Item W16a – Exhibit 1
Special Condition 8 of E-06-013 – Poseidon Resources
November 21, 2008

APPROVED MARINE LIFE MITIGATION PLAN

INTRODUCTION

Poseidon's Carlsbad desalination facility will be co-located with the Encina Power Station and will use the power plant's once-through cooling intake and outfall structures. The desalination facility is expected to use about 304 million gallons per day (mgd) of estuarine water drawn through the structure. The facility will operate both when the power plant is using its once-through cooling system and when it is not.

This Marine Life Mitigation Plan (the Plan) will result in mitigation necessary to address the entrainment impacts caused by the facility's use of estuarine water. The Plan includes two phases of mitigation – Poseidon is required during Phase I to provide at least 37 acres of estuarine wetland restoration, as described below. In Phase II, Poseidon is required to provide an additional 18.4 acres of estuarine wetland restoration. However, as described below, Poseidon may choose to provide all 55.4 acres of restoration during Phase I. Poseidon may also choose during Phase II to apply for a CDP to reduce or eliminate the required 18.4 acres of mitigation and instead conduct alternative mitigation by implementing new entrainment reduction technology or obtaining mitigation credit for conducting dredging.

CONDITION A: WETLAND RESTORATION MITIGATION

The permittee shall develop, implement and fund a wetland restoration project that compensates for marine life impacts from Poseidon's Carlsbad desalination facility.

1.0 PHASED IMPLEMENTATION

Phase I: Poseidon is to provide at least 37 acres of estuarine wetland restoration. Within two years of issuance of the desalination facility's coastal development permit (CDP), Poseidon is to submit a complete CDP application for a proposed restoration project, as described below.

Phase II: Within five years of issuance of the Phase I CDP, Poseidon is to submit a complete CDP application proposing up to 18.4 acres of additional estuarine wetland restoration, subject to reduction as described in Section 6.0 below.

2.0 SITE SELECTION

In consultation with Commission staff, the permittee shall select a wetland restoration site or sites for mitigation in accordance with the following process and terms.

Within 10 months of the effective date of this permit, the permittee shall submit the proposed site(s) and preliminary wetland restoration plan to the Commission for its review and approval or disapproval.

The location of the wetland restoration project(s) shall be within the Southern California Bight. The permittee shall select from sites including, but not limited to, the following eleven sites: Tijuana Estuary in San Diego County; San Dieguito River Valley in San Diego County; Agua Hedionda Lagoon in San Diego County; San Elijo Lagoon in San Diego County; Buena Vista Lagoon in San Diego County; Huntington Beach Wetland in Orange County, Anaheim Bay in Orange County, Santa Ana River in Orange County, Los Cerritos Wetland in Los Angeles County, Ballona Wetland in Los Angeles County, and Ormond Beach in Ventura County. The permittee may also consider any sites that may be recommended by the California Department of Fish & Game as high priority wetlands restoration projects. Other sites proposed by the permittee may be added to this list with the Executive Director's approval.

The basis for the selection shall be an evaluation of the site(s) against the minimum standards and objectives set forth in subsections 3.1 and 3.2 below. The permittee shall take into account and give serious consideration to the advice and recommendations of the Scientific Advisory Panel (SAP) established and convened by the Executive Director pursuant to Condition B.1.0. The permittee shall select the site(s) that meet the minimum standards and best meet the objectives.

3.0 PLAN REQUIREMENTS

In consultation with Commission staff, the permittee shall develop a wetland restoration plan for the wetland site(s) identified through the site selection process. The wetland restoration plan shall meet the minimum standards and incorporate as many as feasible of the objectives in subsections 3.1 and 3.2, respectively.

3.1 Minimum Standards

The wetland restoration project site(s) and preliminary plan(s) must meet the following minimum standards:

a. Location within Southern California Bight;

b. Potential for restoration as tidal wetland, with extensive intertidal and subtidal areas;

c. Creates or substantially restores a minimum of 37 acres and up to at least 55.4 acres of habitat similar to the affected habitats in Agua Hedionda Lagoon, excluding buffer zone and upland transition area;

d. Provides a buffer zone of a size adequate to ensure protection of wetland values, and at least 100 feet wide, as measured from the upland edge of the transition area.

e. Any existing site contamination problems would be controlled or remediated and would not hinder restoration;

f. Site preservation is guaranteed in perpetuity (through appropriate public agency or nonprofit ownership, or other means approved by the Executive Director), to protect against future degradation or incompatible land use;

g. Feasible methods are available to protect the long-term wetland values on the site(s), in perpetuity;

h. Does not result in a net loss of existing wetlands; and

i. Does not result in an adverse impact on endangered animal species or an adverse unmitigated impact on endangered plant species.

3.2 Objectives

The following objectives represent the factors that will contribute to the overall value of the wetland. The selected site(s) shall be determined to achieve these objectives. These objectives shall also guide preparation of the restoration plan.

a. Provides maximum overall ecosystem benefits, e.g. maximum upland buffer, enhancement of downstream fish values, provides regionally scarce habitat, potential for local ecosystem diversity;

b. Provides substantial fish habitat compatible with other wetland values at the site(s);

c. Provides a buffer zone of an average of at least 300 feet wide, and not less than 100 feet wide, as measured from the upland edge of the transition area.

d. Provides maximum upland transition areas (in addition to buffer zones);

e. Restoration involves minimum adverse impacts on existing functioning wetlands and other sensitive habitats;

f. Site selection and restoration plan reflect a consideration of site specific and regional wetland restoration goals;

g. Restoration design is that most likely to produce and support wetland-dependent resources;

h. Provides rare or endangered species habitat;

i. Provides for restoration of reproductively isolated populations of native California species;

j. Results in an increase in the aggregate acreage of wetland in the Southern California Bight;

k. Requires minimum maintenance;

l. Restoration project can be accomplished in a reasonably timely fashion; and,

m. Site(s) in proximity to the Carlsbad desalination facility.

3.3 Restrictions

a. The permittee may propose a wetland restoration project larger than the minimum necessary size specified in subsection 3.1(c) above, if biologically appropriate for the site(s), but the additional acreage must (1) be clearly identified, and (2) must not be the portion of the project best satisfying the standards and objectives listed above.

b. If the permittee jointly enters into a restoration project with another party: (1) the permittee's portion of the project must be clearly specified, (2) any other party involved cannot gain mitigation credit for the permittee's portion of the project, and (3) the permittee may not receive mitigation credit for the other party's portion of the project.

c. The permittee may propose to divide the mitigation requirement between a maximum of two wetland restoration sites, unless there is a compelling argument, approved by the Executive Director, that the standards and objectives of subsections 3.1 and 3.2 will be better met at more than two sites.

4.0 PLAN IMPLEMENTATION

4.1 Coastal Development Permit Applications

The permittee shall submit complete Coastal Development Permit applications for the Phase I and Phase II restoration plan(s) that include CEQA documentation and local or other state agency approvals. The CDP application for Phase I shall be submitted within 24 months following the issuance of the Coastal Development Permit for the Carlsbad desalination facility. The CDP application for Phase II shall be submitted within 5 years of issuance of the CDP for Phase I. The Executive Director may grant an extension to these time periods at the request of and upon a demonstration of good cause by the permittee. The restoration plans shall substantially conform to Section 3.0 above and shall include, but not be limited to the following elements:

a. Detailed review of existing physical, biological, and hydrological conditions; ownership, land use and regulation;

b. Evaluation of site-specific and regional restoration goals and compatibility with the goal of mitigating for Poseidon's marine life impacts;

c. Identification of site opportunities and constraints;

d. Schematic restoration design, including:

   1. Proposed cut and fill, water control structures, control measures for stormwater, buffers and transition areas, management and maintenance requirements;
   2. Planting program, including removal of exotic species, sources of plants and or seeds (local, if possible), protection of existing salt marsh plants, methods for preserving top soil and augmenting soils with nitrogen and other necessary soil amendments before planting, timing of planting, plans for irrigation until established, and location of planting and elevations on the topographic drawings;
   3. Proposed habitat types (including approximate size and location);
   4. Assessment of significant impacts of design (especially on existing habitat values) and net habitat benefits;
   5. Location, alignment and specifications for public access facilities, if feasible;
   6. Evaluation of steps for implementation e.g. permits and approvals, development agreements, acquisition of property rights;
   7. Cost estimates;
   8. Topographic drawings for final restoration plan at 1" = 100 foot scale, one foot contour interval; and
   9. Drawings shall be directly translatable into final working drawings.

e. Detailed information about how monitoring and maintenance will be implemented;

f. Detailed information about construction methods to be used;

g. Defined final success criteria for each habitat type and methods to be used to determine success;

h. Detailed information about how Poseidon will coordinate with the Scientific Advisory Panel including its role in independent monitoring, contingency planning review, cost recovery, etc.;

i. Detailed information about contingency measures that will be implemented if mitigation does not meet the approved goals, objectives, performance standards, or other criteria; and,

j. Submittal of "as-built" plans showing final grading, planting, hydrological features, etc. within 60 days of completing initial mitigation site construction.

4.2 Wetland Construction Phase

Within 6 months of approval of the Phase I restoration plan, subject to the permittee's obtaining the necessary permits, the permittee shall commence the construction phase of the wetland restoration project. The permittee shall be responsible for ensuring that construction is carried out in accordance with the specifications and within the timeframes specified in the approved final restoration plan and shall be responsible for any remedial work or other intervention necessary to comply with final plan requirements.

4.3 Timeframe for Resubmittal of Project Elements

If the Commission does not approve any element of the project (i.e. site selection, restoration plan), the Commission will specify the time limits for compliance relative to selection of another site or revisions to the restoration plan.

5.0 WETLAND MONITORING, MANAGEMENT AND REMEDIATION

Monitoring, management (including maintenance), and remediation shall be conducted over the "full operating life" of Poseidon's desalination facility, which shall be 30 years from the date "as-built" plans are submitted pursuant to subsection 4.1(l).

The following section describes the basic tasks required for monitoring, management and remediation. Condition B specifies the administrative structure for carrying out these tasks, including the roles of the permittee and Commission staff.

5.1 Monitoring and Management Plan

A monitoring and management plan will be developed in consultation with the permittee and appropriate wildlife agencies, concurrently with the preparation of the restoration plan to provide an overall framework to guide the monitoring work. It will include an overall description of the studies to be conducted over the course of the monitoring program and a description of management tasks that are anticipated, such as trash removal. Details of the monitoring studies and management tasks will be set forth in a work program (see Condition B).

5.2 Pre-restoration site monitoring

Pre-restoration site monitoring shall be conducted to collect baseline data on the wetland attributes to be monitored. This information will be incorporated into and may result in modification to the overall monitoring plan.

5.3 Construction Monitoring

Monitoring shall be conducted during and immediately after each stage of construction of the wetland restoration project to ensure that the work is conducted according to plans.

