid rodents. The underlying layers, however, tend to be highly compacted soils and are unlikely to support PPM burrowing activities.

The BSA soil map (Figure 3) was produced by showing only soil polygons designated by the USFWS as having high to low probability of supporting the PPM (Spencer 2000b). These polygons were examined for their status as indicated on 1:1000 scale aerial photographs. As indicated in Section 2, most of these are not suitable PPM habitat since they are developed with buildings, parking lots, and streets, for example. The remaining sites (Table 2) were examined by walkover surveys to determine whether they supported appropriate vegetation for PPM, such as grasses and forbs or CSS.

3.2 PPM HABITAT CONDITIONS IN THE BIOLOGICAL STUDY AREA

Table 4 provides detailed descriptions of the five traplines, the vegetation present, as well as a description of the soils. Figures 4 through 8 in Appendix E show the location of the five traplines.

The south part of Trapline 2 is the most different from the other traplines, although in gross physiognomy appears much like occupied habitat at Dana Point and San Mateo on Camp Pendleton. Only woodrats and one House Mouse were captured here. All other traplines had pocket mice (not PPM) and several other rodent species.

Table 4
HABITAT DESCRIPTIONS

Trapline	General Description	Vegetation/Community Description	Soil Type/Description
Trapline 1	This trapline includes two specific locations where traps were distributed within the same general area. This split trapline is located on the east side of the I-5 adjacent to Overlook Park Open Space and south of the San Diequito River valley. The first half of the trapline was located at the base of a terrace escarpment, north of an agriculture field and approximately 75 meters (245 feet) east of I-5 center divide. At this location the topography is gradually sloped upward to the south. The second half of the trapline was positioned farther south on mid- and upper terraces along an I-5 ascending cut-slope. The second half of the trapline is slightly closer to the I-5 center divide. The topography at this location is a steep west-facing slope.	The first half of this trapline is positioned on the edge of a Chaparral community were the vegetation is transitioning from Chamise-dominated chaparral to a mostly ruderal (weedy) setting. In this area, ruderal plant percent cover was highest along the western end of the study area. The species diversity was moderate and supported a mix of herbs, grasses, sub-shrubs, and large shrubs. The plant percent cover in this area is approximately 80 percent. The second half of the trapline is positioned on mid and upper terraces of an I-5 cut-slope. The cut-slope and middle terrace has been re-vegetated with Coastal Sage Scrub species, although some invasive species are also present. The cut slope and middle terrace supports sub-shrubs of a low stature and have a low percent cover (approximately 50 percent). The upper terrace is generally undisturbed and supports larger sub-shrubs and shrubs (e.g., Chamise) but also exhibits moderate plant percent cover (approximately 50 percent). The dominate plant species supported on this trapline include Laurel Sumac (*Malosma laurina*), Lemonadeberry (*Rhus integrifolia*), Slender Wild Oat (*Avena barbata*), Fescue (*Festuca arundinacea*), Ripgut Brome (*Bromus diandrus*), Foxtail Chess (*B. madritensis* ssp. *rubens*), Slender-leaved Iceplant (*Mesembryanthemum nodiflorum*), California Everlasting (*Gnaphalium californicum*), California Sagebrush (*Artemisia californica*), Coyote Brush (*Baccharis pilularis*), Black Mustard (*Brassica nigra*), Short-pod Mustard (*Hirschfeldia incana*), Coastal Prickly Pear (*Opuntia littoralis*), Mexican Elderberry (*Sambucus mexicana*), Red-Stem Filaree (*Erodium botrys*), Filaree (*Erodium cicutarium*), Black Sage (*Salvia mellifera*), Eucalyptus (*Eucalyptus globulus*), Buckwheat (*Eriogonum fasciculatum*), Chamise (*Adenostoma fasciculatum*), Felt-leaved Yerba Santa (*Eriodictyon crassifolium*), Tocalote (*Centaurea melitensis*), and Yellow Pincushion (*Chaenactis glabriuscula*).	Both halves of the trapline are located in areas that have been mapped as "terrace escarpment" (TeF) by the U.S.D.A. (Soil Survey of Sand Diego County, CA. 1973). The first half of the trapline exhibited approximately 20 percent bare ground. The soil in this area is mostly sandy and generally compact. The second half of the trapline exhibited approximately 50 percent bare ground. The soil in this half is sandy and very compact along the cut slope and compact to very loose along the upper terrace.
Trapline 2	This trapline includes two specific locations where traps were distributed within the same general area. This split trapline is located on the west side of the I-5 within the southern portion of the San Elijo Lagoon County Park and Ecological Reserve. The first half of the trapline was located in a basin at the base of a terrace escarpment	The first half of this trapline is positioned in a basin at the base of a terrace escarpment. The basin supports a dense stand of Coastal Sage Scrub while the adjacent terrace escarpment supports Chaparral [dominated with Chamise (*Adenostoma fasciculatum*) and Scrub Oak (*Quercus berberidifolia*)]. The Coastal Sage Scrub was low in diversity and was homogeneous in distribution and percent cover. The plant percent cover in this basin was approximately 90 percent with few open areas. The dominant species included California Sagebrush (*Artemisia californica*), Coyote Brush (*Baccharis pilularis*), Buckwheat (*Eriogonum*	Both halves of the trapline are located in areas that have been mapped as "Corralitos loamy sand, 9-15 percent slope" (CsD) by the U.S.D.A. (Soil Survey of Sand Diego County, CA. 1973). The first half of the trapline exhibited less than 10 percent bare ground overall, with few small open patches of soil. The soil in this half is

Table 4
HABITAT DESCRIPTIONS
(continued)

Trapline	General Description	Vegetation/Community Description	Soil Type/Description
	approximately 90 meters (295 feet) west of the I-5 center divide. The topography at this location is generally flat with ascending slopes to the north, south, and west. To the east, a steep cut-slope descends to the I-5 below. The second half of the trapline was located farther north on a north-facing slope consisting of descending terraces. The second trapline is also approximately 90 meters (295 feet) west of the I-5 center divide.	*fasciculatum*), Black Sage (*Salvia mellifera*), Red Bush Monkey Flower (*Mimulus aurantiacus*) and some White Sage (*Salvia apiana*). The second trapline is positioned on the edge of a Chaparral community were the vegetation is transitioning from Chamise dominated chaparral to a mix of ruderal and Coastal Sage Scrub species. In this area, the species diversity was greater and supported a mix of herbs, sub-shrubs, and large shrubs with an overall plant percent cover of approximately 60 percent. This area also exhibited numerous open sandy areas. The dominate plant species supported on this half of the trapline included California Sagebrush (*Artemisia californica*), Coyote Brush (*Baccharis pilularis*), Buckwheat (*Eriogonum fasciculatum*), Black Sage (*Salvia mellifera*), Red Bush Monkey Flower (*Mimulus aurantiacus*), White Sage (*Salvia apiana*), Laurel Sumac (*Malosma laurina*), Lemonadeberry (*Rhus integrifolia*), Slender Wild Oat (*Avena barbata*), Fescue (*Festuca arundinacea*), California Everlasting (*Gnaphalium californicum*), Black Mustard (*Brassica nigra*), Short-Pod Mustard (*Hirschfeldia incana*), Tocalote (*Centaurea melitensis*), Yellow Pincushion (*Chaenactis glabriuscula*), Popcorn Flower (Plagiobothrys sp.), and Golden Yarrow (*Eriophyllum confertiflorum*).	sandy and moderately compacted. Because of the dense plant cover the soil surface had a noticeable litter layer. The second half of the trapline exhibited approximately 40 percent bare ground. The soil in this half is sandy and varied from moderately compact along ridges to very loose sand at the base of terraces.
Trapline 3	This trapline includes two specific locations where traps were distributed within the same general area. This split trapline is located on the east side of the I-5 within the southern portion of the San Elijo Lagoon County Park and Ecological Reserve. The first half of the trapline was located at the base of an I-5 fill-slope approximately 20 meters (65 feet) below the highway grade. The trapline parallels the I-5 and is located inside and adjacent to the I-5 Right-of-Way fence. At the base of the slope the terrain gradually descends in elevation to the north, but is essentially flat. This trapline is located approximately 45 meters (150 feet) east of the I-5 center divide.	The first half of this trapline is positioned at the base of the highway fill-slope. This area supports scattered Coastal Sage Scrub shrubs and a mix native and ruderal herbs and grasses. The species diversity in this area is moderate with a percent cover of approximately 90 percent. The dominate plant species in this area included California Sagebrush (*Artemisia californica*), Coyote Brush (*Baccharis pilularis*), Buckwheat (*Eriogonum fasciculatum*), Laurel Sumac (*Malosma laurina*), Black Sage (*Salvia mellifera*), Deerweed (*Lotus scoparius*), White Sage (*Salvia apiana*), Fascicled Tarplant [*Deinandra* (*Hemizonia*) *fasciculata*], Saw-Toothed Goldenbush (*Hazardia squarrosa* var. *squarrosa*) Toyon (*Heteromeles arbutifolia*) Fescue (*Festuca arundinacea*), Ripgut Brome (*Bromus diandrus*), Foxtail Chess (*B. madritensis* ssp. *rubens*), Slender-Leaved Iceplant (*Mesembryanthemum nodiflorum*), Black Mustard (*Brassica nigra*), Short-Pod Mustard (*Hirschfeldia incana*), Tocalote (*Centaurea melitensis*), and Coastal Prickly Pear (*Opuntia littoralis*). The second trapline is positioned on a flat terrace dominated with Coyote Brush and a large ruderal patch dominated with Tocalote, Black Mustard, Short-Pod Mustard,	Both halves of the trapline are located in areas that have been mapped as "Corralitos loamy sand, 9-15 percent slope" (CsD) by the U.S.D.A. (Soil Survey of Sand Diego County, CA. 1973). Both traplines exhibited less than 10 percent bare ground overall, with few small open patches of soil. The soil ranged from sandy to loamy sand with moderate to high compaction.

Table 4
HABITAT DESCRIPTIONS
(continued)

Trapline	General Description	Vegetation/Community Description	Soil Type/Description
	The second half of the trapline was located approximately 15 meters (50 feet) farther east.	and Locoweed (*Astragalus* sp.). The adjacent vegetation to the north and east included a mix of dense scrub including willow species, Coyote Brush, and Lemonadeberry. The trapline in this area was positioned at the edge of the ruderal patch, often at the base of Coyote Bush shrubs. The percent cover in this area was approximately 90 percent and exhibited very few open areas.	
Trapline 4	The trapline is located between Manchester Avenue and Birmingham Avenue in the City of Cardiff-by-the-Sea on the east side of the I-5. This trapline was oriented parallel with the I-5 and was positioned on the upper ridge of a cut-slope. The topography is gradually sloped up to the north. The southern end of this trapline was located adjacent to a drainage outlet associated with a of a large Chaparral dominated basin. The south end is located approximately 30 meters (100 feet) east of the I-5 center divide and approximately 8 meters (26 feet) above the I-5 grade. The northern end is positioned approximately 60 meters (200 feet) above the I-5 grade and slightly farther east than the southern end.	This linear trapline is positioned along an ascending cut-slope ridgeline. The trapline is dominated with a mix of Coastal Sage Scrub and ruderal species. The percent cover varies but averages approximately 50 percent. The dominate species include Lemonadeberry (*Rhus integrifolia*), Coyote Brush (*Baccharis pilularis*), Fescue (*Festuca arundinacea*), Black Sage (*Salvia mellifera*), Laurel Sumac (*Malosma laurina)*, Buckwheat (*Eriogonum fasciculatum*), California Sagebrush (*Artemisia californica*), Yellow Pincushion (*Chaenactis glabriuscula*), Deerweed (Lotus scoparius), White Sage (*Salvia apiana*), Fascicled Tarplant [*Deinandra* (*Hemizonia*) *fasciculata*], Saw-Toothed Goldenbush (*Hazardia squarrosa* var. *squarrosa*), Toyon (*Heteromeles arbutifolia*), Slender Wild Oat (*Avena barbata*), Ripgut Brome (*Bromus diandrus*), Foxtail Chess (*B. madritensis* ssp. *rubens*), Slender-Leaved Iceplant (*Mesembryanthemum nodiflorum*), Black Mustard (*Brassica nigra*), Short-Pod Mustard (*Hirschfeldia incana*), and Tocalote (*Centaurea melitensis*).	This trapline is located in an area that has been mapped as "terrace escarpment" (TeF) by the U.S.D.A. (Soil Survey of Sand Diego County, CA. 1973). This trapline exhibited approximately 50 percent bare ground. The soil is very sandy and ranged from very compact, along exposed ridges, to loose, along the base of slopes.
Trapline 5	The trapline is located south of Birmingham Avenue (south of where Playa Rivera terminates) in City of Cardiff-by-the-Sea on the east side of the I-5. The northern end of this trapline begins in a relatively flat basin (approximately 6 meters (20 feet) below the I-5 grade) then ends on the top of terrace escarpment (approximately 15 meter (50 feet) above I-5 grade). This trapline was located approximately 40 meters (145 feet) east of I-5 center divide. This area is surrounded by single-family residential dwellings to the north and east.	This trapline meanders through a basin dominated with dense Coastal Sage Scrub species then ascends up a terrace escarpment that is dominated with Chaparral species. The species diversity within the basin ranges from low to moderate and exhibited approximately 90 percent plant cover. Dominate plant species within the basin included California Sagebrush (*Artemisia californica*), Buckwheat (*Eriogonum fasciculatum*), Black Sage (*Salvia mellifera*), Tarragon (*Artemisia dracunculus*), Yellow Pincushion (*Chaenactis glabriuscula)*, Fascicled Tarplant [*Deinandra* (*Hemizonia*) *fasciculata*], Saw-Toothed Goldenbush (*Hazardia squarrosa* var. *squarrosa*), Slender Wild Oat (*Avena barbata*), Ripgut Brome (*Bromus diandrus*), Foxtail Chess (*B. madritensis* ssp. *rubens*), Slender-Leaved Iceplant (*Mesembryanthemum nodiflorum*), Black Mustard (*Brassica nigra*), Short-Pod Mustard (*Hirschfeldia incana*), and Tocalote (*Centaurea melitensis*).	This trapline is located in an area that has been mapped as "Loamy alluvial land-Huerhuero complex, 9 to 50 percent slopes, severely eroded" (LvF3) by the U.S.D.A. (Soil Survey of Sand Diego County, CA. 1973). This trapline ranged from approximately 10 percent bare ground within the basin and approximately 50 percent bare ground on the terrace escarpment. The soil in this half is mostly sandy and generally compact.

Table 4
HABITAT DESCRIPTIONS
(continued)

Trapline	General Description	Vegetation/Community Description	Soil Type/Description
		Species diversity on the terrace escarpment is relatively moderate and exhibited approximately 50 percent plant cover. Dominate plant species on the terrace included Chamise (*Adenostoma fasciculatum*), White Sage (*Salvia apiana*), Weed's Mariposa Lily (*Calochortus weedii*), Lemonadeberry (*Rhus integrifolia*), Buckwheat (*Eriogonum fasciculatum*), Fescue (*Festuca arundinacea*), , Eastwood Manzanita (*Arctostaphylos glandulosa*), Popcorn Flower (*Plagiobothrys* sp.), Golden Yarrow (*Eriophyllum confertiflorum*), Fingertips (*Dudleya edulis*), Chalk Dudleya (*Dudleya pulverulenta*), Slender-Leaved Iceplant (*Mesembryanthemum nodiflorum*), Black Mustard (*Brassica nigra*), Short-Pod Mustard (*Hirschfeldia incana*), and Tocalote (*Centaurea melitensis*), and Skunkweed (*Navarretia hamata*).	

4.1 SPECIES CAPTURED ON TRAPLINES IN THE PROJECT AREA

The five selected areas (Figures 4 through 8) within the BSA with the apparent highest probability of supporting populations of the PPM were trapped, although the likelihood of the PPM being present at these sites was judged to be low. Table 5 presents the results of the trapping program and Photographs 1 through 16 (Appendix F) show some details of the traplines. Photographs 17 through 21 are photographs of each of the species captured.

No PPM was captured during the trapping program.

Eight species of mammals were captured, including two species of pocket mouse. The trapline habitats were selected because of their similarity to heteromyid habitats in general, and PPM habitats in particular. The presence of the two species of other pocket mouse species tend to substantiate that the habitats may be appropriate for the PPM in the BSA. The PPM is often found in habitats where woodrats (*Neotoma*), house mice (*Mus*), and deermice (*Peromyscus*) are also present.

Sixty nine captures of one species of a medium-sized, "smooth" pocket mouse were captured, and are nominately identified in this document as "Bailey's" Pocket Mouse (*Chaetodipus* cf. *baileyi*) with quotation marks, because the range of Bailey's Pocket Mouse has traditionally been recorded well east of the BSA in desert habitats. Results from recent trapping projects in this area of Southern California do not include Bailey's Pocket Mouse in the species lists. Only four species of pocket mice have been recorded in cismontane Southern California: the San Diego Pocket Mouse, California Pocket Mouse (*Chaetodipus californicus*), Short-nosed Pocket Mouse (*Perognathus longimembris brevinasus*), and the PPM. Thus, there appears to be a fifth species that may have moved from the desert areas into Southern California. This same phenomenon has been reported recently in the Central United States, apparently in response to global climatic changes (Los Angeles Times, January 2, 2003).

This taxon, whatever its final identification, is also present in the Santa Ana River of San Bernardino County just below the Seven Oaks Dam (URS, unpublished data). Specimens of this taxon are smaller than the San Diego Pocket Mouse, are distinctly gray in color (but not juveniles), and do not have any spines. Its hair is finer than the hairs of the spiny pocket mouse group, and they appear to be smaller. Several obviously adult specimens (lactating female and scrotal testes male) were twice the size (17-23 g) of the PPM (6-11g), but not as large as Bailey's Pocket Mouse (24-34 g). The identification of this species will require voucher specimens for comparison with museum specimens. The permits under which this project was conducted currently do not allow for the take of captured individuals.

Trapping resulted in 369 Rodent captures, including 8 species; no Pacific Pocket Mouse (PPM) was captured. In total, 5 traplines were set with 1,200 trap nights completed. The San Diego Pocket Mouse (*Chaetodipus fallax*), and "Bailey's" Pocket Mouse (*Chaetodipus* cf. *baileyi*) were captured in all traplines, except one (Trapline 2), which corroborate that the traplines were set in habitat physiognomicaly suitable for heteromyids.

Table 5
CALTRANS I-5 TRAPLINE CAPTURES

Common Name	Scientific Name	Status	Trapline 1	Trapline 2	Trapline 3	Trapline 4	Trapline 5	Total Captures
Pacific Pocket Mouse (None Captured)	*Pergnathus longimembris pacificus*	FE SSC	0	0	0	0	0	0
House Mouse	*Mus musculus*	None	4 ♂♂ 2 ♀♀	0 ♂ 1 ♀	17 ♂♂ 12 ♀♀	0 ♂ 0 ♀	0 ♂ 1 ♀	21 ♂♂ 16 ♀♀
Northwestern San Diego Pocket Mouse	*Chaetodipus fallax fallax*	SSC	18 ♂♂ 10 ♀♀	0 ♂ 0 ♀	1 ♂ 15 ♀♀	2 ♂♂ 0 ♀	3 ♂♂ 10 ♀♀	24 ♂♂ 35 ♀♀
"Bailey's" Pocket Mouse	*Chaetodipus cf. baileyi*	None	22 ♂♂ 3 ♀♀	0 ♂ 0 ♀	19 ♂♂ 16 ♀♀	0 ♂ 2 ♀♀	4 ♂♂ 3 ♀♀	45 ♂♂ 24 ♀♀
Deer Mouse	*Peromyscus maniculatus*	None	15 ♂♂ 12 ♀♀	0 ♂ 0 ♀	0 ♂ 0 ♀	0 ♂ 0 ♀	0 ♂ 0 ♀	15 ♂♂ 12 ♀♀
California Mouse	*Peromyscus californicus*	None	0 ♂♂ 0 ♀♀	0 ♂ 0 ♀	2 ♂♂ 4 ♀♀	0 ♂ 0 ♀	0 ♂ 0 ♀	2 ♂♂ 4 ♀♀
Cactus Mouse	*Peromyscus eremicus*	None	2 ♂♂ 2 ♀♀	0 ♂ 0 ♀	16 ♂♂ 14 ♀♀	1 ♂ 1 ♀	3 ♂♂ 2 ♀♀	22 ♂♂ 19 ♀♀
Dusky footed Wood Rat	*Neotoma fuscipes*	None	8 ♂♂ 28 ♀♀	8 ♂♂ 6 ♀♀ 1?	4 ♂♂ 6 ♀♀	17 ♂♂ 19 ♀♀ 2?	13 ♂♂ 16 ♀♀	50 ♂♂ 75 ♀♀ 3?
San Diego Desert Wood Rat	*Neotoma lepida intermedia*	SSC	2 ♂♂ 0 ♀	0 ♂ 0 ♀	0 ♂ 0 ♀	0 ♂ 0 ♀	0 ♂ 0 ♀	2 ♂♂ 0 ♀
		Total	**128**	**16**	**126**	**44**	**55**	**369**

Status: Federal Endangered (FE); State Species of Special Concern (SSC). (DFG Special Animals January 2003).

?? = Escaped animal, identified to species, but not to gender.

The absence of PPM captures on the traplines indicate that the animals (a) may never have been present, (b) may have been present but eliminated due to changes in their habitat from previous disturbances, (c) may not trappable due to their small size (6-11g), or (d) to behavioral factos. Because other pocket mice were trapped, and because individuals of the House Mouse (*Mus musculus*) and very young and small (7g) individuals of the Cactus Mouse (*Peromyscus eremicus*) were captured, we are confident that the PPM is not present in the areas trapped. The triggers on our traps have been modified to be especially sensitive for capturing animals as small as 5 g. Further, we believe that the PPM is absent within the BSA in the areas between the traplines documented in this report.

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PROJECT HABITAT ASSESSMENT MAP
I-5 WIDENING PACIFIC POCKET MOUSE TRAPPING PROJECT/MAY-JUNE 2003
(500' ON EITHER SIDE OF CENTERLINE)
SOURCES: AirPhoto USA (March 2002 Aerial), URS (survey/sample locations).
N
URS
0.5 0 0.5 1 Miles
SCALE: 1" = 1/2 Mile (1:31680)
CHECKED BY: RF
DATE: 6-27-03
PM: PM
PROJ. NO: 26814226.00030
FIG. NO: 2
OCEANSIDE
CARLSBAD
UNIC
ENCINITAS
SOLANA BEACH
DEL MAR
SAN DIE
KEY:
OVERVIEW MAP:

PARTICLE-SIZE ANALYSIS : by Sieving using Soil Sieve Sizes & with Water Content
ASTM C 117, C 136 or D 422 and D 2216

Project Number: 26814226.00020 Task Number: ____ Exploration No.: ____
Project Name: I-5 Widening Assignment No.: ____ Sample No.: DP-1
Project Engineer: RF Depth (ft): ____
Visual Description: Dark brown silty Sand (SM)
SM

SPECIMEN: Tested From:
Bulk Sample [X] Thin-Walled Tube [ ]
SPT Sample [ ] Engr. Property Test [ ]
Mod Calif. Sample [ ] Specimen's WC [ ]
Other: ____

Selection Method:
X Sieves (1) - whole sample used
___ Sieves (1) - partial sample used & selected by Method(s) ___
___ Sieves (1) - partial sample used & selected by Method(s) ___
Methods: (a): Splitter, (use for dry soils or that which will segregate)
(b): Quartering; (use for dry soils or that which will segregate)
(c): Representative scoop after mixing, or slice of intact sample. (use for moist soils or that which will not segregate)

[ ] See Bulk Sample Processing Information Form (S-106)

Preparation:
Sample/Specimen: Oven-Dried [ ] Air Dried [ ] As-Received State [X]
Oven-Dried Soil Broken Up Before:
Selecting partial sample: No [X]; Yes [ ]
Seiving 1st Sieve Series: No [ ]; Yes [ ]
Seiving 2nd Sieve Series: No [ ]; Yes [ ]
Seiving 3rd Sieve Series: No [ ]; Yes [ ]
By: Mortar & Pestle [ ] Pulverizer [ ] Hand [ ] Other ____
Remarks: ____

Washing: No Yes
Whole Specimen Washed on No. 200 sieve ? [ ] [X] and Soil Soaked for 6 hrs.
Retained Fraction: 1st Split Washed ? [ ] [ ] ; 2nd Split Washed ? No [ ] ; Yes [ ]
Fine Fraction Washed on No. 200 sieve ? [ ] [ ] and Soil Soaked for ____ hrs.

MASS OF TEST SPECIMEN (g)

	Total Test Specimen	Partial Test Specimen 1st Split	2nd Split	Soil Retained (after washing) 2nd Split	+200
Min.sieve size in sieving sequence (1)	#200				
Container Number	LF-5				LF5
Mass of Container and Dry Soil, (g)	582.60				496.56
Mass of Container, (g)	189.66				189.66
Dry Soil, Ws (g)	392.94				306.90
Mass of Dry Soil from Hydrometer, Ws (g)					

Water Content As Recieved or

Container No.	LF-5
Wet, M1 (g)	617.05
Dry, M2 (g)	582.60
Cont.,M3 (g)	189.66
Water Content (%)	8.77

SIEVING RESULTS

See (2)	Sieve No.	Cum. Mass Retained (g)	% Finer than Sieve ___	Total Specimen % Finer N'
	3"			
	2"			
	1 1/2"			
	1"			
	3/4"			
	1/2"			
	3/8"			
	4			
	Pan		XXXXXXXX	XXXXXXXXXX

Req. Mass of Test Spec. for 1% (kg)
3"= 70
1 1/2"=10
3/4"= 1.1
3/8"= 0.25
#4 = 0.1
#10 = 0.1

Sieve No. / (3)	Cum. Mass Retained (g)	% Finer than Sieve ___	Total Specimen % Finer N'
1"			
3/4"			
1/2"			
3/8"			
4 / 325	0.0		100.0
* 10 / 180	0.26		99.9
20 / 115	4.08		99.0
40 / 75	118.31		69.9
60 / 60	249.31		36.6
100* / 40	288.38		26.6
140 / 30	298.78		24.0
200 / 20	306.16		22.1
Pan	306.78	XXXXXXXX	XXXXXXXXXX

Notes: (1) Sieve size given, denotes min. sieve size used in the appropriate sieving sequence
(2) X in box denotes sieve on which split was made (3) Proposed allowable amount of soil retained on 8" dia. sieve

SUMMARY: Shape & Filter Parameters

% COBBLES		D60		D85	
% GRAVEL	0	D30		D15	
% SAND	77.9	D10		D50	
% FINES	22.1	Cu =		Cc =	

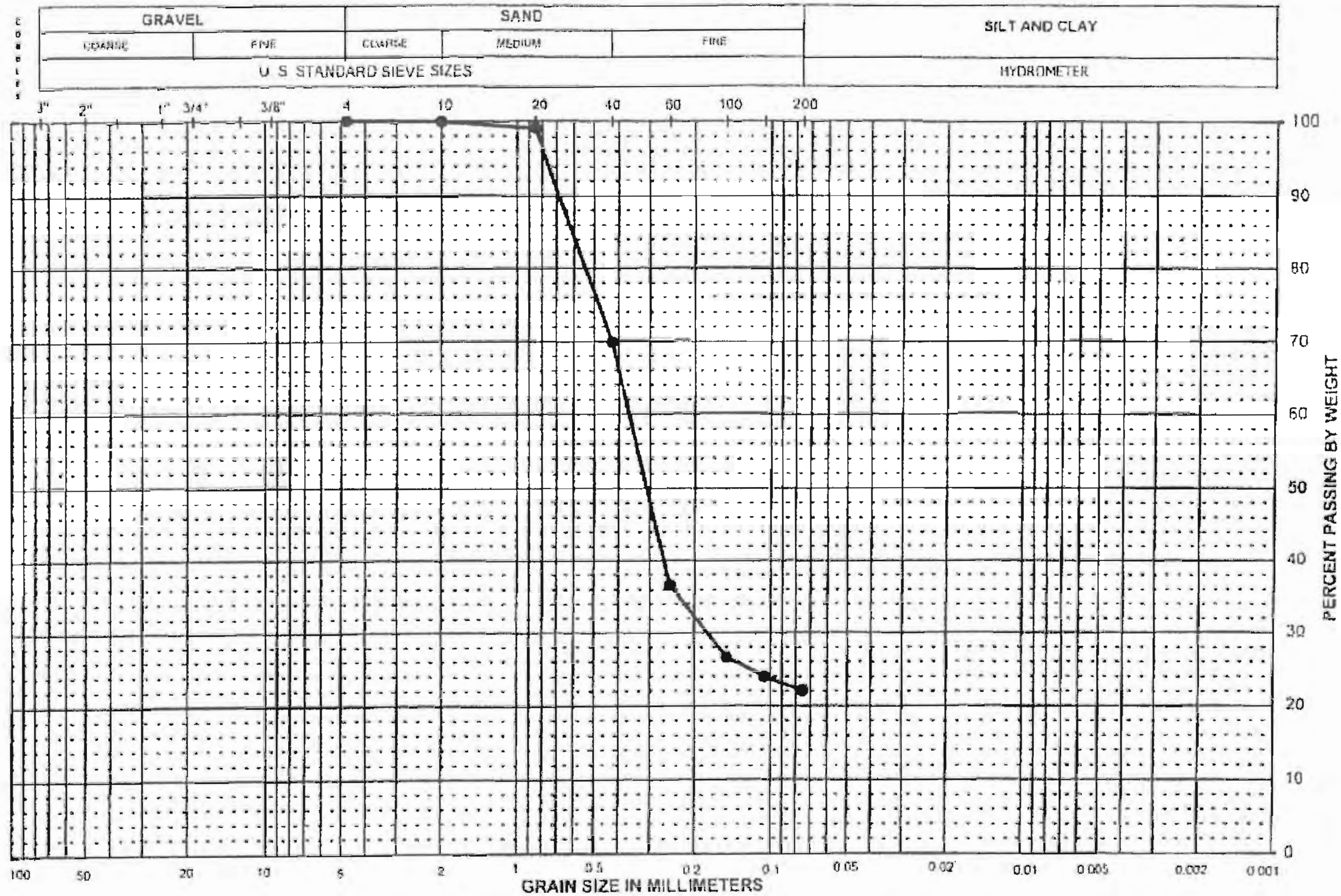
Mica Noted: No [ ] ; Yes [ ] Amount Adjective: ____
Remarks: * Organics only on #10 sieve
Coefficient of Uniformity, Cu = D60 / D10 Coefficient of Curvature, Cc = D30^2 / (D60 * D10)
Note: The above values D## denotes particle size (mm) at the corresponding percent passing.
* Denotes sieve added to better define gradation curve

	SET-UP BY:	DRY MASS BY:	WASHED BY:
COARSE FRACTION:			
FINE FRACTION:	RD	RD	RD
DATE:	4/15/03	4/16/03	4/16/03

CALCULATED BY: RD
CHECKED BY: ____
SPOT CHECKED BY: ____
REVIEWED BY: ____

S-104 (06/02) (SNA) Siev_s_h URS

UNIFIED SOIL CLASSIFICATION



Sieve No.	Dia mm	% Finer
3"	75.0	
2"	50.0	
1 1/2"	37.5	
1"	25.0	
3/4"	19.00	
1/2"	12.50	
3/8"	9.50	
#4	4.75	100.0
#10	2.00	99.9
#20	0.850	99.0
#40	0.425	69.9
#60	0.250	36.6
#100	0.150	26.6
#140	0.106	24.0
#200	0.075	22.1
Hydrometer Analysis		

% Cobbles	
% Gravel	0.0
% Sand	77.9
% Fines	22.1
D_{60}	
D_{30}	
D_{10}	
C_u	
C_c	

Exploration	Sample No.	Depth (ft)	SYMBOL	Wn (%)	LL	PI	% Clay	Description and Classification
	DP-1		●	8.8				Dark brown silty Sand (SM)

PROJECT NAME: **I-5 Widening**

PROJECT NUMBER: **26814226.00020**

PARTICLE-SIZE DISTRIBUTION CURVES

Figure:

URS

(SNA) sieve only (04/2000)

sa_I5_dp1

PARTICLE-SIZE ANALYSIS : by Sieving using Soil Sieve Sizes & with Water Content

ASTM C 117, C 136 or D 422 and D 2216

Project Number: 26814226.00020 Task Number: ______ Exploration No.: ______
Project Name: I-5 Widening Assignment No.: ______ Sample No.: DP-2
Project Engineer: RF Depth (ft): ______

Visual Description: Dark brown silty Sand (SM)
SM

SPECIMEN: **Tested From:**
Bulk Sample [X] Thin-Walled Tube [ ]
SPT Sample [ ] Engr. Property Test
Mod Calif. Sample [ ] Specimen's WC [ ]
Other: ______

[ ] See Bulk Sample Processing Information Form (S-106)

Selection Method:
X Sieves (1) - whole sample used
___ Sieves (1) - partial sample used & selected by Method(s) ___
___ Sieves (1) - partial sample used & selected by Method(s) ___
Methods: (a): Splitter; (use for dry soils or that which will segregate)
(b): Quartering; (use for dry soils or that which will segregate)
(c): Representative scoop after mixing, or slice of intact sample. (use for moist soils or that which will not segregate)

Preparation:
Sample/Specimen: Oven-Dried [ ] Air Dried [ ] As-Received State [X]

Oven-Dried Soil Broken Up Before:
Selecting partial sample: No [X]; Yes [ ]
Seiving 1st Sieve Series: No [ ]; Yes [ ]
Seiving 2nd Sieve Series: No [ ]; Yes [ ]
Seiving 3rd Sieve Series: No [ ]; Yes [ ]

By: Mortar & Pestle [ ] Pulverizer [ ] Hand [ ] Other ______
Remarks: ______

Washing: No Yes
Whole Specimen Washed on No. 200 sieve ? [ ] [X] and Soil Soaked for 6 hrs.
Retained Fraction: 1st Split Washed ? [ ] [ ] ; 2nd Split Washed ? No [ ] ; Yes [ ]
Fine Fraction Washed on No. 200 sieve ? [ ] [ ] and Soil Soaked for ______ hrs.

	MASS OF TEST SPECIMEN (g) Total Test Specimen	Partial Test Specimen 1st Split	2nd Split	Soil Retained (after washing) 2nd Split	+200	Water Content As Recieved or	
Min sieve size in sieving sequence (1)	#200					Container No.	LF-4
Container Number	LF-4				LF-4	Wet, M1 (g)	540.12
Mass of Container and Dry Soil, (g)	520.11				462.39	Dry, M2 (g)	520.11
Mass of Container, (g)	188.43				188.44	Cont., M3 (g)	188.43
Dry Soil, Ws (g)	331.68				273.95	Water Content (%)	6.03
Mass of Dry Soil from Hydrometer, Ws (g)							

SIEVING RESULTS

See (2)	Sieve No.	Cum. Mass Retained (g)	% Finer than Sieve ___	Total Specimen % Finer N'	Req. Mass of Test Spec. for 1% (kg)
	3"				3" = 70
	2"				1 1/2" = 10
	1 1/2"				3/4" = 1.1
	1"				3/8" = 0.25
	3/4"				#4 = 0.1
	1/2"				#10 = 0.1
	3/8"				
	4				
	Pan		XXXXXXXX	XXXXXXXXXX	

Sieve No. / (3)	Cum. Mass Retained (g)	% Finer than Sieve ___	Total Specimen % Finer N'
1"			
3/4"			
1/2"			
3/8"			
4 / 325	0.0		100.0
* 10 / 180	0.27		99.9
20 / 115	2.65		99.2
40 / 75	108.10		67.4
60 / 60	223.58		32.6
100* / 40	258.23		22.1
140 / 30	267.91		19.2
200 / 20	273.33		17.6
Pan	273.85	XXXXXXXX	XXXXXXXXXX

Notes: (1) Sieve size given, denotes min. sieve size used in the appropriate sieving sequence
(2) X in box denotes sieve on which split was made (3) Proposed allowable amount of soil retained on 8" dia. sieve

SUMMARY: Shape & Filter Parameters

% COBBLES		D60		D85	
% GRAVEL	0	D30		D15	
% SAND	82.4	D10		D50	
% FINES	17.6	Cu =		Cc =	

Mica Noted: No [ ] ; Yes [ ] Amount Adjective: ______
Remarks: * Mainly organics on #10 sieve
Coefficient of Uniformity, Cu = D60 / D10 Coefficient of Curvature, Cc = D30^2 / (D60 * D10)

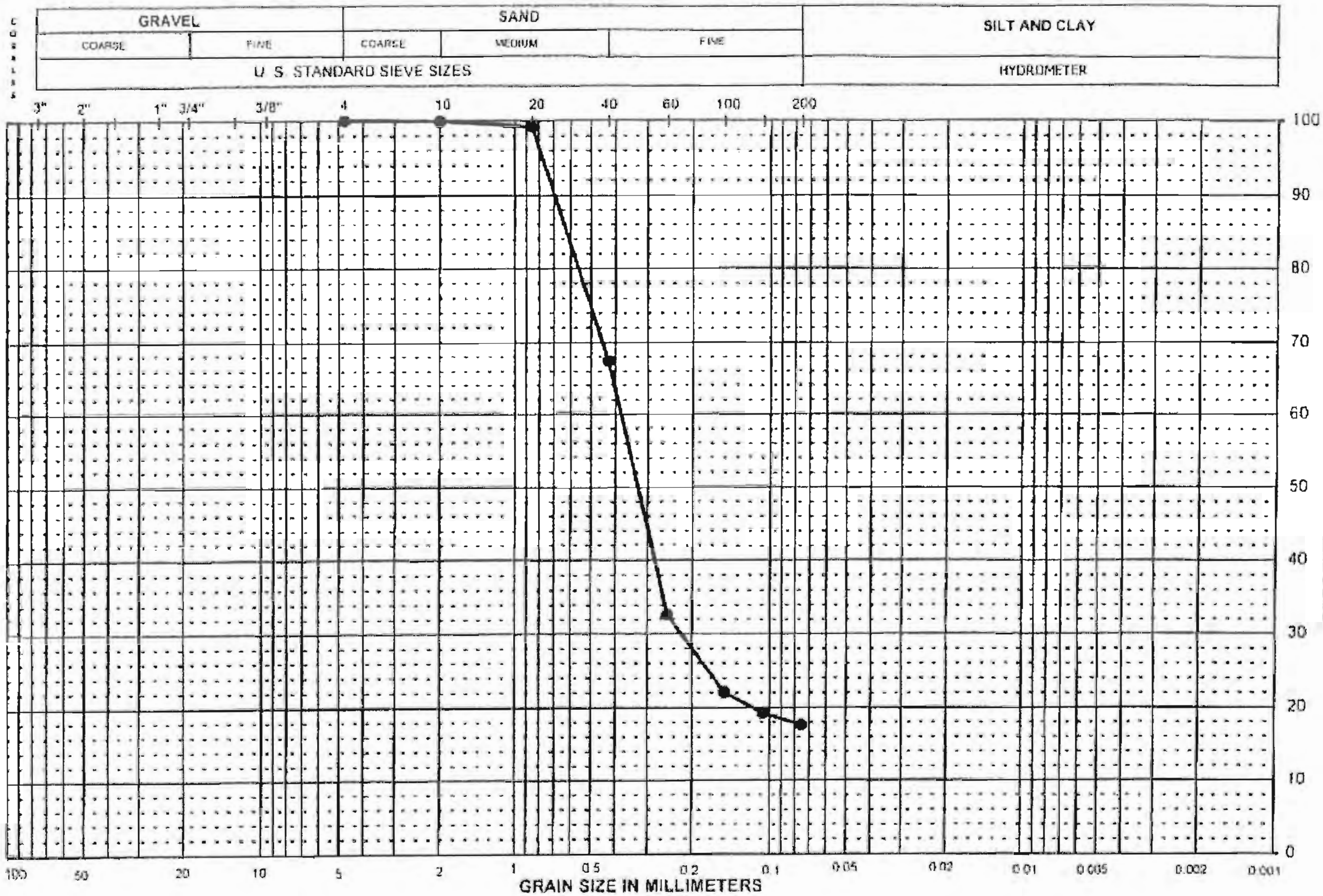
Note: The above values Dxx denotes particle size (mm) at the corresponding percent passing.
* Denotes sieve added to better define gradation curve

	SET-UP BY:	DRY MASS BY:	WASHED BY:
COARSE FRACTION:			
FINE FRACTION:	DD	DD	DD
DATE:	4/15/03	4/16/03	4/16/03

CALCULATED BY: DD
CHECKED BY: ______
SPOT CHECKED BY: ______
REVIEWED BY: ______

S-104 (06/02) (SNA) Siev_s_th URS

UNIFIED SOIL CLASSIFICATION



Sieve No.	Dia. mm	% Finer
3"	75.0	
2"	50.0	
1 1/2"	37.5	
1"	25.0	
3/4"	19.00	
1/2"	12.50	
3/8"	9.50	
#4	4.75	100.0
#10	2.00	99.3
#20	0.850	99.2
#40	0.425	67.4
#60	0.250	32.6
#100	0.150	22.1
#140	0.106	19.2
#200	0.075	17.6
Hydrometer Analysis		

% Cobbles	
% Gravel	0.0
% Sand	82.4
% Fines	17.6
D_{60}	
D_{30}	
D_{10}	
C_u	
C_c	

Exploration	Sample No.	Depth (ft)	SYMBOL	Wn (%)	LL	PI	% Clay	Description and Classification
	DP-2		•	6.0				Dark brown silty Sand (SM)

PROJECT NAME: **I-5 Widening**

PROJECT NUMBER: **26814226.00020**

PARTICLE-SIZE DISTRIBUTION CURVES

Figure:

URS

(SNA) sieve only (04/2000)

sa_I5_dp2

PARTICLE-SIZE ANALYSIS : by Sieving using Soil Sieve Sizes & with Water Content

ASTM C 117, C 136 or D 422 and D 2216

Project Number: 26814226.00020 Task Number: ______ Exploration No.: ______

Project Name: I-5 Widening Assignment No.: ______ Sample No.: DP-3

Project Engineer: RF Depth (ft): ______

Visual Description: Dark brown poorly graded Sand with silt (SP-SM)

SP-SM

SPECIMEN: Tested From:

Bulk Sample [X] Thin-Walled Tube [ ]
SPT Sample [ ] Engr. Property Test
Mod Calif. Sample [ ] Specimen's WC [ ]
Other: ______

[ ] See Bulk Sample Processing Information Form (S-106)

Selection Method:

X Sieves (1) - whole sample used
___ Sieves (1) - partial sample used & selected by Method(s) ___
___ Sieves (1) - partial sample used & selected by Method(s) ___

Methods: (a): Splitter; (use for dry soils or that which will segregate)
(b): Quartering; (use for dry soils or that which will segregate)
(c): Representative scoop after mixing, or slice of intact sample. (use for moist soils or that which will not segregate)

Preparation:

Sample/Specimen: Oven-Dried [ ] Air Dried [ ] As-Received State [X]

Oven-Dried Soil Broken Up Before:
Selecting partial sample: No [X]; Yes [ ]
Seiving 1st Sieve Series: No [ ]; Yes [ ]
Seiving 2nd Sieve Series: No [ ]; Yes [ ]
Seiving 3rd Sieve Series: No [ ]; Yes [ ]

By: Mortar & Pestle [ ] Pulverizer [ ] Hand [ ] Other ______

Remarks: ______

Washing:

Whole Specimen Washed on No. 200 sieve ? No [ ] Yes [X] and Soil Soaked for 6 hrs.
Retained Fraction: 1st Split Washed ? [ ] [ ] ; 2nd Split Washed ? No [ ] ;Yes [ ]
Fine Fraction Washed on No. 200 sieve ? [ ] [ ] and Soil Soaked for ______ hrs.