5.4 Post-Restoration Monitoring and Remediation

Upon completion of construction of the wetland(s), monitoring shall be conducted to measure the success of the wetland(s) in achieving stated restoration goals (as specified in the restoration plan(s)) and in achieving performance standards, specified below. The permittee shall be fully responsible for any failure to meet these goals and standards during the facility's full operational years. Upon determining that the goals or standards are not achieved, the Executive Director shall prescribe remedial measures, after consultation with the permittee, which shall be immediately implemented by the permittee with Commission staff direction. If the permittee does not agree that remediation is necessary, the matter may be set for hearing and disposition by the Commission.

Successful achievement of the performance standards shall (in some cases) be measured relative to approximately four reference sites, which shall be relatively undisturbed, natural tidal wetlands within the Southern California Bight. The Executive Director shall select the reference sites. The standard of comparison, i.e., the measure of similarity to be used (e.g., within the range, or within the 95% confidence interval) shall be specified in the work program.

In measuring the performance of the wetland project, the following physical and biological performance standards will be used:

a. **Longterm Physical Standards.** The following long-term standards shall be maintained over the full operative life of the desalination facility:

    1. ***Topography.*** The wetland(s) shall not undergo major topographic degradation (such as excessive erosion or sedimentation);
    2. ***Water Quality.*** Water quality variables [to be specified] shall be similar to reference wetlands;
    3. ***Tidal prism.*** If the mitigation site(s) require dredging, the tidal prism shall be maintained and tidal flushing shall not be interrupted; and,
    4. ***Habitat Areas.*** The area of different habitats shall not vary by more than 10% from the areas indicated in the restoration plan(s).

b. **Biological Performance Standards.** The following biological performance standards shall be used to determine whether the restoration project is successful. Table 1, below, indicates suggested sampling locations for each of the following biological attributes; actual locations will be specified in the work program:

    1. ***Biological Communities.*** Within 4 years of construction, the total densities and number of species of fish, macroinvertebrates and birds (see Table 1) shall be similar to the densities and number of species in similar habitats in the reference wetlands;
    2. ***Vegetation.*** The proportion of total vegetation cover and open space in the marsh shall be similar to those proportions found in the reference sites. The percent cover of algae shall be similar to the percent cover found in the reference sites;
    3. ***Spartina Canopy Architecture.*** The restored wetland shall have a canopy architecture that is similar in distribution to the reference sites, with an equivalent proportion of stems over 3 feet tall;

4. ***Reproductive Success.*** Certain plant species, as specified by in the work program, shall have demonstrated reproduction (i.e. seed set) at least once in three years;
5. ***Food Chain Support.*** The food chain support provided to birds shall be similar to that provided by the reference sites, as determined by feeding activity of the birds; and,
6. ***Exotics.*** The important functions of the wetland shall not be impaired by exotic species.

Table 1: Suggested Sampling Locations

	Salt Marsh			Open Water			Tidal
	Spartina	Salicornia	Upper	Lagoon	Eelgrass	Mudflat	Creeks
1) Density/spp:							
– Fish				X	X	X	X
– Macroinvert-ebrates				X	X	X	X
– Birds	X	X	X	X		X	X
2) % Cover							
Vegetation	X	X	X		X		
algae	X	X				X	
3) Spartina architecture	X						
4) Reproductive success	X	X	X				
5) Bird feeding				X		X	X
6) Exotics	X	X	X	X	X	X	X

6.0 ALTERNATIVE MITIGATION

As part of Phase II, Poseidon may propose in its CDP application alternatives to reduce or eliminate the required 18.4 acres of mitigation. The alternative mitigation proposed may be in the form of implementing new entrainment reduction technology or may be mitigation credits for conducting dredging, either of which could reduce or eliminate the 18.4 acres of mitigation.

CONDITION B: ADMINISTRATIVE STRUCTURE

1.0 ADMINISTRATION

Personnel with appropriate scientific or technical training and skills will, under the direction of the Executive Director, oversee the mitigation and monitoring functions identified and required by Condition A. The Executive Director will retain scientific and administrative support staff needed to perform this function, as specified in the work program.

This technical staff will oversee the preconstruction and post-construction site assessments, mitigation project design and implementation (conducted by permittee), and monitoring activities (including plan preparation); the field work will be done by contractors under the Executive Director's direction. The contractors will be responsible for collecting the data, analyzing and interpreting it, and reporting to the Executive Director.

The Executive Director shall convene a Scientific Advisory Panel to provide the Executive Director with scientific advice on the design, implementation and monitoring of the wetland restoration. The panel shall consist of recognized scientists, including a marine biologist, an ecologist, a statistician and a physical scientist.

2.0 BUDGET AND WORK PROGRAM

The funding necessary for the Commission and the Executive Director to perform their responsibilities pursuant to these conditions will be provided by the permittee in a form and manner reasonably determined by the Executive Director to be consistent with requirements of State law, and which will ensure efficiency and minimize total costs to the permittee. The amount of funding will be determined by the Commission on a biennial basis and will be based on a proposed budget and work program, which will be prepared by the Executive Director in consultation with the permittee, and reviewed and approved by the Commission in conjunction with its review of the restoration plan. If the permittee and the Executive Director cannot agree on the budget or work program, the disagreement will be submitted to the Commission for resolution.

The budget to be funded by the permittee will be for the purpose of reasonable and necessary costs to retain personnel with appropriate scientific or technical training and skills needed to assist the Commission and the Executive Director in carrying out the mitigation and lost resource compensation conditions. In addition, reasonable funding will be included in this budget for necessary support personnel, equipment, overhead, consultants, the retention of contractors needed to conduct identified studies, and to defray the costs of members of any scientific advisory panel(s) convened by the Executive Director for the purpose of implementing these conditions.

Costs for participation on any advisory panel shall be limited to travel, per diem, meeting time and reasonable preparation time and shall only be paid to the extent the participant is not otherwise entitled to reimbursement for such participation and preparation. The amount of funding will be determined by the Commission on a biennial basis and will be based on a proposed budget and work program, which will be prepared by the Executive Director in consultation with the permittee, and reviewed and approved by the Commission in conjunction

with its review of the restoration plan. If the permittee and the Executive Director cannot agree on the budget or work program, the disagreement will be submitted to the Commission for resolution. Total costs for such advisory panel shall not exceed $100,000 per year adjusted annually by any increase in the consumer price index applicable to California.

The work program will include:

a. A description of the studies to be conducted over the subsequent two year period, including the number and distribution of sampling stations and samples per station, methodology and statistical analysis (including the standard of comparison to be used in comparing the mitigation project to the reference sites);

b. A description of the status of the mitigation projects, and a summary of the results of the monitoring studies to that point;

c. A description of four reference sites;

d. A description of the performance standards that have been met, and those that have yet to be achieved;

e. A description of remedial measures or other necessary site interventions;

f. A description of staffing and contracting requirements; and,

g. A description of the Scientific Advisory Panel's role and time requirements in the two year period.

The Executive Director may amend the work program at any time, subject to appeal to the Commission.

3.0 ANNUAL REVIEW AND PUBLIC WORKSHOP REVIEW

The permittee shall submit a written review of the status of the mitigation project to the Executive Director no later than April 30 each year for the prior calendar year. The written review will discuss the previous year's activities and overall status of the mitigation project, identify problems and make recommendations for solving them, and review the next year's program.

To review the status of the mitigation project, the Executive Director will convene and conduct a duly noticed public workshop during the first year of the project and every other year thereafter unless the Executive Director deems it unnecessary. The meeting will be attended by the contractors who are conducting the monitoring, appropriate members of the Scientific Advisory Panel, the permittee, Commission staff, representatives of the resource agencies (CDFG, NMFS, USFWS), and the public. Commission staff and the contractors will give presentations on the previous biennial work program's activities**,** overall status of the mitigation project, identify problems and make recommendations for solving them, and review the next upcoming period's biennial work program.

The public review will include discussions on whether the wetland mitigation project has met the performance standards, identified problems, and recommendations relative to corrective measures necessary to meet the performance standards. The Executive Director will use information presented at the public review, as well as any other relevant information, to determine whether any or all of the performance standards have been met, whether revisions to the standards are necessary, and whether remediation is required. Major revisions shall be subject to the Commission's review and approval.

The mitigation project will be successful when all performance standards have been met each year for a three-year period. The Executive Director shall report to the Commission upon determining that all of the performance standards have been met for three years and that the project is deemed successful. If the Commission determines that the performance standards have been met and the project is successful, the monitoring program will be scaled down, as recommended by the Executive Director and approved by the Commission. A public review shall thereafter occur every five years, or sooner if called for by the Executive Director. The work program shall reflect the lower level of monitoring required. If subsequent monitoring shows that a standard is no longer being met, monitoring may be increased to previous levels, as determined necessary by the Executive Director.

The Executive Director may make a determination on the success or failure to meet the performance standards or necessary remediation and related monitoring at any time, not just at the time of the workshop review.

4.0 ADDITIONAL PROCEDURES

4.1 Dispute Resolution

In the event that the permittee and the Executive Director cannot reach agreement regarding the terms contained in or the implementation of any part of this Plan, the matter may be set for hearing and disposition by the Commission.

4.2 Extensions

Any of the time limits established under this Plan may be extended by the Executive Director at the request of the permittee and upon a showing of good cause.

CONDITION C: SAP DATA MAINTENANCE

The permittee shall make available on a publicly-accessible website all scientific data collected as part of the project. The website and the presentation of data shall be subject to Executive Director review and approval.