MASS OF TEST SPECIMEN (g)	Total Test Specimen	Partial Test Specimen 1st Split	2nd Split	Soil Retained (after washing) 2nd Split	+200
Min. sieve size in sieving sequence (1)	#200				
Container Number	L-11				L-11
Mass of Container and Dry Soil, (g)	650.16				611.20
Mass of Container, (g)	136.00				136.02
Dry Soil, Ws (g)	514.16				475.18
Mass of Dry Soil from Hydrometer, Ws (g)					

Water Content As Recieved or	
Container No.	L-11
Wet, M1 (g)	679.19
Dry, M2 (g)	650.16
Cont.,M3 (g)	136.00
Water Content (%)	5.65

SIEVING RESULTS

See (2)	Sieve No.	Cum. Mass Retained (g)	% Finer than Sieve ___	Total Specimen % Finer N'
	3"			
	2"			
	1 1/2"			
	1"			
	3/4"			
	1/2"			
	3/8"			
	4			
	Pan		XXXXXXXX	XXXXXXXXXX

Req. Mass of Test Spec. for 1% (kg)
3"= 70
1 1/2"=10
3/4"= 1.1
3/8"= 0.25
#4 = 0.1
#10 = 0.1

	Sieve No / (3)	Cum. Mass Retained (g)	% Finer than Sieve ___	Total Specimen % Finer N'
	1"			
	3/4"			
	1/2"			
	3/8"			
	4 / 325	0.0		100.0
1	10 / 180	0.88		99.8
2	20 / 115	5.43		98.9
	40 / 75	142.32		72.3
	60 / 60	362.95		29.4
	100* / 40	443.27		13.8
	140 / 30	462.40		10.1
	200 / 20	472.87		8.0
	Pan	475.06	XXXXXXXX	XXXXXXXXXX

Notes: (1) Sieve size given, denotes min. sieve size used in the appropriate sieving sequence
(2) X in box denotes sieve on which split was made (3) Proposed allowable amount of soil retained on 8" dia. sieve

SUMMARY: Shape & Filter Parameters

% COBBLES ______ D60 0.38 D85 ______
% GRAVEL 0 D30 0.26 D15 ______
% SAND 92.0 D10 0.10 D50 ______
% FINES 8.0 Cu = 3.8 Cc = 1.8

Note: The above values D## denotes particle size (mm) at the corresponding percent passing.

Mica Noted; No [ ] ; Yes [ ] Amount Adjective: ______

Remarks: (1) Organics only (2) Mostly organics

Coefficient of Uniformity, Cu = D60 / D10 Coefficient of Curvature, Cc = D30^2 / (D60 * D10)

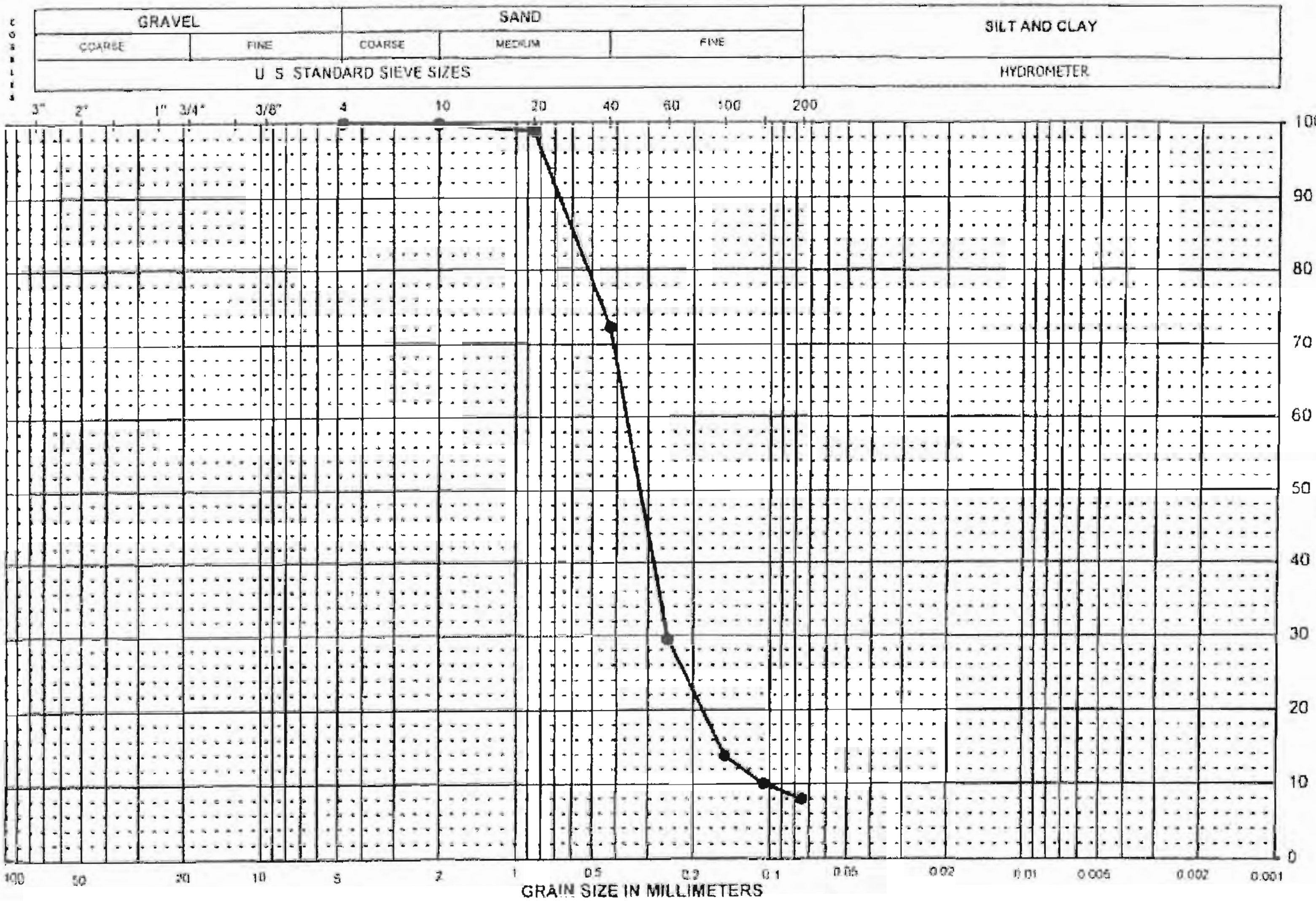
* Denotes sieve added to better define gradation curve

	SET-UP BY:	DRY MASS BY:	WASHED BY:
COARSE FRACTION:			
FINE FRACTION:	DD	DD	DD
DATE:	4/15/03	4/16/03	4/16/03

CALCULATED BY: DD
CHECKED BY: ______
SPOT CHECKED BY: ______
REVIEWED BY: ______

S-104 (06/02) (SNA) Siev_s_h URS

UNIFIED SOIL CLASSIFICATION



Sieve No.	Dia. mm	% Finer
3"	75.0	
2"	50.0	
1 1/2"	37.5	
1"	25.0	
3/4"	19.00	
1/2"	12.50	
3/8"	9.50	
#4	4.75	100.0
#10	2.00	99.8
#20	0.850	98.9
#40	0.425	72.3
#60	0.250	29.4
#100	0.150	13.8
#140	0.106	10.1
#200	0.075	8.0
Hydrometer Analysis		

% Cobbles	
% Gravel	0.0
% Sand	92.0
% Fines	8.0
D_{60}	0.38
D_{30}	0.26
D_{10}	0.1
C_u	3.8
C_c	1.8

Exploration	Sample No.	Depth (ft)	SYMBOL	Wn (%)	LL	PI	% Clay	Description and Classification
	DP-3		●	5.7				Dark brown poorly graded Sand with silt (SP-SM)

PROJECT NAME: I-5 Widening

PROJECT NUMBER: 26814226.00020

PARTICLE-SIZE DISTRIBUTION CURVES

Figure:

URS

(SNA) sieve only (04/2000)

sa_I5_dp3

PARTICLE-SIZE ANALYSIS : by Sieving using Soil Sieve Sizes & with Water Content

ASTM C 117, C 136 or D 422 and D 2216

Project Number: 26814226.00020 Task Number: ____ Exploration No.: High Terrace
Project Name: I-5 Widening Assignment No.: ____ Sample No.: 7
Project Engineer: RF Depth (ft): ____

Visual Description: Brown silty Sand (SM)
SP-SM

SPECIMEN: Tested From:
Bulk Sample [X] Thin-Walled Tube [ ]
SPT Sample [ ] Engr. Property Test [ ]
Mod Calif. Sample [ ] Specimen's WC [ ]
Other: ____

[ ] See Bulk Sample Processing Information Form (S-106)

Selection Method:
X Sieves (1) - whole sample used
____ Sieves (1) - partial sample used & selected by Method(s) ____
____ Sieves (1) - partial sample used & selected by Method(s) ____
Methods: (a) Splitter; (use for dry soils or that which will segregate)
(b) Quartering; (use for dry soils or that which will segregate)
(c) : Representative scoop after mixing, or slice of intact sample (use for moist soils or that which will not segregate)

Preparation:
Sample/Specimen: Oven-Dried [ ] Air Dried [ ] As-Received State [X]

Oven-Dried Soil Broken Up Before:
Selecting partial sample: No [X]; Yes [ ]
Seiving 1st Sieve Series: No [ ]; Yes [ ]
Seiving 2nd Sieve Series: No [ ]; Yes [ ]
Seiving 3rd Sieve Series: No [ ]; Yes [ ]

By: Mortar & Pestle [ ] Pulverizer [ ] Hand [ ] Other ____
Remarks: ____

Washing: No Yes
Whole Specimen Washed on No. 200 sieve ? [ ] [X] and Soil Soaked for 6 hrs.
Retained Fraction: 1st Split Washed ? [ ] [ ] ; 2nd Split Washed ? No [ ] ;Yes [ ]
Fine Fraction Washed on No. 200 sieve ? [ ] [ ] and Soil Soaked for ____ hrs

MASS OF TEST SPECIMEN (g)

	Total Test Specimen	Partial Test Specimen 1st Split	2nd Split	Soil Retained (after washing) 2nd Split	+200
Min sieve size in sieving sequence (1)	#200				
Container Number	L-20				L-20
Mass of Container and Dry Soil, (g)	686.26				626.78
Mass of Container, (g)	152.87				152.88
Dry Soil, Ws (g)	533.39				473.90
Mass of Dry Soil from Hydrometer, Ws (g)					

Water Content — As Recieved or

Container No.	L-20
Wet, M1 (g)	700.07
Dry, M2 (g)	686.26
Cont., M3 (g)	152.87
Water Content (%)	2.59

SIEVING RESULTS

See (2)	Sieve No.	Cum. Mass Retained (g)	% Finer than Sieve ____	Total Specimen % Finer N'
	3"			
	2"			
	1 1/2"			
	1"			
	3/4"			
	1/2"			
	3/8"			
	4			
	Pan		XXXXXXXX	XXXXXXXXXX

Req. Mass of Test Spec. for 1% (kg)
3"= 70
1 1/2"=10
3/4"= 1.1
3/8"= 0.25
#4 = 0.1
#10 = 0.1

Sieve No. / (3)	Cum. Mass Retained (g)	% Finer than Sieve ____	Total Specimen % Finer N'
1"			
3/4"			
1/2"	0.0		100.0
3/8"	1.16		99.8
4 / 325	3.60		99.3
10 / 180	6.21		98.8
20 / 115	23.11		95.7
40 / 75	121.84		77.2
60 / 60	286.64		46.3
100* / 40	414.15		22.4
140 / 30	445.94		16.4
200 / 20	466.71		12.5
Pan	473.83	XXXXXXXX	XXXXXXXXXX

Notes: (1) Sieve size given, denotes min. sieve size used in the appropriate sieving sequence
(2) X in box denotes sieve on which split was made (3) Proposed allowable amount of soil retained on 8" dia. sieve

SUMMARY: Shape & Filter Parameters

% COBBLES	____	D60	____	D85	____
% GRAVEL	0.7	D30	____	D15	____
% SAND	86.8	D10	____	D50	____
% FINES	12.5	Cu =	____	Cc =	____

Mica Noted: No [ ] ; Yes [ ] Amount Adjective: ____
Remarks: (1) Some organics

Coefficient of Uniformity, Cu = D60 / D10 Coefficient of Curvature, Cc = D30^2 / (D60 * D10)

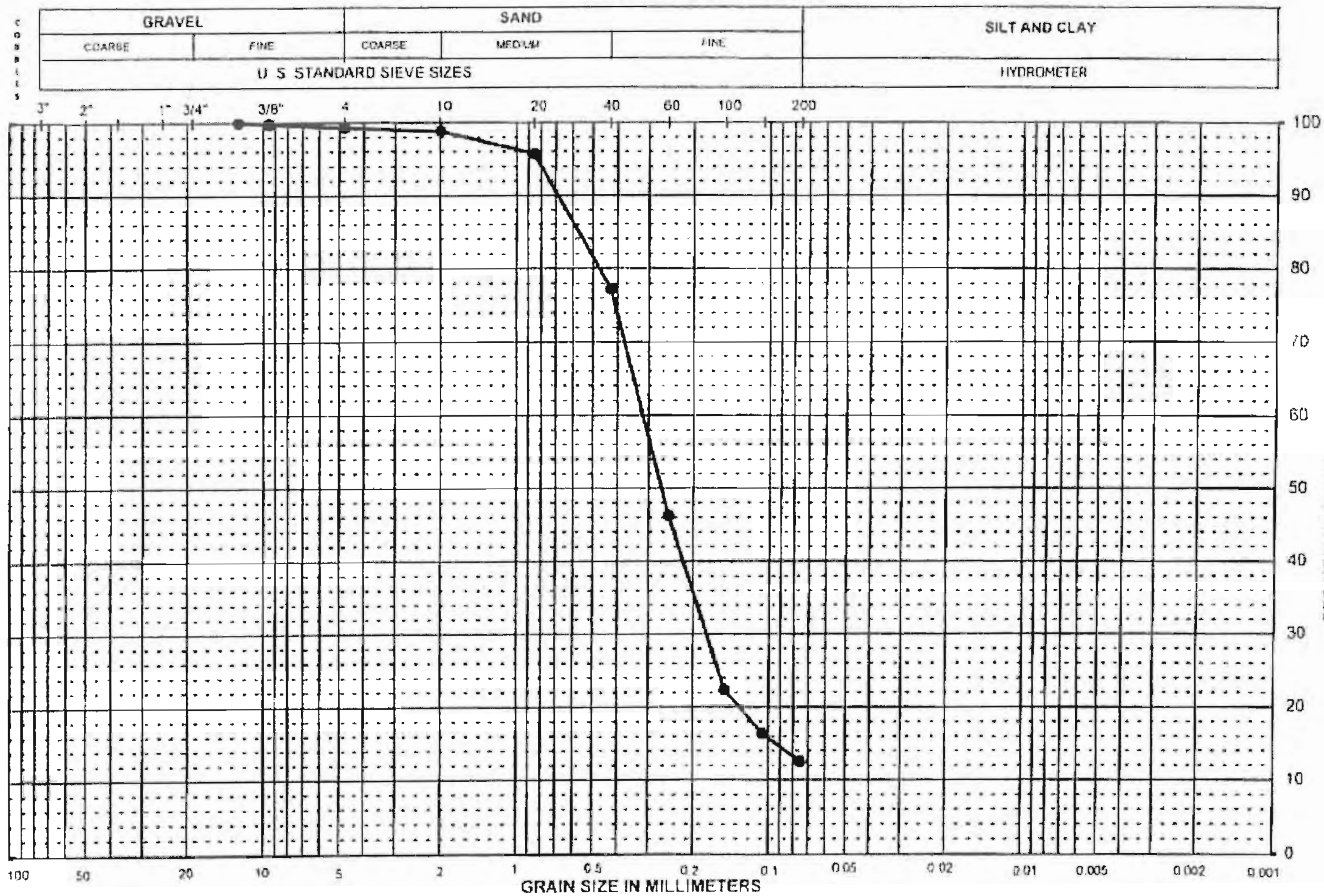
Note: The above values D## denotes particle size (mm) at the corresponding percent passing.
* Denotes sieve added to better define gradation curve

	SET-UP BY:	DRY MASS BY:	WASHED BY:
COARSE FRACTION:			
FINE FRACTION:	[initials]	[initials]	[initials]
DATE:	4/15/03	4/16/03	4/16/03

CALCULATED BY: [initials]
CHECKED BY: ____
SPOT CHECKED BY: ____
REVIEWED BY: ____

S-104 (06/02) (SNA) Siev_s_h URS

UNIFIED SOIL CLASSIFICATION



Sieve No.	Dia. mm	% Finer
3"	75.0	
2"	50.0	
1 1/2"	37.5	
1"	25.0	
3/4"	19.00	
1/2"	12.50	100.0
3/8"	9.50	99.8
#4	4.75	99.3
#10	2.00	98.8
#20	0.850	95.7
#40	0.425	77.2
#60	0.250	46.1
#100	0.150	22.4
#140	0.106	16.4
#200	0.075	12.5
Hydrometer Analysis		

% Cobbles	
% Gravel	0.7
% Sand	86.8
% Fines	12.5
D_{60}	
D_{30}	
D_{10}	
C_u	
C_c	

Exploration	Sample No.	Depth (ft)	SYMBOL	Wn (%)	LL	PI	% Clay	Description and Classification
High Terrace	7		●	2.6				Brown silty Sand (SM)

PROJECT NAME: I-5 Widening
PROJECT NUMBER: 26814226.00020

PARTICLE-SIZE DISTRIBUTION CURVES

Figure:

URS

(SNA) sieve only (04/2000)

sa_15_7

PARTICLE-SIZE ANALYSIS : by Sieving using Soil Sieve Sizes & with Water Content

ASTM C 117, C 136 or D 422 and D 2216

Project Number: 26814226.00020 | Task Number: ______ | Exploration No.: Overlook

Project Name: I-5 Widening | Assignment No.: ______ | Sample No.: 6

Project Engineer: RF | Depth (ft): ______

Visual Description: yellowish brown ~~poorly~~ well-graded Sand with silt ~~(SP-SM)~~ ~~SP-SM~~ (SW-SM)

SPECIMEN: Tested From: Bulk Sample [X] Thin-Walled Tube [ ] SPT Sample [ ] Engr. Property Test Mod Calif. Sample [ ] Specimen's WC [ ] Other: ______

Selection Method:
- X Sieves (1) - whole sample used
- ___ Sieves (1) - partial sample used & selected by Method(s) ___
- ___ Sieves (1) - partial sample used & selected by Method(s) ___

Methods: (a): Splitter; (use for dry soils or that which will segregate) (b): Quartering; (use for dry soils or that which will segregate) (c) : Representative scoop after mixing, or slice of intact sample. (use for moist soils or that which will not segregate)

[ ] See Bulk Sample Processing Information Form (S-106)

Preparation:
Sample/Specimen: Oven-Dried [ ] Air Dried [ ] As-Received State [X]

Oven-Dried Soil Broken Up Before: Selecting partial sample: No [X]; Yes [ ] Seiving 1st Sieve Series: No [ ]; Yes [ ] Seiving 2nd Sieve Series: No [ ]; Yes [ ] Seiving 3rd Sieve Series: No [ ]; Yes [ ]

By: Mortar & Pestle [ ] Pulverizer [ ] Hand [ ] Other ______

Remarks: ______

Washing: (No / Yes)
Whole Specimen Washed on No. 200 sieve ? [ ] [X] and Soil Soaked for 6 hrs.
Retained Fraction: 1st Split Washed ? [ ] [ ] ; 2nd Split Washed ? No [ ] ;Yes [ ]
Fine Fraction Washed on No. 200 sieve ? [ ] [ ] and Soil Soaked for ______ hrs.

MASS OF TEST SPECIMEN (g)

	Total Test Specimen	Partial Test Specimen 1st Split	2nd Split	Soil Retained (after washing) 2nd Split	+200
Min sieve size in sieving sequence (1)	#200				
Container Number	L-12				L-12
Mass of Container and Dry Soil, (g)	615.81				570.45
Mass of Container, (g)	141.27				141.27
Dry Soil, Ws (g)	474.54				429.18
Mass of Dry Soil from Hydrometer, Ws (g)					

Water Content As Recieved or

Container No.	L-12
Wet, M1 (g)	632.45
Dry, M2 (g)	615.81
Cont.,M3 (g)	141.27
Water Content (%)	3.51

SIEVING RESULTS

See (2)	Sieve No.	Cum. Mass Retained (g)	% Finer than Sieve ___	Total Specimen % Finer N'
	3"			
	2"			
	1 1/2"			
	1"			
	3/4"			
	1/2"			
	3/8"			
	4			
	Pan		XXXXXXXX	XXXXXXXXXX

Req. Mass of Test Spec. for 1% (kg)
3"= 70
1 1/2"=10
3/4"= 1.1
3/8"= 0.25
#4 = 0.1
#10 = 0.1

Sieve No. / (3)	Cum. Mass Retained (g)	% Finer than Sieve ___	Total Specimen % Finer N'
1"			
3/4"			
1/2"			
3/8"			
4 / 325	0.0		100.0
10 / 180	6.09		98.7
20 / 115	76.18		83.7
40 / 75	235.05		50.5
60 / 60	346.08		27.1
100* / 40	397.11		16.3
140 / 30	417.11		12.1
200 / 20	428.21		9.8
Pan	429.13	XXXXXXXX	XXXXXXXXXX

Notes: (1) Sieve size given, denotes min. sieve size used in the appropriate sieving sequence
(2) X in box denotes sieve on which split was made (3) Proposed allowable amount of soil retained on 8" dia. sieve

SUMMARY: Shape & Filter Parameters

% COBBLES		D60	0.53	D85	
% GRAVEL	0	D30	0.28	D15	
% SAND	90.2	D10	0.076	D50	
% FINES	9.8	Cu =	7.0	Cc =	1.9

Mica Noted: No [ ] ; Yes [ ] Amount Adjective: ______

Remarks: ______

Coefficient of Uniformity, Cu = D60 / D10 Coefficient of Curvature, Cc = D30^2 / (D60 * D10)

Note: The above values D## denotes particle size (mm) at the corresponding percent passing.

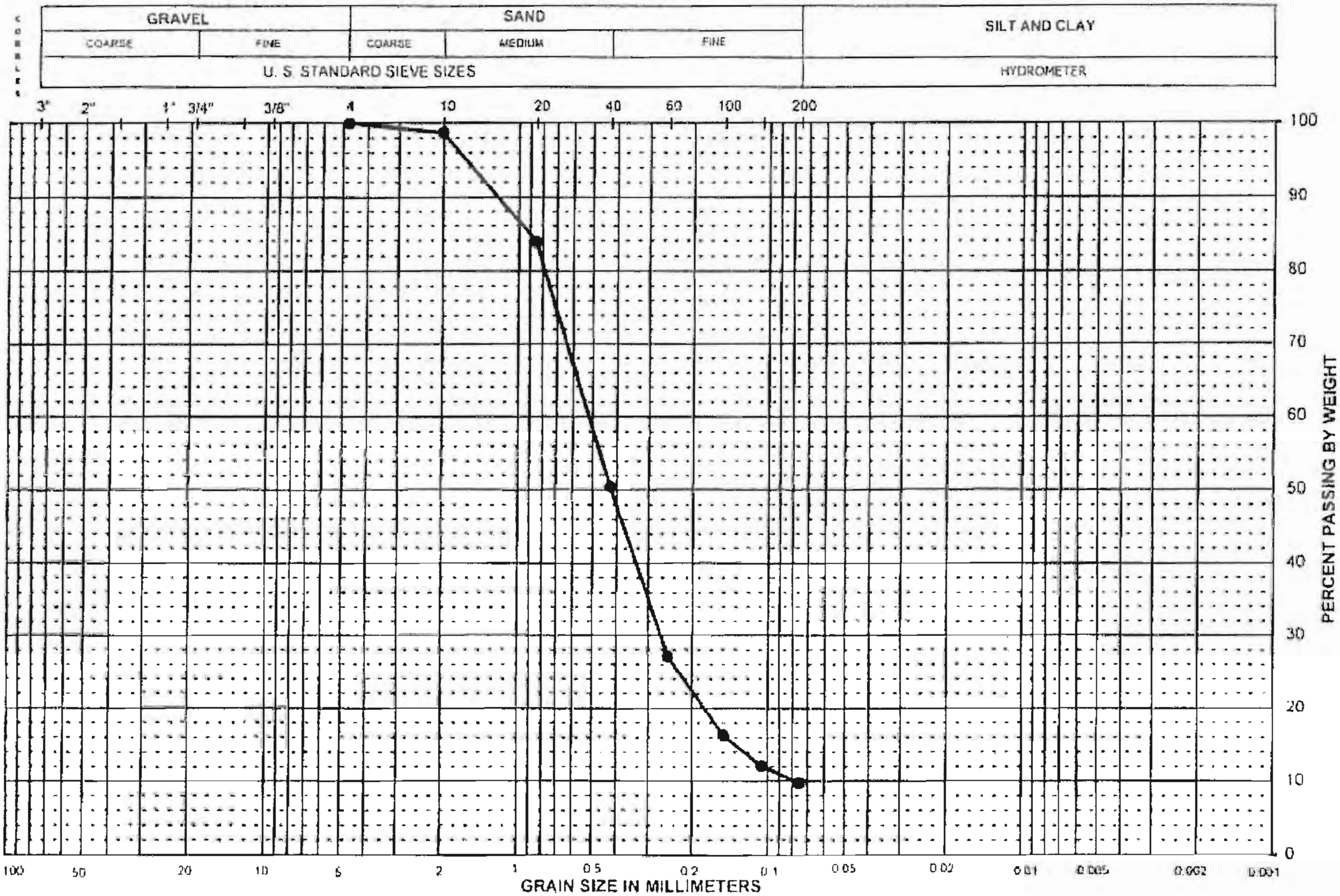
* Denotes sieve added to better define gradation curve

	SET-UP BY:	DRY MASS BY:	WASHED BY:
COARSE FRACTION:			
FINE FRACTION:	[initials]	[initials]	[initials]
DATE:	4/15/03	4/16/03	4/16/03

CALCULATED BY: [initials]
CHECKED BY: ______
SPOT CHECKED BY: ______
REVIEWED BY: ______

S-104 (06/02) (SNA) Siev_s_h URS

UNIFIED SOIL CLASSIFICATION



Sieve No.	Dia. mm	% Finer
3"	75.0	
2"	50.0	
1 1/2"	37.5	
1"	25.0	
3/4"	19.00	
1/2"	12.50	
3/8"	9.50	
#4	4.75	100.0
#10	2.00	98.7
#20	0.850	83.9
#40	0.425	50.5
#60	0.250	27.1
#100	0.150	16.3
#140	0.106	12.1
#200	0.075	9.8
Hydrometer Analysis		

% Cobbles	
% Gravel	0.0
% Sand	90.2
% Fines	9.8
D_{60}	0.53
D_{30}	0.28
D_{10}	0.076
C_u	7.0
C_c	1.9

Exploration	Sample No.	Depth (ft)	SYMBOL	Wn (%)	LL	PI	% Clay	Description and Classification
Overlook	6		•	3.5				Yellowish brown well-graded Sand with silt (SW-SM)

PROJECT NAME: I-5 Widening
PROJECT NUMBER: 26814226.00020

PARTICLE-SIZE DISTRIBUTION CURVES

Figure:

URS

(SNA) sieve only (04/2003)

sa_I5_6

PARTICLE-SIZE ANALYSIS : by Sieving using Soil Sieve Sizes & with Water Content

ASTM C 117, C 136 or D 422 and D 2216

Project Number: 26814226.00020 Task Number: ______ Exploration No.: View Point

Project Name: I-5 Widening Assignment No.: ______ Sample No.: 5

Project Engineer: RF Depth (ft): ______

Visual Description: Pale brown poorly graded Sand with silt (SP-SM)

SP-SM

SPECIMEN: Tested From:
Bulk Sample [X] Thin-Walled Tube [ ]
SPT Sample [ ] Engr. Property Test
Mod Calif. Sample [ ] Specimen's WC [ ]
Other: ______

Selection Method:
X Sieves (1) - whole sample used
___ Sieves (1) - partial sample used & selected by Method(s)__
___ Sieves (1) - partial sample used & selected by Method(s)__

Methods: (a): Splitter, (use for dry soils or that which will segregate)
(b): Quartering; (use for dry soils or that which will segregate)
(c). Representative scoop after mixing, or slice of intact sample. (use for moist soils or that which will not segregate)

[ ] See Bulk Sample Processing Information Form (S-106)

Preparation:
Sample/Specimen: Oven-Dried [ ] Air Dried [ ] As-Received State [X]

Oven-Dried Soil Broken Up Before:
Selecting partial sample: No [X]; Yes [ ]
Seiving 1st Sieve Series: No [ ]; Yes [ ]
Seiving 2nd Sieve Series: No [ ]; Yes [ ]
Seiving 3rd Sieve Series: No [ ]; Yes [ ]

By: Mortar & Pestle [ ] Pulverizer [ ] Hand [ ] Other ______

Remarks: ______

Washing: No Yes
Whole Specimen Washed on No. 200 sieve ? [ ] [X] and Soil Soaked for 6 hrs.
Retained Fraction: 1st Split Washed ? [ ] [ ] ; 2nd Split Washed ? No [ ] ;Yes [ ]
Fine Fraction Washed on No. 200 sieve ? [ ] [ ] and Soil Soaked for ______ hrs.

MASS OF TEST SPECIMEN (g)	Total Test Specimen	Partial Test Specimen 1st Split	Partial Test Specimen 2nd Split	Soil Retained (after washing) 2nd Split	Soil Retained (after washing) +200
Min. sieve size in sieving sequence (1)	#200				
Container Number	L-18				L-18
Mass of Container and Dry Soil, (g)	568.43				547.54
Mass of Container, (g)	147.58				147.58
Dry Soil, Ws (g)	420.85				399.96
Mass of Dry Soil from Hydrometer, Ws (g)					

Water Content As Recieved or	
Container No.	L-18
Wet, M1 (g)	581.26
Dry, M2 (g)	568.43
Cont., M3 (g)	147.58
Water Content (%)	3.05

SIEVING RESULTS

See (2)	Sieve No.	Cum. Mass Retained (g)	% Finer than Sieve ___	Total Specimen % Finer N'
	3"			
	2"			
	1 1/2"			
	1"			
	3/4"			
	1/2"			
	3/8"			
	4			
	Pan		XXXXXXXX	XXXXXXXXXX

Req. Mass of Test Spec. for 1% (kg)
3" = 70
1 1/2" = 10
3/4" = 1.1
3/8" = 0.25
#4 = 0.1
#10 = 0.1

Sieve No. / (3)	Cum. Mass Retained (g)	% Finer than Sieve ___	Total Specimen % Finer N'
1"			
3/4"			
1/2"			
3/8"	0.0		100.0
4 / 325	0.79		99.8
(1) 10 / 180	2.83		99.3
(1) 20 / 115	23.70		94.4
40 / 75	110.91		73.6
60 / 60	279.67		33.5
100*/ 40	365.70		13.1
140 / 30	388.52		7.7
200 / 20	398.46		5.3
Pan	400.11	XXXXXXXX	XXXXXXXXXX

Notes: (1) Sieve size given, denotes min. sieve size used in the appropriate sieving sequence
(2) X in box denotes sieve on which split was made (3) Proposed allowable amount of soil retained on 8" dia. sieve

SUMMARY: Shape & Filter Parameters

% COBBLES		D60	0.37	D85	
% GRAVEL	0.2	D30	0.24	D15	
% SAND	94.5	D10	0.13	D50	
% FINES	5.3	Cu =	2.8	Cc =	1.2

Mica Noted: No [ ] ; Yes [ ] Amount Adjective: ______

Remarks: (1) Some organics

Coefficient of Uniformity, Cu = D60 / D10 Coefficient of Curvature, Cc = D30^2 / (D60 * D10)

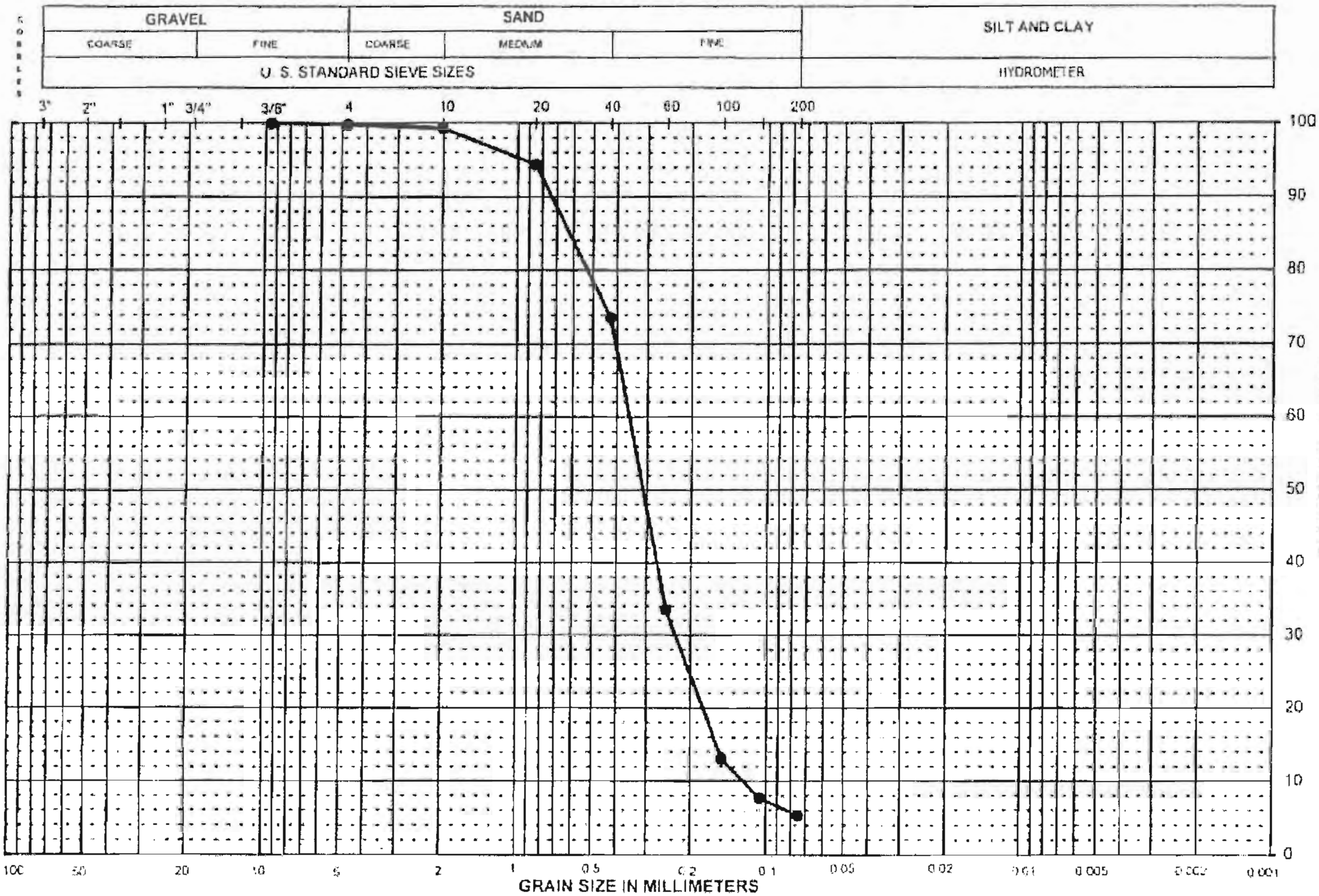
Note: The above values D## denotes particle size (mm) at the corresponding percent passing.