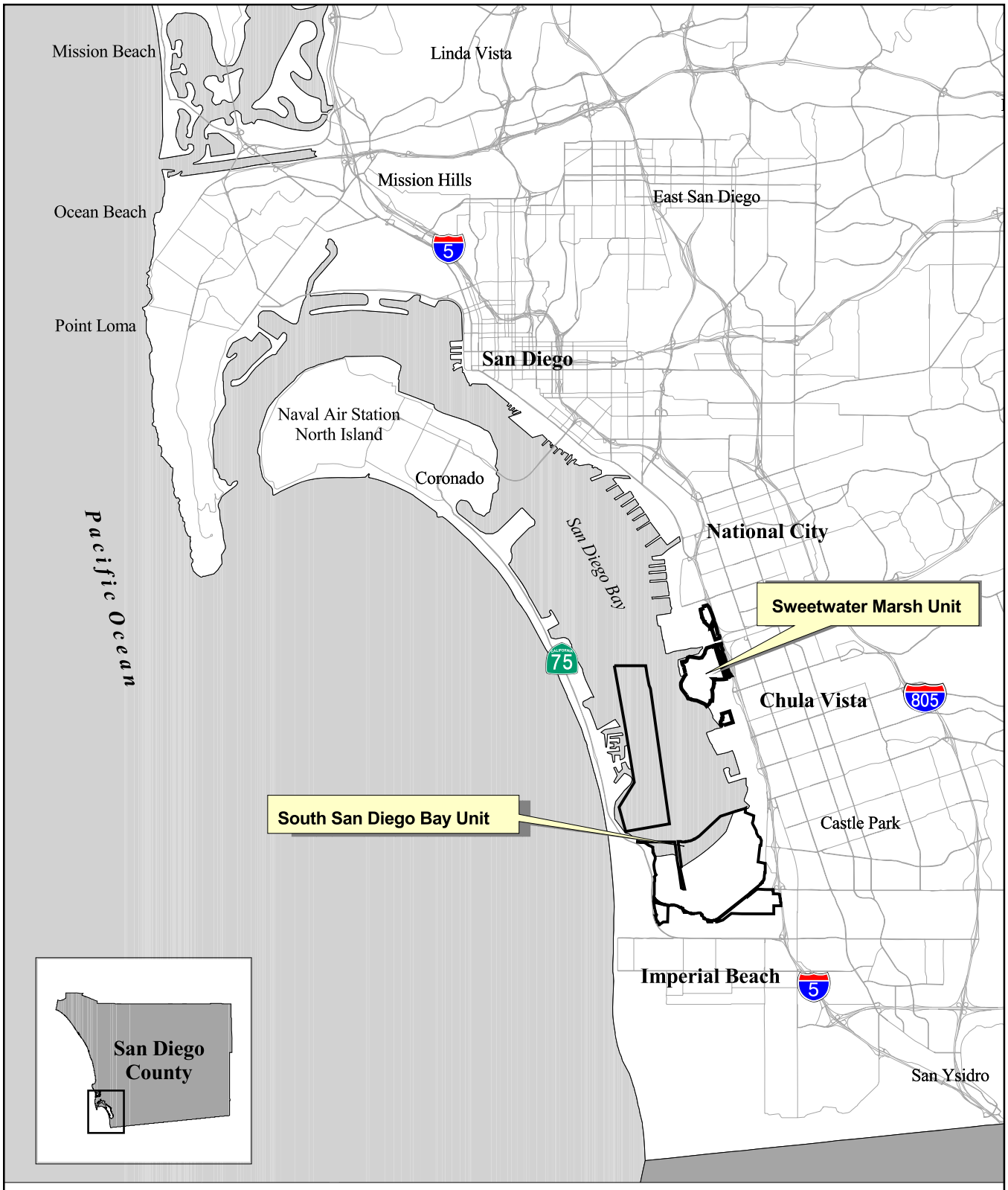

Figure 1
Location of the San Diego Bay National Wildlife Refuge

N

0 1 2 Miles

Source: California Spatial Information Library, Tele Atlas, USFWS

Carlsbad Field Office - 2003
/stem/stacey/ssdbay/fig_sum/figures.apr

Exhibit 2a

Figure 2
San Diego Bay NWR Comprehensive Conservation Plan
Project Study Area (Area of Potential Effects)

N

0 0.25 0.5 Miles

Source: USFWS, Local Agency Partnership 2000 (2 ft imagery)

Carlsbad Field Office - 2003
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Exhibit 2b

Figure A-7
South San Diego Bay Unit, Alternative C - Otay River Floodplain Restoration Option 1

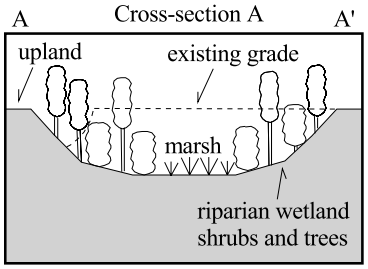
Refuge management boundary

Freshwater wetland
(30% marsh and 70% riparian)

50% intertidal mudflat,
30% cordgrass, 20% pickleweed

Restored uplands

Transition from freshwater wetland
to salt marsh

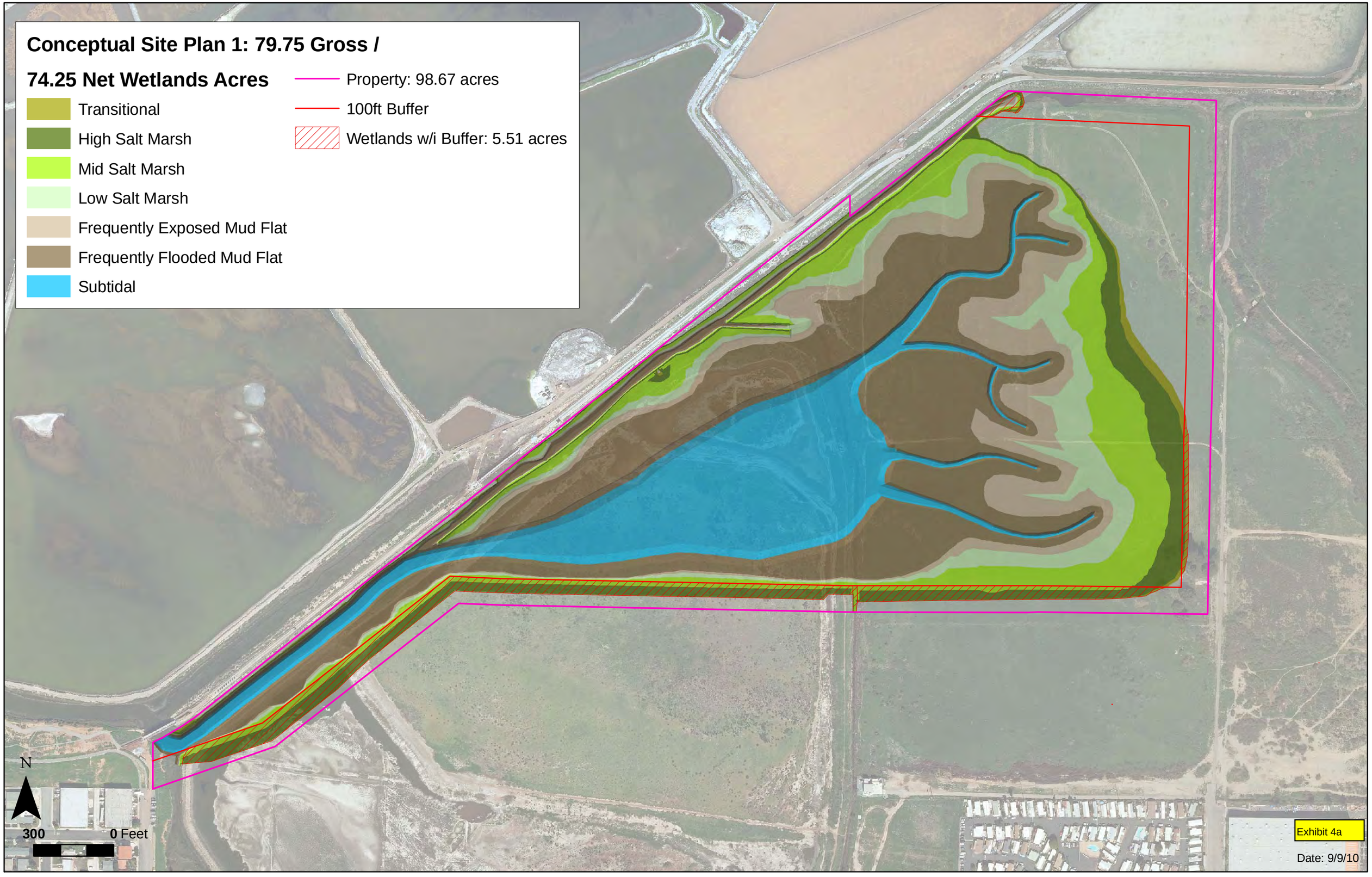


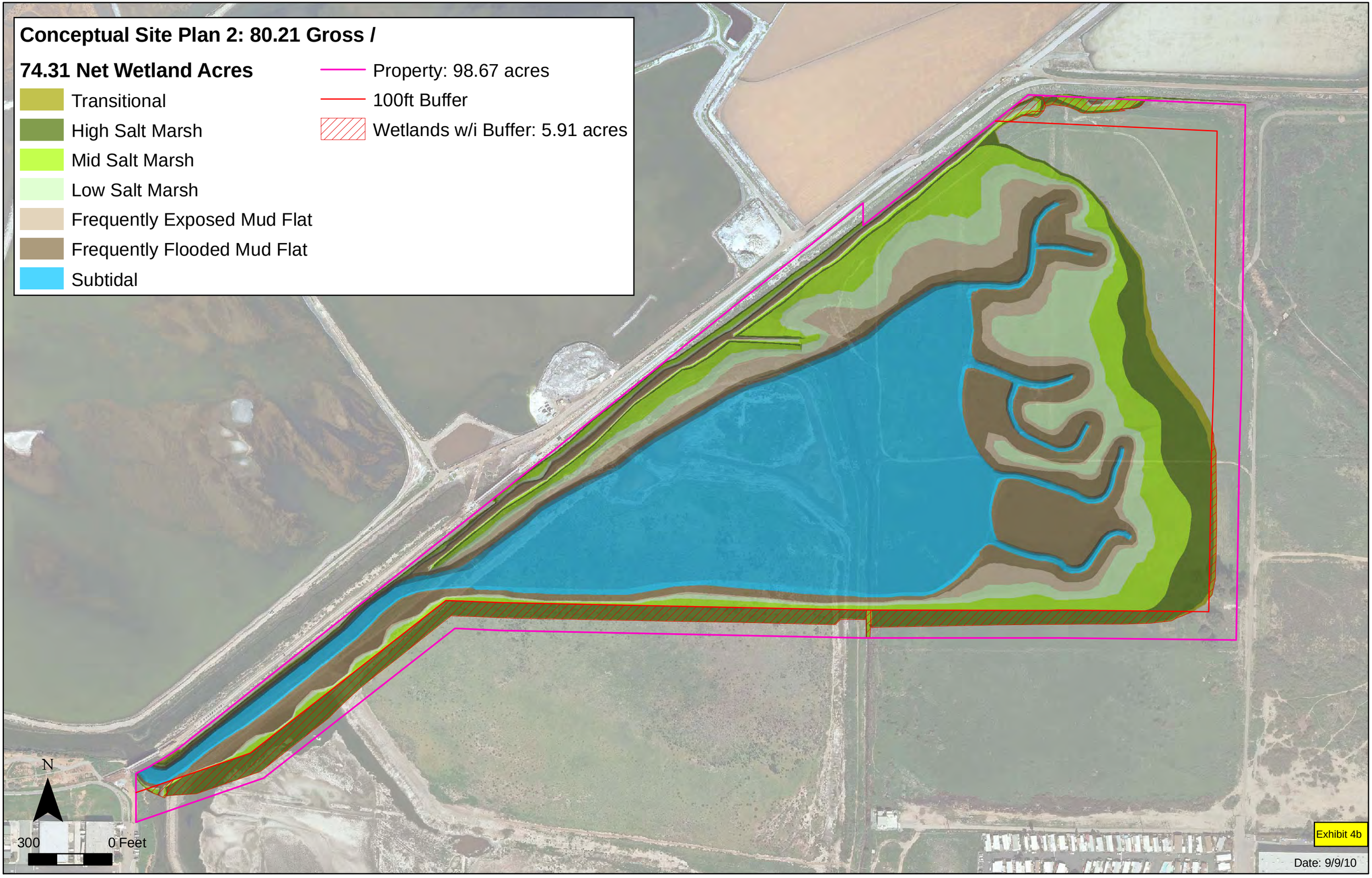
0.25 0 0.25 Miles

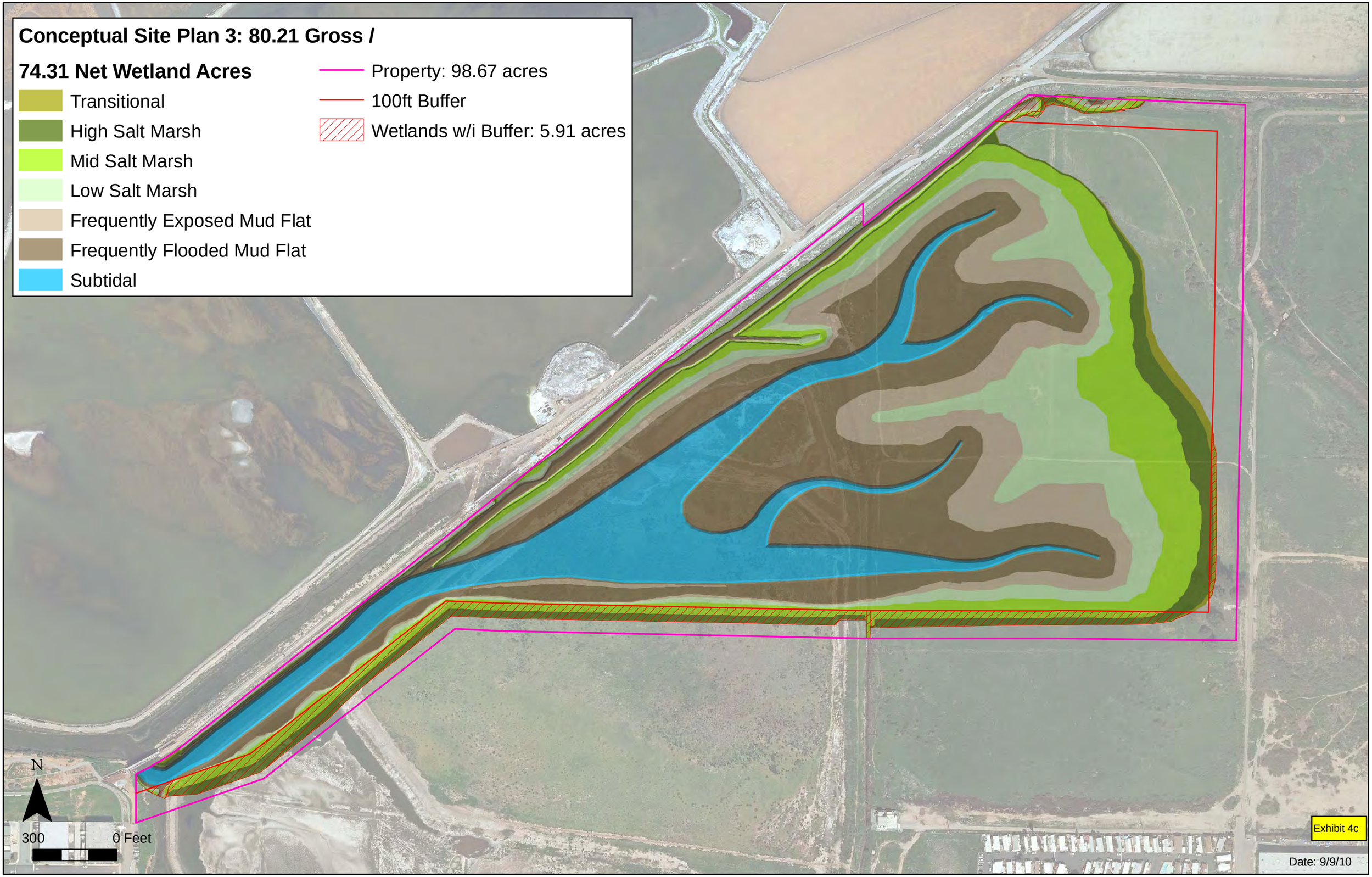
Carlsbad Field Office - 2003
/stem/stacey/ssdbay/fig_apndx/habfigures.apr

Source: USFWS, Local Agency Partnership 2000 (2 ft imagery)

Exhibit 3


Conceptual Site Plan 1: 79.75 Gross /
74.25 Net Wetlands Acres
Transitional
High Salt Marsh
Mid Salt Marsh
Low Salt Marsh
Frequently Exposed Mud Flat
Frequently Flooded Mud Flat
Subtidal
Property: 98.67 acres
100ft Buffer
Wetlands w/i Buffer: 5.51 acres
N
300
0 Feet
Exhibit 4a
Date: 9/9/10


Conceptual Site Plan 2: 80.21 Gross /
74.31 Net Wetland Acres
Transitional
High Salt Marsh
Mid Salt Marsh
Low Salt Marsh
Frequently Exposed Mud Flat
Frequently Flooded Mud Flat
Subtidal
Property: 98.67 acres
100ft Buffer
Wetlands w/i Buffer: 5.91 acres
N
300
0 Feet
Exhibit 4b
Date: 9/9/10


Conceptual Site Plan 3: 80.21 Gross /
74.31 Net Wetland Acres
Transitional
High Salt Marsh
Mid Salt Marsh
Low Salt Marsh
Frequently Exposed Mud Flat
Frequently Flooded Mud Flat
Subtidal
Property: 98.67 acres
100ft Buffer
Wetlands w/i Buffer: 5.91 acres
N
300
0 Feet
Exhibit 4c
Date: 9/9/10

Mitigation Outreach

POSEIDON RESOURCES

REQUEST FOR EXPRESSIONS OF INTEREST
(REI)

FOR

DEVELOPMENT AND IMPLEMENTATION
OF
COASTAL HABITAT ENHANCEMENT
PROJECT (CHE)

ASSOCIATED WITH

THE CARLSBAD SEAWATER DESALINATION
PLANT

Response Deadline:

September 24th, 2007 by 5:00 PM PST

Issued - August 31, 2007

Exhibit 5

Mitigation RFP
Address List

ORGANIZATIONS	CONTACT	ADDRESS	CITY
Adopt-A-Watershed	Kim Stokely	P.O. Box 1850	Hayfork
Agua Hedionda Creek Watershed Management Plan	Meleah Ashford	132 N. El Camino Real, # 334	Encinitas
Agua Hedionda Lagoon Foundation	Eric Muncz	1580 Cannon Road	Carlsbad
AMEC Earth & Environmental	Rolf Schottle	9210 Skyk Park Ct., Suite 200	San Diego
Ashford Engineering, Inc.	Meleah Ashford	132 N. El Camino Real, #334	Encinitas
Batiquitos Lagoon Foundation	Fred Sandquist	7380 Gabbiano Lane	Carlsbad
Brown and Caldwell	Nancy Gardiner	9665 Chesapeake Dr., Suite 201	San Diego
Buena Vista Audubon	Dennis Huckaby	PO Box 480	Oceanside
Buena Vista Lagoon Foundation	Regg Antle	PO Box 4516	Carlsbad
CA Center for Ocean Science Education Excellence	Cheryl Peach	9500 Gilman Drive	La Jolla
CA Department of Fish and Game		4949 Viewridge Ave	San Diego
Camp Dresser & Mckee, Inc.	Donald Schroeder, Vice Pres	9220 Cleveland Ave, Suite 100	Rancho Cucamo
Carlsbad Aquafarm	John Davis	4600 Carlsbad Blvd.	Carlsbad
Carlsbad Watershed Network	Jayne Strommer	1635 Faraday Avenue	Carlsbad
City of Carlsbad	Attn. Watershed Restoration Coordinator	1635 Faraday Avenue	Carlsbad
City of Chula Vista	Attn. Watershed Restoration Coordinator	276 Fourth Avenue	Chula Vista
City of Del Mar	Attn. Watershed Restoration Coordinator	1050 Camino del Mar	Del Mar
City of Encinitas	Attn. Watershed Restoration Coordinator	505 S. Vulcan Avenue	Encinitas
City of Imperial Beach	Attn. Watershed Restoration Coordinator	825 Imperial Beach Blvd	Imperial Beach
City of National City	Attn. Watershed Restoration Coordinator	1243 National City Blvd	National City
City of Oceanside	Attn. Watershed Restoration Coordinator	300 N. Coast Hwy.	Oceanside
City of San Diego	Attn. Watershed Restoration Coordinator	600 B Street, 4th Floor	San Diego
Conservation Biology Institute	Dr. Michael White	5510 Morehouse Drive	San Diego
County of San Diego		1600 Pacific Coast Hwy, Room 335	San Diego
CRG Laboratories, Inc.	Mark D. Baker	2020 Del Amo Blvd., Suite 200	Torrance
Dan Cloak Environmental Consulting	Dan Cloak, P.E.	1824 Prince St.	Berkeley
D-Max Engineering, Inc.	Arsalan Dadkhah	8380 Miramar Mall, Suite 227	San Diego
Dudek & Associates	D. Michael Metts, P.E.	605 Third St.	Encinitas
Dynamic Solutions, LLC	Chris Wallen	322 Nancy Lynn Lane, Suite 1	Knoxville
EDAW / AECOM	Mark Williams	1420 Kettner Blvd, Suite 620	San Diego
EIP Associates	John Moynier	1200 Second Street, Suite 200	Sacramento
EOA, Inc.	Jill Bicknell	699 Town & County Village	Sunnyvale
Everest Consultants	David Cannon		
H. T. Harvey & Associates	Max Busnardo	3150 Almaden Expressway, Suite 145	San Jose
Larry Walker Associates	Ashli Desai, Associate	429 Santa Monica Blvd., Suite 270	Santa Monica