* Denotes sieve added to better define gradation curve

	SET-UP BY:	DRY MASS BY:	WASHED BY:
COARSE FRACTION:			
FINE FRACTION:	DO	DO	DO
DATE:	4/15/03	4/16/03	4/16/03

CALCULATED BY: DO
CHECKED BY: ______
SPOT CHECKED BY: ______
REVIEWED BY: ______

UNIFIED SOIL CLASSIFICATION



Sieve No.	Dia. mm	% Finer
3"	75.0	
2"	50.0	
1 1/2"	37.5	
1"	25.0	
3/4"	19.00	
1/2"	12.50	
3/8"	9.50	100.0
#4	4.75	99.8
#10	2.00	99.1
#20	0.850	94.4
#40	0.425	73.6
#60	0.250	33.5
#100	0.150	13.1
#140	0.106	7.7
#200	0.075	5.3
Hydrometer Analysis		

% Cobbles	
% Gravel	0.2
% Sand	94.5
% Fines	5.3
D_{60}	0.37
D_{30}	0.24
D_{10}	0.13
C_u	2.8
C_c	1.2

Exploration	Sample No.	Depth (ft)	SYMBOL	Wn (%)	LL	PI	% Clay	Description and Classification
View Point	5		•	3.1				Pale brown poorly graded Sand with silt (SP-SM)

PROJECT NAME: I-5 Widening
PROJECT NUMBER: 26814226.00020

PARTICLE-SIZE DISTRIBUTION CURVES

Figure:

URS

(SNA) sieve only (04/2000)

sa_l5_5

PARTICLE-SIZE ANALYSIS : by Sieving using Soil Sieve Sizes & with Water Content

ASTM C 117, C 136 or D 422 and D 2216

Project Number: 26814226.00020 Task Number: ______ Exploration No.: NW Slope
Project Name: I-5 Widening Assignment No.: ______ Sample No.: 4
Project Engineer: RF Depth (ft): ______

Visual Description: Reddish brown silty Sand (SM)
SM

SPECIMEN: **Tested From:**
Bulk Sample [X] Thin-Walled Tube [ ]
SPT Sample [ ] Engr. Property Test
Mod Calif. Sample [ ] Specimen's WC [ ]
Other: ______

[ ] See Bulk Sample Processing Information Form (S-106)

Selection Method:
X Sieves (1) - whole sample used
___ Sieves (1) - partial sample used & selected by Method(s) ___
___ Sieves (1) - partial sample used & selected by Method(s) ___

Methods: (a): Splitter; (use for dry soils or that which will segregate)
(b): Quartering; (use for dry soils or that which will segregate)
(c) : Representative scoop after mixing, or slice of intact sample (use for moist soils or that which will not segregate)

Preparation: **Oven-Dried Soil Broken Up Before:** **By:** Remarks: ______

Sample/Specimen:
Oven-Dried [ ]
Air Dried [ ]
As-Received State [X]

Selecting partial sample: No [X]; Yes [ ]
Seiving 1st Sieve Series: No [ ]; Yes [ ]
Seiving 2nd Sieve Series: No [ ]; Yes [ ]
Seiving 3rd Sieve Series: No [ ]; Yes [ ]

Mortar & Pestle [ ]
Pulverizer [ ]
Hand [ ]
Other ______

Washing: No Yes
Whole Specimen Washed on No. 200 sieve ? [ ] [X] and Soil Soaked for 6 hrs.
Retained Fraction: 1st Split Washed ? [ ] [ ] ; 2nd Split Washed ? No [ ] ;Yes [ ]
Fine Fraction Washed on No. 200 sieve ? [ ] [ ] and Soil Soaked for ______ hrs.

	MASS OF TEST SPECIMEN (g) Total Test Specimen	Partial Test Specimen 1st Split	2nd Split	Soil Retained (after washing) 2nd Split	+200
Min.sieve size in sieving sequence (1)	#200				
Container Number	L-21				L-21
Mass of Container and Dry Soil, (g)	701.84				592.55
Mass of Container, (g)	136.65				136.65
Dry Soil, Ws (g)	565.19				455.90
Mass of Dry Soil from Hydrometer, Ws (g)					

Water Content As Recieved or	
Container No.	L-21
Wet, M1 (g)	733.14
Dry, M2 (g)	701.84
Cont. M3 (g)	136.65
Water Content (%)	5.54

SIEVING RESULTS

See (2)	Sieve No.	Cum. Mass Retained (g)	% Finer than Sieve ___	Total Specimen % Finer N'
	3"			
	2"			
	1 1/2"			
	1"			
	3/4"			
	1/2"			
	3/8"			
	4			
	Pan		XXXXXXXX	XXXXXXXXXX

Req. Mass of Test Spec. for 1% (kg)
3"= 70
1 1/2"=10
3/4"= 1.1
3/8"= 0.25
#4 = 0.1
#10 = 0.1

Sieve No. / (3)	Cum. Mass Retained (g)	% Finer than Sieve ___	Total Specimen % Finer N'
1"			
3/4"			
1/2"			
3/8"			
4 / 325	0.0		100.0
10 / 180	0.25 (1)		100.0
20 / 115	11.26		98.0
40 / 75	228.40		59.6
60 / 60	387.88		31.4
100* / 40	437.72		22.6
140 / 30	449.19		20.5
200 / 20	454.89		19.5
Pan	455.92	XXXXXXXX	XXXXXXXXXX

Notes: (1) Sieve size given, denotes min. sieve size used in the appropriate sieving sequence
(2) X in box denotes sieve on which split was made (3) Proposed allowable amount of soil retained on 8" dia. sieve

SUMMARY: Shape & Filter Parameters

% COBBLES		D60		D85	
% GRAVEL	0	D30		D15	
% SAND	80.5	D10		D50	
% FINES	19.5	Cu =		Cc =	

Mica Noted: No [ ] ; Yes [ ] Amount Adjective: ______

Remarks: (1) Organics only on #10 sieve

Coefficient of Uniformity, Cu = D60 / D10 Coefficient of Curvature, Cc = D30^2 / (D60 * D10)

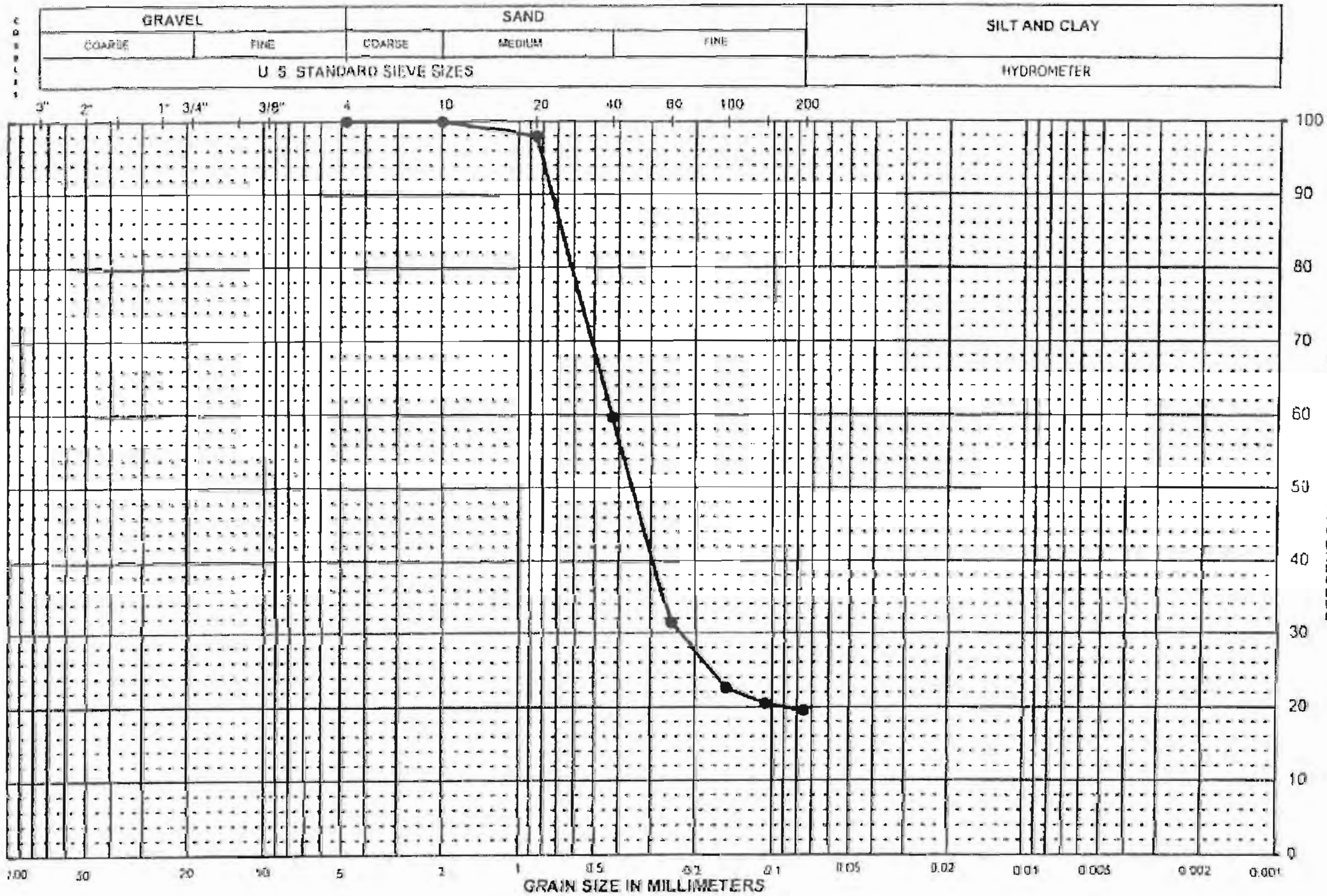
Note: The above values (D##) denotes particle size (mm) at the corresponding percent passing.

* Denotes sieve added to better define gradation curve

	SET-UP BY:	DRY MASS BY:	WASHED BY:
COARSE FRACTION:			
FINE FRACTION:	JD	JD	JD
DATE:	4/15/03	4/16/03	4/16/03

CALCULATED BY: JD
CHECKED BY: ______
SPOT CHECKED BY: ______
REVIEWED BY: ______

UNIFIED SOIL CLASSIFICATION



Sieve No.	Dia. mm	% Finer
3"	75.0	
2"	50.0	
1 1/2"	37.5	
1"	25.0	
3/4"	19.00	
1/2"	12.50	
3/8"	9.50	
#4	4.75	100.0
#10	2.00	100.0
#20	0.850	98.0
#40	0.425	59.6
#60	0.250	31.4
#100	0.150	22.6
#140	0.106	20.5
#200	0.075	19.5
Hydrometer Analysis		

% Cobbles	
% Gravel	0.0
% Sand	80.5
% Fines	19.5
D_{60}	
D_{30}	
D_{10}	
C_u	
C_c	

Exploration	Sample No.	Depth (ft)	SYMBOL	Wn (%)	LL	PI	% Clay	Description and Classification
NW Slope	4		●	5.5				Reddish brown silty Sand (SM)

PROJECT NAME: I-5 Widening
PROJECT NUMBER: 26814226.00020

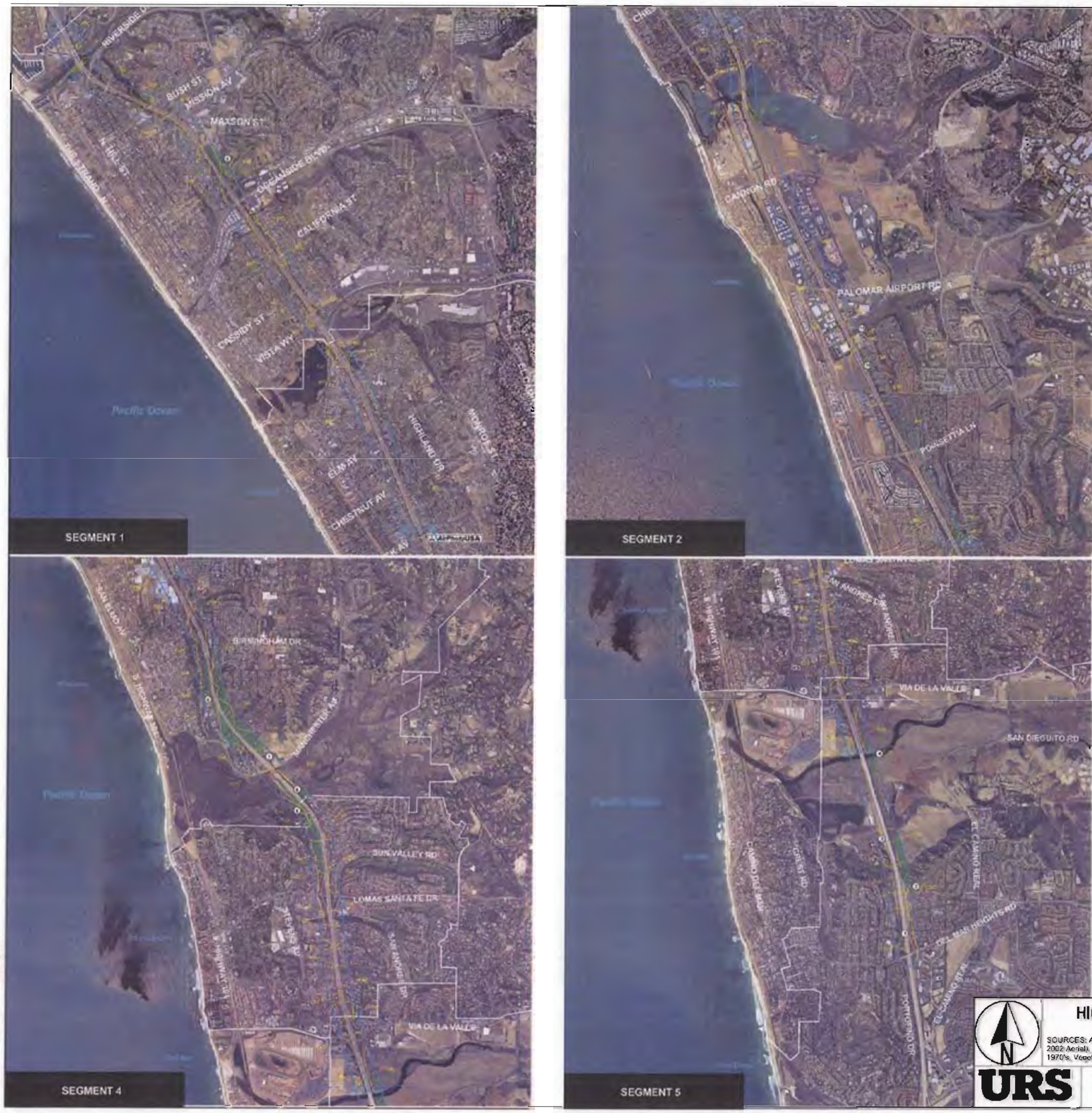
PARTICLE-SIZE DISTRIBUTION CURVES

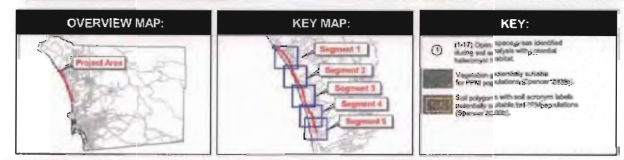
Figure:

URS

(SNA) sieve only (04/2000)

sa_I5_4





HIGH SUITABLE SOILS FOR PACIFIC POCKET MOUSE LOCATIONS WITHIN ALIGNMENT:
(Soil Acronym/Soil Description/Total Acreage)

CbB	Carlsbad gravelly loamy sand, 2 to 5 percent slopes	37.46	GaE	Gaviota fine sandy loam, 9 to 30 percent slopes	15.56
CbC	Carlsbad gravelly loamy sand, 5 to 9 percent slopes	41.75	GaF	Gaviota fine sandy loam, 30 to 50 percent slopes	13.27
CbD	Carlsbad gravelly loamy sand, 9 to 15 percent slopes	76.75	LeD	Las Flores loamy fine sand, 9 to 15 percent slopes	4.45
CbE	Carlsbad gravelly loamy sand, 15 to 30 percent slopes	7.11	LeD2	Las Flores loamy fine sand, 9 to 15 percent slopes, eroded	4.84
CfB	Chesterton fine sandy loam, 2 to 5 percent slopes	163.56	LeE	Las Flores loamy fine sand, 15 to 30 percent slopes	0.63
CfC	Chesterton fine sandy loam, 5 to 9 percent slopes	18.14	MlC	Marina loamy coarse sand, 2 to 9 percent slopes	[illegible]
CsB	Corralitos loamy sand, 0 to 5 percent slopes	17.21	MlE	Marina loamy coarse sand, 9 to 30 percent slopes	196.16
CsC	Corralitos loamy sand, 5 to 9 percent slopes	147.12	TeF*	Terrace escarpments	165.24
CsD	Corralitos loamy sand, 9 to 15 percent slopes	[illegible]	TuB	Tujunga sand, 0 to 5 percent slopes	17.27

(*Low Suitability)

HIGH SUITABLE VEGETATION FOR PACIFIC POCKET MOUSE LOCATIONS WITHIN ALIGNMENT:
(Vegetation Acronym/Vegetation Description/Total Acreage)

DCSS	Diegan Coastal Sage Scrub	100.76	SMC*	Southern Mixed Chaparral	2.51
NNG	Non-Native Grassland	121.74	VFG*	Valley and Foothill Grassland	3.14

(*Low Suitability)

HIGH SUITABLE SOILS & VEGETATION FOR PACIFIC POCKET MOUSE LOCATIONS WITHIN PROJECT VICINITY/ I-5 CORRIDOR STUDY (500' ON EITHER SIDE OF CENTERLINE)

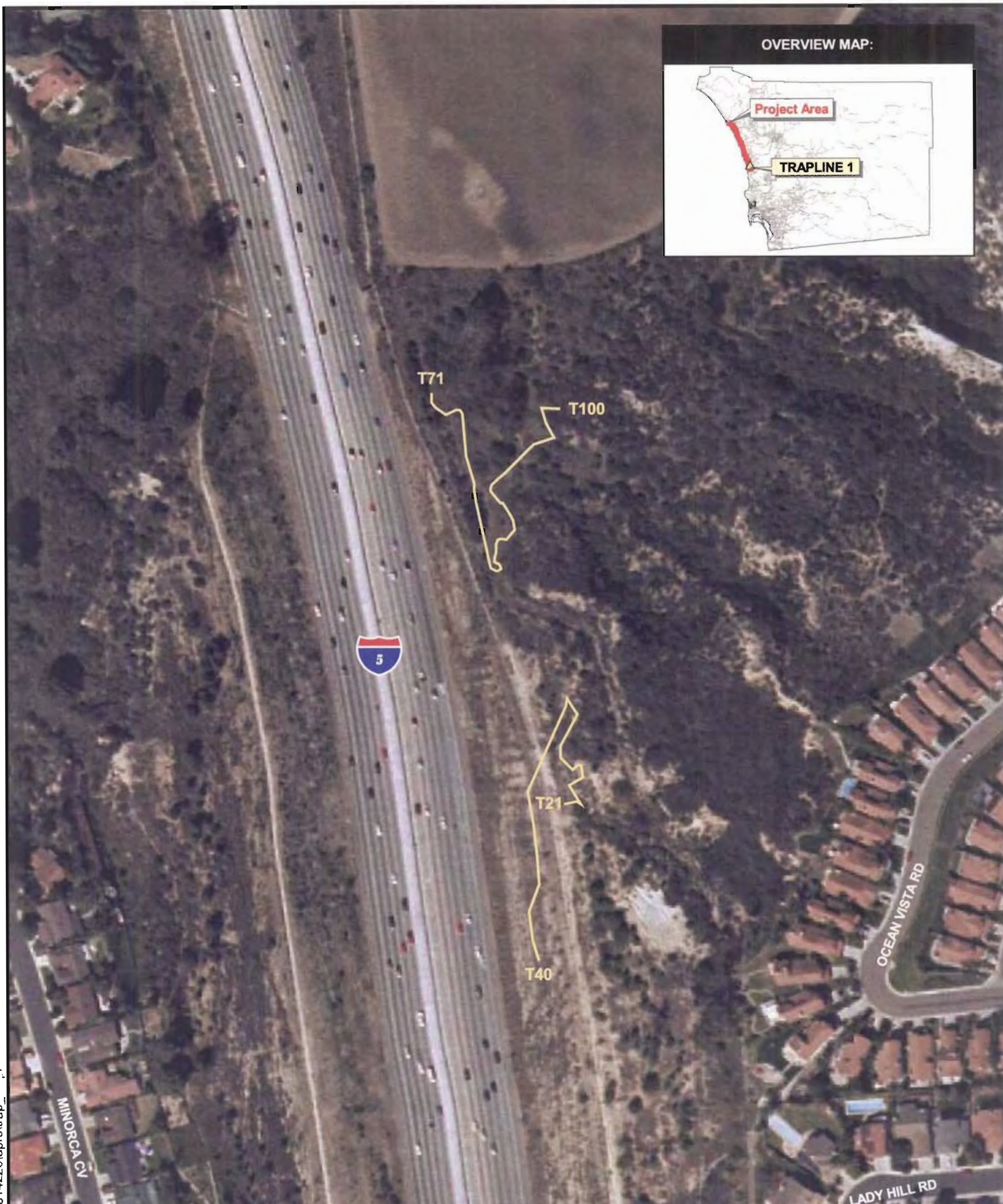
URS

SOURCES: AirPhoto USA (March 2002 Aerial), SANDAG (Soils-early 1970's, Vegetation-1995).

2000 0 2000 4000 Feet

SCALE: 1" = 2,000' (1:24,000)

CHECKED BY: AJ	DATE: 6-27-03	FIG. NO: 3
PM: PM	PROJ. NO: 26814226.00030	



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SOURCES: AirPhoto USA (March 2002 Aerial), URS (Traplines).

TRAPLINE 1
I-5 WIDENING PACIFIC POCKET MOUSE TRAPPING PROJECT
MAY 2003

URS

100 0 100 200 Feet
SCALE: 1" = 200' (1:2400)

CHECKED BY: RF	DATE: 6-26-03	FIG. NO:
PM: PM	PROJ. NO: 26814226.00030	4

SOURCES: AirPhoto USA (March 2002 Aerial), URS (Traplines).

TRAPLINE 2
I-5 WIDENING PACIFIC POCKET MOUSE TRAPPING PROJECT
JUNE 2003

N

URS

100 0 100 200 Feet
SCALE: 1" = 200' (1:2400)

CHECKED BY: RF	DATE: 6-26-03	FIG. NO:
PM: PM	PROJ. NO: 26814226.00030	5

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SOURCES: AirPhoto USA (March 2002 Aerial), URS (Traplines).

TRAPLINE 3
I-5 WIDENING PACIFIC POCKET MOUSE TRAPPING PROJECT
JUNE 2003

URS

100 0 100 200 Feet
SCALE: 1" = 200' (1:2400)

CHECKED BY: RF	DATE: 6-26-03	FIG. NO: 6
PM: PM	PROJ. NO: 26814226.00030	

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SOURCES: AirPhoto USA (March 2002 Aerial), URS (Traplines).

TRAPLINE 4
I-5 WIDENING PACIFIC POCKET MOUSE TRAPPING PROJECT
JUNE 2003

URS

100 0 100 200 Feet
SCALE: 1" = 200' (1:2400)

CHECKED BY: RF	DATE: 6-26-03	FIG. NO: 7
PM: PM	PROJ. NO: 26814226.00030	

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SOURCES: AirPhoto USA (March 2002 Aerial), URS (Traplines).

TRAPLINE 5
I-5 WIDENING PACIFIC POCKET MOUSE TRAPPING PROJECT
JUNE 2003

N

URS

100 0 100 200 Feet

SCALE: 1" = 200' (1:2400)

CHECKED BY: RF	DATE: 6-26-03	FIG. NO: 8
PM: PM	PROJ. NO: 26814226.00030	

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URS Corporation
2020 East First Street, Suite 400
Santa Ana, California 92705

URS Corporation

Fax Transmission

To:	Daniel Marquez, Biologist	**From:**	Richard Friesen, Ph. D.
Address:	US Fish and Wildlife Service 6010 Hidden Valley Road Carlsbad, California 92000	**Items:**	Request for PPM Trapping
Fax:	760-431-9624		
Phone:	760-431-9440	**Date:**	May 7, 2003 (Resend 12 May 2003)
Re:	Trapping Requests	**CC:**	

X **Urgent** **For Review** ☐ **Please Comment** X **Please Reply** ☐ **FYI**

Comments:

URS is under contract with Caltrans to conduct trapping for possible populations of the Pacific Pocket Mouse (PPM, *Perognathus longimembris pacificus*) on Interstate 5 right-of-ways (ROWs) between Mission Boulevard in Oceanside, California and Del Mar Heights Road in the City of San Diego, California. This project is known as the I-5 Widening Project. The potential trapping areas are located within 500 feet of the roadway centerline. Much of this study area was disturbed during the construction of Interstate 5 and landscape species were planted in many areas. The purpose of the study is to determine the presence or absence , and location, if any, of the PPM.

In spite of construction activities, there are some natural-appearing areas within, and adjacent to, the 500 feet buffers on each side of the roadway that potentially could support PPM. We surveyed many of the most natural sites along the roadway ROW on foot to determine those that would have the most potential, if any, for supporting the PPM. By using our experience on the walkover surveys, and using USDA Soil Maps, USFWS GIS Suitability Model maps, and the soil / vegetation analysis in *W. Spencer, C. Schaefer, S. Dodd, S. J. Montgomery, and C. Holland. 2000. Pacific Pocket Mouse Studies Program, Phase II Report: Task 5 – Translocation Receiver Site Study, May 2000. Pages 3-16, and Appendix B (Soil Types in Orange and San Diego Counties, Ranked for Potential to Support Pacific Pocket Mouse), prepared for Foothill/Eastern Transportation Corridor Agency and U.S. Fish and Wildlife Service*, we selected eight sites that may have best potential for the PPM, even though the potential appears to be low.

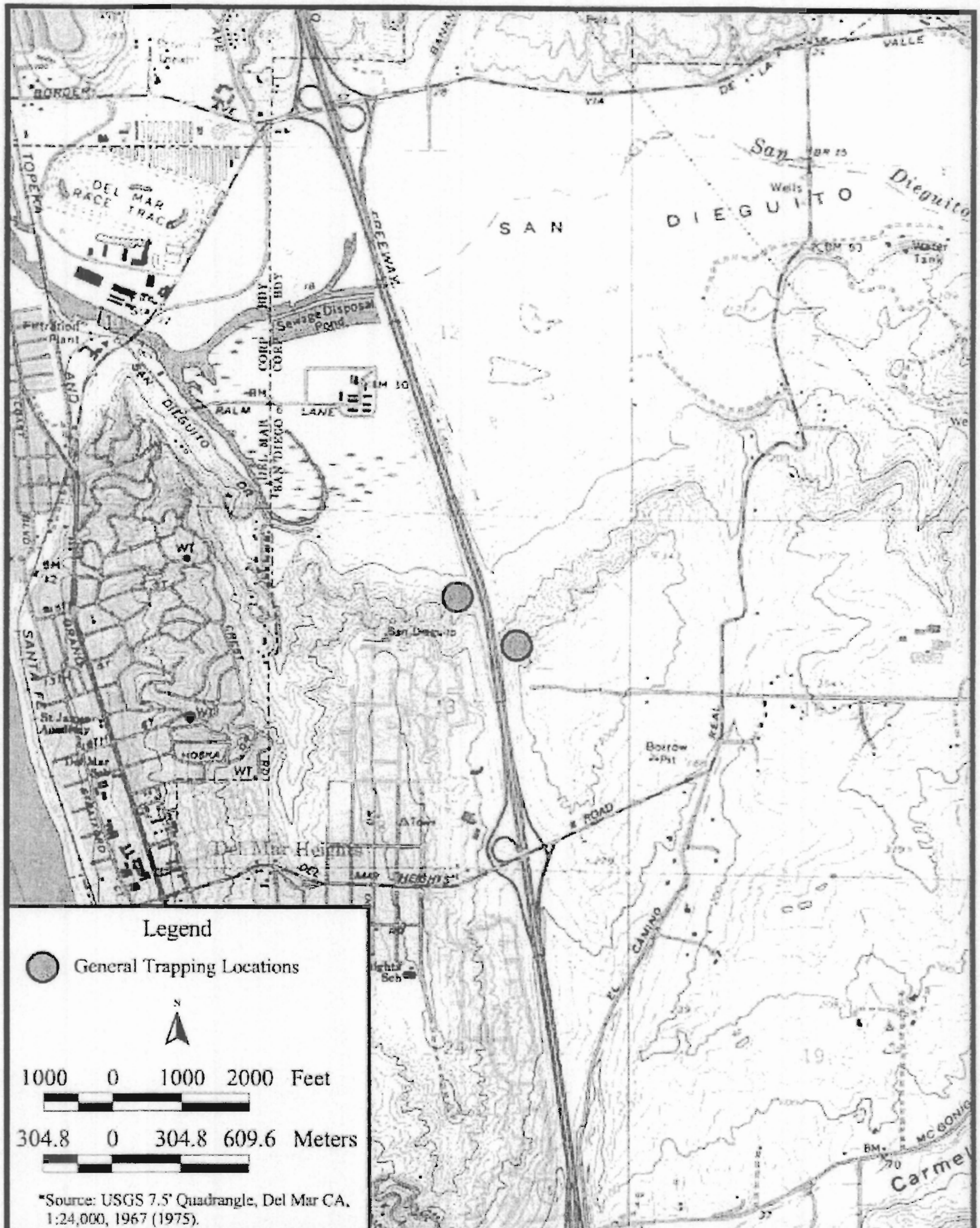
We have funds to trap five of these sites during May and June of 2003. The remaining sites, and others, may be trapped in later Caltrans budget years, if funds are made available. Because the present funds will expire on 30 June, we cannot trap beyond that date this year. The nighttime temperatures in the project area have been below 50° F until the last few days, and rains have continued to keep the soils wet. Providing the nighttime temperatures are predicted to remain above 50° F and the soils have dried out adequately, we plan to begin trapping the week of 12 May 2003. The number of trapping areas (up to five) we can sample this season will depend upon the weather parameters and the number of lines we can trap before our funding source cut off.

The trapping program will comply with conditions of the URS permit PRT-775869, which designates Richard Friesen as principal investigator and Phil Richards and Lincoln Hulse as field assistants. Sherman live traps [9 inch folding traps with a (Friesen) modified trigger that can more readily catch animals about 5g] will be sign set in areas where soils and vegetation appear most suitable for PPM. Small grained mixed seeds will be used as bait.

The three attached maps indicate the location of the potential trapping lines. We plan to start from the south (Figure 1) and work our way northward. If any PPM are captured, the trapline at that location would be terminated, and we would move northward to the next location.

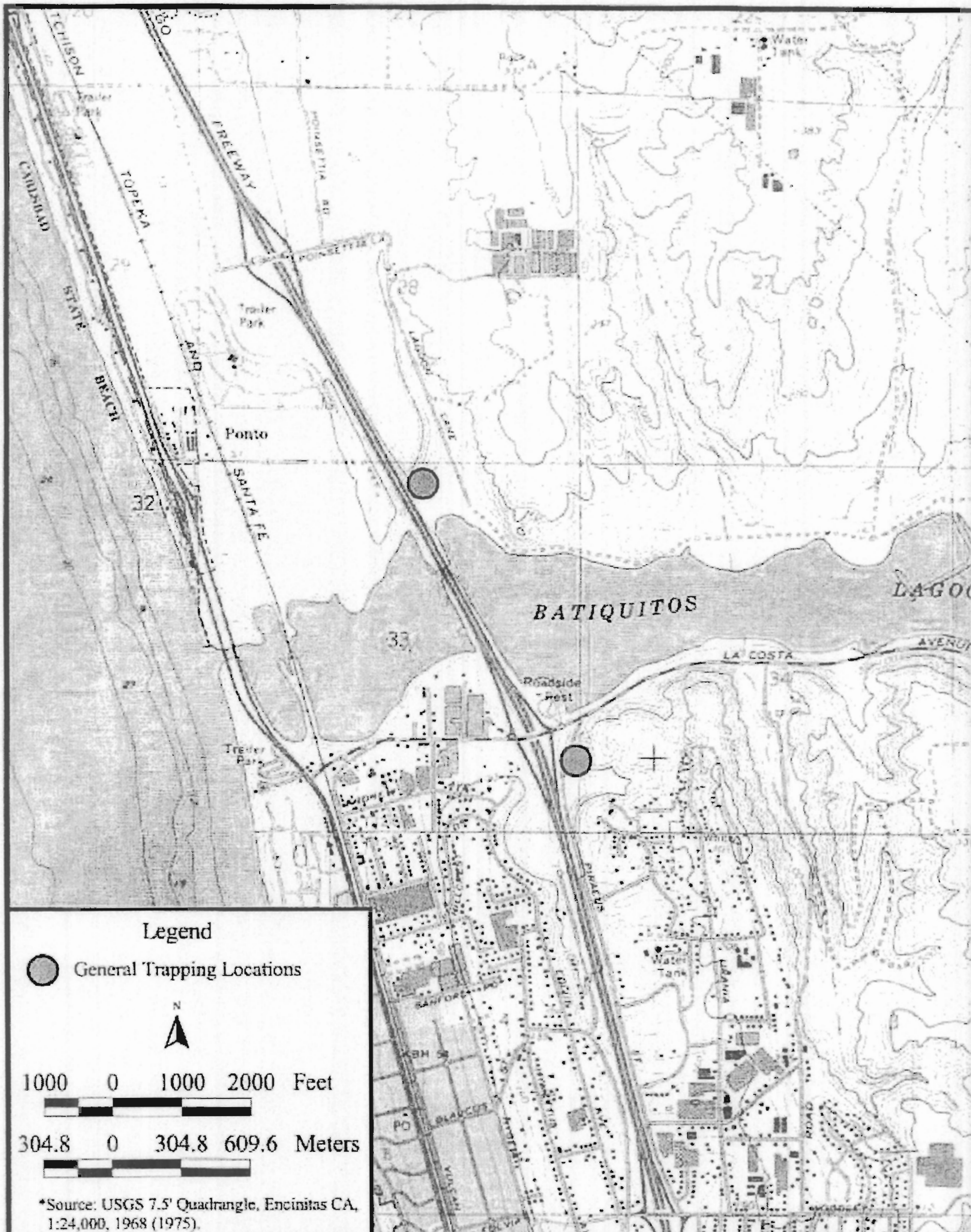
If you have any questions, please call me at 714-433-7608. Thanks for acting on these requests in an expeitious manner.

Richard Dean Friesen, Ph. D.
Senior Biologist



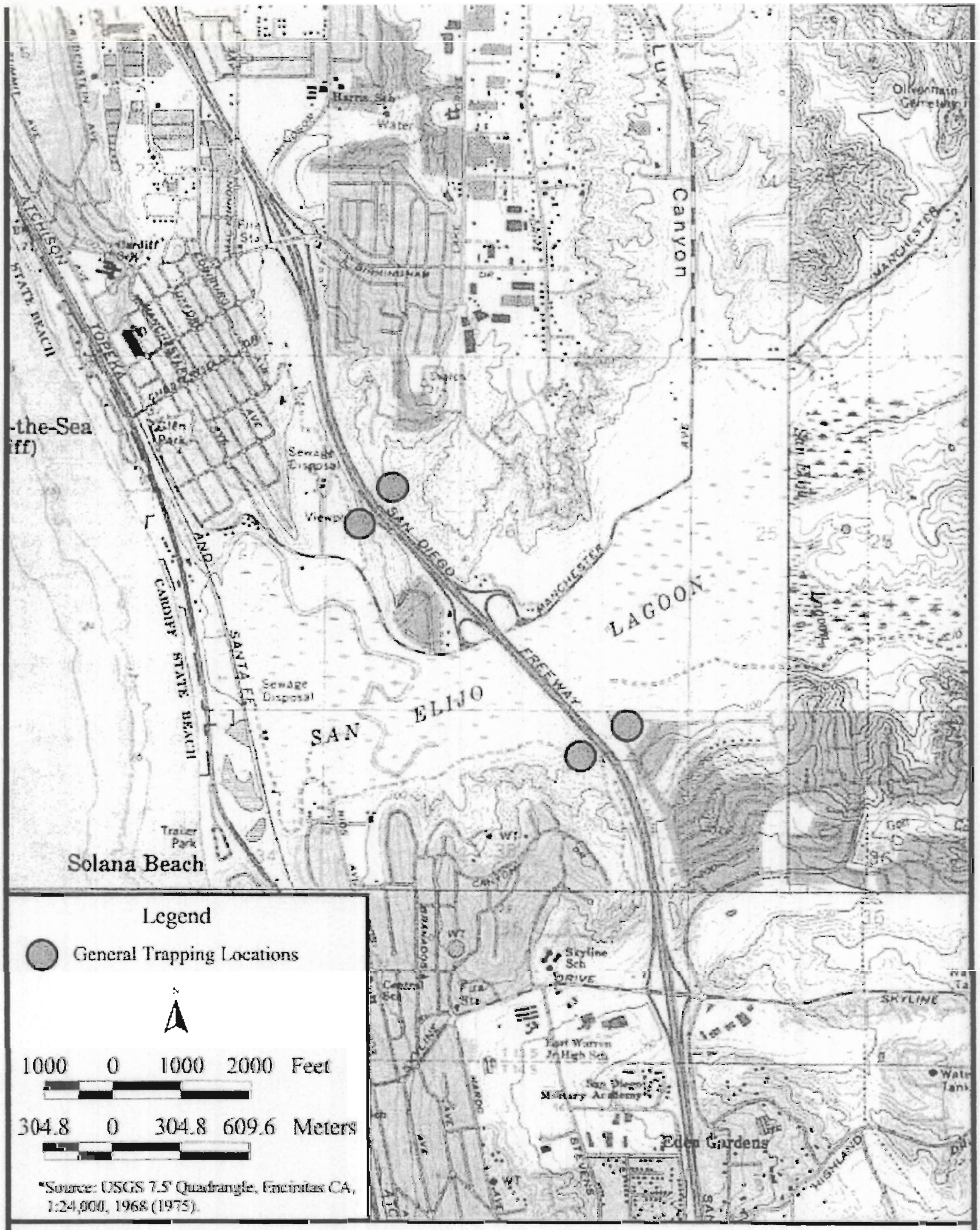
GENERAL PACIFIC POCKET MOUSE TRAPPING LOCATIONS

URS	May 2003	I-5 Widening Project	Figure 1



GENERAL PACIFIC POCKET MOUSE TRAPPING LOCATIONS

URS	May 2003	I-5 Widening Project	Figure 2



GENERAL PACIFIC POCKET MOUSE TRAPPING LOCATIONS

URS	May 2003	I-5 Widening Project	Figure 3

Photograph: 1

Date of Photo: 21 May 2003

Trapline: 1

Location: East side of I-5 FWY, near overlook park

Direction. View facing North

Comments: View of Coastal Sage Scrub (CSS) with open sandy areas in the background largely obscured by vegetation in the foreground. Open sandy areas within CSS are characteristic of heteromyid habitat.

Photograph: 2

Date of Photo: 21 May 2003

Trapline: 1

Location: East side of I-5 FWY, near overlook park

Direction: View facing North

Comments: View of CSS with intermittent weedy/ruderal vegetation. Patches of open sandy areas within the vegetation are not visible on this photograph. Portions of this vegetation is characteristic of heteromyid habitat.

Photograph: 3

Date of Photo: 24 May 2003

Trapline: 1

Location: East side of I-5 FWY, near overlook park

Direction: View facing West

Comments: View of trap 35, set in open sandy areas within CSS. These open areas are characteristic of heteromyid habitats.

Photograph: 4

Date of Photo: 24 May 2003

Trapline: 1

Location: East side of I-5 FWY, near overlook park

Direction: View facing South West

Comments: View of open sandy areas between CSS. Such sands have accumulated in the drain on this small terrace. These open areas may support heteromyid rodents.

	**Photograph:** 5 **Date of Photo:** 7 June 2003 **Trapline:** 2 **Location:** West side of I-5 near San Elijo Lagoon **Direction:** View facing South **Comments:** Overview of Trapline 2. This view shows the dominating shrubs. Open areas among the shrubs do not show in this view. This trapline has physiognomy similar to PPM habitat at Dana Point Headlands and San Mateo creek. The slope however, faces eastward..
	**Photograph:** 6 **Date of Photo:** 7 June 2003 **Trapline:** 2 **Location:** West side of I-5 near San Elijo Lagoon **Direction:** View facing West **Comments:** View of open sandy areas between the shrubs shown in photograph 5. These open areas are characteristic of heteromyid habitats, and very similar to the PPM habitat at Dana Point Headlands. Only wood rats and house mouse however, were captured here.