Mitigation RFP
Address List

Loma Alta Lagoon - City of Oceanside	City of Oceanside - Clean Watershed Program	300 N. Coast Hwy.	Oceanside
Los Penasquitos Lagoon Foundation	Joan Jackson	P.O. Box 940	Cardiff
MACTEC Engineering and Consulting, Inc.	Jim Hogan	9177 Sky Park Court, Suite A	San Diego
MACTEC Engineering and Consulting, Inc.	Jay Shrake	9177 Sky Park Court, Suite A	San Diego
Marine Biological Consultants	Chuck Mitchell	947 Newhall Street	Costa Mesa
~~Merkel & Associates, Inc.~~		5434 Ruffin Road	San Diego
Merkel & Associates, Inc.	Keith Merkel	5434 Ruffin Rd.	San Diego
Mikhail Ogawa Engineering	Mikhail Ogawa	3525 Del Mar Heights Road #429	San Diego
Moffatt & Nichol	John Menge	1660 Hotel Circle North #200	San Diego
Nautilus Environmental	Chris Stranski	5550 Morehouse Dr., Suite 150	San Diego
Nolte and Associates, Inc.	Larry Shaw	15070 Avenue of Science, Suite 101	San Diego
P&D Consultants	Susan Moon	999 Town and Country Road, 4th	Orange
Pacific REMS	George Wilkins	P.O. Box 23390	San Diego
PBS & J	Rosanna LaCarra	175 Calle Magdalena	Encinitas
Preserve Calvera	Diane Nygaard	5020 Nighthawk Way	Oceanside
RBF Consulting	Diane Elias		
RBF Consulting	Richard A. Rubin	9755 Clairemont Mesa Boulevard,	San Diego
~~RBF Consulting~~	Anna Lantin, PE, Vice Pres	14725 Alton Parkway	Irvine
Rick Engineering Company	Houshmand Aftahi	5620 Friars Road	San Diego
RMC Water and Environment	Alyson Watson, P.E.	12707 High Bluff Dr., Suite 200	San Diego
San Diego Coastkeeper	Danielle Miller	2924 Emerson Street, Suite 220	San Diego
San Diego Department of Parks and Recreation	Renée E. Bahl	9150 Chesapeake Dr., Suite 200	San Diego
San Diego Oceans Foundations	Noelle Morris	P.O. Box 90672	San Diego
San Diego River Coalition		PO Box 80126	San Diego
San Diego River Conservancy		PO Box 80126	San Diego
San Diego River Park Foundation		PO Box 80126	San Diego
San Dieguito River Park	Dick Bobertz	18372 Sycamore Creek Road	Escondido
San Dieguito River Valley Conservancy		PO Box 89	Del Mar
San Elijo Joint Powers Authority		P.O. Box 1077	Cardiff
San Elijo Lagoon Conservancy	Doug Gibson	2049 San Elijo Avenue	Cardiff
Scripps Institution of Oceanography	Watershed / Grants Department	9500 Gilman Drive	La Jolla
Southern California Coastal Research Project	Stephen Weisberg	3535 Harbor Blvd., Suite 110	Costa Mesa
State Coastal Conservancy	Mary Small	1330 Broadway, 11th Floor	Oakland
Tetra Tech	Stephen Carter	1230 Columbia St., Suite 1000	San Diego
The Nature Conservancy		3033 5th Ave # 105	San Diego
Weston Solution		2433 Impala Dr	Carlsbad
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Mitigation RFP
Address List

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Wetland Recovery Project	Megan Johnson	973 Hermes Avenue	Encinitas
Wetlands Recovery Project - Coastal Conservancy	Mary Small	1330 Broadway, 11th Floor	Oakland
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COMPARISON OF SELECTED SOUTHERN CALIFORNIA TIDAL WETLANDS AS POTENTIAL SITES FOR MITIGATION OF IMPACTS ASSOCIATED WITH POSEIDON RESOURCES PROPOSED CARLSBAD DESALINATION PLANT

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January 2010

Exhibit 6

INTRODUCTION

Poseidon Resources Corporation (Poseidon) proposes to operate a desalination plant at Aqua Hedionda Lagoon, in the City of Carlsbad, California. The Carlsbad Desalination Project (CDP) is designed to operate in conjunction with the existing Encina Power Station (EPS) by using the EPS cooling water discharge as its source of water when the power plant is operating.

In August 2008, the California Coastal Commission (Coastal Commission) approved the final Marine Life Mitigation Plan (MLMP) for the project to provide mitigation for the desalination facility's anticipated entrainment and impingement impacts through creation, enhancement, or restoration of aquatic and wetland habitat, and ensured long-term performance, monitoring, and protection of the approved mitigation measures in a manner consistent with the Coastal Act Sections 30230 and 30231.

The conditions of the MLMP required that Poseidon develop a mitigation plan to restore approximately 66 acres of tidal wetlands to offset project impacts. The Coastal Commission directed Poseidon to investigate restoration opportunities at 11 wetlands within the southern California bight. These sites included:

- Tijuana Estuary in San Diego County,
- San Dieguito River Valley in San Diego County,
- Aqua Hedionda Lagoon in San Diego County,
- San Elijo Lagoon in San Diego County,
- Buena Vista Lagoon in San Diego County,
- Huntington Beach Wetlands in Orange County,
- Anaheim Bay in Orange County,
- Santa Ana River in Orange County,
- Los Cerritos Wetlands in Los Angeles County,
- Ballona Wetlands in Los Angeles County,
- and Ormond Beach in Ventura County,

In addition, Poseidon may consider any sites that may be recommended by the California Department of Fish and Game (CDFG) as "high priority wetlands restoration projects". This analysis includes an evaluation of potential restoration opportunity at the U.S. Fish and Wildlife Service San Diego Bay National Wildlife Refuge.

On May 9, 2009, the Regional Water Quality Control Board (RWQCB) approved the MLMP as a condition of the National Pollution Discharge Elimination System permit required for the project. The RWQCB conditioned this approval by requiring that mitigation occur within San Diego County unless all opportunities for restoration in the County proved to be infeasible. Thus, although this assessment includes restoration opportunities located in Orange, Los Angeles and Ventura counties, restoration in San Diego County wetlands are considered higher priority.

With the inclusion of the San Diego Bay National Wildlife Refuge restoration, this analysis compares the restoration potential of 12 southern California wetlands according to Coastal Commission requirements. The final goal of this analysis is to rank the potential restoration sites against standard feasibility criteria and the objectives set forth in the MLMP. The analysis includes a comparison of a number factors, including status of supporting technical studies conducted for restoration plans at each wetland, proposed distribution of habitats created, potential impacts on existing habitats, and potential for compliance with Coastal Commission goals and objectives. The details available for restoration of each wetland varied, as did the dates of those plans. Some plans are relatively detailed, while others are conceptual. Some plans focus on active restoration/creation of tidal wetlands while other plans focus on restoration of non-tidal wetlands or acquisition of property, or passive restoration. Thus, ranking of the potential value of each restoration opportunity is somewhat subjective, although every attempt has been made to avoid bias.

The analysis is presented in a geographical order, from south to north, as presented in the MLMP. A summary of existing restoration planning is presented for each wetland. The potential compatibility of each wetland restoration plan with Coastal Commission requirements of Poseidon follows these summaries.

TIJUANA ESTUARY

Wetland restoration planning and implementation at Tijuana Estuary has been ongoing for over 20 years, beginning in 1986 with large-scale restoration planning funded by the California State Coastal Conservancy (Coastal Conservancy). Plans for restoring approximately 495 acres of tidal marsh in the southern arm of Tijuana Estuary were developed in the late 1980s culminating in the preparation of the Tijuana Estuary Tidal Restoration Program (TETRP) EIS/EIR in 1991 (Entrix et al. 1991). The first phase of TETRP, including a 2.5-acre restoration in the north arm known as the Oneonta Tidal Linkage, and a 20-acre restoration in the south arm known as the Model Marsh, were constructed in 1996 and 2000, respectively. The 495-acre restoration in the south arm was deferred to a later date. In 2003, the Coastal Conservancy funded a renewed look at restoration of the south arm. In 2008, the Tijuana Estuary-Friendship Marsh Restoration Feasibility and Design Study was completed (Tierra Environmental Services March 2008). The feasibility and design study identified a smaller potential restoration area (250 acres) in the south arm of the estuary.

Status of Existing Plans. A restoration feasibility and design study was completed March 2008 with funding from the Coastal Conservancy. A preferred restoration alternative was identified that included approximately 250 acres of wetland restoration (see figures 2-1 and 4-2 of the feasibility and design study).

Status of Environmental Documentation. No Environmental Documentation has been prepared to date. The feasibility and design study identified the need for a project-specific EIR.

FIGURE 2-1 **Regional Location Map**

FIGURE 4-2 **Alternative B (Preferred) Restoration Plan and Habitat Configurations**

Status of Required Permits. The feasibility and design study identified the need for the following permits:

- U.S. Army Corps of Engineers Section 404 permit;
- Regional Water Quality Control Board Section 401 Water Quality Certification;
- California Department of Fish and Game Streambed Alteration Agreement;
- California Coastal Commission Coastal Development Permit;
- U.S. Fish and Wildlife Service Section 7 Federal Endangered Species Act Consultation.

Any potential disposal of excavated soils in the ocean would require an encroachment permit from the State Lands Commission and a Section 10 permit from the USACOE. To date, there has been no action regarding acquisition of the identified permits.

Habitat Distribution. The 250-acre preferred project alternative was planned to be implemented in five phases creating five native habitats as indicated Table 1.

Table 1. Tijuana Estuary Restoration Project Proposed. Phasing and Habitat Distribution, March 2008.

Phase	Habitat (acres)					
	Open Water	Mudflat	Low Salt Marsh	Mid-High Salt Marsh	Transition	Total
1	22.9	6.1	4.1	3.1	2.5	38.7
2	7.7	6.1	10.8	12.7	0	37.3
3	13.0	18.3	23.7	19.9	0	74.9
4	5.5	11.5	5.5	9.2	0	31.7
5	12.0	18.5	15.9	16.3	4.6	67.3
total	61.1	60.5	60.0	61.2	7.1	250

All created wetland habitats would be below 4.9 feet NGVD, the estimated Mean Higher High Water level.

Potential Impacts to Existing Habitats. The majority of the impacts associated with implementation of the preferred alternative are to disturbed upland habitats. However, some of these proposed impacts would affect areas currently considered wetlands by resource agencies. The feasibility study presents each alternative as being "self-mitigating"; however, there has been no attempt to seek concurrence by the resource agencies to date. Impacts of the preferred alternative by are presented in Table 2:

Table 2. Tijuana Estuary Restoration Project Proposed. Impacts by Habitat and Phase. March 2008.

Phase		Habitat (acres)									
	Open Water	Salt Marsh	Dist. Salt Marsh	Dist. Salt Panne	Mulefat Scrub	Dist. Mulefat Scrub	Dist. Trans. Zone	Dist. Willow Scrub	Dist. Brackish Marsh	NNG	Total
1	0	0.06	4.93	0.36	0	22.73	0	0	0		28.08
2	0.02	1.34	12.46	0	0		4.14	0	0	17.49	35.45
3	0	0.56	16.79	0	1.84	13.07	0	0.89	0.01	0	33.16
4	0	0	17.14	13.08	0	0.22	0	0	0	0	30.44
5			7.53	2.48		8.06			45.33		63.40
total	0.02	1.96	58.85	15.92	1.84	44.08	4.14	0.89	45.34	17.49	190.5

Dist. = Disturbed, Trans. = Transition; NNG = Non-native Grassland

Land Ownership. The 250-acre restoration site is located in Border Field State Park on land owned by California Department of Parks and Recreation (California State Parks). California State Parks has been a partner with the Coastal Conservancy in the development of the restoration plan. As stated previously, potential disposal sites are owned or regulated by other entities.

Ease of Compliance with Coastal Commission Objectives and Criteria. Tijuana Estuary is composed of a northern and southern arm, with the central portion dominated by the Tijuana River. The northern arm is relatively pristine salt marsh and has been selected as a reference site by the Coastal Commission's Scientific Advisory Panel for the San Onofre Nuclear Generating Station (SONGS) restoration project in San Dieguito Lagoon. The potential for successful restoration in the northern arm is high.

Restoration at the southern arm of the estuary carries somewhat higher risk. This portion of the estuary has been impacted by sedimentation associated with cross-border canyons which was the focus of restoration planning efforts. A series of sedimentation basins were constructed in 2005 to capture sediment crossing the border, significantly reducing the risk of sedimentation from cross border canyons. Thus, the risk of loss of a restored site from sediment deposition has been significantly reduced. The feasibility and design study addressed sedimentation as an important issues and the restoration site has been designed to accommodate sediment that may remain in the general area from prior depositional events. Sedimentation and scour from the Tijuana River was also identified as a potential risk to wetland restoration at Tijuana Estuary. A low berm and weir were incorporated into the designed to pass flood flows and prevent scour or sediment deposition at the restored wetland.

The disposal of sediment excavated for restoration at Tijuana Estuary presents additional uncertainty. The feasibility study identifies several disposal scenarios, including disposal at a former sand mining operation in Lakeside, California. Disposal at this site would require truck round-trips of approximately 70 miles.

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As stated previously, the restoration plan developed for the site would impact degraded wetland habitats that, nonetheless, may be considered as existing wetland by the Coastal Commission. While the feasibility study presents each restoration phase as being self-mitigating, to date there has been no effort to seek agency resource concurrence.

SAN DIEGO BAY NATIONAL WILDLIFE REFUGE

The San Diego National Wildlife Refuge consists of the Sweetwater Marsh and South San Diego Bay Units. The 316-acre Sweetwater Marsh Unit is located along the eastern edge of San Diego Bay and includes tidally influenced salt marsh, disturbed upland habitat, and the D Street Fill, an old dredge disposal site that is used as nesting habitat by California least terns and western snowy plovers. The Sweetwater Marsh Unit is owned by the USFWS. The South San Diego Bay Unit includes 2,300 acres, most of which are leased to the USFWS by the State Lands Commission. This unit includes portions of the open bay, solar salt

evaporation ponds (1,068 acres), and the western end of the Otay River drainage basin, including approximately 140 acres of upland and wetland habitat.

Status of Existing Plans. A Comprehensive Conservation Plan (CCP) and Environmental Impact Statement (EIS) was prepared to provide a 15-year strategy for management of the refuge, including restoration alternatives. The CCP/EIS was adopted and a Record of Decision was issued in 2006. Preferred alternatives were identified for both the Sweetwater Marsh and South San Diego Bay Units. The preferred alternative for the Sweetwater Marsh Unit includes restoration of up to 21 acres of tidally influenced wetlands, located at three sites within the Unit. The preferred alternative for the South San Diego Bay Unit includes the restoration of approximately 650 acres of tidal wetlands, primarily from the conversion of solar evaporation ponds to tidal wetlands accomplished by breaching existing levees and allowing low marsh habitat to develop. The approximately 140-acre Otay River Floodplain Subarea, located south and west of the southernmost salt ponds, would be excavated and restored to tidal mudflat and salt marsh (see figures 1-2 and 2-11 of the CCP/EIS).

Recently (summer 2009), the USFWS was awarded two federal grants, one from the National Coastal Wetland Conservation (NCWC) and one from the National Oceanic and Atmospheric Administration (NOAA), for the restoration of approximately 230 acres of wetlands within the South San Diego Bay Unit. The restoration entails the conversion of solar evaporation ponds 10, 10a, and 11, also known as the western ponds, to intertidal mudflat and salt marsh habitats. Construction is scheduled for September 2010.

Since mid-2009, Poseidon and the USFWS have been in discussion regarding restoration of the Otay River Floodplain Subarea of the South San Diego Bay Unit. The USFWS has expressed interest in Poseidon restoring this portion of the wildlife refuge and has agreed to enter into a Memorandum of Understanding with Poseidon to develop detailed plans for restoration of this site.

Status of Environmental Documentation. A joint CCP/EIS for the overall restoration of the entire San Diego Bay National Wildlife Refuge was adopted in 2006. Supplemental environmental documentation pursuant to the western pond restoration project is currently being prepared. Preparation of an environmental document for restoration of the Otay River floodplain has not yet been initiated.

Status of Required Permits. The following permits will be required for the restoration of the South San Diego Bay Unit prior to project approval and implementation:

- U.S. Army Corps of Engineers Section 404 permit and Rivers and Harbors Act Section 10 permit;
- U.S. Fish and Wildlife Service Section 7 Endangered Species Act consultation;
- NOAA National Marine Fisheries Service Consultation pursuant to the Magnuson-Stevens Fishery Conservation and Management Act;
- U.S. Department of the Navy approval to alter Navy-owned land;
- Regional Water Quality Control Board Section 401 Water Quality Certification, and possibly, a waste discharge permit for breaching salt pond levees;;
- California Department of Fish and Game Streambed Alteration Agreement;

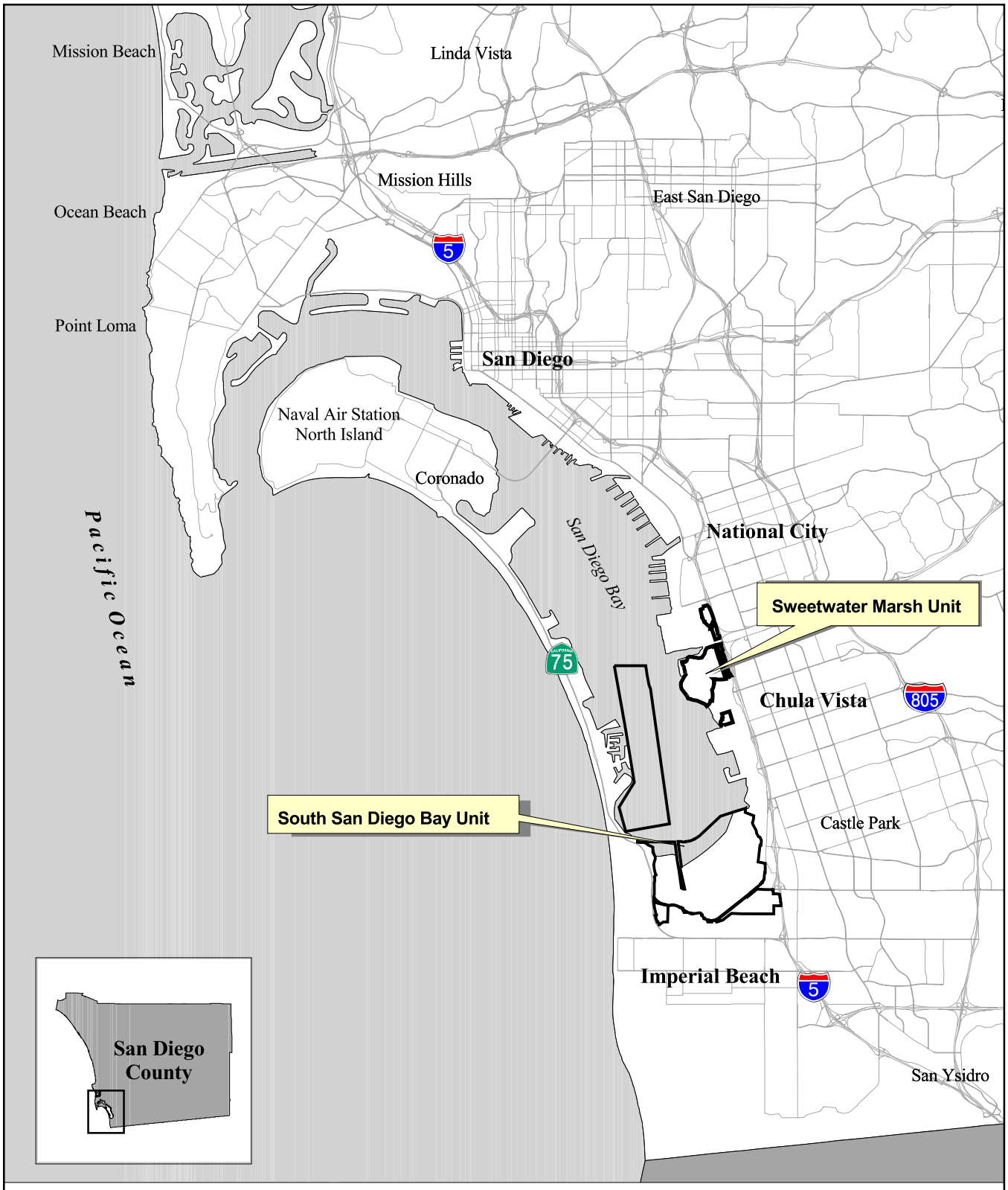


Figure 1-2
Location of the San Diego Bay National Wildlife Refuge

N

0 1 2 Miles

Source: California Spatial Information Library, Tele Atlas, USFWS

Carlsbad Field Office - 2003
/stem/stacey/ssdbay/fig_4-03/figures.apr

Figure 2-11
South San Diego Bay Unit, Alternative C - Otay River Floodplain Restoration Option 2

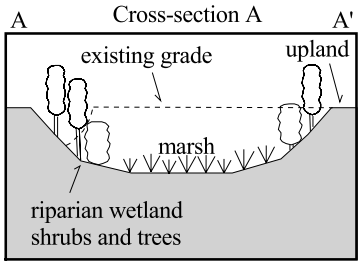
Refuge management boundary

Freshwater wetland
(70% marsh and 30% riparian)

50% intertidal mudflat,
30% cordgrass, 20% pickleweed

Restored uplands

Transition from freshwater wetland
to salt marsh



0.25 0 0.25 Miles

Carlsbad Field Office - 2003
/stem/stacey/ssdbay/fig_4-03/habfigures.apr

Source: USFWS, Local Agency Partnership 2000 (2 ft imagery)

- California Coastal Commission Concurrence with the USFWS Consistency Determination for the CCP;
- Caltrans District 11 Encroachment permit for potential impacts to Interstate 5;
- San Diego County Air Pollution Control District compliance with Rule 1501 of the Air Pollution Control District's Rules and Regulations;
- City of San Diego Encroachment Permit for any impacts to lands owned by the City of San Diego.

A similar suite of permits will be required for the now-funded western pond restoration. To date, these permits have not been acquired. Similarly, a number of discretionary permits will be required for the potential restoration of the Otay River floodplain by Poseidon. This potential restoration project is in the early planning stages and the required discretionary permits have not yet been identified.

Habitat Distribution.