Photograph: 7

Date of Photo: 7 June 2003

Trapline: 2

Location: West side of I-5 near San Elijo Lagoon

Direction: View facing North

Comments: View of trap 25 within CSS on an edge with Chaparral. The open sandy soil and weedy/ruderal vegetation between the CSS is characteristic of heteromyid habitat.

Photograph: 8

Date of Photo: 10 June 2003

Trapline: 3

Location: East side of I-5, near San Elijo Lagoon.

Direction: View facing North

Comments: View of North facing CSS slope. Trapping was conducted at the tee of this slope.

Photograph: 9

Date of Photo: 10 June 2003

Trapline: 3

Location: East side of I-5, near San Elijo Lagoon.

Direction: View facing East

Comments: Over view of trapline 2. This photo shows a mix of CSS elements and weedy/ruderal vegetation species, with open sandy soils throughout. This habitat has characteristics of PPM in other locations north of the BSA.

Photograph: 10

Date of Photo: 10 June 2003

Trapline: 3

Location: East side of I-5, near San Elijo Lagoon.

Direction: View facing North West

Comments: View of trap 71 placed in an open area between ruderal species and mixed CSS/Chaparral. The physiognomy of this trapline is similar to the PPM habitat at Dana Point Headlands.

Photograph: 11

Date of Photo: 21 June 2003

Trapline: 4

Location: East side of I-5, near Cardiff by the Sea

Direction: View facing North West

Comments: View of west facing slope with I-5 in back ground. West facing slopes have shown a greater frequency of PPM in know populations at Camp Pendleton. This photo shows open sandy areas between CSS. Motor bikers have disturbed the site.

Photograph: 12

Date of Photo: 21 June 2003

Trapline: 4

Location: East side of I-5, near Cardiff by the Sea

Direction: View facing North West

Comments: View of open sandy areas between CSS and Mixed Chaparral. A wood rat's *Neotoma fuscipes*)stick nest is present on the right side of this photograph.

Photograph: 13

Date of Photo: 21 June 2003

Trapline: 5

Location: East side of I-5, near Cardiff by the Sea

Direction: View facing North West

Comments: Over view of Trapline 5. This view shows in the dense shrub land and dominating CSS, mixed with Chaparral. The soil between the vegetation is very sandy (not shown). This slope has similar physiognomy as the PPM habitat Dana Point Headlands.

Photograph: 14

Date of Photo: 21 June 2003

Trapline: 5

Location: East side of I-5, near Cardiff by the Sea

Direction: View facing North West

Comments:

Comments: View of west facing slope with I-5 in back ground. Terrace escarpments occur in the foreground and behind the photographers back.

Photograph: 15

Date of Photo: 21 June 2003

Trapline: 5

Location: East side of I-5, near Cardiff by the Sea

Direction: View facing South

Comments: View of open sandy areas between CSS. These open areas are characteristic of heteromyid habitats, and are very similar in physiognomy to PPM habitat at Dana Point Headlands.

Photograph: 16

Date of Photo: 21 June 2003

Trapline: 5

Location: East side of I-5, near Cardiff by the Sea

Direction: View facing North

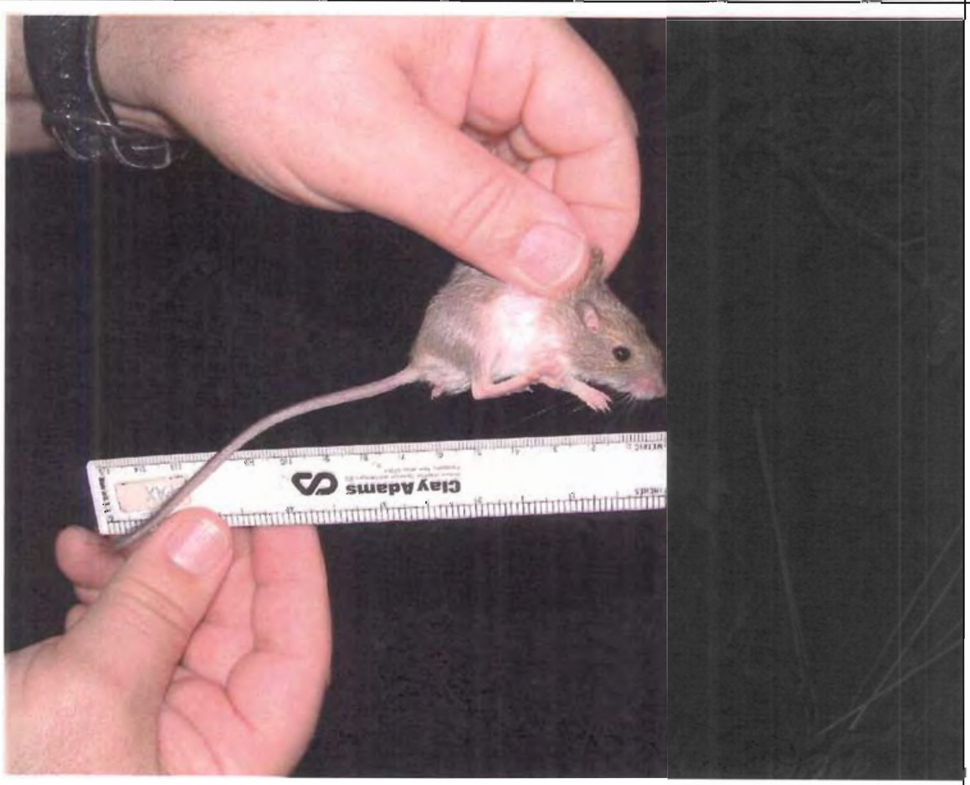
Comments: View of trap 170 within CSS.

Photograph: 17

Date of Photo: 22 May 2003

Trapline: 1

Comments: Photo of captured Cactus Mouse (*Peromyscus eremicus*).



Photograph: 18

Date of Photo: 11 June 2003

Trapline: 3

Comments: Photo of captured "Bailey's" Pocket Mouse (*Chaetodipus* cf. *baileyi*).

Photograph: 19

Date of Photo: 11 June 2003

Trapline: 3

Location:

Comments: Photo of captured House Mouse (*Mus musculus).*

Photograph: 20

Date of Photo: 12 June 2003

Trapline: 3

Comments: Photo of captured young juvenile Dusky-footed Wood Rat (*Neotoma fuscipes).*

Photograph: 21

Date of Photo: 12 June 2003

Trapline: 3

Comments: Photo of captured Northwestern San Diego Pocket Mouse (*Chaetodipus Fallax fallax*)

Appendix C

I-5 Lagoons Marine Resource Investigations (Merkel and Assoc. 2006)

M&A# 06-029-01

INTERSTATE 5 LAGOONS
MARINE RESOURCE INVESTIGATION
San Elijo Lagoon
Batiquitos Lagoon
Agua Hedionda Lagoon

Prepared for:

EDAW Inc.
1420 Kettner Boulevard
San Diego, CA 92101
Contact: Ms. Paula Jacks
and
Caltrans District 11
4050 Taylor Street MS 242
San Diego, CA 92110
Contact: Ms. Sue Scatolini

Prepared by:

Merkel & Associates, Inc.
5434 Ruffin Road
San Diego, CA 92123
Phone: (858) 560-5465
Fax: (858) 560-7779

June 19, 2006

Keith W. Merkel

Keith W. Merkel, Principal Consultant

Rachel Woodfield

Rachel Woodfield, Lead Biologist

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Batiquitos Lagoon
Agua Hedionda Lagoon

June 2006

INTRODUCTION

Merkel & Associates, Inc. (M&A) has been contracted to conduct an assessment of the existing marine biological resources in the vicinity of the Interstate 5 (I-5) bridges that span San Elijo Lagoon, Batiquitos Lagoon, and Agua Hedionda Lagoon in north San Diego County, in support of proposed improvements to the Interstate.

This report is intended to document the results of the field investigations, including characterization of the eelgrass (*Zostera marina*), fish, and epibenthic macroinvertebrate communities at the three lagoons.

STUDY LOCATIONS AND SAMPLING AREAS

The three study locations investigated were San Elijo Lagoon, Batiquitos Lagoon, and Agua Hedionda Lagoon (Figure 1). At each study location, sampling areas were established extending 122 meters (m) (400 feet) outward from the centerline of I-5. In tidal systems, investigations were limited to areas occurring below +2 feet Mean Lower Low Water. Separate investigations are expected to address lagoon environments above this elevation.

SAN ELIJO LAGOON

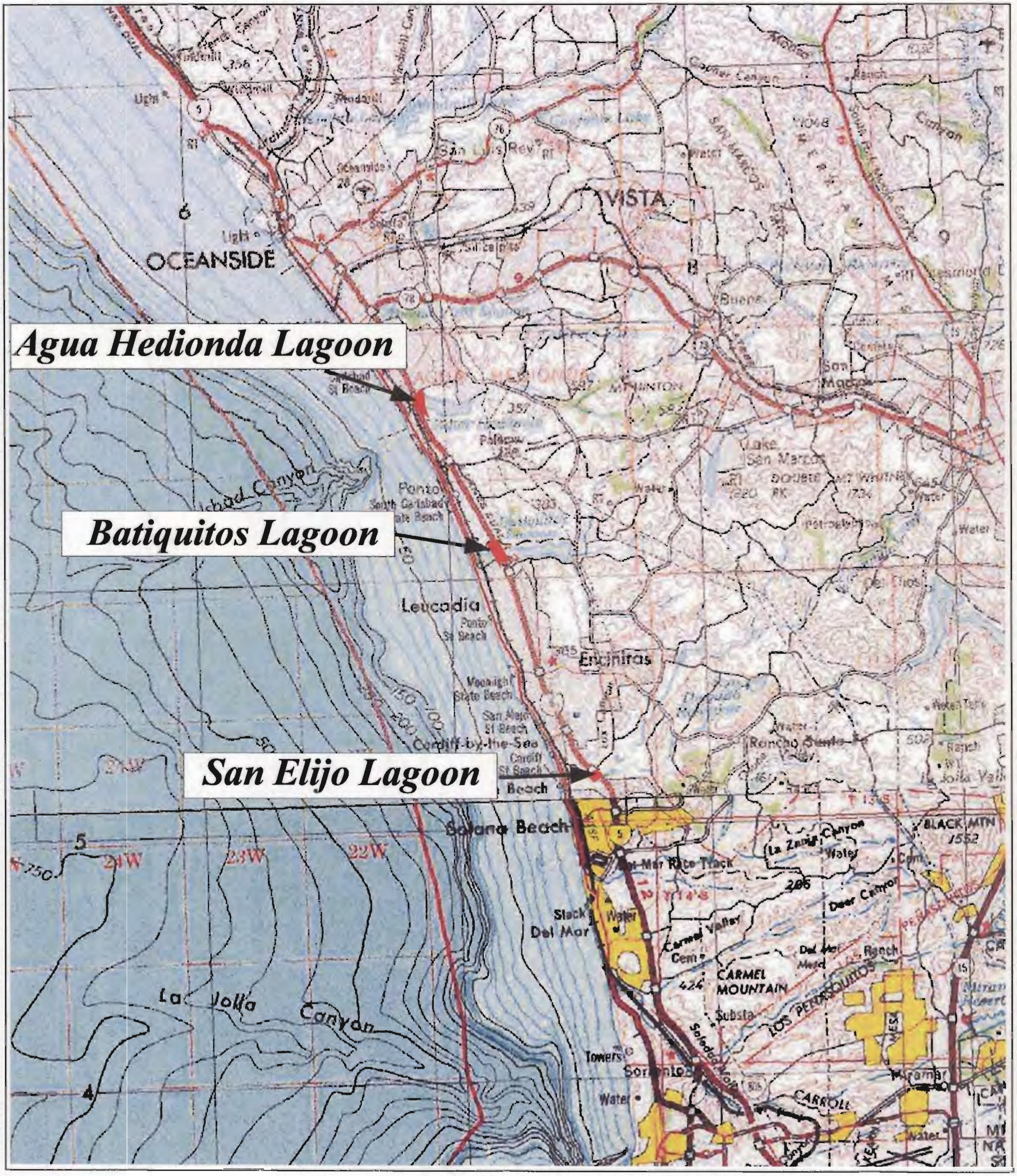
San Elijo Lagoon is located between the cities of Solana Beach and Encinitas, and is crossed by I-5 about 2.4 kilometers (km) (1.5 miles) east of the lagoon mouth (Figure 2). The lagoon is intermittently open to oceanic tidal influence as a result of mechanized maintenance of the lagoon mouth by the San Elijo Lagoon Conservancy. At the time that this marine resource inventory was conducted, the lagoon was closed to the ocean and subject to freshwater influence related to late season rain events. The sampling area included approximately 0.05 hectare (0.13 acre) of open water in channels occurring near the I-5 bridge.

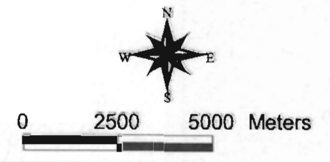
BATIQUITOS LAGOON

Batiquitos Lagoon is located in the city of Carlsbad. The lagoon is permanently open to the ocean, subject to daily tidal flushing, and is crossed by the I-5 about 1.1 km (0.7 mile) from the lagoon mouth (Figure 2). The sampling area included approximately 4.0 hectares (9.8 acres) of open water.

AGUA HEDIONDA LAGOON

Agua Hedionda Lagoon is also located in the city of Carlsbad. The lagoon is permanently open to the ocean, subject to daily tidal flushing, and is crossed by the I-5 about 1.1 km (0.7 mile) from the lagoon mouth (Figure 2). The sampling area included approximately 6.6 hectares (16.4 acres) of open water.

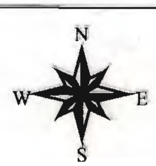




I-5 Marine Resource Investigation
Project Vicinity of Study Locations

Image Source: USGS 1x2 deg Southeast California (se102)

Figure 1



I-5 Marine Resouce Investigation

Study Locations

sampling areas outlined in red

Image Source: Image Trader www.landsat.com

Figure 2

SAMPLING EQUIPMENT AND METHODS

This marine resource investigation included an inventory and assessment of the eelgrass habitat within the sampling areas of each study location, and collection of fish and epibenthic macroinvertebrate data. Water quality data were collected at each sampling area to characterize the environmental conditions during fish and invertebrate sampling. Infaunal invertebrate and sediment grain size samples were collected, preserved, and archived for future analysis if required. No analyses of these samples have been performed. The field investigations were conducted by M&A biologists Rachel A. Woodfield, Robert C. Mooney, Julia H. Coates, and Seth J. Jones on April 26, 2006, at Batiquitos Lagoon; on May 7, 2006, at San Elijo Lagoon; and on May 18, 2006, at Agua Hedionda Lagoon. The sampling methodologies are described below. The distribution of sampling stations at each lagoon is illustrated in Figure 3 (San Elijo Lagoon), Figure 4 (Batiquitos Lagoon), and Figure 5 (Agua Hedionda Lagoon).

EELGRASS SURVEYS

During initial site reviews, eelgrass was not found within the San Elijo Lagoon study area and formal mapping surveys were not conducted. Salinities within the sampling area of San Elijo Lagoon are presently and typically well below the range suitable to support eelgrass.

Within the sampling areas of Agua Hedionda Lagoon and Batiquitos Lagoon, eelgrass coverage was quantified using a side-scan SONAR methodology with an integrated differential global positioning system. Data were collected aboard a small vessel using a side-scan SONAR operating at 600 kHz and scanning out 20 m (66 feet [ft]) on both the starboard and port channels for a 40-m (132-ft) wide swath. Transect spacing ensured that adequate overlap was obtained between adjacent side-scan swaths. All data were collected in latitude and longitude using the North American Datum of 1983 in feet (NAD 83). Following completion of the surveys, sonar traces were mosaiced together and geographically registered. Using Geographic information systems (GIS) (ArcView© 3.2a), eelgrass was digitized as a theme over an aerial image of each study location and the areal coverage calculated from the theme.

A SCUBA diver measured eelgrass leaf shoot density by counting shoots within 1/16 square meter (m^2) (0.67 square foot) quadrats. Eelgrass shoot density was measured at 20 randomly selected sites within the surveyed eelgrass beds at each of the two lagoons supporting eelgrass. All eelgrass surveys were conducted in accordance with the Southern California Eelgrass Mitigation Policy (NMFS 1991).

To put the results of the current survey into the broader context of a dynamic habitat such as eelgrass, prior eelgrass assessments performed within Batiquitos Lagoon and Agua Hedionda Lagoon were reviewed to estimate the maximum known extent of eelgrass over the past several years. Given the natural seasonal and annual expansion and contraction exhibited by eelgrass beds, it is useful to consider both the present and the maximum known distribution when assessing eelgrass habitats in a given sampling area.

FISHERIES

The fish sampling at each study location was intended to characterize the fish community occurring within the sampling area, in the immediate vicinity of the I-5 bridge. Sampling was conducted using a beach seine and an otter trawl. The locations of the fish sampling are shown at each lagoon in Figures 3, 4, and 5.

N W E S

0 20 40 60m

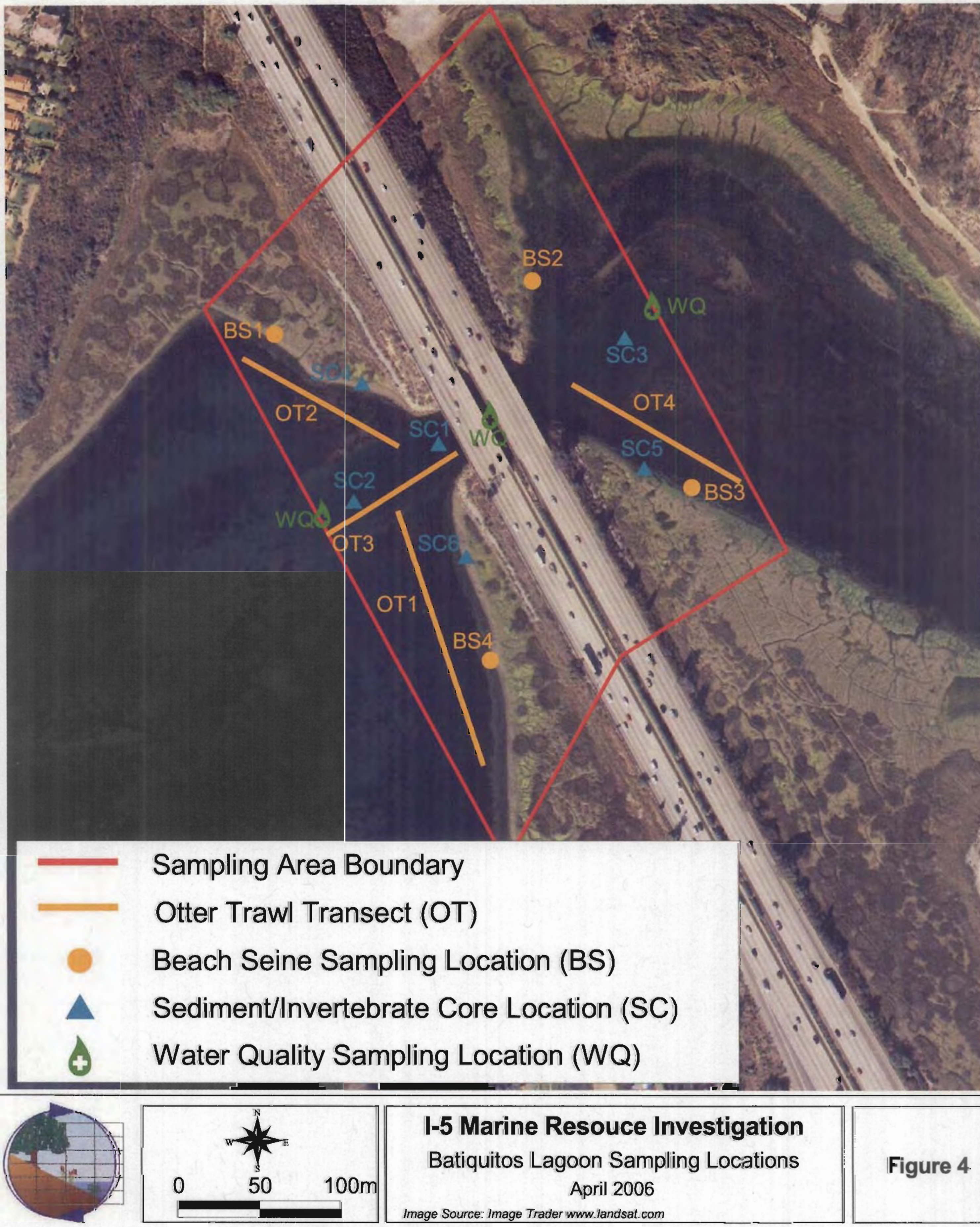
I-5 Marine Resouce Investigation

San Elijo Lagoon Sampling Locations

May 2006

Image Source: Image Trader www.landsat.com

Figure 3



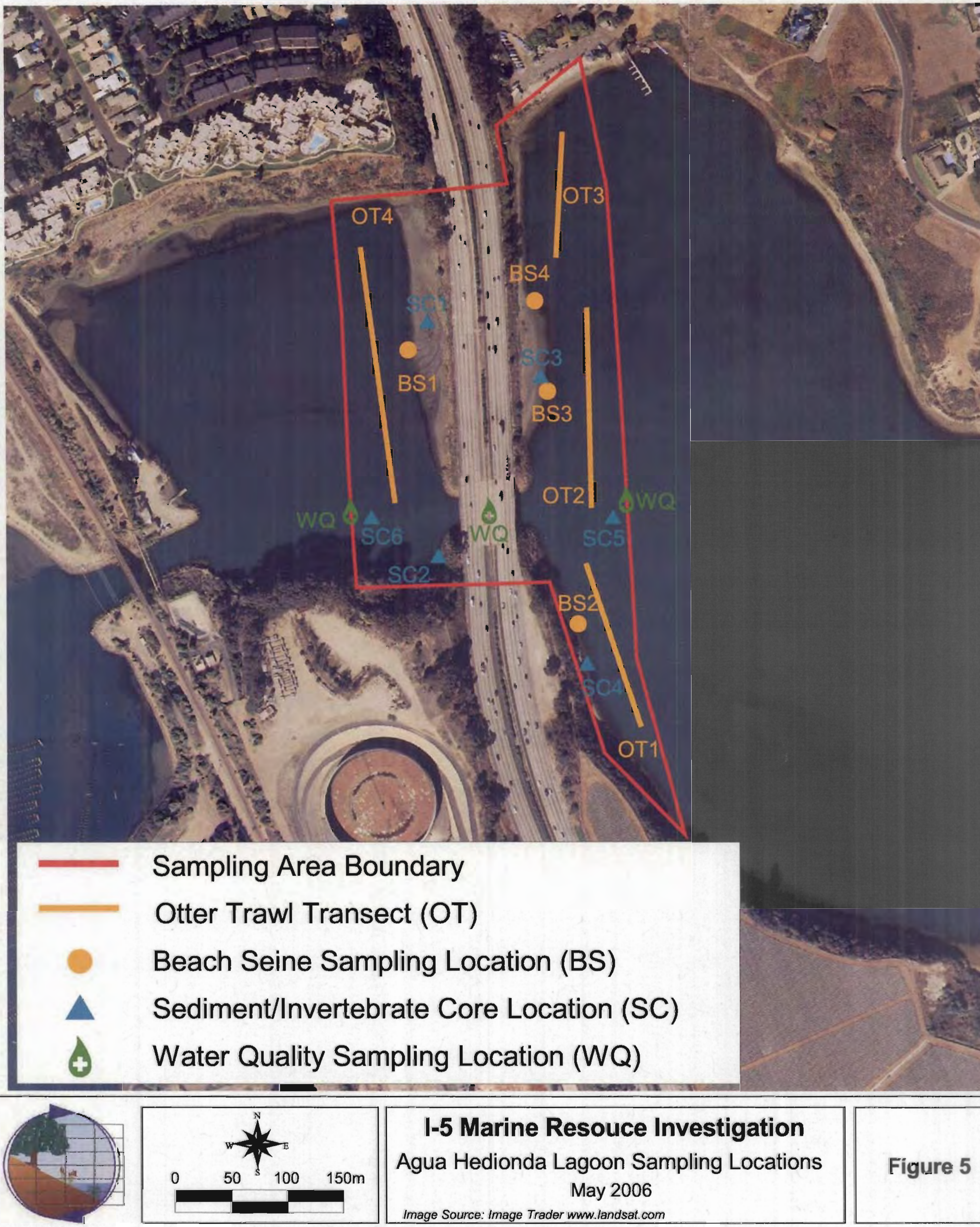
I-5 Marine Resouce Investigation

Batiquitos Lagoon Sampling Locations

April 2006

Image Source: Image Trader www.landsat.com

Figure 4



I-5 Marine Resouce Investigation

Agua Hedionda Lagoon Sampling Locations

May 2006

Image Source: Image Trader www.landsat.com

Figure 5

The beach seine consists of a 15-m x 1.8-m (49.2-ft x 5.9-ft) net with a 1.8-m x 1.8-m x 1.8-m (5.9-ft x 5.9-ft x 5.9-ft) bag in the center. The seine has 1.2-centimeter (cm) (0.5-inch [in]) mesh in the wings and 0.6-cm (0.2-in) mesh in the bag. It was utilized to sample alongshore waters between the bottom and surface in depths of 0 to 1 m (3.3 ft). The seine was positioned parallel to shore 11 to 18 m from the water's edge, depending on bottom contours. The seine was held in place for 3 minutes and then walked slowly to shore. Four replicate beach seine hauls were collected at Batiquitos Lagoon and Agua Hedionda Lagoon.

At San Elijo Lagoon, use of a smaller beach seine was more appropriate. This small seine consists of a 4.6-m x 1.2-m (15.1-ft x 3.9-ft) net with 0.3-cm (0.1-in) mesh. In areas that had a gradually sloping shoreline (such as under the I-5 bridge), the seine was positioned perpendicular to the shore and held in place by one person standing at the edge of the water and a second person standing in the water. The seine was walked parallel to the shoreline, then pivoted and walked in toward the shore. In the channels to the west of the bridge, the seine was used parallel to shore and lifted out at the vegetation on the channel bank. Eight replicate beach seine hauls were done at San Elijo Lagoon.

The otter trawl consists of a 3.2-m (10.5-ft) trawl with 0.8-cm (0.3-in) mesh in the body and 0.6-cm (0.2-in) mesh in the cod end. The otter trawl was deployed at offshore sampling locations using a small vessel traveling between 1.5 and 2 knots along transects ranging in length from 100 to 230 m (328 to 754 ft), as the sampling areas dictated. The trawl was used to sample primarily demersal offshore fish at each lagoon sampling area. Four replicate hauls were collected at Agua Hedionda Lagoon and at Batiquitos Lagoon. Otter trawls were not used at San Elijo Lagoon due to the inaccessibility of the site by boat.

Data collected for fish caught in each haul included identification of each species captured, as well as fish count and mass, by species. All project data were initially recorded in the field on prepared project data sheets and then transferred in the laboratory to digital database files. IDS Ecological Survey®, an ecological information management program, was used to manage relational data from the surveys. Standardizing for the area of each replicate by equipment type, the mean density (individuals/m^2) and biomass (g/m^2) of each species was calculated. Although the presented data include density and biomass calculations, this investigation was not intended to provide comprehensive fish population data, rather to characterize the fish community diversity and relative abundance at each lagoon.

To supplement results of the present fish surveys, the results section references data collected in prior lagoon surveys that investigated wider areas of each study location, but which provide data useful for understanding the conditions of the sampling areas (M&A 2001, MEC 1995, San Elijo Lagoon Conservancy 2006).

EPIBENTHIC MACROINVERTEBRATES

All macroinvertebrates captured during fish sampling described in the previous section were collected, identified to the lowest taxonomic level possible, counted, and weighed. Standardizing for the area of each replicate by equipment type, the mean density and biomass of each taxa were calculated. Due to the tremendous spatial variability of these species in the lagoon, and the non-targeted methodology employed here to sample them, collected data are intended to generate a list of species that occur in the project area, rather than to provide definitive density and biomass data on the populations.

WATER QUALITY

At each study location, physical water quality parameters were measured coincident with the biological sampling described above. Data were collected at three locations: under the centerline of the I-5 bridge, 122 m (400 feet) to the east of the bridge centerline, and 122 m (400 feet) to the west of the bridge centerline. The locations of the water quality sampling are shown at each lagoon in Figures 3, 4, and 5. A Hydrolab Quanta® multi-probe, calibrated in accordance with manufacturer specifications, was used to collect depth temperature, pH, dissolved oxygen, turbidity, and salinity data. Readings were taken at the bottom and top of the water column. Where the water column was greater than 2 m in depth, readings were also taken at a mid-depth between the bottom and surface.

INVERTEBRATE INFAUNA

At each of the study locations, six sediment core samples were taken at subtidal and intertidal locations within the sampling areas (Figures 3, 4, and 5). Samples were collected using a large (15-cm [5.9-inch]) diameter corer. The corer penetrated the sediment to a depth of 15 cm (5.9 in). The approximate tidal elevation at which each sample was taken was recorded on a sampling data sheet. Each core was rinsed through a 1.0-mm sieve. Organisms from each sample were placed in field sampling jars, combined with a buffered 10% formalin:seawater mixture, and transported to the laboratory for identification.

After approximately one week, organisms collected from the benthic cores were transferred in the laboratory from the buffered 10% formalin:seawater solution into a 70% isopropyl alcohol:freshwater solution and archived for future analysis if required. No invertebrate infauna data are reported in this document.

An additional sediment core sample was extracted at each sampling point and transported to the laboratory for archiving. Sediment grain size analysis of these samples can be performed in the future if required. No sediment grain size data are reported in this document.

RESULTS

The results of the sampling methods outlined above are presented in the following section, organized by lagoon.

SAN ELIJO LAGOON

Eelgrass

At present, no eelgrass occurs within the San Elijo Lagoon I-5 study area. Salinities within the sampling area of San Elijo Lagoon are currently, and typically, well below the range suitable to support eelgrass. If future restoration efforts are implemented, circulation and bathymetry may be altered such that the sampling area could support eelgrass. However, at the present time, the conditions at the site are not expected to support eelgrass.

Fisheries

No fish were captured in the seining at San Elijo Lagoon, although the water quality measurements taken at the time of the sampling indicated suitable temperature, salinity, and dissolved oxygen conditions to support a freshwater or euryhaline fish community. This may be due to a patchy or sparse distribution of fish in the sampling area. A single dead common carp (*Cyprinus carpio*) was noted within the sampling area.

The shallower channels within the sampling area are subject to variations in temperature and salinity throughout the year related to seasonal input of freshwater and intermittent oceanic tidal influence. It is likely that hardy estuarine species such as California killifish (*Fundulus parvipinnis*), staghorn sculpin (*Leptocottus armatus*), longjaw mudsucker (*Gillichthys mirabilis*), striped mullet (*Mugil cephalus*), and some gobies are present in the sampling area at various times of the year. In addition, ubiquitous mosquitofish (*Gambusia affinis*) are likely to be found on a regular basis within the sampling area. Finally, it is expected that there will be an intermittent occurrence of freshwater species brought into the sampling area by upstream freshwater input such as sunfish (*Lepomis* spp.), largemouth bass (*Micropterus salmoides*), and bullhead (*Ameiurus* spp.). A list of fish previously noted in prior studies at San Elijo Lagoon is presented in an appendix to this document.

Epibenthic Macroinvertebrates

No epibenthic macroinvertebrates were captured in the seines during the fish sampling at San Elijo Lagoon. The lack of macroinvertebrate collection is not unexpected considering the conditions of the site. Within the freshwater aquatic environments of southern California, the most common macroinvertebrates collected in seines are various insect larvae and the introduced crayfish (*Plocambarus clarki*). However, in estuarine environments with variable salinity conditions, crayfish populations are typically low and aquatic insect larvae are generally less common in such areas as well. For similar reasons, marine macroinvertebrate species are poorly represented in very low salinity environments such as the sampling area at the present time.

Water Quality

The results of the physical water quality monitoring conducted on May 7, 2006 are presented in Table 1. At the three sampling points in San Elijo Lagoon (Figure 3), temperature ranged from 18.2° C to 19.4° C, dissolved oxygen ranged from 5.5 milligrams/liter (mg/L) to 7.5 mg/L, pH was 7.6, salinity was 1.7 parts per thousand (ppt), and turbidity ranged from 15.0 to 50.0 nephelometric turbidity units (NTU).

Table 1. Water quality at San Elijo, Batiquitos, and Agua Hedionda Lagoons.

San Elijo Lagoon - May 2006

Parameter	122 m East of Bridge			Centerline of Bridge			122 m West of Bridge		
	Surface	Mid	Bottom	Surface	Mid	Bottom	Surface	Mid	Bottom
Temp (°C)	19.4	19.2	19.2	18.4		18.2	18.8		18.8
DO (mg/L)	5.7	5.8	5.7	5.9		5.5	7.4		7.5
pH (units)	7.6	7.6	7.6	7.6		7.6	7.6		7.6
Salinity (ppt)	1.7	1.7	1.7	1.7		1.7	1.7		1.7
Turbidity (NTU)	15	29	36	31		50	46		46
Depth (m)	0.0	1.0	2.0	0.0		1.0	0.0		0.6

Batiquitos Lagoon - April 2006

Parameter	122 m East of Bridge			Centerline of Bridge			122 m West of Bridge		
	Surface	Mid	Bottom	Surface	Mid	Bottom	Surface	Mid	Bottom
Temp (°C)	15.1	15.1	15.2	14.8	14.5	14.6	15.4	14.6	14.6
DO (mg/L)	7.4	7.5	7.8	8.1	8.2	9.3	6.9	8.3	9.3
pH (units)	7.9	7.9	7.9	7.9	7.9	7.9	7.9	8.0	7.9
Salinity (ppt)	33.2	33.2	33.1	33.2	33.3	33.5	32.9	33.3	33.5
Turbidity (NTU)	8.1	8.2	8.5	5.5	7.2	5.5	4.3	2.8	6.2
Depth (m)	0.3	1.2	2.6	0.3	3.5	7.2	0.3	1.50	3.5

Agua Hedionda Lagoon - May 2006

Parameter	122 m East of Bridge			Centerline of Bridge			122 m West of Bridge		
	Surface	Mid	Bottom	Surface	Mid	Bottom	Surface	Mid	Bottom
Temp (°C)	19.2	18.9	18.7	18.9	18.8	18.8	18.9	18.8	18.7
DO (mg/L)	8.2	7.2	6.8	7.9	8.2	6.9	7.3	7.1	6.9
pH (units)	8.0	8.0	7.9	8.0	8.0	7.9	8.0	7.9	7.9
Salinity (ppt)	33.1	33.4	33.4	32.9	33.3	33.3	33.2	33.3	33.3
Turbidity (NTU)	8.1	5.5	5.9	6.3	4.3	3.2	5.2	4.0	3.8
Depth (m)	0.3	1.8	3.7	0.3	1.8	3.0	0.3	2.10	5.5

BATIQUITOS LAGOON

Eelgrass

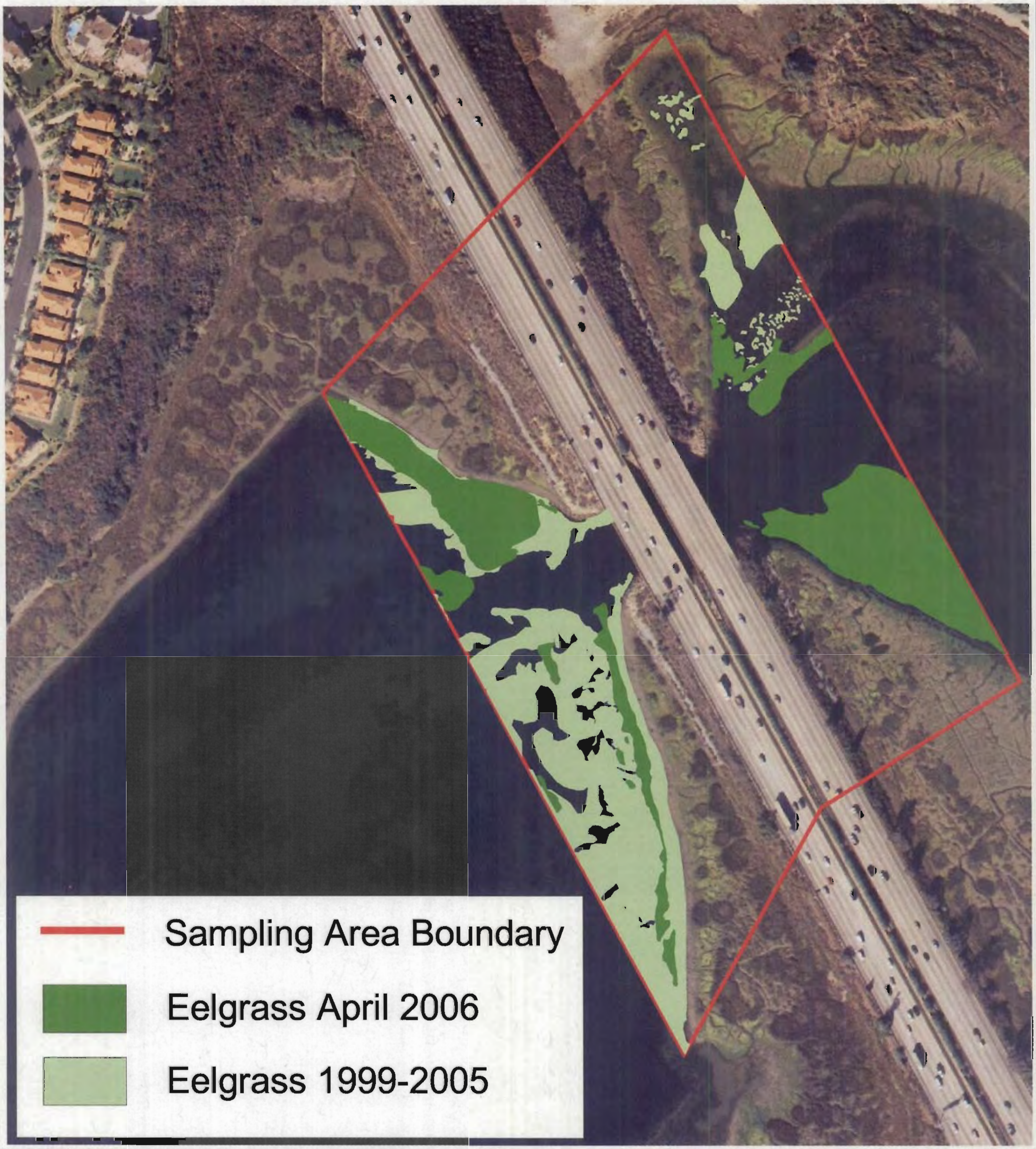
A total of 1.02 hectares (2.52 acres) of eelgrass was mapped within the Batiquitos Lagoon sampling area in April 2006 (Figure 6). To the west of the I-5 bridge, extensive eelgrass occurred on the north shore of the lagoon, with a more narrow fringing bed occurring on the south shore. To the east of the bridge, a small bed occurred immediately north of the bridge, but did not extend farther north due to the elevation of that area. The eelgrass mapped on the southern shore was the western edge of a continuous bed that extended 1.5 km (0.9 mile) farther east in the lagoon. The eelgrass appeared healthy, of tall stature, and generally free from epiphytes. The mean leaf shoot density in the eelgrass beds was 368 $\pm$ 101 shoots/m^2. Eelgrass does not grow in the channel leading up to, under, or past the bridge due to depth and high current velocities. However, eelgrass beds fringing the shoals surrounding the deeper channels are extremely dense compared to beds found in most systems of southern California. This high density is believed to be related to higher current velocities and ideal light environments.

The distribution of eelgrass mapped during the April 2006 survey is typical of this area of Batiquitos Lagoon, although in prior years eelgrass has been more extensive to the west of the bridge in the central basin. Figure 6 maps the cumulative distribution of eelgrass within the sampling area at Batiquitos Lagoon based eelgrass mapping efforts conducted in 1999, 2001, 2003, and 2005 (M&A 2000, 2002a, unpublished data). A total of 1.62 hectares (4.00 acres) of the sampling area has supported eelgrass in September of the 1999, 2001, 2003, and 2005. Eelgrass distribution patterns within Batiquitos Lagoon are influenced by a number of factors, including maintenance dredging near the lagoon mouth; sedimentation in the lagoon; and variable fluvial and oceanic influences including storm-derived sediments and turbidity, nutrient influx, and red tide. In addition, eelgrass within Batiquitos Lagoon was introduced through habitat restoration in October 1997. Given the relatively short period of time since the introduction of this habitat-forming species to the lagoon, it is likely that relative stability in eelgrass beds has not yet been achieved in the system. Because of the dynamics of eelgrass habitats, it is best to use the maximum extent of eelgrass that has been observed as a reasonable gauge for assessing potential eelgrass habitat occurrence.

During the course of the eelgrass surveys, no occurrences of the non-native, invasive seaweed *Caulerpa taxifolia* were detected within the sampling area. There is no record of this seaweed occurring at Batiquitos Lagoon in the past, although the lagoon is considered to be "at-risk" due to its proximity to residential areas, the input of storm drains, and the presence of eelgrass.

Fisheries

A total of 12 species of fish were captured in the otter trawl and beach seine (Tables 2 and 3). The most abundant of the 10 fish species captured in the beach seine was shiner surfperch (*Cymatogaster aggregata*). This species is commonly associated with eelgrass, through which all of the beach seines were pulled. The next most abundant were the silversides: topsmelt (*Atherinops affinis*) and California grunion (*Leuresthes tenuis*). Small numbers of diamond turbot (*Hypsopsetta guttulata*), staghorn sculpin, and California corbina (*Menticirrhus undulatus*) were also captured alongshore. A single arrow goby (*Clevelandia ios*), bay pipefish (*Syngnathus leptorhynchus*), shadow goby (*Quietula y-cauda*), and striped mullet (*Mugil cephalus*) were also captured in the beach seine samples. With a total of 190 fish captured in the beach seine, the mean density of fish was 0.19 individuals/m^2. The mean biomass of fish captured near the shore using a beach seine was 4.32 g/m^2. A relatively large mullet and two corbina accounted for 89% of the total weight captured in the beach seine (Table 3).



I-5 Marine Resouce Investigation

Batiquitos Lagoon Eelgrass Distribution

April 2006 - with historical extent for comparison

Image Source: Image Trader www.landsat.com

Figure 6

Table 2. Fish abundance and density (individuals/m^2) within Batiquitos Lagoon sampling area (April 2006).

	Batiquitos Lagoon							
SPECIES	OT Rep 1	OT Rep 2	OT Rep 3	BS Rep 1	BS Rep 2	BS Rep 3	BS Rep 4	Total
Shiner Surfperch				90		1	8	99
Topsmelt				31		7	1	39
California Grunion					37			37
Round Stingray		2	10					12
California Halibut	2	2	1					5
Diamond Turbot	1				1		3	5
Staghorn Sculpin					1		4	5
California Corbina					2			2
Arrow Goby						1		1
Bay Pipefish				1				1
Shadow Goby				1				1
Striped Mullet					1			1
Total Individuals	3	4	11	123	42	9	16	208
Area Sampled (m^2)	532	330	307	264	279	202	202	
Density (Individuals/m^2)	0.01	0.01	0.04	0.47	0.15	0.04	0.08	
Mean Density by gear (g/m^2)		0.02				0.19		

OT = Otter Trawl BS = Beach Seine

Table 3. Fish weight (g) and biomass (g/m^2) within Batiquitos Lagoon sampling area (April 2006).

	Batiquitos Lagoon							
SPECIES	OT Rep 1	OT Rep 2	OT Rep 3	BS Rep 1	BS Rep 2	BS Rep 3	BS Rep 4	Total
Round Stingray		980	3,710					4,690
California Halibut	104	1,785	2,000					3,889
California Corbina					2,700			2,700
Striped Mullet					1,500			1,500
Shiner Surfperch				202		73	79	354
Diamond Turbot	210				1		15	226
Topsmelt				53		60	6	119
Staghorn Sculpin					3		8	11
California Grunion					10			10
Shadow Goby				1				1
Bay Pipefish				1				1
Arrow Goby						1		1
Total Weight (g)	314	2,765	5,710	256	4,214	134	108	13,501
Area Sampled (m^2)	532	330	307	264	279	202	202	
Biomass (g/m^2)	0.59	8.38	18.60	0.97	15.10	0.66	0.53	
Mean Biomass by gear (g/m^2)		9.19			4.32			

OT = Otter Trawl BS = Beach Seine

It was not possible to complete the fourth otter trawl transect located to the east of I-5 due to the unusual density of the eelgrass in the sampling area. Four attempts were made to deploy and retrieve the otter trawl in this area; however, the dense eelgrass prevented it from traveling properly along the bottom. As a result, no fish were captured in the otter trawl in this area. Data from the other three transects are presented in Tables 2 and 3.

Three species of fish were captured offshore by the otter trawl. These included round stingray (*Urobatis halleri*), California halibut (*Paralichthys californicus*), and diamond turbot. These demersal species are common in both the unvegetated and eelgrass habitats within the lagoon. With a total of 18 fish captured in the otter trawl, the mean density of offshore fish was 0.02 individuals/m^2. Although the fish captured offshore in the otter trawl accounted for only 9% of the total fish captured in the Batiquitos Lagoon survey area, they made up 65% of the total weight, due in great part to the capture of two large California halibut. The mean biomass of fish captured offshore in the otter trawl was 9.19 g/m^2.

The I-5 survey area is located between the central and eastern basins of Batiquitos Lagoon, approximately half way between Station 3 and Station 4 of the post-restoration Batiquitos Lagoon Long-term Biological Monitoring Program (M&A 2002a). As a result, it can reasonably be expected that this area will support some use by fish species collected from these two stations throughout the monitoring program. Collectively, Stations 3 and 4 of the Batiquitos Long-term Monitoring Program have yielded 58 species of fish (M&A 2002a). The fish documented in past studies to have occurred in Batiquitos Lagoon are listed in an appendix to this document. Those that are anticipated to likely occur within the sampling area of Batiquitos Lagoon are indicated in bold type.

Epibenthic Macroinvertebrates

A total of five macroinvertebrate taxa were collected in the fish sampling at Batiquitos Lagoon (Table 4). All were gastropods: California bubble snail (*Bulla gouldiana*), California cone snail (*Conus californicus*), mud nassa (*Nassarius tegula*), navanax (*Navanax inermis*), and guilded turban snail (*Tegula aureotincta*). All were single individuals except for two California cone snails captured in an otter trawl sample.

The epibenthic macroinvertebrate fauna was somewhat surprising in that it lacked small crustaceans, which have been typically collected in similar net hauls within the lagoon during the course of the post-restoration monitoring program (M&A 2002a). While not detected during this present survey, a number of typically occurring invertebrates have been documented to occur on a regular basis within the I-5 survey area. These include the California sea hare (*Aplysia californica*), speckled scallop (*Argopecten aequisulcatus*), California green shrimp (*Hippolyte californiensis*), hermit crab (*Pagurus hirsutiusculus*), and shore crab (*Hemigrapsus oregonensis*).

Water Quality

The results of the physical water quality monitoring conducted on April 26, 2006 are presented in Table 1. At the three sampling points in Batiquitos Lagoon (Figure 4), temperature ranged from 14.5° C to 15.4° C, dissolved oxygen ranged from 6.9 mg/L to 9.3 mg/L, pH ranged from 7.9 to 8.0, salinity ranged from 32.9 ppt to 33.5 ppt, and turbidity ranged from 2.8 NTU to 8.5 NTU. Due to the proximity of the sampling points, there was little variation in water quality between them. Limited water column stratification was generally reflected by slightly lower temperatures at the bottom of the water column and slightly higher dissolved oxygen and salinity at the bottom.

Table 4. Epibenthic macroinvertebrates captured during fish sampling at San Elijo, Batiquitos, and Agua Hedionda Lagoons (2006).

San Elijo Lagoon

Invertebrates	OT Rep 1		OT Rep 2		OT Rep 3		OT Rep 4		BS Rep 1		BS Rep 2		BS Rep 3		BS Rep 4	
	Count (#/m²)	Biomass (g/m²)	Count (#/m²)	Biomass (g/m²)	Count (#/m²)	Biomass (g/m²)	Count (#/m²)	Biomass (g/m²)	Count (#/m²)	Biomass (g/m²)	Count (#/m²)	Biomass (g/m²)	Count (#/m²)	Biomass (g/m²)	Count (#/m²)	Biomass (g/m²)
None Captured																

Batiquitos Lagoon

Invertebrates	OT Rep 1		OT Rep 2		OT Rep 3		BS Rep 1		BS Rep 2		BS Rep 3		BS Rep 4	
	Density (#/m²)	Biomass (g/m²)	Density (#/m²)	Biomass (g/m²)	Density (#/m²)	Biomass (g/m²)	Density (#/m²)	Biomass (g/m²)	Density (#/m²)	Biomass (g/m²)	Density (#/m²)	Biomass (g/m²)	Density (#/m²)	Biomass (g/m²)
Gastropods														
Bulla gouldiana											0.005	0.005		
Conus californicus	0.004	0.004												
Nassarius tegula							0.004	0.004	0.004	0.004				
Navanax inermis									0.004	0.165				
Tegula aureotincta			0.003	0.003										

Agua Hedionda Lagoon

Invertebrates	OT Rep 1		OT Rep 2		OT Rep 3		OT Rep 4		BS Rep 1		BS Rep 2		BS Rep 3		BS Rep 4	
	Density (#/m²)	Biomass (g/m²)	Density (#/m²)	Biomass (g/m²)	Density (#/m²)	Biomass (g/m²)	Density (#/m²)	Biomass (g/m²)	Density (#/m²)	Biomass (g/m²)	Density (#/m²)	Biomass (g/m²)	Density (#/m²)	Biomass (g/m²)	Density (#/m²)	Biomass (g/m²)
Gastropods																
Bulla gouldiana	0.028	0.359	0.007	0.040			0.781	0.753	0.938	1.730			0.012	0.036		
Conus californicus							0.004	0.012	0.006	0.035						
Nassarius tegula	0.002	0.002	0.002	0.002							0.006	0.006	0.016	0.012		
Tegula aureotincta									0.018	0.029						
Crustaceans																
Crangon franciscorum											0.176	0.018	0.484	0.040	0.211	0.030

AGUA HEDIONDA LAGOON

Eelgrass

A total of 0.35 hectare (0.86 acre) of eelgrass was detected within the Agua Hedionda Lagoon sampling area in May 2006 (Figure 7). The eelgrass was primarily restricted to fringing shoreline beds along the shore of both the east and central basin of the lagoon. The eelgrass appeared healthy, of moderate stature, and generally free from epiphytes. The mean leaf shoot density in the eelgrass beds was 243 $\pm$ 103 shoots/m^2.

The present distribution of eelgrass covered approximately 10% of the area that has been known to support eelgrass during surveys conducted in recent years (M&A 2001, 2002b, 2003, 2004). In September 2003, the area investigated in the present survey supported a total of 3.36 hectares (8.31 acres) of eelgrass (Figure 7). There was a large-scale dieback of eelgrass that occurred in 2005 in Agua Hedionda Lagoon, and the eelgrass has not yet recovered to the distribution of prior years (M&A 2006a). Therefore, it should be assumed that the present distribution of eelgrass is significantly more restricted than it will likely be in coming years. As mentioned above, considering the potential maximum extent of eelgrass is useful when assessing potential eelgrass habitat occurrence.

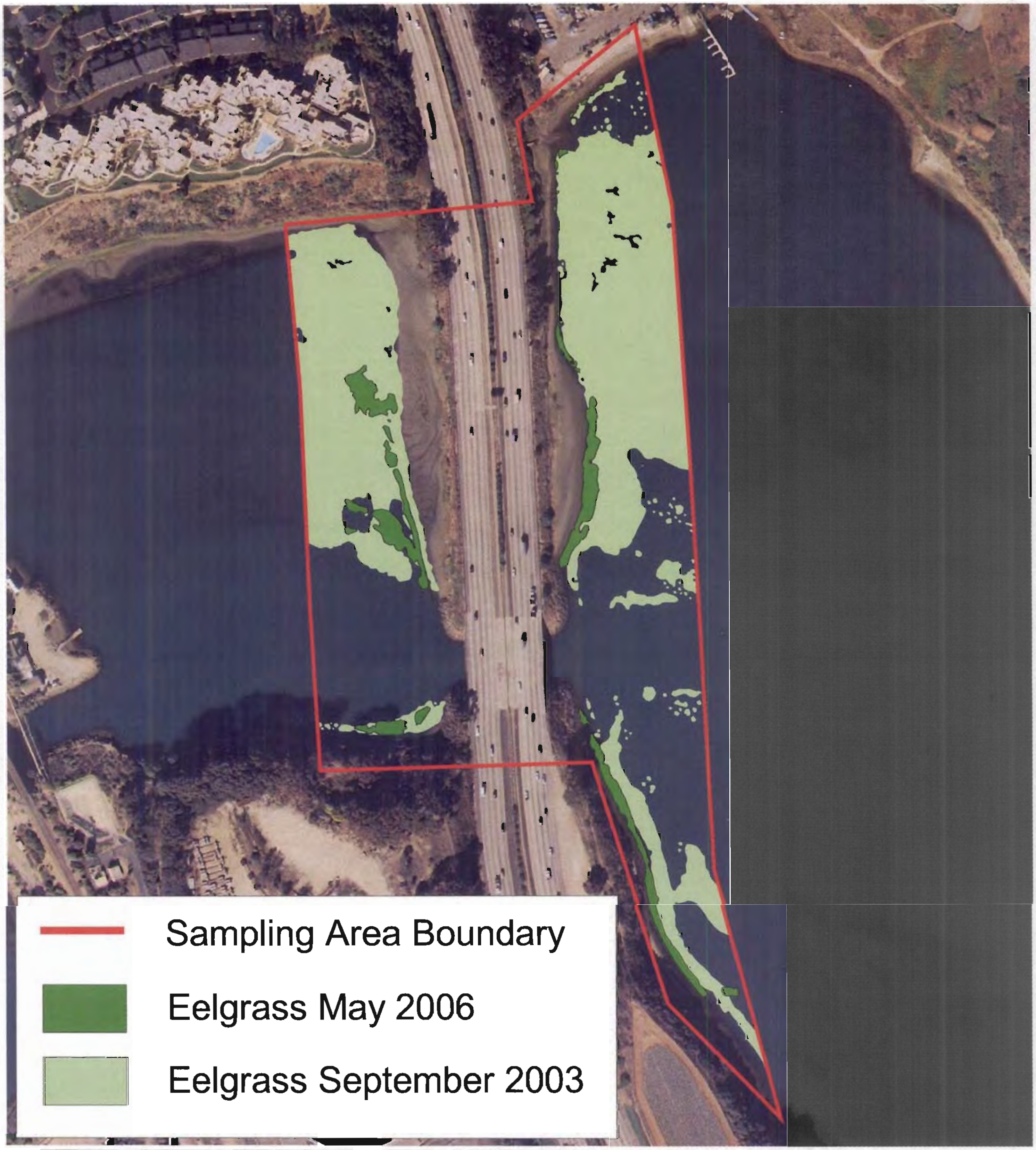
A large infestation of the non-native, invasive seaweed *Caulerpa taxifolia* was discovered growing in Agua Hedionda Lagoon in 2000. A portion of the infestation occurred within the sampling area of the present study. Successful eradication efforts have been under way since 2000 and *C. taxifolia* is now eradicated from Agua Hedionda Lagoon (M&A 2006b).

Fisheries

The fish sampling efforts captured a total of 14 species of fish in the otter trawl and beach seine (Tables 5 and 6). The most abundant of the 11 fish species captured in the alongshore community, sampled by the beach seine, were topsmelt, followed by shiner surfperch. Also commonly captured were giant kelpfish (*Heterostichus rostratus*), bay pipefish, and staghorn sculpin. California halibut, spotted sand bass (*Paralabrax maculatofasciatus*), diamond turbot, and black surfperch (*Embiotoca jacksoni*) were captured in low numbers, with a single dwarf surfperch (*Micrometrus minimus*) also being captured. Three non-native yellowfin goby (*Acanthogobius flavimanus*) were captured. With 1,751 fish captured in the beach seine, the mean density of fish was 2.31 individuals/m^2, driven primarily by the large number of topsmelt captured (1,308 of the total). Alongshore fish weights generally tracked abundance (Table 5), although 11 spotted sand bass were the second heaviest portion of the total weight. The mean biomass of fish captured alongshore in the beach seine was 16.97 g/m^2.

Fish captured offshore by the otter trawl represented a total of seven species. Most abundant were California halibut and shiner surfperch, with low numbers of spotted sand bass, diamond turbot, and speckled sanddab (*Citharichthys stigmaeus*). Single individual specklefin midshipman (*Porichthys myriaster*) and yellowfin croaker (*Umbrina roncador*) were also captured in the otter trawl. With 52 fish captured in the otter trawl, the mean density of offshore fish was 0.02 individuals/m^2. Although the fish captured offshore in the otter trawl accounted for only 3% of the fish captured in the Agua Hedionda Lagoon survey area, they made up 30% of the total weight, due to the capture of comparatively large California halibut, diamond turbot, and spotted sand bass (Table 6). The mean biomass of fish captured offshore in the otter trawl was 2.26 g/m^2.

The fish captured in the sampling area at Agua Hedionda Lagoon (within 122 m of the bridge centerline) are typical of the fish communities commonly observed in the region's coastal lagoons. It



I-5 Marine Resouce Investigation

Agua Hedionda Lagoon Eelgrass Distribution

May 2006 - with historical extent for comparison

Image Source: Image Trader www.landsat.com

Figure 7

Table 5. Fish abundance and density (individuals/m^2) within Agua Hedionda Lagoon sampling area (May 2006).

	Agua Hedionda Lagoon								
SPECIES	OT Rep 1	OT Rep 2	OT Rep 3	OT Rep 4	BS Rep 1	BS Rep 2	BS Rep 3	BS Rep 4	Total
Topsmelt					1,009	14	65	220	1,308
Shiner Surfperch	5	4	1	4	8	67	121	107	317
Giant Kelpfish					2	11	18	14	45
Bay Pipefish						9	29	6	44
Staghorn Sculpin					6		5	15	26
California Halibut	3	4	4	5			2		18
Spotted Sand Bass	1	2		3			4	7	17
Diamond Turbot	6	2		1	1		3	1	14
Speckled Sanddab	1	2		2					5
Black Surfperch						1	2		3
Yellowfin Goby							3		3
Dwarf Surfperch								1	1
Specklefin Midshipman		1							1
Yellowfin Croaker				1					1
Total Individuals	16	15	5	16	1,026	102	252	371	1,803
Area Sampled (m^2)	493	570	356	740	171	171	248	233	
Density (Individuals/m^2)	0.03	0.03	0.01	0.02	6.02	0.60	1.02	1.60	

OT = Otter Trawl BS = Beach Seine

Table 6. Fish weight (g) and biomass (g/m^2) within Agua Hedionda Lagoon sampling area (May 2006).

	Agua Hedionda Lagoon								
SPECIES	OT Rep 1	OT Rep 2	OT Rep 3	OT Rep 4	BS Rep 1	BS Rep 2	BS Rep 3	BS Rep 4	Total
Topsmelt					7,578	36	372	1,590	9,576
California Halibut	240	254	210	2,140			23		2,867
Spotted Sand Bass	80	355		270			216	1,667	2,588
Diamond Turbot	1,190	230		15	1		30	1	1,466
Shiner Surfperch	6	15	1	9	239	251	347	215	1,082
Yellowfin Croaker				165					165
Specklefin Midshipman		150							150
Giant Kelpfish					8	20	53	29	110
Staghorn Sculpin					64		10	19	93
Speckled Sanddab	15	22		16					53
Bay Pipefish						7	33	7	47
Black Surfperch						13	18		30
Yellowfin Goby							17		17
Dwarf Surfperch								1	1
Total Weight (g)	1,531	1,026	211	2,615	7,890	327	1,117	3,529	18,245
Area Sampled (m^2)	493	570	356	740	171	171	248	233	
Biomass (g/m^2)	3.10	1.80	0.59	3.53	46.27	1.92	4.50	15.18	

OT = Otter Trawl BS = Beach Seine

is likely that as the eelgrass recovers in the coming years, fish diversity and abundance may also increase. The fish documented in past studies to have occurred in Agua Hedionda Lagoon are listed in an appendix to this document. Those that are anticipated to likely occur within the sampling area of Agua Hedionda Lagoon are indicated in bold type.

Epibenthic Macroinvertebrates

A total of five macroinvertebrates taxa were captured in the fish sampling at Agua Hedionda Lagoon (Table 4). Four gastropods were captured: California bubble snail, California cone snail, mud nassa, and guilded turban snail. The California bubble snail was caught in the highest number, with a mean density of 0.204 and 0.238 individuals/m^2 in the otter trawl and beach seine, respectively, and a mean biomass of 0.288 and 0.442 g/m^2 in the otter trawl and beach seine, respectively. The other snails were captured in low numbers, between 0 and 5 per replicate.

One crustacean was captured: the bay shrimp (*Crangon franciscorum*). The bay shrimp were captured only in the beach seine, with a mean density of 0.218 individuals/m^2 and a mean biomass of 0.022 g/m^2.

These species represent a portion of the typical macroinvertebrate community found in the region's coastal lagoons. Additional species of crustacean and gastropod likely occur, as well as various species of bivalve, echinoderm, and cnidarian. Species observed within the sampling area between 2000 and 2005 have included navanx, California sea hare (*Aplysia californica*), speckled scallop (*Argopecten aequisulcatus*), armored sea star (*Astropecten armatus*), white urchin (*Lytechinus anamesus*), and fairy palm hydroid (*Corymorpha palma*).

Water Quality

The results of the physical water quality monitoring are presented in Table 1. At the three sampling points (Figure 5), temperature ranged from 18.7° C to 19.2° C, dissolved oxygen ranged from 6.8 mg/L to 8.2 mg/L, pH ranged from 7.9 to 8.0, salinity ranged from 32.9 ppt to 33.4 ppt, and turbidity ranged from 3.2 NTU to 8.1 NTU. Due to the proximity of the sampling points, there was little variation between them. Slightly lower temperature and dissolved oxygen levels and slightly higher salinities were found at the bottom of the water column. These water quality measurements are typical of Agua Hedionda Lagoon.

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APPENDIX

Appendix. Fish Species Documented in Other Studies at San Elijo Lagoon, Batiquitos Lagoon, and Agua Hedionda Lagoon (species expected or documented to occur within present sampling area indicated by bold +)

Common Name	Scientific Name	Batiquitos Lagoon [1]	Agua Hedionda Lagoon [2]	San Elijo Lagoon [3]
Gray smoothhound	*Mustelus californicus*	**+**	**+**	+
Leopard shark	*Triakis semifasciata*		+	
Brown smoothhound	*Mustelus henlei*	**+**	**+**	
Shovelnose guitarfish	*Rhinobatos productus*	**+**	+	
Thornback ray	*Platyrhinoidis triseriata*		+	
Round stingray	*Urolophus halleri*	**+**	**+**	
Bat ray	*Myliobatis californica*	**+**	**+**	+
California butterfly ray	*Gymnura marmorata*	**+**	**+**	+
Diamond stingray	*Dasyatis dipterura*		+	
Bonefish	*Albula vulpes*	**+**		
Pacific worm eel	*Myrophis vafer*	**+**		
Pacific herring	*Clupea harengus pallisi*	+		
Round herring	*Etrumeus teres*	+		
Pacific sardine	*Sardinops sagax caeruleus*	**+**	+	
Threadfin shad	*Dorosoma petenense*	+		
Deepbody anchovy	*Anchoa compressa*	**+**		+
Slough anchovy	*Anchoa delicatissima*	**+**	**+**	
Northern anchovy	*Engraulis mordax*	**+**	**+**	+
California lizardfish	*Synodus lucioceps*	+		
Specklefin midshipman	*Porichthys myriaster*	**+**	**+**	
Plainfin midshipman	*Porichthys notatus*		**+**	
California flyingfish	*Cypselurus californicus*	+		
California needlefish	*Strongylura exilis*	**+**	**+**	
California killifish	*Fundulus parvipinnis*	**+**	**+**	**+**
California grunion	*Leuresthes tenuis*	**+**	**+**	
Jacksmelt	*Atherinopsis californiensis*	**+**	**+**	+
Topsmelt	*Atherinops affinis*	**+**	**+**	+
Bay pipefish	*Syngnathus leptorhynchus*	**+**	**+**	+
Barred pipefish	*Syngnathus auliscus*	**+**	**+**	+
Sculpin (Ca. scorpionfish)	*Scorpaena guttata*	**+**	**+**	
Rockfish, unidentified juvenile	*Sebastes* sp.	+		
Kelp rockfish	*Sebastes atrovirens*	+	+	
Staghorn sculpin	*Leptocottus armatus*	**+**	**+**	+
Kelp bass	*Paralabrax clathratus*	**+**		
Spotted sand bass	*Paralabrax maculatofasciatus*	**+**		+
Barred sand bass	*Paralabrax nebulifer*	**+**	**+**	
Jack mackerel	*Trachurus symmetricus*		**+**	
Pompano	*Trachinotus* sp.		+	
Salema	*Xenistius californiensis*	**+**		
Sargo	*Anisotremus davidsonii*	**+**	+	
Queenfish	*Seriphus politus*	**+**		

Common Name	Scientific Name	Batiquitos Lagoon [1]	Agua Hedionda Lagoon [2]	San Elijo Lagoon [3]
White seabass	*Cynoscion nobilis*	+		
Yellowfin croaker	*Umbrina roncador*	+		
California corbina	*Menticirrhus undulatus*	+	+	
Spotfin croaker	*Roncador stearnsii*	+	+	
Opaleye	*Girella nigricans*	+	+	+
Zebra perch	*Hermosilla azurea*		+	
Black surfperch	*Embiotoca jacksoni*	+		
Barred surfperch	*Amphistichus argenteus*	+		
Walleye surfperch	*Hyperprosopon argenteum*	+	+	
Shiner surfperch	*Cymatogaster aggregata*	+		
Dwarf surfperch	*Micrometrus minimus*	+		
Pile surfperch	*Damalichthys vacca*	+		
White surfperch	*Phanerodon furcatus*	+		
Blacksmith	*Chromis punctipinnis*		+	
Striped mullet	*Mugil cephalus*	+	+	+
California barracuda	*Sphyraena argentea*	+	+	
Bay blenny	*Hypsoblennius gentilis*	+	+	
Mussel blenny	*Hypsoblennius jenkinsi*	+		+
Giant kelpfish	*Heterostichus rostratus*	+		
Striped kelpfish	*Gibbonsia metzi*	+		
Longjaw mudsucker	*Gillichthys mirabilis*	+	+	+
Longtail goby	*Gobionellus longicaudus*	+		
Yellowfin goby	*Acanthogobius flavimanus*	+		+
Bay goby	*Lepidogobius lepidus*	+		
Cheekspot goby	*Ilypnus gilberti*	+		+
Arrow goby	*Clevelandia ios*	+	+	+
Shadow goby	*Quietula y-cauda*	+		+
Pacific cutlassfish	*Trichiurus nitens*	+		
California tonguefish	*Symphurus atricauda*	+	+	
California halibut	*Paralichthys californicus*	+	+	+
Spotted turbot	*Pleuronichthys ritteri*	+		
Diamond turbot	*Hypsopsetta guttulata*	+	+	+
Longnose puffer	*Sphoeroides lobatus*	+		
Bluegill	*Lepomis macrochirus*	+		
Smallmouth bass	*Micropterus dolomieui*	+		
Largemouth bass	*Micropterus salmoides*	+		
Mosquitofish	*Gambusia affinis*	+	+	+
Brown bullhead	*Ameiurus nebulosus*	+		
Total Species		71	43	23

1 Merkel & Associates 2002; 2 MEC Analytical Systems 1995; 3 San Elijo Lagoon Conservancy 2006

Appendix D

Plant Species Observed in the Study Area

FLORAL SPECIES LIST
(Based on Simpson et al. 2001)

Family	Scientific Name	Common Name
Lycopodiae		
Selaginellaceae		
	Selaginella cinerascens	Ashy Spike-moss
Filicae		
Polypodiaceae		
	Polypodium californicum	California Polypody Fern
Coniferae		
Cupressaceae - Cypress Family		
	Cupressus sp.	Ornamental Cypress
Pinaceae - Pine Family		
	Pinus sp.	Ornamental Pine
	Pinus torreyana	Torrey Pine
Dicotyledoneae		
Aizoaceae - Carpet-Weed Family		
	Aptenia cordifolia	Red Apple
	Carpobrotus edulis	Hottentot-fig
	Drosanthemum sp.	Dewflower
	Mesembryanthemum crystallinum	Ice-plant
	Mesembryanthemum nodiflorum	Little Ice-plant
	Tetragonia tetragonioides	New Zealand-spinach
Anacardiaceae - Sumac Family		
	Malosma laurina	Laurel Sumac
	Rhus integrifolia	Lemonadeberry
	Schinus molle	Peruvian Pepper Tree
	Schinus terebinthifolius	Brazilian Pepper

Toxicodendron diversilobum	Poison Oak
Apiaceae (Umbelliferae) - Carrot Family	
Apium graveolens	Celery
Conium maculatum	Poison Hemlock
Daucus pusillus	Rattlesnake Weed
Foeniculum vulgare	Sweet Fennel
Lomatium lucidum	Hog-fennel
Apocynaceae - Dogbane Family	
Nerium oleander	Oleander
Asteraceae (Compositae) -Sunflower Family	
Achillea millefolium	Yarrow
Ambrosia psilostachya	Western Ragweed
Artemisia californica	California Sagebrush
Artemisia douglasiana	Douglas Mugwort,
Artemisia palmeri	San Diego Sagewort
Baccharis pilularis	Coyote Brush
Baccharis salicifolia	Mule Fat
Baccharis sarothroides	Broom Baccharis
Bidens frondosa	Beggar’s Tick
Bidens pilosa var. *p.*	Beggar's Tick
Centaurea melitensis	Tocalote
Chaenactis glabriuscula var. *g.*	Yellow Pincushion
Chrysanthemum coronarium	Annual Chrysanthemum
Conyza canadensis	Horseweed
Coreopsis gigantea	Giant Sea-Dahlia
Coreopsis maritima	Sea-Dahlia
Corethrogyne filaginifolia var. *linifolia*	Del Mar Sand Aster

Cotula coronopifolia	African Brass-buttons
Cynara cardunculus	Cardoon
Deinandra fasciculata	Fascicled Tarweed
Dimorphotheca sinuate	Blue-eye Cape-marigold
Encelia californica	California Encelia
Encelia farinosa	Brittle-bush
Euryops pectinatus	Golden Euryops
Eriophyllum confertiflorum	Flat-topped Golden Yarrow
Filago gallica	Narrowleaf Filago
Filago sp.	Filago
Gnaphalium bicolor	Cudweed
Gnaphalium californicum	California Everlasting
Gnaphalium sp.	Cudweed
Gutierrezia sarothrae	Broom Snakeweed
Hazardia squarrosa var. *grindelioides*	Saw-toothed Goldenbush
Hedypnois cretica	Hedypnois
Heterotheca grandiflora	Telegraph Weed
Hypochaeris glabra	Cat's Ear
Isocoma menziesii	Goldenbush
Iva hayesiana	San Diego Marsh-elder
Jaumea carnosa	Fleshy Jaumea
Lactuca serriola	Prickly Lettuce
Lasthenia californica	Common Goldfields
Osmadenia tenella	Rosin Weed
Picris echioides	Bristly Ox-tongue
Pluchea odorata	Salt Marsh Fleabane
Pluchea sericea	Arrow Weed

Senecio californicus	California Butterweed
Senecio sp.	Groundsel
Sonchus asper	Prickly Sow Thistle
Sonchus oleraceus	Sow Thistle
Sonchus tenerrimus	Slender Sow Thistle
Stephanomeria virgata	Virgate Wreath-plant
Stylocline gnaphalioides	Everlasting Nest Straw
Taraxacum officinale	Dandelion
Uropappus lindleyi	Silver Puffs
Viguiera laciniata	San Diego County Viguiera
Xanthium strumarium	Cocklebur
Batidaceae - Batis Family	
Batis maritima	Saltwort
Berberidaceae - Barberry Family	
Berberis nevinii	Nevin's Barberry
Bignoniaceae -Bignonia Family	
Jacaranda mimosifolia	Jacaranda
Tecomaria capensis	Cape Honeysuckle
Bombacaceae – Bombax Family	
Chorisia speciosa	Silk Floss Tree
Boraginaceae - Borage Family	
Amsinckia menziesii var. *intermedia*	Yellow Fiddleneck
Cryptantha sp.	Cryptantha
Cryptantha intermedia	Nievitas
Echium fatuosum	Pride of Madiera
Heliotropium curassavicum	Salt Heliotrope
Plagiobothrys sp.	Popcorn Flower

Brassicaceae (Cruciferae) - Mustard Family

Brassica nigra	Black Mustard
Brassica rapa	Field Mustard
Brassica tournefortii	Wild Turnip
Cakile maritima	Sea-rocket
Capsella bursa-pastoris	Shepherd's-purse
Caulanthus heterophyllus var. *h.*	Jewelflower
Descurainia pinnata ssp. *glabra*	Tansy-mustard
Erysimum capitatum ssp. *capitatum*	Western Wallflower
Guillenia lasiophylla	California Mustard
Hirschfeldia incana	Perennial Mustard
Lepidium lasiocarpum var. *l.*	Sand Peppergrass
Lepidium nitidum var. *n.*	Peppergrass
Lepidium virginicum	Wild Peppergrass
Lobularia maritima	Sweet Alyssum
Raphanus sativus	Wild Radish
Rorippa nasturtium-aquaticum	Water Cress
Sisymbrium irio	London Rocket
Sisymbrium orientale	Hare's-ear Cabbage

Cactaceae - Cactus Family

Cylindropuntia prolifera	Coast Cholla
Ferocactus viridescens	San Diego Barrel Cactus
Mammillaria dioica	Fishhook Cactus
Opuntia littoralis	Coastal Prickly Pear
Opuntia sp.	Cholla

Capparaceae - Caper Family

Isomeris arborea	Bladderpod

Caprifoliaceae - Honeysuckle Family	
Hedera helix	English Ivy
Lonicera subspicata var. *denudata*	Honeysuckle
Sambucus mexicana	Elderberry
Caryophyllaceae - Pink Family	
Cardionema ramosissimum	Tread-lightly
Silene gallica	Windmill Pink
Silene sp.	Silene, Catchfly
Spergularia sp.	Sand Spurrey
Spergularia villosa	Villous Sand Spurrey
Chenopodiaceae - Goosefoot Family	
Atriplex canescens ssp. *c.*	Shad-scale
Atriplex lentiformis ssp. *l.*	Quail Saltbush
Atriplex semibaccata	Australian Saltbush
Chenopodium album	Pigweed, Lamb's Quarter
Chenopodium ambrosioides	Mexican Tea
Chenopodium sp.	Goosefoot
Kochia scoparia	Belvedere, Summer-Cypress
Salicornia subterminalis	Glasswort
Salicornia virginica	Pickleweed
Salsola tragus	Russian Thistle
Suaeda esteroa	Estuary Sea-Blite
Cistaceae - Rock-Rose Family	
Cistus creticus	Purple Rock-rose
Helianthemum scoparium	Peak Rush-rose
Convolvulaceae- Morning Glory Family	
Calystegia macrostegia	Morning-glory

Convolvulus arvensis	Bindweed
Cressa truxillensis	Alkali Weed
Crassulaceae - Stonecrop Family	
Crassula ovata	Jade Plant
Dudleya edulis	Mission Live-forever
Dudleya lanceolata	Dudleya
Dudleya pulverulenta	Chalk Live-forever
Dudleya sp.	Live-forever
Cucurbitaceae - Gourd Family	
Cucurbita foetidissima	Calabazilla
Cucurbita palmata	Desert Gourd
Marah macrocarpus	Wild Cucumber
Cuscutaceae - Dodder Family	
Cuscuta salina	Witch's Hair, Dodder
Ericaceae - Heath Family	
Arctostaphylos glandulosa ssp. *crassifolia*	Del Mar Manzanita
Xylococcus bicolor	Mission Manzanita
Euphorbiaceae -Spurge Family	
Croton californicus	California Croton
Eremocarpus setigerus	Turkey Mullein, Dove Weed
Euphorbia peplus	Petty Spurge
Chamaesyce maculata	Spotted Spurge
Chamaesyce polycarpa	Fairy Mats
Ricinus communis	Castor Bean
Fabaceae (Leguminosae) - Pea Family	
Acacia baileyana	Bailey's Acacia
Acacia longifolia	Golden Wattle

Acacia redolens	Acacia
Acacia sp.	Acacia
Astragalus trichopodus ssp. *leucopsis*	Coast Locoweed
Calliandra sp.	Ornamental Calliandra
Cassia sp.	Cassia
Ceratonia siliqua	Carob
Erythrina caffra	Coral Tree
Lathryus vestitus var. *alefeldii*	San Diego Sweet Pea
Lotus scoparius ssp. *scoparius*	Deerweed
Lupinus hirsutissimus	Nettle Lupine
Lupinus sp.	Lupine
Lupinus succulentus	Blue-bonnet Lupine
Lupinus truncatus	Chaparral Lupine
Medicago polymorpha	Bur-clover
Melilotus albus	White Sweetclover
Melilotus indica	Indian Sweetclover
Trifolium hirtum	Rose Clover
Trifolium sp.	Clover
Fagaceae - Oak Family	
Quercus agrifolia var. *agrifolia*	Coast Live Oak
Quercus dumosa	Nuttall's Scrub Oak
Frankeniaceae - Frankenia Family	
Frankenia salina	Alkali-heath
Geraniaceae - Geranium Family	
Erodium botrys	Pin Clover
Erodium cicutarium	Red-stem Filaree
Erodium moschatum	Green-stem Filaree

Geranium carolinianum	California Geranium
Geranium sp.	Ornamental Geranium
Grossulariaceae - Gooseberry Family	
Ribes speciosum	Fuchia-flowered Gooseberry
Hydrophyllaceae - Waterleaf Family	
Eriodictyon crassifolium	Felt-leaved Yerba Santa
Eucrypta micrantha	Common Eucrypta
Phacelia distans	Wild Heliotrope
Phacelia sp.	Bell Phacelia, California Blue Bells
Pholistoma auritum var. *auritum*	Fiesta Flower
Pholistoma racemosum	Filaree-leaf Nemophila
Lamiaceae (Labiatae) - Mint Family	
Marrubium vulgare	Horehound
Rosmarinus officinale	Rosemary
Salvia apiana	White Sage
Salvia columbariae var. *columbariae*	Chia
Salvia leucantha	Mexican Sage
Salvia mellifera	Black Sage
Lythraceae - Loosestrife Family	
Lythrum hyssopifolium	Grass Poly
Malvaceae - Mallow Family	
Lavatera cretica	Mission Mallow
Malacothamnus densiflorus	Bush Mallow
Malva parviflora	Cheeseweed
Malva sp.	Mallow
Myoporaceae - Myoporum Family	