Long-term Restoration at San Diego Bay National Wildlife Refuge. The CCP/EIS identified conceptual-level restoration for both the Sweetwater Marsh and South San Diego Bay Units. The approximately 21 acres of tidal wetland restoration at the Sweetwater Marsh Unit do not specify habitat distribution (e.g., subtidal and low marsh habitats) other than a minimum of 10 acres must be low marsh. Habitat acreages restored under the preferred alternative for the long-term restoration of South San Diego Bay Unit are presented in Table 3.

Table 3. Overall San Diego Bay Wildlife Refuge and Western Ponds Restoration. Habitat Distribution

Habitats Created (acres)	Overall Restoration Plan	Western Ponds Restoration Component.
Shallow Subtidal	44	25.5
Intertidal Mudflat	124	15.8
Low Salt Marsh	447	129.4
Mid-high Salt Marsh	32	52.6
Total	647	223.3

Restoration of Ponds 10a, 10 and 11 (western ponds). The western pond restoration is the first phase of the overall San Diego Bay Wildlife refuge restoration program. The habitat acreages to be created by the USFWS under the currently-funded western salt ponds restoration are presented in Table 3. These acreages are conceptual and may change following the development of final engineering plans.

Otay River Floodplain. The USFWS prepared two alternatives for restoration of the Otay River Floodplain Subarea. The habitat acreages that would be created by both alternatives are presented in Table 4. These acreages are conceptual and may change following the development of final engineering plans by Poseidon or the USFWS.

Table 4. Habitat Acreages for the Otay River Floodplain Restoration Options – USFWS 2006.

Restoration Option	Habitat Type (acres)					
	Tidally-influenced Wetlands			Freshwater Wetlands		Uplands
	Mudflat (50%)	Cordgrass (30%)	Pickleweed (20%)	Marsh	Riparian	
Option 1	31	19	13	6	13	61
Option 2	44	26	18	12	5	38

Potential Impacts to Existing Habitats.

According to the CCP/EIS, creation of intertidal wetlands at the Otay River Floodplain would impact up to 6 acres of intertidal habitat, 3 acres of freshwater marsh and up to 130 acres of uplands, primarily old agricultural fields. However, a refined restoration plan may reduce those anticipated impacts.

Land Ownership The approximately 2,300-acre South San Diego Bay Unit, including the Otay River Floodplain Subarea, is leased to the USFWS by the State Lands Commission.

Ease of Compliance with California Coastal Commission Objectives and Criteria. Selection of the San Diego Wildlife Refuge as a mitigation site holds potential for compliance with CCC objectives and goals. The American Bird Conservancy has designated the South San Diego Bay Unit as a Globally Important Bird Area due to the presence of globally significant populations nesting gull-billed terns, and continentally significant populations of surf scoters, Caspian terns and western snowy plovers. The entire southern end of San Diego Bay has been recognized as a Western Hemisphere Shorebird Reserve Network Site. Given that the CCC criteria are likely to include very stringent success criteria for bird species, the use of this area by significant populations of wetland bird species is beneficial in meeting those criteria.

The South Bay's shallow subtidal habitat also supports a group of twelve species of fish that are indigenous to the bays and estuaries of the Southern California Bight. The extensive shallow water habitat and eelgrass beds of the South Bay provide important habitat for these and a variety of other fish, including midwater, schooling fishes, such as northern anchovies, slough anchovies, and topsmelt. These species, in turn, represent a major forage resource for predatory fish and avian species. The warmer, hypersaline waters of the South Bay also offer shelter for a number of fish species commonly encountered further south in the Eastern Subtropical and Tropical Pacific. The south end of San Diego Bay also appears to function as an important nursery area for juvenile California halibut and young spotted and barred sand bass. Thus, compliance with objectives regarding fish populations appears to be attainable.

Restoration of the Otay River Floodplain Subarea to intertidal wetlands would restore areas that were formerly mapped as intertidal mudflats and salt marsh (1852 U.S. Coast Survey map and 1859 Survey of the Coast of the United States, Coastal Survey Office). Thus, the potential for successful restoration is high.

SAN DIEGUITO LAGOON

Wetland restoration planning at San Dieguito Lagoon has been on-going since the late 1970s when the City of Del Mar and the Coastal Conservancy prepared a plan for revitalizing and managing the lagoon and surrounding areas. As a result of that effort, the City of Del Mar adopted the San Dieguito Lagoon Resource Enhancement Program in 1979. In 1983, a portion of the enhancement plan was implemented with dredging of a 70-acre tidal lagoon. In the 1991, the Coastal Commission adopted new operating conditions for the San Onofre Nuclear Generating Station (SONGS) Units 2 and 3 operated by Southern California Edison (SCE). These conditions required SCE to restore 150 acres of tidal wetlands as mitigation for impacts to the marine environment from operation of SONGS units 2 and 3. The Coastal Commission identified eight potential wetland mitigation sites, including San Dieguito Lagoon, as potential mitigation sites, ultimately selecting San Dieguito Lagoon in 1992. In 2000, the San Dieguito Wetland Restoration EIR/EIS was competed. That document was based on the final Coastal Commission conditions that SCE submit a plan for a total of 150 acres of credit, including creation or substantial restoration of 115 acres of tidal wetland with up to 35 acres credit for perpetual maintenance of the tidal inlet of the lagoon. SCE began construction of the restoration project in 2006.

In 2007, Poseidon Resources identified San Diegutio Lagoon as a potential site to mitigate for impacts to the marine environment from the proposed operation of its Carlsbad Desalination Plant in Carlsbad, California. Conceptual plans for approximately 42 acres of tidal wetland creation were developed and submitted to the Coastal Commission pursuant to Poseidon's application for a Coastal Development Permit (see project location and figure 2 of the mitigation plan).

Despite developing a conceptual restoration plan, Poseidon ultimately rejected the San Diegutio Lagoon restoration site following unsuccessful negotiations with SCE. The San Dieguito River Park JPA has adopted a Memorandum of Understanding with Caltrans District 11 and SANDAG for restoration of the property.

Status of Existing Plans. The San Dieguito Lagoon Wetland Restoration Plan Element of the Marine Life Mitigation Plan for the Carlsbad Desalination Plant, Carlsbad, California was prepared for Poseidon Resources in July 2008 (Nordby Biological Consulting et al. July, 2008). The wetland restoration plan included restoration of approximately 42 acres of tidal wetland that would have been biologically and hydraulically linked to the San Dieguito Wetland Restoration currently being constructed by SCE. Poseidon has abandoned plans to implement the restoration plan following unsuccessful negations with SCE.

Status of Environmental Documentation. The need for a project-specific EIR was been identified; however, due to the conceptual nature of the wetland restoration plan and the uncertainty of the project, preparation of the EIR has not been initiated.

San Dieguito Lagoon

2006 Aerial

File Name: n:\2609\mxd\2609-2006_aerial.mxd
Date: 01/14/07
Source: Aerial - AlphotoUSA 2006

0 75 150 Feet

NORTH

PROJECT DESIGN CONSULTANTS

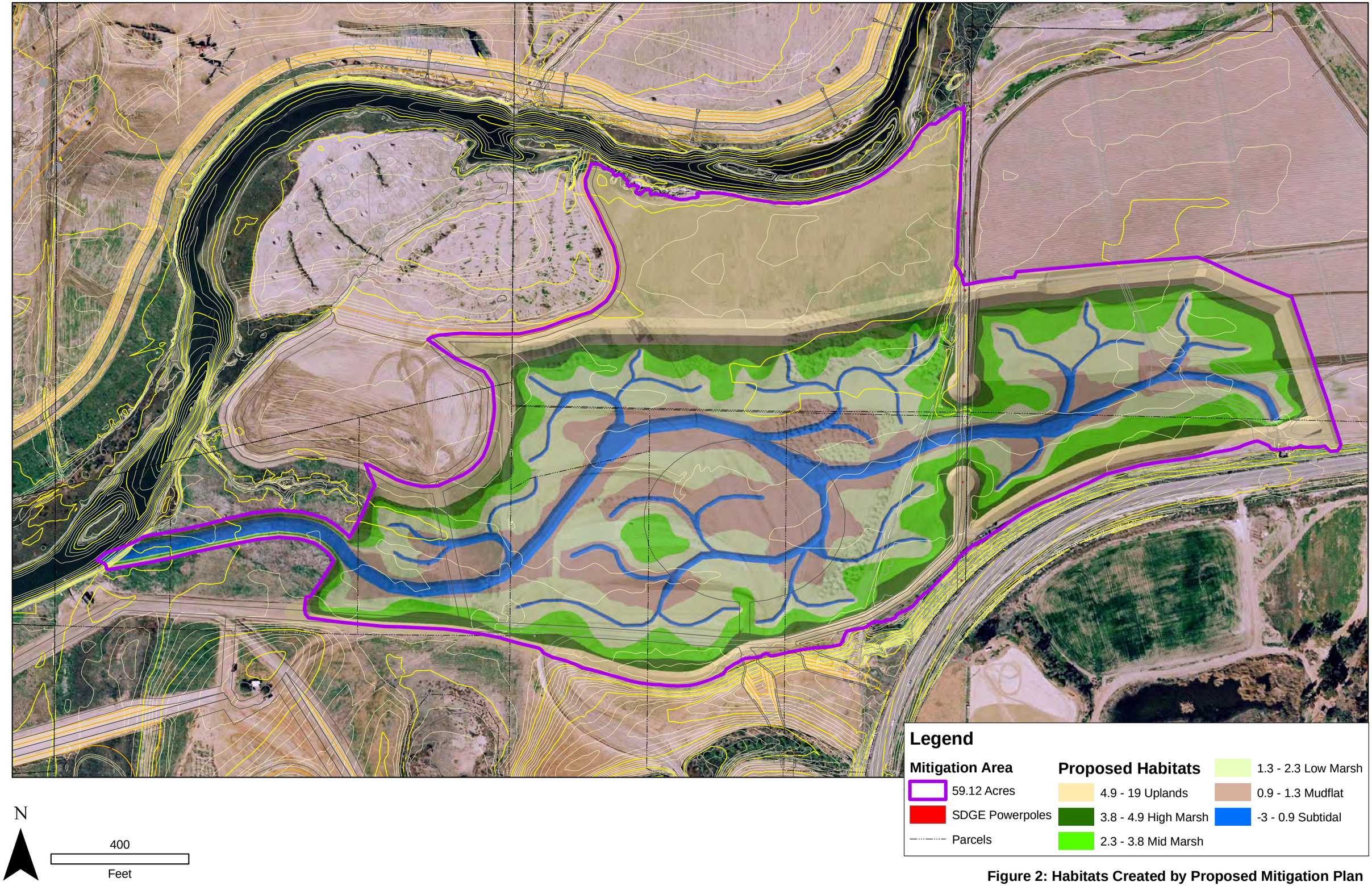


Figure 2: Habitats Created by Proposed Mitigation Plan

Status of Required Permits. The following permits will be required prior to project approval and implementation:

- City of San Diego Site Development Permit
- U.S. Army Corps of Engineers Section 404 permit;
- Regional Water Quality Control Board Section 401 Water Quality Certification;
- California Department of Fish and Game Streambed Alteration Agreement;
- California Coastal Commission Coastal Development Permit;
- U.S. Fish and Wildlife Service Section 7 Federal Endangered Species Act Consultation.
- San Diego County Air Pollution Control District dredge operation permit.