Myoporum laetum	Myoporum
Myrtaceae - Myrtle Family	
Callistemon viminalis	Bottlebrush
Eucalyptus globulus	Tasmanian Blue Gum
Eucalyptus polyanthemos	Silver Dollar Gum
Eucalyptus sideroxylon	Red Ironbark
Eucalyptus sp.	Eucalyptus
Leptospermum laevigatum	Australian Tea Tree
Eugenia paniculata	Eugenia
Nyctaginaceae - Four O'Clock Family	
Bougainvillea spectablis	Bougainvillea
Mirabilis laevis var. *crassifolia*	Coastal Wishbone Bush
Oleaceae - Olive Family	
Fraxinus sp.	Ash
Olea europea	Olive
Onagraceae - Evening Primrose Family	
Camissonia cheiranthifolia	Beach Evening-primrose
Camissonia micrantha	Field Sun Cup
Camissonia sp.	Evening Primrose
Epilobium ciliatum ssp. *ciliatum*	Willow Herb
Epilobium californicum	California Cottonweed
Oenothera elata ssp. *hirsutissima*	Evening Primrose
Oxalidaceae - Wood Sorrel Family	
Oxalis pes-caprae	Bermuda Buttercup
Papaveraceae - Poppy Family	
Dendromecon rigida ssp. *rigida*	Bush Poppy
Eschscholzia californica	California Poppy

Plantaginaceae - Plantain Family	
Plantago erecta	California Plantain
Plantago lanceolata	Narrow-leaf Plantain
Plantago major	Common Plantain
Plantago sp.	Plantain
Platanaceae - Plane Tree Family	
Platanus racemosa	Western Sycamore
Plumbaginaceae - Leadwort Family	
Limonium californicum	Sea-lavendar
Limonium perezii	Statice
Polygonaceae - Buckwheat Family	
Eriogonum fasciculatum ssp. *fasciculatum*	California Buckwheat, Flat-topped buckwheat
Eriogonum giganteum var. *giganteum*	Channel Island Buckwheat
Rumex conglomeratus	Dock
Rumex crispus	Curly Dock
Portulaceae - Purslane Family	
Calandrinia ciliata	Red-maids
Claytonia perfoliata ssp. *p.*	Miner's Lettuce
Primulaceae - Primrose Family	
Anagallis arvensis	Scarlet Pimpernel
Dodecatheon clevelandii ssp. *c.*	Cleveland's Shooting Star
Ranunculaceae - Crowfoot Family	
Clematis lasiantha	Pipestem Clematis
Rhamnaceae - Buckthorn Family	
Adolphia californica	California Adolphia
Ceanothus verrucosus	Wart-stemmed Ceanothus

Ceanothus sp.	Ornamental Ceanothus
Rhamnus crocea	Red-berry
Rhamnus ilicifolia	Hollyleaf Red-berry
Rosaceae - Rose Family	
Adenostoma fasciculatum	Chamise
Cercocarpus betuloides var. betuloides	Mountain Mahogany
Cercocarpus minutiflorus	San Diego Mountain Mahogany
Heteromeles arbutifolia	Toyon
Malus sp.	Apple
Prunus ilicifolia	Holly-leaved Cherry
Rubus ursinus	California Blackberry
Rubiaceae - Madder Family	
Galium angustifolium spp. *a.*	Narrowleaf Bedstraw
Galium aparine	Annual Bedstraw
Galium californicum	California Bedstraw
Rutaceae - Rue Family	
Cneoridium dumosum	Bushrue
Salicaceae - Willow Family	
Populus fremontii ssp. *f.*	Fremont Cottonwood
Salix gooddingii	Goodding's Black Willow
Salix exigua	Narrow-leaved Willow,
Salix lasiolepis	Arroyo Willow
Saururaceae - Lizard-Tail Family	
Anemopsis californica	Yerba Mansa
Scrophulariaceae-Figwort Family	
Antirrhinum coulterianum	Snapdragon
Antirrhinum nuttallianum ssp. *n.*	Nuttall Snapdragon

Antirrhinum sp.	Wild Snapdragon
Castilleja exserta	Puple Owl's Clover
Keckiella antirrhinoides	Chaparral Beard-tongue
Mimulus aurantiacus	Red Bush Monkey-flower
Scrophularia californica var. *floribunda*	Coast Figwort, Bee Plant
Solanaceae - Nightshade Family	
Datura wrightii	Jimson Weed
Nicotiana glauca	Tree Tobacco
Solanum parishii	Parish's Nightshade
Solanum xanti	Purple Nightshade
Tamaricaceae -Tamarisk Family	
Tamarix sp.	Tamarisk
Tropaeolaceae - Tropaeolum Family	
Tropaeolum majus	Nasturtium
Urticaceae - Nettle Family	
Urtica dioica ssp. *holosericea*	Stinging Nettle
Urtica urens	Dwarf Nettle
Verbenaceae -Vervain Family	
Lantana camara	Lantana
Verbena lasiostachys	Verbena
Monocotyledoneae	
Agavaceae - Agave Family	
Agave sp.	Ornamental Agave
Hesperoyucca whipplei ssp. *whipplei*	Our Lord's Candle
Yucca schidigera	Mohave Yucca
Alliaceae - Onion Family	

Agapanthus orientalis	Lily of the Nile
Araceae - Arum Family	
Zantedeschia aethiopica	Calla Lily
Arecaceae (Palmae) - Palm Family	
Phoenix canariensis	Canary Island Date Palm
Washingtonia robusta	Washington Palm
Asparagaceae - Asparagus Family	
Asparagus asparagoides	Florist's Smilax
Asphodelaceae – Asphodel Family	
Aloe sp.	Ornamental Aloe
Asphodelus fistulosus	Onion Weed
Cyperaceae -Sedge Family	
Cyperus involucratus	Umbrella Sedge
Eleocharis sp.	Spike-rush
Scirpus californicus	California Bulrush
Scirpus maritimus	Alkali Bulrush
Hyacinthaceae - Hyacinth Family	
Chlorogalum pomeridianum var. *p.*	Soap-Plant, Amole
Iridaceae -Iris Family	
Iris sp.	Ornamental Iris
Sisyrinchium bellum	Blue-eyed Grass
Juncaceae - Rush Family	
Juncus acutus ssp. *leopoldii*	Southwestern Spiny Rush
Juncus mexicanus	Mexican Rush
Juncus rugulosus	Wrinkled Rush
Juncus sp.	Rush
Melanthiaceae – Camas Family	
Zigadenus fremontii	Star-lily

Poaceae (Gramineae) - Grass Family

Agrosits viridis	Water Bent
Agrostis sp.	Bent Grass
Arundo donax	Giant Reed
Avena barbata	Slender Wild Oat
Avena fatua	Wild Oat
Bromus diandrus	Ripgut Grass
Bromus hordeaceus	Soft Chess
Bromus madritensis ssp. *rubens*	Red Brome
Cortaderia selloana	Pampas Grass
Cynodon dactylon	Bermuda Grass
Digitaria sanguinalis	Crabgrass
Distichlis spicata	Saltgrass
Ehrharta calycina	Veldt Grass
Festuca californica	California Fescue
Gastridium ventricosum	Nit Grass
Hordeum murinum ssp. *glaucum*	Glaucous Barley
Lamarckia aurea	Goldentop
Leymus condensatus	Giant Rye Grass
Lolium multiflorum	Italian Ryegrass
Monanthochloe littoralis	Shoregrass
Nassella pulchra	Purple Needle Grass
Paspalum dilatatum	Dallis Grass
Pennisetum setaceum	Fountain Grass
Phalaris canariensis	Canary Grass
Piptatherum miliaceum	Smilo Grass
Polypogon monspeliensis	Rabbitfoot Grass

Spartina foliosa	Cordgrass
Triticum aestivum	Wheat
Vulpia myuros var. *hirsuta*	Foxtail Fescue
Themidaceae - Brodiaea Family	
Dichelostemma capitatum	Blue Dicks, Wild Hyacinth
Typhaceae - Cattail Family	
Typha latifolia	Tall Cattail, Soft Flag

Appendix E

Wildlife Species Observed in the Study Area

WILDLIFE SPECIES LIST

Scientific Name	Common Name
	INVERTEBRATES
Phylum: Arthropoda	
Uca crenulata	Fiddlercrab
Hemigrapsus oregonensis	Shore crab
Pachygrapsus crassipes	crab
Cerethidia californica	Horn snail
Melampus olivaceus	Snail
Balanus balanoides	acorn barnacle
Class: Insecta	
Order: Lepidoptera	**Butterflies**
Vanessa carye anabella	West Coast Lady
Vanessa cardui	Painted Lady
Danaus plexippus	Monarch Butterfly
Pontia protodice	Common white
Nymphalis antiopa	Mourning Cloak
Pieris rapae	Cabbage White
Leptotes marina	Marine Blue
Plebejus acmon acmon	Acmon Blue
Glaucopsyche lygdamus australis	Southern Blue
Agraulus vanillae incarnata	Gulf fritillary
Anthocharis sara	Sara's orangetip
Apodemia mormo virfulti	Behr's metalmark
Strymon columella	Common hairstreak
Satyrium tetra	Grey Hairstreak
	VERTEBRATES
	Fish
Gambusia affinis	Mosquitofish
	REPTILES AND AMPHIBIANS**
Order Salientia	**Frogs and Toads**
Hyla regilla	Pacific Treefrog
Rana catesbeiana	Bullfrog

Order Squamata	**Lizards and Snakes**
Sceloporus occidentalis	Western Fence Lizard
Uta stansburiana	Side-blotched Lizard
Phrynosoma coronatum blainvillei	San Diego Horned Lizard
Cnemidophorus hyperythrus beldingi	Orange-throated Whiptail
Elgaria multicarinata	Southern Alligator Lizard
Pituophis melanoleucus	Gopher Snake
Thamnophis hammondii	Two-striped Garter Snake
Thamnophis sp.	Common Garter Snake
Crotalus viridis	Southern Pacific Rattlesnake

BIRDS*

Podilymbus podiceps	Pied-billed Grebe
Podiceps nigricollis	Eared Grebe
Aechmophorus occidentalis	Western Grebe
Pelecanus erythrorhynchos	American White Pelican
Pelecanus occidentalis californicus	California Brown Pelican
Phalacrocorax auritus	Double-crested Cormorant
Ixobrychus exilis	Least Bittern
Ardea herodias	Great Blue Heron
Casmerodius albus	Great Egret
Egretta thula	Snowy Egret
Butorides striatus	Green Heron
Nycticorax nycticorax	Black-crowned Night Heron
Branta canadensis	Canada Goose
Anas crecca	Green-winged Teal
Anas platyrhynchos	Mallard
Anas acuta	Northern Pintail
Anas cyanoptera	Cinnamon Teal
Anas clypeata	Northern Shoveler
Anas strepera	Gadwall
Anas americana	American Wigeon
Aythya affinis	Lesser Scaup
Melanitta perspicillata	Surf Scoter
Bucephala albeola	Bufflehead
Mergus serrator	Red-breasted Merganser
Oxyura jamaicensis	Ruddy Duck
Cathartes aura	Turkey Vulture
Pandion haliaetus	Osprey
Elanus leucurus majusculus	White-tailed Kite
Circus cyaneus	Northern Harrier
Accipiter striatus	Sharp-shinned Hawk
Accipiter cooperi	Cooper's Hawk
Buteo lineatus	Red-shouldered Hawk
Buteo jamaicensis	Red-tailed Hawk
Falco sparverius	American Kestrel

Callipepla californica	California Quail
Rallus longirostris levipes	Light-footed Clapper Rail
Porzana carolina	Sora
Fulica americana	American Coot
Pluvialis squatarola	Black-bellied Plover
Pluvialis fulva	Pacific Golden Plover
Charadrius semipalmatus	Semipalmated Plover
Charadrius vociferus	Killdeer
Himantopus mexicanus	Black-necked Stilt
Recurvirostra americana	American Avocet
Tringa melanoleuca	Greater Yellowlegs
Catoptrophorus semipalmatus	Willet
Actitis macularia	Spotted Sandpiper
Numenius phaeopus	Whimbrel
Numenius americanus	Long-billed Curlew
Limosa fedoa	Marbled Godwit
Calidris pusilla	Semipalmated Sandpiper
Limnodromus scolopaceus	Long-billed Dowitcher
Larus delawarensis	Ring-billed Gull
Larus californicus	California Gull
Larus occidentalis	Western Gull
Sterna caspia	Caspian Tern
Sterna forsteri	Forster's Tern
Sterna antillarum browni	California Least Tern
Columba livia	Rock Dove
Zenaida macroura	Mourning Dove
Geococcyx californianus	Greater Roadrunner
Aeronautes saxatalis	White-throated Swift
Archilochus alexandri	Black-chinned Hummingbird
Calypte anna	Anna's Hummingbird
Ceryle alcyon	Belted Kingfisher
Picoides nuttallii	Nuttall's Woodpecker
Picoides pubescens	Downy Woodpecker
Empidonax difficilis	Pacific Slope Flycatcher
Sayornis nigricans	Black Phoebe
Sayornis saya	Say's Phoebe
Myiarchus cinerascens	Ash-throated Flycatcher
Tyrannus vociferans	Cassin's Kingbird
Tyrannus verticalis	Western Kingbird
Stelgidopteryx serripennis	Northern Rough-winged Swallow
Hirundo pyrrhonota	Cliff Swallow
Hirundo rustica	Barn Swallow
Aphelocoma coerulescens	Scrub Jay
Corvus brachyrhynchos	American Crow
Corvus corax	Common Raven
Psaltriparus minimus	Bushtit
Thryomanes bewickii	Bewick's Wren
Troglodytes aedon	House Wren

Cistothorus palustris	Marsh Wren
Regulus calendula	Ruby-crowned Kinglet
Polioptila caerulea	Blue-gray Gnatcatcher
Polioptila californica californica	Coastal California Gnatcatcher
Chamaea fasciata	Wrentit
Mimus polyglottos	Northern Mockingbird
Toxostoma redivivum	California Thrasher
Bombycilla cedrorum	Cedar Waxwing
Sturnus vulgaris	European Starling
Vireo bellii pusillus	Least Bell's Vireo
Vireo huttoni	Hutton's Vireo
Vermivora celata	Orange-crowned Warbler
Vermivora ruficapilla	Nashville Warbler
Dendroica petechia	Yellow Warbler
Dendroica coronata	Yellow-rumped Warbler
Dendroica nigrescens	Black-throated Gray Warbler
Dendroica townsendi	Townsend's Warbler
Geothlypis trichas	Common Yellowthroat
Wilsonia pusilla	Wilson's Warbler
Piranga ludoviciana	Western Tanager
Pheucticus melanocephalus	Black-headed Grosbeak
Pipilo maculatus	Spotted Towhee
Pipilo crissalis	California Towhee
Aimophila ruficeps canescens	Southern California Rufous-crowned Sparrow
Spizella passerina	Chipping Sparrow
Ammodramus sandwichensis	Savannah Sparrow
Ammodramus sandwichensis beldingi	Belding's Savannah sparrow
Melospiza melodia	Song Sparrow
Zonotrichia leucophrys	White-crowned Sparrow
Agelaius phoeniceus	Red-winged Blackbird
Agelaius tricolor	Tricolored Blackbird
Sturnella neglecta	Western Meadowlark
Euphagus cyanocephalus	Brewer's Blackbird
Quiscalus mexicanus	Great-tailed Grackle
Molothrus ater	Brown-headed Cowbird
Icterus cucullatus	Hooded Oriole
Icterus bullockii	Bullock’s Oriole
Carpodacus mexicanus	House Finch
Carduelis psaltria	Lesser Goldfinch
Carduelis tristis	American Goldfinch

MAMMALS*

Order Lagomorpha	**Rabbits, Hares, and Pikas**
Sylvilagus audubonii	Audubon’s Cottontail

Order Rodentia	**Squirrels, Rats, Mice, and Relatives**
Spermophilus beecheyi	California Ground Squirrel
Thomomys bottae	Botta's Pocket Gopher
Chaetodipus fallax fallax	Northwestern San Diego Pocket Mouse
Chaetodipus californicus baileyi	“Bailey’s” Pocket Mouse
Peromyscus eremicus	Cactus Mouse
Peromyscus californicus	California Mouse
Peromyscus maniculatus	Deer Mouse
Neotoma lepida intermedia	San Diego Desert Woodrat
Neotoma fuscipes	Dusky-footed Woodrat
Mus musculus	House Mouse
Order Carnivora	**Carnivores**
Canis latrans	Coyote
Procyon lotor	Raccoon
Mephitis mephitis	Striped Skunk
Order Artiodactyla	**Even-Toed ungulates**
Odocoileus hemionus	Mule Deer

** Amphibian, reptile, bird, and mammal nomenclature follows Laudenslayer et. al. 1991.

Appendix F

Noise Report for Sensitive Wildlife Receptors within the I-5 North Coast Project (EDAW 2006)

NOISE REPORT FOR
SENSITIVE WILDLIFE RECEPTORS
WITHIN THE I-5 NORTH COAST PROJECT

Prepared for:

Caltrans District 11
2829 Juan Street
P.O. Box 85406
San Diego, California 92186-5406

Prepared by:

EDAW, Inc.
1420 Kettner Boulevard, Suite 620
San Diego, California 92101
Phone: (619) 233-1454
Fax: (619) 233-0952

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1. INTRODUCTION

The California Department of Transportation (Department) is proposing to improve 27 miles of Interstate 5 (I-5) between the city of San Diego and the city of Oceanside, and the northernmost 1.8 miles of Interstate 805 in San Diego. The project, known as the I-5 Northcoast Project, would consist of the addition of either 1 or 2 general purpose (GP) lanes in each direction on I-5 from La Jolla Village Drive to Harbor Drive. It would also include 2 high occupancy vehicle (HOV) lanes in each direction. All proposed alternatives of the project would include construction of direct access ramps to the HOV lanes, the addition of auxiliary lanes, and the widening of bridges and overcrossings (OCs) on the project route. This report is limited to the potential impacts of these improvements to noise sensitive wildlife species within San Dieguito, San Elijo, Batiquitos, Buena Vista, and Agua Hedionda lagoons. Figure 1 depicts the project area in a regional context.

2. PURPOSE AND NEED

This noise report has been prepared to provide preliminary noise contour data to analyze potential project-related noise effects to biological resources located within the study area. This report provides an analysis of potential noise impacts within five lagoons (San Dieguito, Batiquitos, San Elijo, Buena Vista, and Agua Hedionda) located along I-5 in San Diego County, California. The analysis of biological impacts is based on computer model-generated noise contours and estimated traffic volumes for existing and future conditions. Future I-5 traffic volume increases were developed based on a 10+4 future development scenario, defined in Section 3, Project Description, with an operational level of service (LOS) C.

3. PROJECT DESCRIPTION

Four alternative configurations of GP and HOV lanes are being considered at the current stage of the I-5 North Coast project development. In general, the existing configuration of I-5 from the Del Mar Heights Road OC (KP 54.9, PM 34.1) northward throughout the project area is 4 GP lanes in each direction with no HOV lanes (8+0). Two proposed alternatives would add HOV lanes, with 4 HOV lanes throughout, and with 4 GP lanes in each direction from the Del Mar Heights Road OC (KP 54.9, PM 34.1) northward to the project terminus (8+4). In one of these 8-lane alternatives, the HOV lanes would be separated from the GP lanes by K-rail barriers. In the other 8-lane alternative, the HOV lanes would be separated from the GP lanes by 3-foot-wide buffers.

No Scale

Figure 1
Regional Location Map

Two other alternatives would add a GP lane in each direction from Del Mar Heights Road northward to the SR 78 bridge over I-5 south of Oceanside (KP 82.4, PM 51.2), as well as the HOV lanes described above (10+4). Similar to the 8-lane alternatives, one 10-lane alternative would separate the HOV and GP lanes with a barrier, and the other 10-lane alternative would separate the HOV and GP lanes with a 3-foot-wide buffer. Thus, the basic configurations of the proposed alternatives are termed the 8+4 with buffer, the 8+4 with barrier, the 10+4 with buffer, and the 10+4 with barrier. Each alternative would also add auxiliary lanes between interchanges in certain locations, listed below.

4. FUNDAMENTALS OF NOISE

Sound is a vibratory disturbance created by a moving or vibrating source, in the pressure and density of a gaseous, liquid medium or in the elastic strain of a solid, which is capable of being detected by the hearing organs. *Noise* is defined as sound that is loud, unpleasant, unexpected, or undesired and may therefore be classified as a more specific group of sounds.

4.1 Frequency and Decibels

In its most basic form, a continuous sound can be described by its *frequency* or *wavelength* (pitch) and its *amplitude* (loudness). For a given single pitch of sound, the sound pressure waves are characterized by a sinusoidal periodic (recurring with regular intervals) wave. The number of times per second that the wave passes from a period of compression through a period of rarefaction and starts another period of compression is referred to as the *frequency* of the wave. Frequency is expressed in *cycles per second*, or *hertz (H*z). One Hz equals one cycle per second. High frequencies are sometimes more conveniently expressed in units of *kilohertz* (*kH*z), or 1,000 Hz. The extreme range of frequencies that can be heard by the healthiest human ears spans from 16 to 20 Hz on the low end to about 20,000 Hz (or 20 kHz) on the high end. Frequencies are heard as the pitch or tone of sound. High-pitched sounds produce high frequencies; low-pitched sounds produce low frequencies.

The pressure of sound waves continuously changes with time or distance, and within certain ranges. The ranges of these pressure fluctuations (actually deviations from the ambient air pressure) are called the amplitude of the pressure waves. Whereas the *frequency* of the sound waves is responsible for the pitch or tone of a sound, the *amplitude* determines the loudness of the sound. Loudness of sound increases and decreases with the amplitude. Sound pressures can be measured in units of micro Newtons per square meter (mN/m^2) called micro Pascals (mPa). The pressure of a very loud sound may be 200,000,000 mPa, or 10,000,000 times the pressure of the weakest audible sound (20 mPa). Expressing sound levels in terms of mPa would be very cumbersome because of this wide range. For this reason, *sound pressure levels* are described in units called the decibel (dB).

Decibels are measured on a logarithmic scale that quantifies sound intensity in a manner similar to the Richter scale used for earthquake magnitudes. Thus, a doubling of the energy of a noise source, such as doubling of traffic volume, would increase the noise level by 3 dB; a halving of the energy would result in a 3 dB decrease.

4.2 A-Weighting and Noise Levels

The human ear is not equally sensitive to all frequencies within the sound spectrum. To accommodate this phenomenon, the A-scale, which approximates the frequency response of the average young ear when listening to most ordinary everyday sounds, was devised. When people make relative judgments of the loudness or annoyance of a sound, their judgments correlate well with the A-scale sound levels of those sounds. Therefore, the "A-weighted" noise scale is used for measurements and standards involving the human perception of noise. Noise levels using A-weighted measurements are written as dB(A) or dBA. Table 1 shows the relationship of various noise levels to commonly experienced noise events.

Although sensitive biological species considered in this report are bird species and are not human, A-weighted noise values have been used by federal, state, and local agencies to evaluate noise impacts to biological species. The specific effects from increased noise levels to wildlife species are discussed in detail in Section 4.5.

4.3 Noise Propagation

From the source to the receiver, noise changes both in level and frequency spectrum. The most obvious is the decrease in noise as the distance from the source increases. The manner in which noise reduces with distance depends on the following important factors:

- geometric spreading from point and line sources
- ground absorption
- atmospheric effects and refraction
- shielding by natural and man-made features, noise barriers, diffraction, and reflection

Table 1
Typical Noise Levels

Common Outdoor Activities	Noise Level (dBA)	Common Indoor Activities
	--110--	Rock Band
Jet Fly-over at 1,000 ft	--100--	
Gas Lawn Mower at 3 ft	--90--	
Diesel Truck at 50 ft, at 50 mph	--80--	Food Blender at 3 ft Garbage Disposal at 3 ft
Noisy Urban Area, Daytime Gas Lawn Mower, 100 ft	--70--	Vacuum Cleaner at 10 ft
Commercial Area Heavy Traffic at 300 ft	--60--	Normal Speech at 3 ft
Quiet Urban Daytime	--50--	Large Business Office Dishwasher in Next Room
Quiet Urban Nighttime	--40--	Theater, Large Conference Room (Background)
Quiet Suburban Nighttime	--30--	Library
Quiet Rural Nighttime	--20--	Bedroom at Night, Concert Hall (Background)
	--10--	Broadcast/Recording Studio
Lowest Threshold of Human Hearing	--0--	Lowest Threshold of Human Hearing

Source: Department 1998
ft = foot, hr = hour, mph = miles per hour

Geometric Spreading

Sound from a small localized source (approximating a "point" source) radiates uniformly outward as it travels away from the source in a spherical pattern. The sound level attenuates or drops off at a rate of 6 dBA for each doubling of the distance (6 dBA/DD). This decrease, due to the geometric spreading of the energy over an ever increasing area, is referred to as the *inverse square la*w. Sound from construction equipment can often be considered as a point source.

Highway traffic noise is not a single, stationary point source of sound. The movement of the vehicles makes the source of the sound appear to emanate from a line (line source) rather than a point when viewed over some time interval. This results in cylindrical spreading rather than spherical spreading of a point source. Since the change in surface area of a cylinder only increases by two times for each doubling of the radius instead of the four times associated with spheres, the change in sound level is 3 dBA/DD.

Ground Absorption

Most often, the noise path between the highway and the observer is very close to the ground. Noise attenuation from ground absorption and reflective wave canceling adds to the attenuation due to geometric spreading. Traditionally, the attenuation has been expressed in terms of attenuation per doubling of distance. This approximation is done for simplification only, and for distances of less than 200 feet, prediction results based on this scheme are sufficiently accurate. The sum of the geometric spreading attenuation and the excess ground attenuation (if any) is referred to as the *attenuation rate*, or *drop-off rate*. The amount of excess ground attenuation depends on the height of the noise path and the characteristics of the intervening ground or site. In practice, this excess ground attenuation may vary from nothing to 8 to 10 dBA/DD or more. For the sake of simplicity, two site types are currently used in traffic noise models and are described below:

- Hard sites are those with a reflective surface between the source and the receiver, such as parking lots or smooth bodies of water. No excess ground attenuation is assumed for these sites, and the change in noise levels with distance (drop-off rate) is simply the geometric spreading of the line source, or 3 dBA/DD (6 dBA/DD for a point source).

- Soft sites have an absorptive ground surface such as soft dirt, grass, or scattered bushes and trees. An excess ground attenuation value of 1.5 dBA/DD is normally assumed. When added to the geometric spreading, this results in an overall drop-off rate of 4.5 dBA/DD for a line source (7.5 dBA/DD for a point source).

Atmospheric Effects and Refraction

Research by the Department and others has shown that atmospheric conditions can have a profound effect on noise levels within 200 feet from a highway. Wind has shown to be the single most important meteorological factor within approximately 500 feet, while vertical air temperature gradients are more important over longer distances. Other factors such as air temperature, humidity, and turbulence also have significant effects.

Shielding by Natural and Man-made Features, Noise Barriers, Diffraction, and Reflection

A large object in the path between a noise source and a receiver can significantly attenuate noise levels at that receiver. The amount of attenuation provided by this “shielding” depends on the size of the object and the frequencies of the noise levels. Natural terrain features such as hills and dense woods, as well as man-made features such as buildings and walls, can significantly alter noise levels. Walls are often specifically used to reduce noise.

4.4 Noise Descriptors

Average noise levels over a period of minutes or hours are expressed as dBA L_{eq}, or the equivalent noise level for that period of time. The period of time average may be specified; $L_{eq(3)}$ would be a 3-hour average. When no period is specified, a 1-hour average is assumed. The 1-hour average L_{eq} is used in this analysis.

4.5 Noise Effects on Wildlife

Increased levels of noise have the potential to affect behavioral and physiological responses in noise sensitive wildlife receptors. Adverse responses to increased noise may include hearing loss or the temporary masking of vocalizations used in communication during the breeding season, nest abandonment, and decreased predator awareness, thereby resulting in a decrease in the reproductive and overall fitness of certain animal species (Fletcher 1980, 1990). Increased noise from roadway traffic has the potential to create a situation of long-term hearing loss in wildlife species, while the periodic, point-source noise impacts typically associated with construction activities would result in short-term effects to wildlife species.

Bird species utilize sound, in the form of a variety of vocalizations (e.g., mating calls, contact notes, etc.), throughout their daily activities and, therefore, are the focus of the potential effects analysis of this study. Bird species associated with the study area include the California least tern (*Sterna antillarum browni*), western snowy plover (*Charadrius alexandrinus nivosus*), least Bell's vireo (*Vireo bellii pusillus*), light-footed clapper rail (*Rallus longirostris levipes*), southwestern willow flycatcher (*Empidonax traillii extimus*), and Belding's savannah sparrow (*Passerculus sandwichensis beldingi*), all species associated with the wetland/riparian areas within and adjacent to the coastal lagoons along the I-5 corridor. This analysis also addresses potential effects to the coastal California gnatcatcher (*Polioptila californica californica*), an upland bird species, in suitable habitat that occurs between the I-5 corridor and the coastal lagoons.

5. METHODOLOGY

5.1 Selection of Receivers and Measurement Sites

Noise sensitive receptors are generally considered human activities or land uses that may be subject to the stress of significant interference from noise. For the purposes of this report, noise receptors include threatened or endangered biological species. An initial selection of receptor points for modeling and measurement was made by EDAW, based on maps and aerial photos of the project area. Actual measurement points for each of the lagoons were selected based on the general location of sensitive biological resources located within each lagoon and the availability of access to the lagoons for measurements.

5.2 Field Measurement Procedures

Short-term noise levels were measured on April 13, 17, and 18, 2006, at San Dieguito, Batiquitos, Buena Vista, and Agua Hedionda lagoons. Noise measurements for San Elijo Lagoon were taken from the *Noise Report for Sensitive Wildlife Receptors within the Manchester Avenue Interstate 5 Interchange Project* (Manchester Report) (Department 2003). Noise measurements for San Elijo Lagoon were taken August 14 and 15, and October 4, 2002. Instrumentation and settings for the San Elijo Lagoon measurements are detailed in that report.

A Larson-Davis Laboratories Model 820 Type 1 sound level meter and a Larson-Davis Laboratories Model 824 Type 1 sound level meter were used to measure noise levels at San Dieguito, Batiquitos, Buena Vista, and Agua Hedionda lagoons. Meter calibrations were checked before and after use. The following parameters were used:

Filter:	A-weighted
Response:	Fast
Time History Period:	5 seconds

Traffic on I-5 was not counted due to high volumes. Qualitative descriptions of freeway traffic conditions were noted for most measurements to assist in relating measured noise levels to noisiest hour noise levels. Measurement data, including noise levels, traffic observations, weather conditions, and comments about measurement locations and nontraffic noise, are included in Appendix A.

5.3 Traffic Noise Prediction

TNM Version 2.5, the Federal Highway Administration Traffic Noise Model (FHWA 2004), was used to develop existing (2005) and future (2035) traffic noise level contours at San Dieguito, San Elijo, Batiquitos, Buena Vista, and Agua Hedionda lagoons. Inputs to TNM include the three-dimensional coordinates of the roadways, noise receptors, and topographic or planned barriers that would affect noise propagation; vehicle volumes and speeds, by type of vehicle; and vehicle noise emission characteristics. The model outputs are noise levels at the selected receptor points and noise level contours. Traffic situations are typically complex, with vehicles of many types moving at various speeds. Therefore, assumptions of average traffic values, such as volumes, speed, and vehicle mix, must be made when using TNM.

TNM was used to generate 50-foot by 50-foot receptor grids over each of the lagoons and plot the existing and future dBA L_{eq} noise level contours. The existing and future elevations of the roadway, receptors, barriers, and terrain lines were interpolated from available topography data. The existing alignment of I-5 was assumed to remain under the future conditions with only widening of the paved areas occurring. Existing conditions were modeled assuming 4 GP lanes in each direction, northbound and southbound, with an average pavement width of 48 feet in each direction. Future conditions were modeled assuming 5 GP lanes and 2 HOV lanes in each direction, with an average pavement width of 84 feet in each direction.

Receptor height in the lagoon was modeled at 5 feet above lagoon elevation, a constraint of the contour module in TNM model. The 5-foot elevation represents a conservative location for noise assessment for noise sensitive bird species; noise levels would be less at the estimated nesting heights of 1 foot and 3 feet than at 5 feet because the road elevation is above the lagoon elevation, and the noise reduction effects occurring at the edges of the roadway are greater for lower receptors. The difference in noise between receptor heights at the location of the noise contours of interest would be less than 1 dBA.

5.4 Model Calibration

The purpose of model calibration is to “fine-tune” the prediction model to actual site conditions not adequately accounted for by the model. Calibration is performed by algebraically adding a constant to the noise level calculated in TNM. The magnitude of the constant is initially determined by the difference between measured and modeled noise levels at specific points. Additional factors may be applied based on the experience and judgment of the noise engineer performing the analysis. No calibrations were used in this assessment as there was a difference of less than 2 dBA between the modeled noise levels and the measured noise levels.

5.5 Traffic Parameters

Existing and future 2035 traffic data used in the modeling of existing and future noise conditions for I-5 were provided by the Department. The peak noise hour is not necessarily the peak traffic hour because vehicles move more slowly in heavy traffic, which generates less noise than high-speed traffic conditions. The traffic conditions for the peak noise hour, with most of the traffic averaging the posted 65 miles per hour (mph) speed, corresponds to 1,800 vehicles per GP lane per hour. HOV lanes on I-5 would have projected traffic volumes of 1,500 vehicles per lane per hour. Traffic speed for automobiles and medium trucks was assumed to be 65 mph and heavy trucks were assumed to travel at 55 mph. Vehicle mix data were provided by the Department. Traffic data provided by the Department are included in Appendix B.

6. ANALYTICAL CRITERIA AND IMPACT METHODOLOGY

There is no single standard or threshold for determining significant noise effects on all bird species. Prior studies that have indicated a possible noise effects threshold for certain species of songbirds have not been scientifically shown to be valid for those species addressed in this report. Therefore, the existing ambient noise levels within the study area were compared to the predicted noise levels associated with the proposed future vehicle traffic over the five coastal lagoons along the I-5 corridor in San Diego County. No noise thresholds were used to determine the potential for effects of noise on special status bird species.

7. EXISTING AND FUTURE NOISE CONDITIONS

7.1 Measured Existing Noise Environment

Existing 24-hour noise levels were measured along I-5 as part of the overall I-5 North Coast Project in March and April 2006. These 24-hour data were used to determine the loudest hour and to adjust measurements taken outside the loudest hour. Short-term noise measurements near the project site were taken on April 13, 17, and 18, 2006, at 14 locations, with 3 to 4 measurements per lagoon. Measurements were generally taken between the hours of 11:00 a.m. and 5:00 p.m. During the measurements, the weather was cloudy and dry, and the wind speed was less than 5 mph. The dominant source of noise in the area was traffic on I-5.

Measured noise levels at San Elijo Lagoon were measured on August 14 and 15, and October 4, 2002. Specific sound level meter settings and parameters are detailed in the Manchester Report. Measurement locations used from the Manchester Report were M5, M6, M15a, and M14d and coincide with receptor locations 4 through 7.

Existing noise levels are shown in Table 2. Appendix A describes the location of the measurements, environmental conditions at the time, measurement duration, comments and observations, the measured noise levels, and adjustments to the measured noise levels to normalize them to the loudest hour. Measurement points are shown in Figures 2 through 6 along with the existing and future peak noise hour 60 dBA L_{eq} contours.

Table 2
Modeled Existing Traffic Noise Levels

Receptor Number	Existing Measured Noise Levels (dBA L_{eq})[1]	Existing Modeled Noise Levels (dBA L_{eq})	Difference
San Dieguito Lagoon			
1	64	64	0
2	61	61	0
3	66	66	0
San Elijo Lagoon			
4	64	64	0
5	67	67	0
6	66	66	0
7	60	60	0
Batiquitos Lagoon			
8	63	64	1
9	62	62	0
10	64	64	1
Agua Hedionda Lagoon			
11	59	59	0
12	61	62	1
13	59	61	2
14	57	59	2
Buena Vista Lagoon			
15	62	63	1
16	61	63	2
17	52	53	1

[1] Noise levels measured outside the loudest hour have been adjusted to reflect the loudest hour. A table of adjustments has been included in Appendix A.

7.2 Modeled Existing Traffic Noise Levels

Existing traffic noise levels were modeled using TNM. The locations for the modeled noise receptors are shown in Figures 2 through 6 and coincide with the measurement locations. The results of modeling are compared to the adjusted measured noise levels in Table 2. After verification of the model from measured noise levels, the noisiest hour noise contours for each lagoon were plotted and are shown in Figures 2 through 6. Sample TNM input and output data are included in Appendix C.

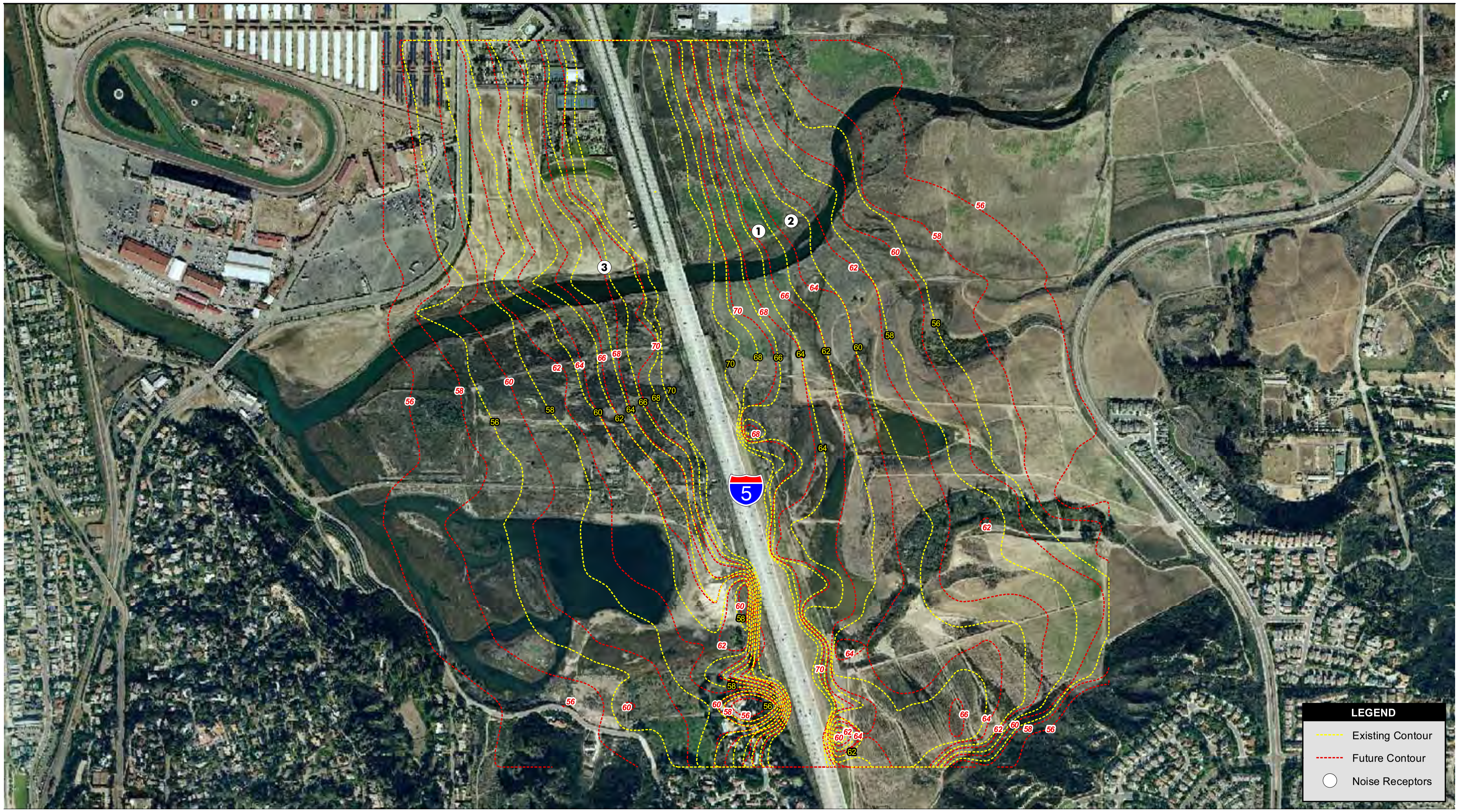
7.3 Future Operations

Noise Sources and Noise Levels

Future 2035 noise levels were modeled using the maximum LOS C capacity assumptions under the 10+4 lane configuration. No other future conditions were modeled as this condition would represent the typical noisiest anticipated scenario. As with the existing conditions, specific topography for the future alignment is not available and was extrapolated from available data. The results of the modeling for the future condition are shown in Table 3. Noisiest hour noise contours for future conditions are shown in Figures 2 through 6. As shown in Table 3, future noise level increases during the noisiest hour, from existing to future build traffic levels, at most receptor points would be 1 to 3 dBA L_{eq}. Two exceptions to this occur at Receptor 10 in Batiquitos Lagoon and Receptor 5 in San Elijo Lagoon. Receptor 10 would increase by 4 dBA L_{eq} due to the loss of a noise shadow resulting from topographic features. Receptor 5 would decrease by 1 dBA L_{eq} due to the widening of I-5, which would increase the width of the freeway creating a noise shadow immediately adjacent to the roadway due to steep topography.

Potential Effects

Potential noise effects associated with the future expansion of the I-5 corridor over the lagoons were determined by calculating the relative noise difference between the predicted future noise and the existing traffic noise contours modeled on field data measurements (Figures 2 through 6). The potential effects of traffic noise on noise sensitive wildlife receptors are addressed for each lagoon.



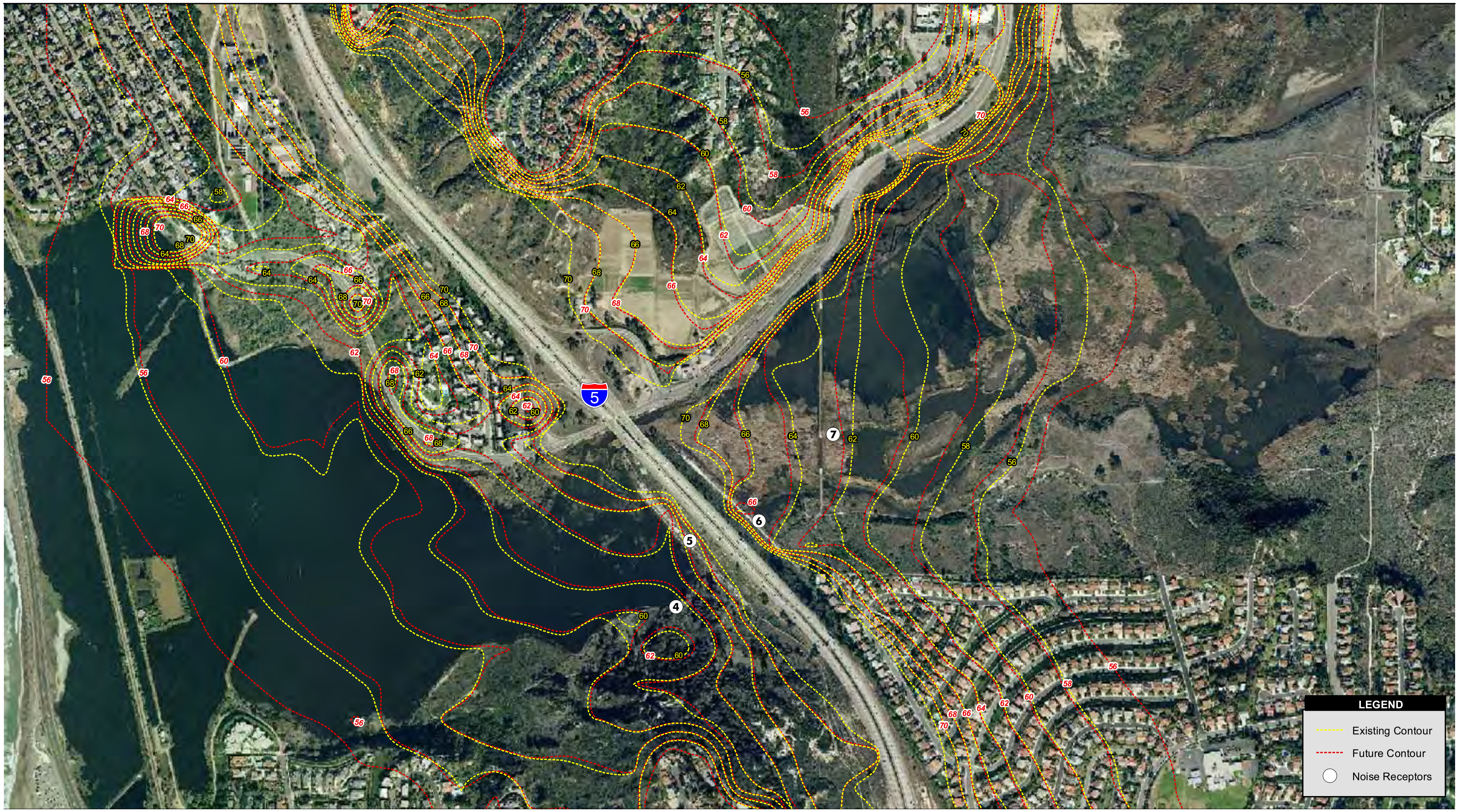
Source: AirPhotoUSA 2006, EDAW survey 2006

800 400 0 800 Feet

Scale: 1:9,600; 1 inch = 800 feet

Figure 2
Noise Measurement Locations and Noise Contours
San Dieguito Lagoon

Path: P:\2006\06080071 I-5 No Coast Existing Conditions Noise Rpt\5GIS\Mxd\DRAFTReivew\20060914\San Dieguito_noise.mxd, 09/19/06, AugelloP



Source: AirPhotoUSA 2006, EDAW survey 2006, San Elijo Lagoon Conservancy, 2002

700 350 0 700 Feet

Scale: 1:8,400; 1 inch = 700 feet

Figure 3
Noise Measurement Locations and Noise Contours
San Elijo Lagoon

Path: P:\2006\06080071 I-5 No Coast Existing Conditions Noise Rpt\5GIS\Mxd\DRAFTReivew\20060914\SE_noise.mxd, 09/19/06, AugelloP

Figure 4
Noise Measurement Locations and Noise Contours
Batiquitos Lagoon

Path: P:\2006\06080071 I-5 No Coast Existing Conditions Noise Rpt\5GIS\Mxd\DRAFTReivew\20060914\Batiquitos_noise.mxd, 09/19/06, AugelloP

Figure 5
Noise Measurement Locations and Noise Contours
Agua Hedionda Lagoon

Path: P:\2006\06080071 I-5 No Coast Existing Conditions Noise Rpt\5GIS\Mxd\DRAFTReivew\20060914\AH_noise.mxd, 09/19/06, AugelloP

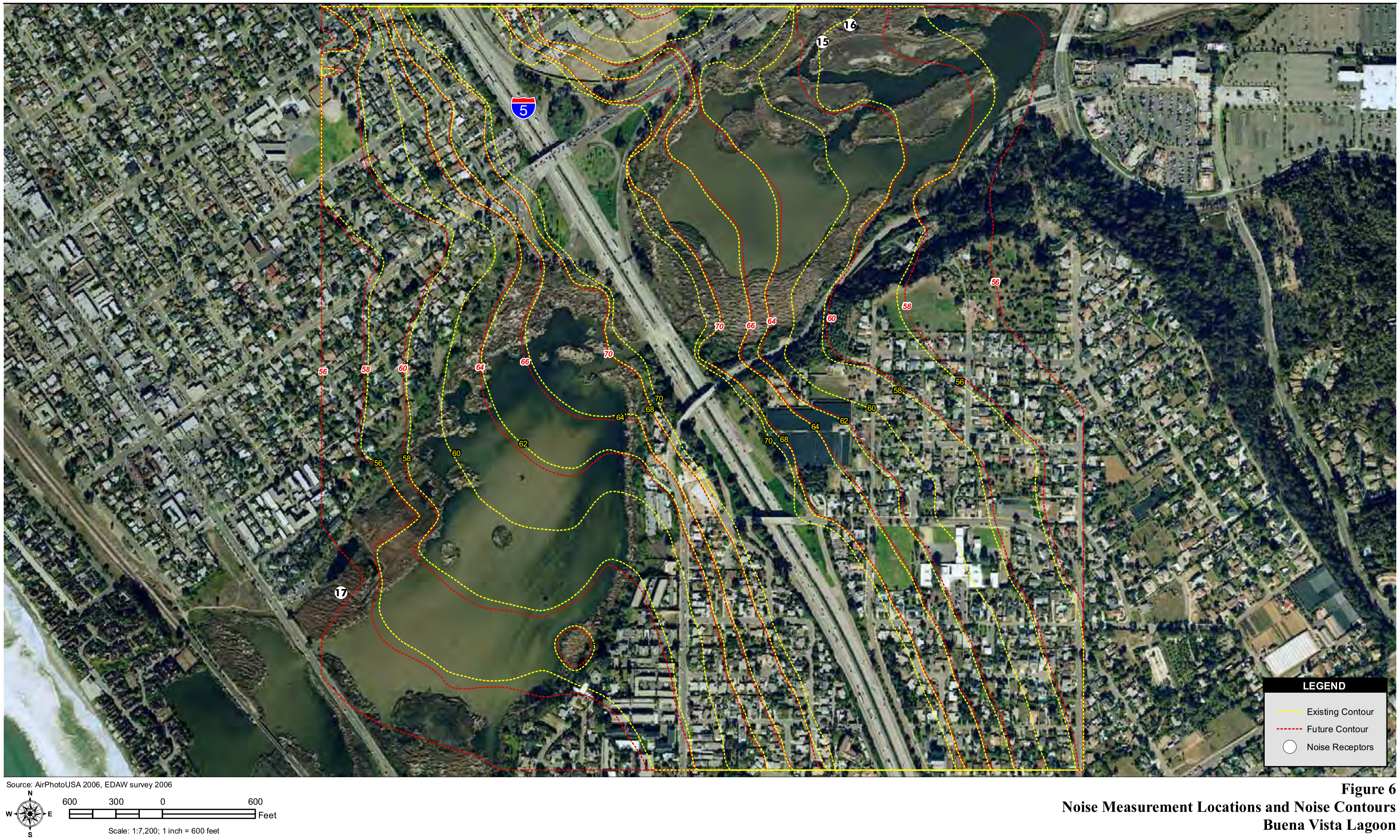


Figure 6
Noise Measurement Locations and Noise Contours
Buena Vista Lagoon

Path: P:\2006\06080071 I-5 No Coast Existing Conditions Noise Rpt\5GIS\Mxd\DRAFTReivew\20060914\BV_noise.mxd, 09/20/06, AugelloP

It should be noted that under existing conditions, noise in excess of 70 dBA occurs over various amounts of wetland and upland habitats that either support, or have the potential to support, special status bird species at the five coastal lagoons within the study area as shown in Figures 7 through 11. Although population numbers have undergone natural fluctuations over the years, these species continue to forage, nest, breed, and otherwise consistently occur within suitable habitat during the breeding season in areas subjected to a wide range of noise levels.

Table 3
Modeled Future Traffic Noise Levels

Receptor Number	Existing Noise Levels (dBA L_{eq})	Future Noise Levels (dBA L_{eq})	Difference
San Dieguito Lagoon			
1	64	66	2
2	61	63	2
3	66	68	2
San Elijo Lagoon			
4	64	65	1
5	67	66	-1
6	66	67	1
7	60	61	1
Batiquitos Lagoon			
8	64	66	2
9	62	65	3
10	64	68	4
Agua Hedionda Lagoon			
11	59	62	3
12	62	64	2
13	61	64	3
14	59	61	2
Buena Vista Lagoon			
15	63	64	1
16	63	64	1
17	53	55	2

San Dieguito Lagoon

As shown in Table 3, the sampling location at San Dieguito Lagoon with the loudest existing noise level was 66 dBA L_{eq}, with a predicted future noise level at that location of 68 dBA L_{eq}, indicating an anticipated increase of 2 dBA. This 2 dBA increase was predicted at all three noise sampling locations, and the noise modeling predictions indicate that similar increases would occur across the entire open lagoon area, typically ranging between 2 to 3 dBA (Figure 7). Within the study area, a majority of the documented locations of the Belding's savannah sparrows east of I-5 (6 of 10) and coastal California gnatcatcher (8 of 11) west of I-5 occur within the existing 66 dBA L_{eq} noise contour. The Belding's savannah sparrow population west of I-5 occur in between the existing 56 and 62 dBA L_{eq} contour, and is not subject to the relatively higher noise levels on the eastern side, due primarily to the distribution of suitable habitat and naturally sound-attenuating geographic features of the landscape. However, the predicted relative noise increase for these individuals is also approximately 2 dBA.

The 2005 statewide light-footed clapper rail census indicates that there are 12 locations of light-footed clapper rail within the lagoon (Zembal et al. 2005). The census report does not include mapped locations of the species within the lagoon. However, based on the predictive model, noise levels would also increase by 2 dBA for the species. The least Bell's vireo is also known from upstream of the lagoon, along the San Dieguito River, but very little suitable habitat exists for this species within the lagoon.

Although a healthy human ear can barely perceive changes on the order of 3 dBA, it is unclear what level is perceptible to bird species in general, and it is even less clear as to what is discernible to the target species of this study. However, the bird species within San Dieguito Lagoon are expected to be exposed to an increase of 2 dBA throughout the entire study area, but the relative effects are likely to vary, due to the nonlinear scale in which noise is measured. An increase from 66 to 68 dBA L_{eq} requires a relatively greater amount of acoustic energy, than an increase from 56 to 58 dBA L_{eq}. As such, the 6 Belding's savannah sparrows and 8 coastal California gnatcatchers within the future 66 dBA L_{eq} noise contour may be affected to a greater degree that the rest of the populations of these species in the lagoon, by the ultimate build-out of the I-5 corridor at San Elijo Lagoon.

Similar to the situation at San Dieguito Lagoon, the proposed future expansion of the I-5 corridor across San Elijo Lagoon would result in a relative increase in traffic-related noise over the entire lagoon of approximately 2 dBA L_{eq} (Figure 8). The increase (and in one case, a decrease) of predicted future noise by 1 dBA for the noise sampling locations shown for San Elijo Lagoon in Table 3 is representative of the variables associated with the sampling locations, such as the anticipated noise shielding effect of the future widened portion of I-5 across the lagoon, and does not reflect the overall results of the model for the entire lagoon study area.

According to recent survey data provided by the San Elijo Lagoon Conservancy, as well as data obtained from the Department, a total of 37 locations of Belding's savannah sparrows occur throughout the extent of San Elijo Lagoon shown in Figure 8, and are dispersed broadly throughout suitable habitat within the lagoon. In fact, only 4 of the 37 Belding's savannah sparrow locations are currently exposed to noise levels of 66 dBA L_{eq}, or greater (i.e., within areas subject to projected future noise levels of 68 dBA L_{eq}, or greater).

Source: AirPhotoUSA 2006, EDAW survey 2006

Scale: 1:9,600; 1 inch = 800 feet

Figure 7
Known Sensitive Species Locations
San Dieguito Lagoon

Path: P:\2006\06080071 I-5 No Coast Existing Conditions Noise Rpt\5GIS\Mxd\DRAFTReivew\20060914\San Dieguito_bio.mxd, 09/20/06, AugelloP

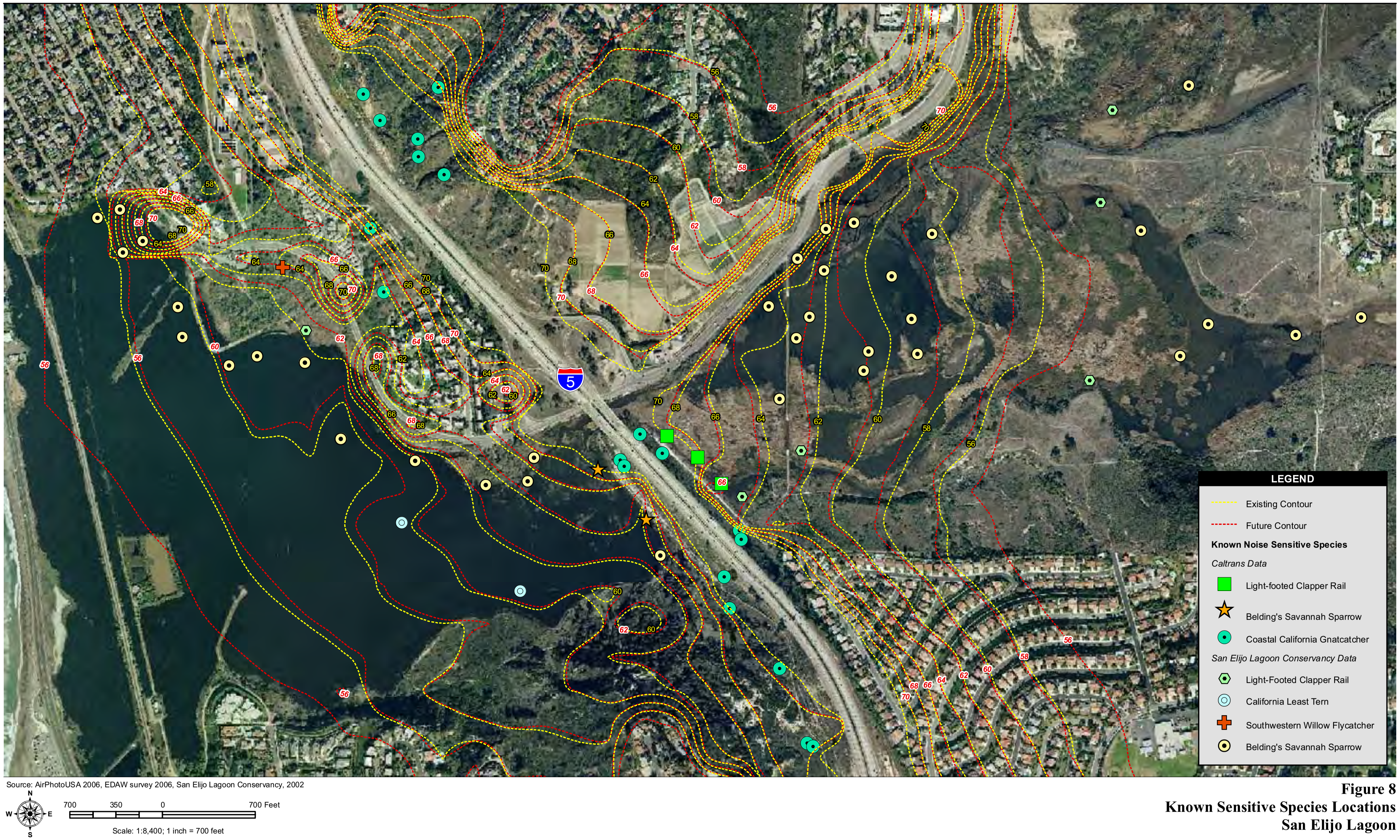


Figure 8
Known Sensitive Species Locations
San Elijo Lagoon

Path: P:\2006\06080071 I-5 No Coast Existing Conditions Noise Rpt\5GIS\Mxd\DRAFTReivew\20060914\SE_bio.mxd, 09/20/06, AugelloP

Figure 9
Known Sensitive Species Locations
Batiquitos Lagoon

Path: P:\2006\06080071 I-5 No Coast Existing Conditions Noise Rpt\5GIS\Mxd\DRAFTReivew\20060914\Batiquitos_bio.mxd, 09/20/06, AugelloP

Source: AirPhotoUSA 2006, EDAW survey 2006

N W E S

600 300 0 600 Feet

Scale: 1:7,200; 1 inch = 600 feet

Figure 10
Known Sensitive Species Locations
Agua Hedionda Lagoon

Path: P:\2006\06080071 I-5 No Coast Existing Conditions Noise Rpt\5GIS\Mxd\DRAFTReivew\20060914\AH_bio.mxd, 09/20/06, AugelloP

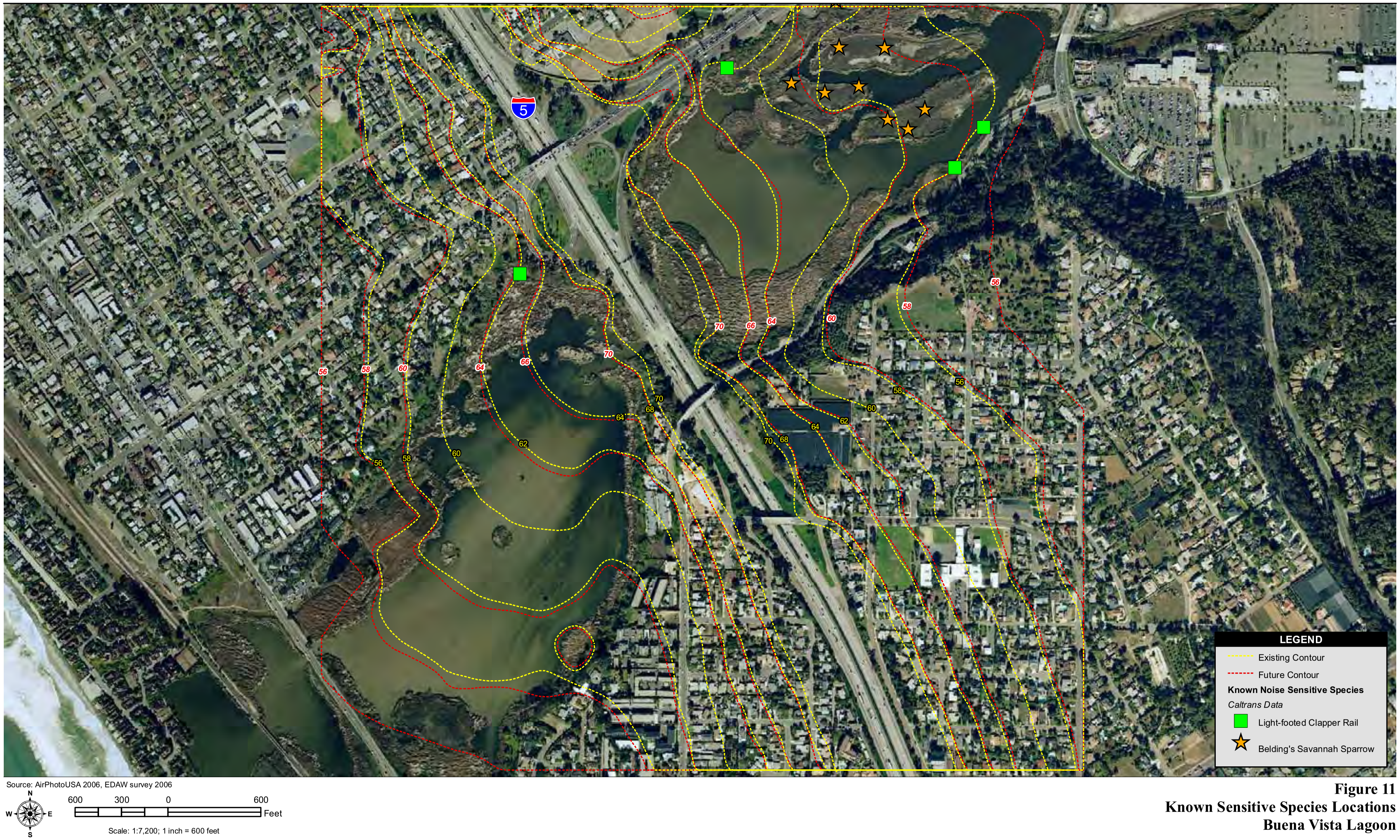


Figure 11
Known Sensitive Species Locations
Buena Vista Lagoon

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Similarly, the known population of light-footed clapper rail within San Elijo Lagoon is dispersed throughout the suitable patches of habitat across the lagoon. A total of 4 of the 9 clapper rail locations documented within the extent of the lagoon shown in Figure 8 occur within areas currently exposed to noise levels of 66 dBA L_{eq}, or greater (i.e., within areas subject to projected future noise levels of 68 dBA L_{eq}, or greater).

The documented population of the coastal California gnatcatcher within the study area consists of 18 locations along the slopes immediately adjacent to the I-5 corridor. The predictive noise model indicates that 17 of the 18 locations occur in areas currently exposed to 66 dBA L_{eq}, or greater (i.e., within areas subject to projected future noise levels of 68 dBA L_{eq}, or greater) (Figure 8).

The southwestern willow flycatcher and the California least tern are also known from San Elijo Lagoon. However, the flycatcher has only been observed as a transient in the project area, and the tern only forages in the open water of the lagoon. Neither species is known or is expected to nest within the study area.

For similar reasons as those discussed in the analysis of San Dieguito Lagoon, the 4 Belding's savannah sparrows, 4 light-footed clapper rails, and 17 coastal California gnatcatchers that would be exposed to an increase of 2 dBA (within the 66 dBA L_{eq} contour), may be more likely to be adversely affected than those individuals experiencing a 2 dBA noise increase in relatively quieter portions of the lagoon.

Batiquitos Lagoon

Special status species data are relatively sparse for Batiquitos Lagoon, compared to San Dieguito and San Elijo lagoons. The documented special status species locations for Batiquitos Lagoon are all relatively close to the I-5 corridor and fall within or adjacent to the existing 66 dBA L_{eq} noise contour (Figure 9). Known sensitive species data for the lagoon includes 1 record of the light-footed clapper rail, 2 locations of Belding's savannah sparrow, and 6 locations of the coastal California gnatcatcher. As with the previous lagoon traffic noise analyzed, the future traffic noise is predicted to be 2 dBA higher, in general, across the entire lagoon. However, future noise was predicted to increase by 4 dBA at one sampling location, due to the anticipated loss of a noise shadow associated with the proposed build-out of I-5 across the lagoon.

Of all the lagoons analyzed for this study, Batiquitos Lagoon was unique in terms of having all known target species distributed within a relatively narrow set of noise contours. As such, there is a potential for adverse effects to occur to all of the special status bird species at their currently known locations within the lagoon.

Agua Hedionda Lagoon

No point location records of any of the special status bird species addressed in this study are known to occur within Agua Hedionda Lagoon. However, the California Natural Diversity Database (CNDDB) reports the occurrence of generalized light-footed clapper rail occupation of the lagoon (Figure 10). The predictive noise model indicates an increase to the current traffic noise associated with the expansion of I-5, similar to the other lagoons, with a general 2 dBA increase over a majority of Agua Hedionda Lagoon. Portions of the lagoon would see increases ranging from 2 to 3 dBA (Table 3). As previously noted, due to the nonlinear nature of the dBA scale, an increase of 3 dBA approximates a doubling of the acoustic energy, regardless of what percent change is represented by the 3 dBA increase. Therefore, of all of the lagoons analyzed, Agua Hedionda Lagoon, the location with the fewest target species (i.e., none), should be exposed to the greatest relative increase in traffic noise.

Since no distinct locations of target species have been identified at Agua Hedionda Lagoon, a traditional effects analysis cannot be performed. However, based on the CNDDB-documented general occurrence of the light-footed clapper rail within the vicinity of the lagoon, there is a potential that the predicted 2 dBA increase over the entire study area has the potential to adversely affect the species.

Buena Vista Lagoon

Once the future widening of I-5 has been constructed, the increase in traffic volume in the vicinity of Buena Vista Lagoon is expected to result in a corresponding rise in traffic noise. Increased traffic noise would result in an increase in approximately 2 dBA across the lagoon (Figure 11). Documented special status bird species within the study area of Buena Vista Lagoon includes 4 locations of the light-footed clapper rail (2 within the current 62 dBA L_{eq} noise contour, and 2 within the 56 dBA L_{eq} noise contour), and 8 locations of Belding's savannah sparrow (all within, or in close proximity to, the 58 dBA L_{eq} noise contour).

Other sensitive species whose habitat occurs within the lagoon habitat potentially affected by the increased traffic noise include the western snowy plover and California least tern, that have the potential to forage over the open water of the lagoon and have been documented in the vicinity of the lagoon. However, it is not expected that these species would nest within the lagoon study area.

The 2 light-footed clapper rail locations documented for Buena Vista Lagoon within the current 62 dBA L_{eq} noise contour, have a greater probability of being adversely affected by the 2 dBA predicted noise increase, than either the remaining 2 clapper rail locations or the 8 Belding's savannah sparrow locations. This assessment is based on the greater amount of acoustic energy required to register an increase of 2 dBA from a baseline of 62 dBA L_{eq}, versus a baseline of 56 dBA L_{eq} or 58 dBA L_{eq}. However, adverse effects could potentially occur to these other birds, but likely to a lesser extent than the 2 light-footed clapper rails within the 62 dBA L_{eq} contour.

8. LIST OF PREPARERS

Personnel responsible for preparation of this Noise Report for Sensitive Wildlife Receptors include the following:

EDAW, Inc.
1420 Kettner Boulevard, Suite 620
San Diego, CA 92101

Bill Graham, Project Manager
Wei Luo, GIS Specialist
Paul Moreno, GIS Specialist
William Maddux, Acoustics and Air Quality Specialist
Lyndon Quon, Senior Wildlife Biologist

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APPENDIX A

NOISE MEASUREMENT DATA

Appendix A
Noise Measurements

Measure Point	Location	Date	Time	Avg. Wind (mph)	Measurement Duration (minutes)	Noise Level	
						L_{eq} (dBA)	L_{max} (dBA)
1	East of I-5 - 700 feet, in San Dieguito Lagoon	4-18-16	11:53 a.m.	3	**15**	**62**	68
2	East of I-5 - 950 feet, in San Dieguito Lagoon	4-18-06	11:53 a.m.	3	**15**	**60**	66
3	West of I-5 - 500 feet, in San Dieguito Lagoon	4-13-06	4:09 p.m.	4	**15**	**59**	76
4	West of I-5 - 480 feet, in San Elijo Lagoon	8-15-02	11:35	3	**19**	**60**	78
5	West of I-5 - 80 feet, in San Elijo Lagoon	8-15-02	12:44p	3	**20**	**59**	73
6	East of I-5 - 200 feet, in San Elijo Lagoon	8-14-02	3:45p	4	**15**	**66**	72
7	East of I-5 - 1,420 feet, in San Elijo Lagoon	10-04-02	3:51p	2	**12**	**61**	64
8	West of I-5 - 230 feet, in Batiquitos Lagoon	4-17-06	2:49 p.m.	2	**16**	**62**	75
9	East of I-5 – 1,650 feet, north of Batiquitos Lagoon	4-17-06	12:59p.m.	2	**15**	**61**	67
10	East of I-5 - 890 feet, South of Batiquitos Lagoon in Least turn preserve	4-17-06	2:09 p.m.	2	**15**	**60**	67
11	East of I-5 - 890 feet, south of Agua Hedinoda Lagoon	4-17-06	3:49 p.m.	2	**15**	**58**	72
12	East of I-5 1,030 feet, north of Agua Hedinoda Lagoon	4-17-06	4:35 p.m.	2	**15**	**60**	68
13	West of I-5 - 815 feet, north of Agua Hedinoda Lagoon	4-18-06	3:15 p.m.	3	**15**	**58**	66
14	West of I-5 – 1,030 feet, north of Agua Hedinoda Lagoon	4-18-06	3:15 p.m.	3	**15**	**56**	68
15	East of I-5 – 1,775 feet, South of SR 78 - 335 feet, north of Buena Vista Lagoonn	4-18-06	1:50 p.m.	3	**16**	**62**	74
16	East of I-5 1.930 feet, South of SR 78 - 335 feet, north of Buena Vista Lagoonn	4-18-06	1:50 p.m.	3	**16**	**61**	71
17	West of I-5 2,250 feet, north of Buena Vista Lagoonn	4-18-06	2:26 p.m.	3	**15**	**52**	69

APPENDIX B

TRAFFIC DATA

7.1 TRAFFIC DATA

The highest traffic noise levels occur when traffic is heavy but remains free-flowing. Level-of-Service (LOS) C volumes were modeled to ensure the absolute worst-case scenario traffic noise for the future year. The LOS C volumes used for "No-Build" and "Build" scenarios of this project are 1,800 vehicles per hour per lane for I-5 mainline lanes.

Table 7-1 presents the future traffic volumes and traffic distributions used for the noise analysis per direction of travel. The traffic distribution for the projected year 2030 has been applied to the LOS C volume limit of 1,800 vehicles per hour (vph) per lane to obtain these volumes. Speeds of 105 kilometers per hour (km/h) (65 miles per hour [mph]) are assumed for all vehicle types for I-5 mainline traffic. Since the freeway traffic would be the dominant noise source at a majority of the receptors located adjacent to the project corridor, no local surface street traffic was modeled.

TABLE 7-1 – TRAFFIC VOLUMES

Roadway/ Roadway Segment	Peak-Hour Traffic Volume (LOS C)[1] per Lane	Cars Vol (%)	Medium Trucks Vol (%)	Heavy Trucks Vol (%)	Vehicle Speed, km/h / mph
I-5 Mainline Traffic					
La Jolla Village Drive to I-805 Junction	1800	1707 (94.8)	53 (2.9)	40 (2.2)	105 / 65
I-805 Junction to SR-78 (Vista Way)	1800	1696 (94.2)	44 (2.4)	61 (3.4)	105 / 65
SR-78 (Vista Way) to SR-76	1800	1682 (93.5)	49 (2.7)	69 (3.8)	105 / 65
North of SR 76	1800	1663 (92.4)	57 (3.2)	80 (4.4)	105 / 65
I-5 HOV Lanes					
All Road Segments	1500	1500 (100)	0 (0)	0 (0)	105 / 65

Note:
1- Level-of-Service (LOS) C volumes are used to predict worst-case traffic noise levels. These volumes are used for both existing and future year 2030 traffic conditions.

Tables 7-2 and 7-3 present the ramp traffic volumes used in the analysis for the future "No-Build" and "Build" scenarios, respectively. The ramp traffic data provided by the Department was examined and has been capped at a maximum of 1,000 vph/lane for LOS C conditions. The number of lanes in the traffic noise model for a ramp is governed by the lowest number of lanes in the ramp. If an off ramp begins at one lane on the freeway and then at its end point becomes three lanes, only one lane's worth of traffic, capped at 1,000 vph/lane, is modeled. The higher of either the AM or PM ramp traffic volumes has been used in the model to ensure the worst-case scenario. Speeds of 105 km/h (65 mph) were modeled for the connector ramps, while average speeds of 72 km/h (45 mph) were used for all "on" and "off" ramps. Slower speeds of 40 km/h (25 mph)

TABLE 7-2 – RAMP TRAFFIC VOLUMES – FUTURE NO-BUILD

Intersection/ Ramp	Total Peak-Hour Traffic Volume (LOS C)[1]	# of lanes[2]	Cars Vol (%)	Medium Trucks Vol (%)[3]	Heavy Trucks Vol (%)[3]	Vehicle Speed, km/h / mph
La Jolla Village Drive						
SB On-ramp	1000	1	957 (95.7)	29 (2.9)	14 (1.4)	72 / 45
SB On-ramp (Loop)	1000	1	957 (95.7)	29 (2.9)	14 (1.4)	40 / 25
SB Off-ramp	1000	1	957 (95.7)	29 (2.9)	14 (1.4)	72 / 45
NB On-ramp	600	1	574 (95.7)	17 (2.9)	8 (1.4)	72 / 45
NB On-ramp (Loop)	900	1	861 (95.7)	26 (2.9)	13 (1.4)	40 / 25
NB Off-ramp	1000	1	957 (95.7)	29 (2.9)	14 (1.4)	72 / 45
Genesse Avenue						
SB On-ramp	1000	1	957 (95.7)	29 (2.9)	14 (1.4)	72 / 45
SB Off-ramp	1000	1	957 (95.7)	29 (2.9)	14 (1.4)	72 / 45
NB On-ramp	1000	1	957 (95.7)	29 (2.9)	14 (1.4)	72 / 45
NB Off-ramp	1000	1	957 (95.7)	29 (2.9)	14 (1.4)	72 / 45
Carmel Mountain Road						
SB On-ramp	1000	1	950 (95.0)	24 (2.4)	26 (2.6)	72 / 45
SB Off-ramp	1000	1	950 (95.0)	24 (2.4)	26 (2.6)	72 / 45
SB By Pass	7100	4	6688 (94.2)	170 (2.4)	241 (3.4)	105 / 65
NB On-ramp	1000	1	950 (95.0)	24 (2.4)	26 (2.6)	72 / 45
NB Off-ramp	1000	1	950 (95.0)	24 (2.4)	26 (2.6)	72 / 45
NB By Pass	6780	4	6387 (94.2)	163 (2.4)	231 (3.4)	105 / 65
Carmel Valley Road / SR-56						
SB On-ramp	1000	1	950 (95.0)	24 (2.4)	26 (2.6)	72 / 45
SB Off-ramp	120	1	114 (95.0)	3 (2.4)	3 (2.6)	72 / 45
SB By Pass Ramp	2700	2	2543 (94.2)	65 (2.4)	92 (3.4)	105 / 65
SB Connector from SR-56	2000	2	1884 (94.2)	48 (2.4)	68 (3.4)	105 / 65
NB On-ramp	150	1	143 (95.0)	4 (2.4)	4 (2.6)	72 / 45
NB Off-ramp	2000	2	1900 (95.0)	48 (2.4)	52 (2.6)	72 / 45
NB By Pass Ramp	2390	2	2251 (94.2)	57 (2.4)	81 (3.4)	105 / 65
NB Connector to SR-56	2000	2	1884 (94.2)	48 (2.4)	68 (3.4)	105 / 65
Del Mar Heights Road						
SB On-ramp	700	1	665 (95.0)	17 (2.4)	18 (2.6)	72 / 45
SB On-ramp (Loop)	1000	1	950 (95.0)	24 (2.4)	26 (2.6)	40 / 25
SB Off-ramp	1000	1	950 (95.0)	24 (2.4)	26 (2.6)	72 / 45
NB On-ramp	1000	1	950 (95.0)	24 (2.4)	26 (2.6)	72 / 45
NB Off-ramp	1340	2	1273 (95.0)	32 (2.4)	35 (2.6)	72 / 45
Via De La Valle						
SB On-ramp	900	1	855 (95.0)	22 (2.4)	23 (2.6)	72 / 45
SB On-ramp (Loop)	700	1	665 (95.0)	17 (2.4)	18 (2.6)	40 / 25
SB Off-ramp	1000	1	950 (95.0)	24 (2.4)	26 (2.6)	72 / 45
NB On-ramp	550	1	523 (95.0)	13 (2.4)	14 (2.6)	72 / 45
NB On-ramp (Loop)	650	1	618 (95.0)	16 (2.4)	17 (2.6)	40 / 25
NB Off-ramp	1000	1	950 (95.0)	24 (2.4)	26 (2.6)	72 / 45
Lomas Santa Fe Drive						
SB On-ramp	690	1	656 (95.0)	17 (2.4)	18 (2.6)	72 / 45
SB Off-ramp	840	1	798 (95.0)	20 (2.4)	22 (2.6)	72 / 45
NB On-ramp	840	1	798 (95.0)	20 (2.4)	22 (2.6)	72 / 45
NB Off-ramp	650	1	618 (95.0)	16 (2.4)	17 (2.6)	72 / 45

Notes:

1- The existing and predicted design-year 2030 conditions for ramp traffic were compared to the LOS C volumes of 1,000 vph/ lane, and the lesser of the two have been used to model ramp traffic for each of the alternatives.

2- The number of lanes modeled for each ramp are governed by the lowest number of lanes in the ramp.

3- Truck percentages for I-5 ramp traffic are based on mainline I-5 traffic.

TABLE 7-2 – RAMP TRAFFIC VOLUMES – FUTURE NO-BUILD (CONT'D.)

Intersection/ Ramp	Total Peak-Hour Traffic Volume (LOS C)[1]	# of lanes[2]	Cars Vol (%)	Medium Trucks Vol (%)[3]	Heavy Trucks Vol (%)[3]	Vehicle Speed, km/h / mph
Manchester Avenue						
SB On-ramp (Loop)	950	1	903 (95.0)	23 (2.4)	25 (2.6)	40 / 25
SB Off-ramp	200	1	190 (95.0)	5 (2.4)	5 (2.6)	72 / 45
NB On-ramp	140	1	133 (95.0)	3 (2.4)	4 (2.6)	72 / 45
NB Off-ramp (Loop)	1000	1	950 (95.0)	24 (2.4)	26 (2.6)	40 / 25
Birmingham Drive						
SB On-ramp	930	1	908 (97.6)	13 (1.4)	9 (1.0)	72 / 45
SB Off-ramp	420	1	410 (97.6)	6 (1.4)	4 (1.0)	72 / 45
NB On-ramp	430	1	420 (97.6)	6 (1.4)	4 (1.0)	72 / 45
NB Off-ramp	480	1	468 (97.6)	7 (1.4)	5 (1.0)	72 / 45
Santa Fe Drive						
SB On-ramp	480	1	456 (95.0)	12 (2.4)	12 (2.6)	72 / 45
SB Off-ramp	480	1	456 (95.0)	12 (2.4)	12 (2.6)	72 / 45
NB On-ramp	670	1	637 (95.0)	16 (2.4)	17 (2.6)	72 / 45
NB Off-ramp	520	1	494 (95.0)	12 (2.4)	14 (2.6)	72 / 45
Encinitas Boulevard						
SB On-ramp	720	1	684 (95.0)	17 (2.4)	19 (2.6)	72 / 45
SB Off-ramp	700	1	665 (95.0)	17 (2.4)	18 (2.6)	72 / 45
NB On-ramp	880	1	836 (95.0)	21 (2.4)	23 (2.6)	72 / 45
NB Off-ramp	730	1	694 (95.0)	18 (2.4)	19 (2.6)	72 / 45
Leucadia Boulevard						
SB On-ramp	750	1	713 (95.0)	18 (2.4)	20 (2.6)	72 / 45
SB Off-ramp	810	1	770 (95.0)	19 (2.4)	21 (2.6)	72 / 45
NB On-ramp	580	1	551 (95.0)	14 (2.4)	15 (2.6)	72 / 45
NB Off-ramp	930	1	884 (95.0)	22 (2.4)	24 (2.6)	72 / 45
La Costa Avenue						
SB On-ramp	800	1	760 (95.0)	19 (2.4)	21 (2.6)	72 / 45
SB Off-ramp	800	1	760 (95.0)	19 (2.4)	21 (2.6)	72 / 45
NB On-ramp	660	1	627 (95.0)	16 (2.4)	17 (2.6)	72 / 45
NB Off-ramp	830	1	789 (95.0)	20 (2.4)	22 (2.6)	72 / 45
Poinsettia Lane						
SB On-ramp	690	1	656 (95.0)	17 (2.4)	18 (2.6)	72 / 45
SB Off-ramp	540	1	513 (95.0)	13 (2.4)	14 (2.6)	72 / 45
NB On-ramp	520	1	494 (95.0)	12 (2.4)	14 (2.6)	72 / 45
NB Off-ramp	740	2	703 (95.0)	18 (2.4)	19 (2.6)	72 / 45
Palomar Airport Road						
SB On-ramp	360	1	342 (95.0)	9 (2.4)	9 (2.6)	72 / 45
SB On-ramp (Loop)	1140	2	1083 (95.0)	27 (2.4)	30 (2.6)	40 / 25
SB Off-ramp	1330	2	1264 (95.0)	32 (2.4)	35 (2.6)	72 / 45
NB On-ramp	1360	2	1292 (95.0)	33 (2.4)	35 (2.6)	72 / 45
NB Off-ramp	1000	1	950 (95.0)	24 (2.4)	26 (2.6)	72 / 45
Cannon Road						
SB On-ramp	470	1	447 (95.0)	11 (2.4)	12 (2.6)	72 / 45
SB Off-ramp	1300	2	1235 (95.0)	31 (2.4)	34 (2.6)	72 / 45
NB On-ramp	1000	1	950 (95.0)	24 (2.4)	26 (2.6)	72 / 45
NB Off-ramp	520	1	494 (95.0)	12 (2.4)	14 (2.6)	72 / 45

Notes:

1- The existing and predicted design-year 2030 conditions for ramp traffic were compared to the LOS C volumes of 1,000 vph/ lane, and the lesser of the two have been used to model ramp traffic for each of the alternatives.

2- The number of lanes modeled for each ramp are governed by the lowest number of lanes in the ramp.

3- Truck percentages for I-5 ramp traffic are based on mainline I-5 traffic.

TABLE 7-2 – RAMP TRAFFIC VOLUMES – FUTURE NO-BUILD (CONT'D.)

Intersection/ Ramp	Total Peak-Hour Traffic Volume (LOS C)[1]	# of lanes[2]	Cars Vol (%)	Medium Trucks Vol (%)[3]	Heavy Trucks Vol (%)[3]	Vehicle Speed, km/h / mph
Tamarack Avenue						
SB On-ramp	820	1	779 (95.0)	20 (2.4)	21 (2.6)	72 / 45
SB Off-ramp	440	1	418 (95.0)	11 (2.4)	11 (2.6)	72 / 45
NB On-ramp	520	1	494 (95.0)	12 (2.4)	14 (2.6)	72 / 45
NB Off-ramp	710	1	675 (95.0)	17 (2.4)	18 (2.6)	72 / 45
Carlsbad Village Drive						
SB On-ramp	650	1	618 (95.0)	16 (2.4)	17 (2.6)	72 / 45
SB Off-ramp	570	1	542 (95.0)	14 (2.4)	15 (2.6)	72 / 45
NB On-ramp	510	1	485 (95.0)	12 (2.4)	13 (2.6)	72 / 45
NB Off-ramp	660	1	627 (95.0)	16 (2.4)	17 (2.6)	72 / 45
Las Flores Drive						
SB On-ramp	240	1	234 (97.6)	3 (1.4)	2 (1.0)	72 / 45
SB Off-ramp	280	1	273 (97.6)	4 (1.4)	3 (1.0)	72 / 45
NB On-ramp	530	1	517 (97.6)	7 (1.4)	5 (1.0)	72 / 45
NB Off-ramp	380	1	371 (97.6)	5 (1.4)	4 (1.0)	72 / 45
SR-78 (Vista Way)						
SB On-ramp	1000	1	945 (94.5)	27 (2.7)	28 (2.8)	72 / 45
SB On-ramp (Loop)	2000	2	1890 (94.5)	54 (2.7)	56 (2.8)	40 / 25
NB On-ramp	2000	2	1890 (94.5)	54 (2.7)	56 (2.8)	72 / 45
NB Off-ramp (Loop)	300	1	284 (94.5)	8 (2.7)	8 (2.8)	40 / 25
NB On-ramp (Loop)	30	1	28 (94.5)	1 (2.7)	1 (2.8)	40 / 25
NB Off-ramp	1000	1	945 (94.5)	27 (2.7)	28 (2.8)	72 / 45
Cassidy Street						
SB On-ramp	360	1	340 (94.5)	10 (2.7)	10 (2.8)	72 / 45
SB Off-ramp	200	1	189 (94.5)	5 (2.7)	6 (2.8)	72 / 45
California Street						
NB On-ramp	240	1	234 (97.3)	4 (1.7)	2 (1.0)	72 / 45
Oceanside Boulevard						
SB On-ramp (Loop)	1000	1	945 (94.5)	27 (2.7)	28 (2.8)	40 / 25
SB Off-ramp	590	1	558 (94.5)	16 (2.7)	17 (2.8)	72 / 45
NB On-ramp	500	1	473 (94.5)	14 (2.7)	14 (2.8)	72 / 45
NB Off-ramp (Loop)	1000	1	945 (94.5)	27 (2.7)	28 (2.8)	40 / 25
Mission Avenue						
SB On-ramp	600	1	567 (94.5)	16 (2.7)	17 (2.8)	72 / 45
SB On-ramp (Loop)	750	1	709 (94.5)	20 (2.7)	21 (2.8)	40 / 25
SB Off-ramp	380	1	359 (94.5)	10 (2.7)	11 (2.8)	72 / 45
NB On-ramp	390	1	369 (94.5)	11 (2.7)	11 (2.8)	72 / 45
NB Off-ramp (Loop)	935	1	884 (94.5)	25 (2.7)	26 (2.8)	40 / 25
NB Off-ramp	935	1	884 (94.5)	25 (2.7)	26 (2.8)	72 / 45
SR-76						
SB On-ramp	1000	1	945 (94.5)	27 (2.7)	28 (2.8)	72 / 45
SB Off-ramp (Loop)	870	1	822 (94.5)	23 (2.7)	24 (2.8)	40 / 25
SB Off-ramp	190	1	180 (94.5)	5 (2.7)	5 (2.8)	72 / 45
NB On-ramp (Loop)	1000	1	945 (94.5)	27 (2.7)	28 (2.8)	40 / 25
NB Off-ramp	1570	2	1484 (94.5)	42 (2.7)	44 (2.8)	72 / 45
Harbor Drive/ Vandergrift Boulevard						
SB On-ramp (Loop)	1000	1	934 (93.4)	32 (3.2)	34 (3.4)	40 / 25
SB Off-ramp	220	1	205 (93.4)	7 (3.2)	7 (3.4)	72 / 45
NB On-ramp	190	1	177 (93.4)	6 (3.2)	6 (3.4)	72 / 45
NB Off-ramp (Loop)	240	1	224 (93.4)	8 (3.2)	8 (3.4)	40 / 25
NB Off-ramp	1000	1	934 (93.4)	32 (3.2)	34 (3.4)	72 / 45

Notes:

1- The existing and predicted design-year 2030 conditions for ramp traffic were compared to the LOS C volumes of 1,000 vph/ lane, and the lesser of the two have been used to model ramp traffic for each of the alternatives.

2- The number of lanes modeled for each ramp are governed by the lowest number of lanes in the ramp.

3- Truck percentages for I-5 ramp traffic are based on mainline I-5 traffic.

TABLE 7-3 – RAMP TRAFFIC VOLUMES - FUTURE BUILD

Intersection/ Ramp	Total Peak-Hour Traffic Volume (LOS C)[1]	# of lanes[2]	Cars Vol (%)	Medium Trucks Vol (%)[3]	Heavy Trucks Vol (%)[3]	Vehicle Speed, km/h / mph
La Jolla Village Drive						
SB On-ramp	1000	1	957 (95.7)	29 (2.9)	14 (1.4)	72 / 45
SB On-ramp (Loop)	1000	1	957 (95.7)	29 (2.9)	14 (1.4)	40 / 25
SB Off-ramp	1000	1	957 (95.7)	29 (2.9)	14 (1.4)	72 / 45
NB On-ramp	600	1	574 (95.7)	17 (2.9)	8 (1.4)	72 / 45
NB On-ramp (Loop)	900	1	861 (95.7)	26 (2.9)	13 (1.4)	40 / 25
NB Off-ramp	1000	1	957 (95.7)	29 (2.9)	14 (1.4)	72 / 45
Genesse Avenue						
SB On-ramp	1000	1	957 (95.7)	29 (2.9)	14 (1.4)	72 / 45
SB Off-ramp	1000	1	957 (95.7)	29 (2.9)	14 (1.4)	72 / 45
NB On-ramp	1000	1	957 (95.7)	29 (2.9)	14 (1.4)	72 / 45
NB Off-ramp	1000	1	957 (95.7)	29 (2.9)	14 (1.4)	72 / 45
Carmel Mountain Road						
SB On-ramp	1000	1	950 (95.0)	24 (2.4)	26 (2.6)	72 / 45
SB Off-ramp	1000	1	950 (95.0)	24 (2.4)	26 (2.6)	72 / 45
SB By Pass	7200	4	6782 (94.2)	173 (2.4)	245 (3.4)	105 / 65
NB On-ramp	1000	1	950 (95.0)	24 (2.4)	26 (2.6)	72 / 45
NB Off-ramp	1000	1	950 (95.0)	24 (2.4)	26 (2.6)	72 / 45
NB By Pass	7200	4	6782 (94.2)	173 (2.4)	245 (3.4)	105 / 65
Carmel Valley Road / SR-56						
SB On-ramp	1000	1	950 (95.0)	24 (2.4)	26 (2.6)	72 / 45
SB Off-ramp	120	1	114 (95.0)	3 (2.4)	3 (2.6)	72 / 45
SB By Pass Ramp	3300	2	3109 (94.2)	79 (2.4)	112 (3.4)	105 / 65
SB Connector from SR-56	2000	2	1884 (94.2)	48 (2.4)	68 (3.4)	72 / 45
NB On-ramp	150	1	143 (95.0)	4 (2.4)	4 (2.6)	72 / 45
NB Off-ramp	2050	2	1948 (95.0)	49 (2.4)	53 (2.6)	72 / 45
NB By Pass Ramp	3040	2	2864 (94.2)	73 (2.4)	103 (3.4)	105 / 65
NB Connector to SR-56	2000	2	1884 (94.2)	48 (2.4)	68 (3.4)	72 / 45
Del Mar Heights Road						
SB On-ramp	700	1	665 (95.0)	17 (2.4)	18 (2.6)	72 / 45
SB On-ramp (Loop)	1000	1	950 (95.0)	24 (2.4)	26 (2.6)	40 / 25
SB Off-ramp	1400	2	1330 (95.0)	34 (2.4)	36 (2.6)	72 / 45
NB On-ramp	1000	1	950 (95.0)	24 (2.4)	26 (2.6)	72 / 45
NB Off-ramp	1700	2	1615 (95.0)	41 (2.4)	44 (2.6)	72 / 45
Via De La Valle						
SB On-ramp	900	1	855 (95.0)	22 (2.4)	23 (2.6)	72 / 45
SB On-ramp (Loop)	700	1	665 (95.0)	17 (2.4)	18 (2.6)	40 / 25
SB Off-ramp	1100	2	1045 (95.0)	26 (2.4)	29 (2.6)	72 / 45
NB On-ramp	550	1	523 (95.0)	13 (2.4)	14 (2.6)	72 / 45
NB On-ramp (Loop)	650	1	618 (95.0)	16 (2.4)	17 (2.6)	40 / 25
NB Off-ramp	1600	2	1520 (95.0)	38 (2.4)	42 (2.6)	72 / 45
Lomas Santa Fe Drive						
SB On-ramp	450	1	428 (95.0)	11 (2.4)	12 (2.6)	72 / 45
SB On-ramp (Loop)	350	1	333 (95.0)	8 (2.4)	9 (2.6)	40 / 25
SB Off-ramp	900	1	855 (95.0)	22 (2.4)	23 (2.6)	72 / 45
NB On-ramp	400	1	380 (95.0)	10 (2.4)	10 (2.6)	72 / 45
NB On-ramp (Loop)	500	1	475 (95.0)	12 (2.4)	13 (2.6)	40 / 25
NB Off-ramp	720	1	684 (95.0)	17 (2.4)	19 (2.6)	72 / 45

Notes:

1- The existing and predicted design-year 2030 conditions for ramp traffic were compared to the LOS C volumes of 1,000 vph/ lane, and the lesser of the two have been used to model ramp traffic for each of the alternatives.

2- The number of lanes modeled for each ramp are governed by the lowest number of lanes in the ramp.

3- Truck percentages for I-5 ramp traffic are based on mainline I-5 traffic.

TABLE 7-3 – RAMP TRAFFIC VOLUMES – FUTURE BUILD (CONT'D.)

Intersection/ Ramp	Total Peak-Hour Traffic Volume (LOS C)[1]	# of lanes[2]	Cars Vol (%)	Medium Trucks Vol (%)[3]	Heavy Trucks Vol (%)[3]	Vehicle Speed, km/h / mph
Manchester Avenue						
SB On-ramp (Loop)	970	2	922 (95.0)	23 (2.4)	25 (2.6)	40 / 25
SB Off-ramp	300	1	285 (95.0)	7 (2.4)	8 (2.6)	72 / 45
NB On-ramp	250	1	238 (95.0)	6 (2.4)	7 (2.6)	72 / 45
NB Off-ramp (Loop)	1330	2	1264 (95.0)	32 (2.4)	35 (2.6)	40 / 25
Birmingham Drive						
SB On-ramp	1000	1	976 (97.6)	14 (1.4)	10 (1.0)	72 / 45
SB Off-ramp	500	1	488 (97.6)	7 (1.4)	5 (1.0)	72 / 45
NB On-ramp	500	1	488 (97.6)	7 (1.4)	5 (1.0)	72 / 45
NB Off-ramp	900	1	878 (97.6)	13 (1.4)	9 (1.0)	72 / 45
Santa Fe Drive						
SB On-ramp	600	1	570 (95.0)	14 (2.4)	16 (2.6)	72 / 45
SB Off-ramp	700	1	665 (95.0)	17 (2.4)	18 (2.6)	72 / 45
NB On-ramp	800	1	760 (95.0)	19 (2.4)	21 (2.6)	72 / 45
NB Off-ramp	650	1	618 (95.0)	16 (2.4)	17 (2.6)	72 / 45
Encinitas Boulevard						
SB On-ramp	800	1	760 (95.0)	19 (2.4)	21 (2.6)	72 / 45
SB Off-ramp	950	1	903 (95.0)	23 (2.4)	25 (2.6)	72 / 45
NB On-ramp	1000	1	950 (95.0)	24 (2.4)	26 (2.6)	72 / 45
NB Off-ramp	800	1	760 (95.0)	19 (2.4)	21 (2.6)	72 / 45
Leucadia Boulevard						
SB On-ramp	970	1	922 (95.0)	23 (2.4)	25 (2.6)	72 / 45
SB Off-ramp	850	1	808 (95.0)	20 (2.4)	22 (2.6)	72 / 45
NB On-ramp	850	1	808 (95.0)	20 (2.4)	22 (2.6)	72 / 45
NB Off-ramp	1000	1	950 (95.0)	24 (2.4)	26 (2.6)	72 / 45
La Costa Avenue						
SB On-ramp	900	1	855 (95.0)	22 (2.4)	23 (2.6)	72 / 45
SB Off-ramp	850	1	808 (95.0)	20 (2.4)	22 (2.6)	72 / 45
NB On-ramp	800	1	760 (95.0)	19 (2.4)	21 (2.6)	72 / 45
NB Off-ramp	900	1	855 (95.0)	22 (2.4)	23 (2.6)	72 / 45
Poinsettia Lane						
SB On-ramp	800	1	760 (95.0)	19 (2.4)	21 (2.6)	72 / 45
SB Off-ramp	650	1	618 (95.0)	16 (2.4)	17 (2.6)	72 / 45
NB On-ramp	650	1	618 (95.0)	16 (2.4)	17 (2.6)	72 / 45
NB Off-ramp	850	2	808 (95.0)	20 (2.4)	22 (2.6)	72 / 45
Palomar Airport Road						
SB On-ramp	400	1	380 (95.0)	10 (2.4)	10 (2.6)	72 / 45
SB On-ramp (Loop)	1230	2	1169 (95.0)	30 (2.4)	32 (2.6)	40 / 25
SB Off-ramp	2000	2	1900 (95.0)	48 (2.4)	52 (2.6)	72 / 45
NB On-ramp	2000	2	1900 (95.0)	48 (2.4)	52 (2.6)	72 / 45
NB Off-ramp	1600	2	1520 (95.0)	38 (2.4)	42 (2.6)	72 / 45
Cannon Road						
SB On-ramp	700	1	665 (95.0)	17 (2.4)	18 (2.6)	72 / 45
SB Off-ramp	1400	2	1330 (95.0)	34 (2.4)	36 (2.6)	72 / 45
NB On-ramp	1000	1	950 (95.0)	24 (2.4)	26 (2.6)	72 / 45
NB Off-ramp	700	2	665 (95.0)	17 (2.4)	18 (2.6)	72 / 45

Notes:

1- The existing and predicted design-year 2030 conditions for ramp traffic were compared to the LOS C volumes of 1,000 vph/ lane, and the lesser of the two have been used to model ramp traffic for each of the alternatives.

2- The number of lanes modeled for each ramp are governed by the lowest number of lanes in the ramp.

3- Truck percentages for I-5 ramp traffic are based on mainline I-5 traffic.

TABLE 7-3 – RAMP TRAFFIC VOLUMES – FUTURE BUILD (CONT'D.)

Intersection/ Ramp	Total Peak-Hour Traffic Volume (LOS C)[1]	# of lanes[2]	Cars Vol (%)	Medium Trucks Vol (%)[3]	Heavy Trucks Vol (%)[3]	Vehicle Speed, km/h / mph
Tamarack Avenue						
SB On-ramp	900	1	855 (95.0)	22 (2.4)	23 (2.6)	72 / 45
SB Off-ramp	750	1	713 (95.0)	18 (2.4)	20 (2.6)	72 / 45
NB On-ramp	700	1	665 (95.0)	17 (2.4)	18 (2.6)	72 / 45
NB Off-ramp	900	1	855 (95.0)	22 (2.4)	23 (2.6)	72 / 45
Carlsbad Village Drive						
SB On-ramp	770	1	732 (95.0)	18 (2.4)	20 (2.6)	72 / 45
SB Off-ramp	650	1	618 (95.0)	16 (2.4)	17 (2.6)	72 / 45
NB On-ramp	600	1	570 (95.0)	14 (2.4)	16 (2.6)	72 / 45
NB Off-ramp	750	1	713 (95.0)	18 (2.4)	20 (2.6)	72 / 45
Las Flores Drive						
SB On-ramp	550	1	537 (97.6)	8 (1.4)	6 (1.0)	72 / 45
SB Off-ramp	550	1	537 (97.6)	8 (1.4)	6 (1.0)	72 / 45
NB On-ramp	600	1	586 (97.6)	8 (1.4)	6 (1.0)	72 / 45
NB Off-ramp	500	2	488 (97.6)	7 (1.4)	5 (1.0)	72 / 45
SR-78 (Vista Way)						
SB On-ramp	400	1	378 (94.5)	11 (2.7)	11 (2.8)	72 / 45
SB On-ramp (Loop)	2000	2	1890 (94.5)	54 (2.7)	56 (2.8)	40 / 25
NB On-ramp	2000	2	1890 (94.5)	54 (2.7)	56 (2.8)	72 / 45
NB Off-ramp (Loop)	350	1	331 (94.5)	9 (2.7)	10 (2.8)	40 / 25
NB On-ramp (Loop)	30	1	28 (94.5)	1 (2.7)	1 (2.8)	40 / 25
NB Off-ramp	1000	1	945 (94.5)	27 (2.7)	28 (2.8)	72 / 45
Cassidy Street						
SB On-ramp	390	1	369 (94.5)	11 (2.7)	11 (2.8)	72 / 45
SB Off-ramp	300	1	284 (94.5)	8 (2.7)	8 (2.8)	72 / 45
California Street						
NB On-ramp	270	1	263 (97.3)	5 (1.7)	3 (1.0)	72 / 45
Oceanside Boulevard						
SB On-ramp (Loop)	1000	1	945 (94.5)	27 (2.7)	28 (2.8)	40 / 25
SB Off-ramp	800	1	756 (94.5)	22 (2.7)	22 (2.8)	72 / 45
NB On-ramp	750	1	709 (94.5)	20 (2.7)	21 (2.8)	72 / 45
NB Off-ramp (Loop)	1000	1	945 (94.5)	27 (2.7)	28 (2.8)	40 / 25
Mission Avenue						
SB On-ramp	600	1	567 (94.5)	16 (2.7)	17 (2.8)	72 / 45
SB On-ramp (Loop)	1000	1	945 (94.5)	27 (2.7)	28 (2.8)	40 / 25
SB Off-ramp	800	1	756 (94.5)	22 (2.7)	22 (2.8)	72 / 45
NB On-ramp	800	1	756 (94.5)	22 (2.7)	22 (2.8)	72 / 45
NB Off-ramp (Loop)	1000	1	945 (94.5)	27 (2.7)	28 (2.8)	40 / 25
NB Off-ramp	1000	1	945 (94.5)	27 (2.7)	28 (2.8)	72 / 45
SR-76						
SB On-ramp	1000	1	945 (94.5)	27 (2.7)	28 (2.8)	72 / 45
SB Off-ramp (Loop)	1000	1	945 (94.5)	27 (2.7)	28 (2.8)	40 / 25
SB Off-ramp	460	1	435 (94.5)	12 (2.7)	13 (2.8)	72 / 45
NB On-ramp (Loop)	1000	1	945 (94.5)	27 (2.7)	28 (2.8)	40 / 25
NB Off-ramp	2000	2	1890 (94.5)	54 (2.7)	56 (2.8)	72 / 45
Harbor Drive/ Vandergrift Boulevard						
SB On-ramp (Loop)	1000	1	934 (93.4)	32 (3.2)	34 (3.4)	40 / 25
SB Off-ramp	400	1	374 (93.4)	13 (3.2)	14 (3.4)	72 / 45
NB On-ramp	300	1	280 (93.4)	10 (3.2)	10 (3.4)	72 / 45
NB Off-ramp (Loop)	300	1	280 (93.4)	10 (3.2)	10 (3.4)	40 / 25
NB Off-ramp	1000	1	934 (93.4)	32 (3.2)	34 (3.4)	72 / 45

Notes:

1- The existing and predicted design-year 2030 conditions for ramp traffic were compared to the LOS C volumes of 1,000 vph/ lane, and the lesser of the two have been used to model ramp traffic for each of the alternatives.

2- The number of lanes modeled for each ramp are governed by the lowest number of lanes in the ramp.

3- Truck percentages for I-5 ramp traffic are based on mainline I-5 traffic.

APPENDIX C

TNM NOISE MODEL INPUT AND OUTPUT DATA FOR LAGOON RECEPTORS

EDAW, Inc. for Caltrans		**15 May 2006**
W Maddux		**TNM 2.5**
		Calculated with TNM 2.5
RESULTS: SOUND LEVELS		
PROJECT/CONTRACT:	**I-5 North Coast Project**	
RUN:	**San Dieguito Lagoon - Existing**	
BARRIER DESIGN:	**INPUT HEIGHTS**	**Average pavement type shall be used unless a State highway agency substantiates the use of a different type with approval of FHWA.**
ATMOSPHERICS:	**68 deg F, 50% RH**	

Receiver													
Name	**No.**	**#DUs**	**Existing LAeq1h**	**No Barrier LAeq1h**		**Increase over existing**		**Type**	**With Barrier**				
				Calculated	**Crit'n**	**Calculated**	**Crit'n Sub'l Inc**	**Impact**	**Calculated LAeq1h**	**Noise Reduction Calculated**	**Goal**	**Calculated minus Goal**	
			dBA	dBA	dBA	dB	dB		dBA	dB	dB	dB	
MS 2	1	1	0.0	60.7	66	60.7	10	----	60.7	0.0	8	-8.0	
MS 1	2	1	0.0	63.5	66	63.5	10	----	63.5	0.0	8	-8.0	
MS 3	3	1	0.0	65.8	66	65.8	10	----	65.8	0.0	8	-8.0	

Dwelling Units	**# DUs**	**Noise Reduction Min**	**Avg**	**Max**
		dB	**dB**	**dB**
All Selected	3	0.0	0.0	0.0
All Impacted	0	0.0	0.0	0.0
All that meet NR Goal	0	0.0	0.0	0.0

EDAW, Inc. for Caltrans		15 May 2006
W Maddux		TNM 2.5
		Calculated with TNM 2.5
RESULTS: SOUND LEVELS		
PROJECT/CONTRACT:	I-5 North Coast Project	
RUN:	San Dieguito Lagoon - Future	
BARRIER DESIGN:	INPUT HEIGHTS	Average pavement type shall be used unless a State highway agency substantiates the use of a different type with approval of FHWA.
ATMOSPHERICS:	68 deg F, 50% RH	

Receiver Name	No.	#DUs	Existing LAeq1h	No Barrier LAeq1h Calculated	Crit'n	Increase over existing Calculated	Crit'n Sub'l Inc	Type Impact	With Barrier Calculated LAeq1h	Noise Reduction Calculated	Goal	Calculated minus Goal
			dBA	dBA	dBA	dB	dB		dBA	dB	dB	dB
MS 2	1	1	0.0	62.9	66	62.9	10	----	62.9	0.0	8	-8.0
MS 1	2	1	0.0	65.7	66	65.7	10	----	65.7	0.0	8	-8.0
MS 3	3	1	0.0	68.0	66	68.0	10	Snd Lvl	68.0	0.0	8	-8.0

Dwelling Units	# DUs	Noise Reduction Min	Avg	Max
		dB	dB	dB
All Selected	3	0.0	0.0	0.0
All Impacted	1	0.0	0.0	0.0
All that meet NR Goal	0	0.0	0.0	0.0

EDAW, Inc.		22 May 2006
W. Maddux		TNM 2.5
		Calculated with TNM 2.5
RESULTS: SOUND LEVELS		
PROJECT/CONTRACT:	I-5 Northcoast Project	
RUN:	San Elijo Lagoon - Existing	
BARRIER DESIGN:	INPUT HEIGHTS	Average pavement type shall be used unless a State highway agency substantiates the use of a different type with approval of FHWA.
ATMOSPHERICS:	68 deg F, 50% RH	

Receiver Name	No.	#DUs	Existing LAeq1h	No Barrier LAeq1h Calculated	Crit'n	Increase over existing Calculated	Crit'n Sub'l Inc	Type Impact	With Barrier Calculated LAeq1h	Noise Reduction Calculated	Goal	Calculated minus Goal
			dBA	dBA	dBA	dB	dB		dBA	dB	dB	dB
Test	1	1	0.0	44.4	66	44.4	10	----	44.4	0.0	8	-8.0
M 6	7	1	0.0	67.0	66	67.0	10	Snd Lvl	67.0	0.0	8	-8.0
M 5	11	1	0.0	63.7	66	63.7	10	----	63.7	0.0	8	-8.0
14 D	12	1	0.0	60.3	66	60.3	10	----	60.3	0.0	8	-8.0
15 A	13	1	0.0	66.0	66	66.0	10	Snd Lvl	66.0	0.0	8	-8.0

Dwelling Units	# DUs	Noise Reduction Min	Avg	Max
		dB	dB	dB
All Selected	5	0.0	0.0	0.0
All Impacted	2	0.0	0.0	0.0
All that meet NR Goal	0	0.0	0.0	0.0

EDAW, Inc. 22 May 2006
W. Maddux TNM 2.5
Calculated with TNM 2.5

RESULTS: SOUND LEVELS
PROJECT/CONTRACT: I-5 Northcoast Project
RUN: San Elijo Lagoon - Future
BARRIER DESIGN: INPUT HEIGHTS

Average pavement type shall be used unless a State highway agency substantiates the use of a different type with approval of FHWA.

ATMOSPHERICS: 68 deg F, 50% RH

Receiver Name	No.	#DUs	Existing LAeq1h	No Barrier LAeq1h Calculated	Crit'n	Increase over existing Calculated	Crit'n Sub'l Inc	Type Impact	With Barrier Calculated LAeq1h	Noise Reduction Calculated	Goal	Calculated minus Goal
			dBA	dBA	dBA	dB	dB		dBA	dB	dB	dB
Test	1	1	0.0	45.9	66	45.9	10	----	45.9	0.0	8	-8.0
M 6	7	1	0.0	65.7	66	65.7	10	----	65.7	0.0	8	-8.0
M 5	11	1	0.0	65.0	66	65.0	10	----	65.0	0.0	8	-8.0
14 D	12	1	0.0	60.9	66	60.9	10	----	60.9	0.0	8	-8.0
15 A	13	1	0.0	66.6	66	66.6	10	Snd Lvl	66.6	0.0	8	-8.0

Dwelling Units	# DUs	Noise Reduction Min	Avg	Max
		dB	dB	dB
All Selected	5	0.0	0.0	0.0
All Impacted	1	0.0	0.0	0.0
All that meet NR Goal	0	0.0	0.0	0.0

EDAW		15 May 2006
W. Maddux		TNM 2.5
		Calculated with TNM 2.5
RESULTS: SOUND LEVELS		
PROJECT/CONTRACT:	I-5 Northcoast Project	
RUN:	Batiquitos Lagoon - Existing	
BARRIER DESIGN:	INPUT HEIGHTS	Average pavement type shall be used unless a State highway agency substantiates the use of a different type with approval of FHWA.
ATMOSPHERICS:	68 deg F, 50% RH	

Receiver Name	No.	#DUs	Existing LAeq1h	No Barrier LAeq1h Calculated	Crit'n	Increase over existing Calculated	Crit'n Sub'l Inc	Type Impact	With Barrier Calculated LAeq1h	Noise Reduction Calculated	Goal	Calculated minus Goal
			dBA	dBA	dBA	dB	dB		dBA	dB	dB	dB
MS 4	1	1	0.0	63.8	66	63.8	10	----	63.8	0.0	8	-8.0
MS 5	2	1	0.0	62.2	66	62.2	10	----	62.2	0.0	8	-8.0
MS 6	3	1	0.0	63.6	66	63.6	10	----	63.6	0.0	8	-8.0

Dwelling Units	# DUs	Noise Reduction Min	Avg	Max
		dB	dB	dB
All Selected	3	0.0	0.0	0.0
All Impacted	0	0.0	0.0	0.0
All that meet NR Goal	0	0.0	0.0	0.0

EDAW		15 May 2006
W. Maddux		TNM 2.5
		Calculated with TNM 2.5
RESULTS: SOUND LEVELS		
PROJECT/CONTRACT:	I-5 Northcoast Project	
RUN:	Batiquitos Lagoon - Future	
BARRIER DESIGN:	INPUT HEIGHTS	Average pavement type shall be used unless a State highway agency substantiates the use of a different type with approval of FHWA.
ATMOSPHERICS:	68 deg F, 50% RH	

Receiver Name	No.	#DUs	Existing LAeq1h	No Barrier LAeq1h Calculated	Crit'n	Increase over existing Calculated	Crit'n Sub'l Inc	Type Impact	With Barrier Calculated LAeq1h	Noise Reduction Calculated	Goal	Calculated minus Goal
			dBA	dBA	dBA	dB	dB		dBA	dB	dB	dB
MS 4	1	1	0.0	66.0	66	66.0	10	Snd Lvl	66.0	0.0	8	-8.0
MS 5	2	1	0.0	64.6	66	64.6	10	----	64.6	0.0	8	-8.0
MS 6	3	1	0.0	68.3	66	68.3	10	Snd Lvl	68.3	0.0	8	-8.0

Dwelling Units	# DUs	Noise Reduction Min	Avg	Max
		dB	dB	dB
All Selected	3	0.0	0.0	0.0
All Impacted	2	0.0	0.0	0.0
All that meet NR Goal	0	0.0	0.0	0.0

EDAW	15 May 2006
W Maddux	TNM 2.5
	Calculated with TNM 2.5
RESULTS: SOUND LEVELS	
PROJECT/CONTRACT:	I-5 Northcoast Project
RUN:	Agua Hedionda Lagoon - Existing
BARRIER DESIGN:	INPUT HEIGHTS
ATMOSPHERICS:	68 deg F, 50% RH

Average pavement type shall be used unless a State highway agency substantiates the use of a different type with approval of FHWA.

Receiver Name	No.	#DUs	Existing LAeq1h	No Barrier LAeq1h Calculated	Crit'n	Increase over existing Calculated	Increase over existing Crit'n Sub'l Inc	Type Impact	With Barrier Calculated LAeq1h	Noise Reduction Calculated	Noise Reduction Goal	Calculated minus Goal
			dBA	dBA	dBA	dB	dB		dBA	dB	dB	dB
MS 10	2	1	0.0	59.1	66	59.1	10	----	59.1	0.0	8	-8.0
MS 9	3	1	0.0	61.4	66	61.4	10	----	61.4	0.0	8	-8.0
MS 8	4	1	0.0	61.7	66	61.7	10	----	61.7	0.0	8	-8.0
MS 7	113	1	0.0	59.4	66	59.4	10	----	59.4	0.0	8	-8.0

Dwelling Units	# DUs	Noise Reduction Min	Noise Reduction Avg	Noise Reduction Max
		dB	dB	dB
All Selected	4	0.0	0.0	0.0
All Impacted	0	0.0	0.0	0.0
All that meet NR Goal	0	0.0	0.0	0.0

EDAW
W Maddux

15 May 2006
TNM 2.5
Calculated with TNM 2.5

RESULTS: SOUND LEVELS

PROJECT/CONTRACT: I-5 Northcoast Project
RUN: Agua Hedinoda Lagoon - Future
BARRIER DESIGN: INPUT HEIGHTS

Average pavement type shall be used unless a State highway agency substantiates the use of a different type with approval of FHWA.

ATMOSPHERICS: 68 deg F, 50% RH

Receiver Name	No.	#DUs	Existing LAeq1h	No Barrier LAeq1h Calculated	Crit'n	Increase over existing Calculated	Crit'n Sub'l Inc	Type Impact	With Barrier Calculated LAeq1h	Noise Reduction Calculated	Goal	Calculated minus Goal
			dBA	dBA	dBA	dB	dB		dBA	dB	dB	dB
MS 10	2	1	0.0	61.3	66	61.3	10	----	61.3	0.0	8	-8.0
MS 9	3	1	0.0	63.6	66	63.6	10	----	63.6	0.0	8	-8.0
MS 8	4	1	0.0	63.9	66	63.9	10	----	63.9	0.0	8	-8.0
MS 7	113	1	0.0	61.7	66	61.7	10	----	61.7	0.0	8	-8.0

Dwelling Units	# DUs	Noise Reduction Min	Avg	Max
		dB	dB	dB
All Selected	4	0.0	0.0	0.0
All Impacted	0	0.0	0.0	0.0
All that meet NR Goal	0	0.0	0.0	0.0

EDAW		15 May 2006
W Maddux		TNM 2.5
		Calculated with TNM 2.5
RESULTS: SOUND LEVELS		
PROJECT/CONTRACT:	I-5 Northcoast Project	
RUN:	Buena Vista Lagoon - Existing	
BARRIER DESIGN:	INPUT HEIGHTS	Average pavement type shall be used unless a State highway agency substantiates the use of a different type with approval of FHWA.
ATMOSPHERICS:	68 deg F, 50% RH	

Receiver Name	No.	#DUs	Existing LAeq1h	No Barrier LAeq1h Calculated	Crit'n	Increase over existing Calculated	Crit'n Sub'l Inc	Type Impact	With Barrier Calculated LAeq1h	Noise Reduction Calculated	Goal	Calculated minus Goal
			dBA	dBA	dBA	dB	dB		dBA	dB	dB	dB
MS 11	1	1	0.0	63.1	66	63.1	10	----	63.1	0.0	8	-8.0
MS 12	2	1	0.0	63.3	66	63.3	10	----	63.3	0.0	8	-8.0
MS 13	3	1	0.0	53.1	66	53.1	10	----	53.1	0.0	8	-8.0

Dwelling Units	# DUs	Noise Reduction Min	Avg	Max
		dB	dB	dB
All Selected	3	0.0	0.0	0.0
All Impacted	0	0.0	0.0	0.0
All that meet NR Goal	0	0.0	0.0	0.0

EDAW **15 May 2006**
W Maddux **TNM 2.5**
Calculated with TNM 2.5

RESULTS: SOUND LEVELS
PROJECT/CONTRACT: **I-5 Northcoast Project**
RUN: **Buena Vista Lagoon - Future**
BARRIER DESIGN: **INPUT HEIGHTS**
Average pavement type shall be used unless a State highway agency substantiates the use of a different type with approval of FHWA.

ATMOSPHERICS: **68 deg F, 50% RH**

Receiver												
Name	No.	#DUs	Existing LAeq1h	No Barrier LAeq1h					With Barrier			
				Calculated	Crit'n	Increase over existing Calculated	Crit'n Sub'l Inc	Type Impact	Calculated LAeq1h	Noise Reduction Calculated	Goal	Calculated minus Goal
			dBA	dBA	dBA	dB	dB		dBA	dB	dB	dB
MS 11	1	1	0.0	64.3	66	64.3	10	----	64.3	0.0	8	-8.0
MS 12	2	1	0.0	63.8	66	63.8	10	----	63.8	0.0	8	-8.0
MS 13	3	1	0.0	55.2	66	55.2	10	----	55.2	0.0	8	-8.0

Dwelling Units	# DUs	Noise Reduction		
		Min	Avg	Max
		dB	dB	dB
All Selected	3	0.0	0.0	0.0
All Impacted	0	0.0	0.0	0.0
All that meet NR Goal	0	0.0	0.0	0.0