Due to the conceptual nature of the wetland restoration plan and the uncertainty of the project, no applications for permits have been submitted.

Habitat Distribution. The 2008 restoration plan would result in the creation of approximately 42 acres of tidally-influenced coastal wetland habitat. All created wetland habitats would be below 4.9 feet NGVD, the estimated Mean Higher High Water level. The following habitats would be created:

- Subtidal (-3 to -0.9 feet NGVD) - 2.5 acres;
- Mudflat (-0.9 to +1.3 feet NGVD) – 14.4 acres;
- Low marsh (+1.3 to +2.3 feet NGVD) – 12.0 acres;
- Mid-marsh (+2.3 to +3.8 feet NGVD) – 7.3 acres;
- High Marsh (+3.8 to +4.9 feet NGVD) – 5.3 acres;

Potential Impacts to Existing Habitats. The proposed project would result in minimal impacts to existing biological resources. These include:

- 0.06 acre of *Sarcocornia pacifica*--dominated wetland at the point of hydraulic connection to the San Dieguito River;
- 0.12 acre of fresh/brackish marsh associated with a man-made drainage channel.

Land Ownership. The area proposed for the 42-acre restoration, as well as an additional 22 acres needed to convey flood flows, is owned by the San Dieguito River Park Joint Powers Authority (JPA). The JPA was a potential partner with Poseidon on the proposed restoration project;however, SCE asserted prior rights to the property, thereby rendering the project infeasible Currently, the JPA is a partner with Caltrans District 11 and SANDAG for restoration of the site.

Ease of Compliance with California Coastal Commission Objectives and Criteria. The potential for successful wetland restoration at the San Dieguito Lagoon site identified by Poseidon is dependent upon the success of the SCE restoration. The two projects would be physically linked, with the 42-acre site essentially an extension of the SCE site. Failure by SCE to provide the requisite tidal flushing through maintenance of the tidal inlet or failure to excavate or maintain the proposed elevations would negatively affect both restorations and ultimately prevent achievement of the stringent Coastal Commission success criteria.

AQUA HEDIONDA LAGOON

Aqua Hedionda Lagoon is located in the City of Carlsbad at the terminus of Aqua Hedionda and Macario creeks (see project location figure). The majority of the lagoon is owned and maintained by Cabrillo Power II, which operates the 900-megawatt Encina Power Station located on the outer basin of the lagoon. The lagoon was created in the early 1950s to provide the Encina plant with seawater for cooling. Poseidon's Carlsbad Desalination Plant (CDP) is located at Aqua Hedionda Lagoon with the intent of using Encina cooling water for desalination while Encina continues to operate.

The entire 400-acre lagoon was completely dredged in 1998-1999 to an average depth of 8 - 11 feet. An extensive eelgrass planting program was initiated after dredging. The City of Carlsbad regulates boating on portions of the inner lagoon, the YMCA operates a canoeing center, and two aquaculture facilities operate on the outer lagoon basin – a white seabass research facility managed by Hubbs/Seaworld and the CDFG, and a commercial mussel aquaculture farm. In 2000, CDFG acquired 186 acres at the eastern end of the lagoon, designated as an Ecological Reserve. The non-profit Aqua Hedionda Lagoon Foundation was founded in 1990 to help conserve, restore and enhance the resources of the lagoon.

In August 2007, Poseidon developed a Request for Expressions of Interest which was sent to a number of organizations associated with the Carlsbad Watershed Network in an attempt to identify mitigation opportunities for the CDP at Aqua Hedionda Lagoon. Three proposals were received as presented below.

1. Expansion of the Aqua Hedionda Lagoon Ecological Reserve. This project includes the acquisition and preservation of land north of the existing Ecological Reserve, primarily upland habitat.
2. Eradication of Invasive Exotic Plants and Restoration with Native Vegetation. This project was proposed by the Aqua Hedionda Lagoon Foundation.
3. Aqua Hedionda Lagoon Abalone Stock Enhancement. This project proposed creation of a 100,000 abalone stock at the Carlsbad Aquafarm and use of this stock to replenish abalone populations near the lagoon.

It was determined that none of the proposed projects meet the goals and objectives of the Coastal Commission, i.e., restoration of 66 intertidal wetland habitats. On May 1, 2008, the Coastal Commission convened a day-long meeting at the Aqua Hedionda Lagoon Foundation Discovery Center that included participants from the California Department of Fish and Game, the Regional Water Quality Control Board, Caltrans, the State Lands Commission, and the cities of Carlsbad and Vista. The purpose was to identify opportunities for wetland restoration in Aqua Hedionda Lagoon that could serve as mitigation for the Carlsbad Desalination Plant. This effort failed to identify any suitable mitigation opportunities within the lagoon.

Status of Existing Plans. Currently there are no restoration plans that meet the goals and objectives of the Coastal Commission.

Aqua Hedionda Lagoon

Status of Supporting Studies. Not applicable.

Status of Environmental Documentation. None.

Status of Required Permits. None.

Habitat Distribution. Not applicable.

Potential Impacts to Existing Habitats. Not applicable.

Land Ownership. CDFG owns the 186-acre Ecological Reserve. Cabrillo Power II owns the remainder of the lagoon.

Ease of Compliance with California Coastal Commission Objectives and Criteria. Currently, there are no restoration plans that meet the goals and objectives of the Coastal Commission.

SAN ELIJO LAGOON

Restoration planning at San Elijo Lagoon has been on-going in various forms for many years. In 1996, the San Elijo Lagoon Area Enhancement Plan was prepared by the San Diego County Department of Parks and Recreation. In 1998, the San Elijo Lagoon Action Pan was prepared by the San Elijo Lagoon Conservancy. In 2001, a restoration assessment of three alternatives was undertaken. The San Elijo Lagoon Inlet Relocation Plan (Coastal Environmental 2001) examined restoration, including the infrastructure improvements, required to implement three alternative restoration projects. In 2006, the U.S. Army Corps of Engineers prepared the San Elijo Lagoon Optimization Study which included detailed analysis of a selected restoration for the lagoon. This plan was rejected by the resource agencies for not providing analysis of restoration alternatives to the selected restoration plan.

Recently (October 2009) SANDAG and the Coastal Conservancy co-funded the San Elijo Lagoon Restoration Project EIR. Project alternatives are being developed for engineering and environmental analysis.

Status of Existing Plans. Thus, there is currently no accepted plan for restoration at San Elijo Lagoon. Project alternatives are under development pursuant to the San Elijo Lagoon Restoration Project EIR. These are presented in the figures below.

Status of Environmental Documentation. A project EIR is in the initial stages of development projected for completion in 2011.

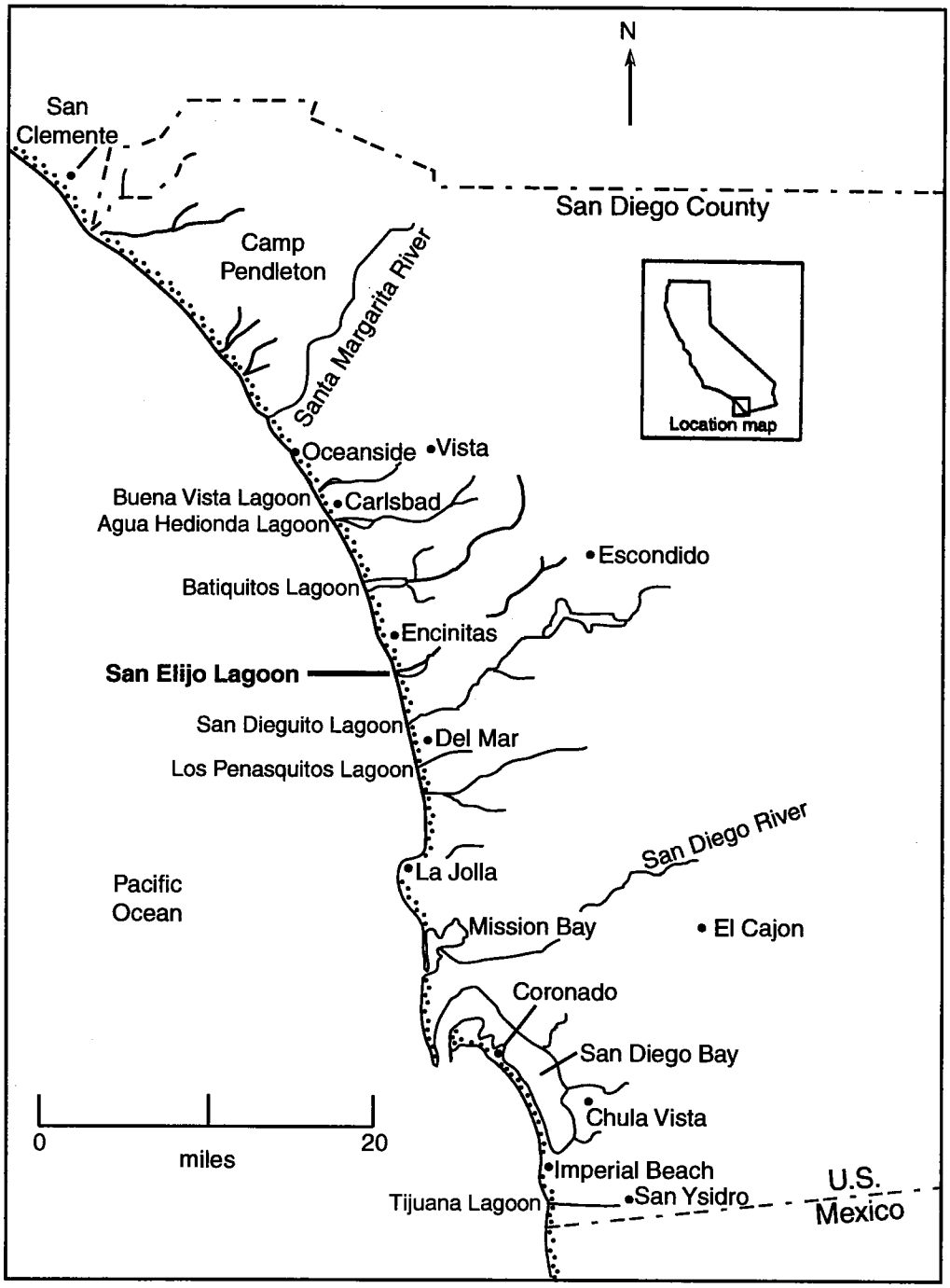


Figure 1-1. Location map of San Elijo Lagoon.

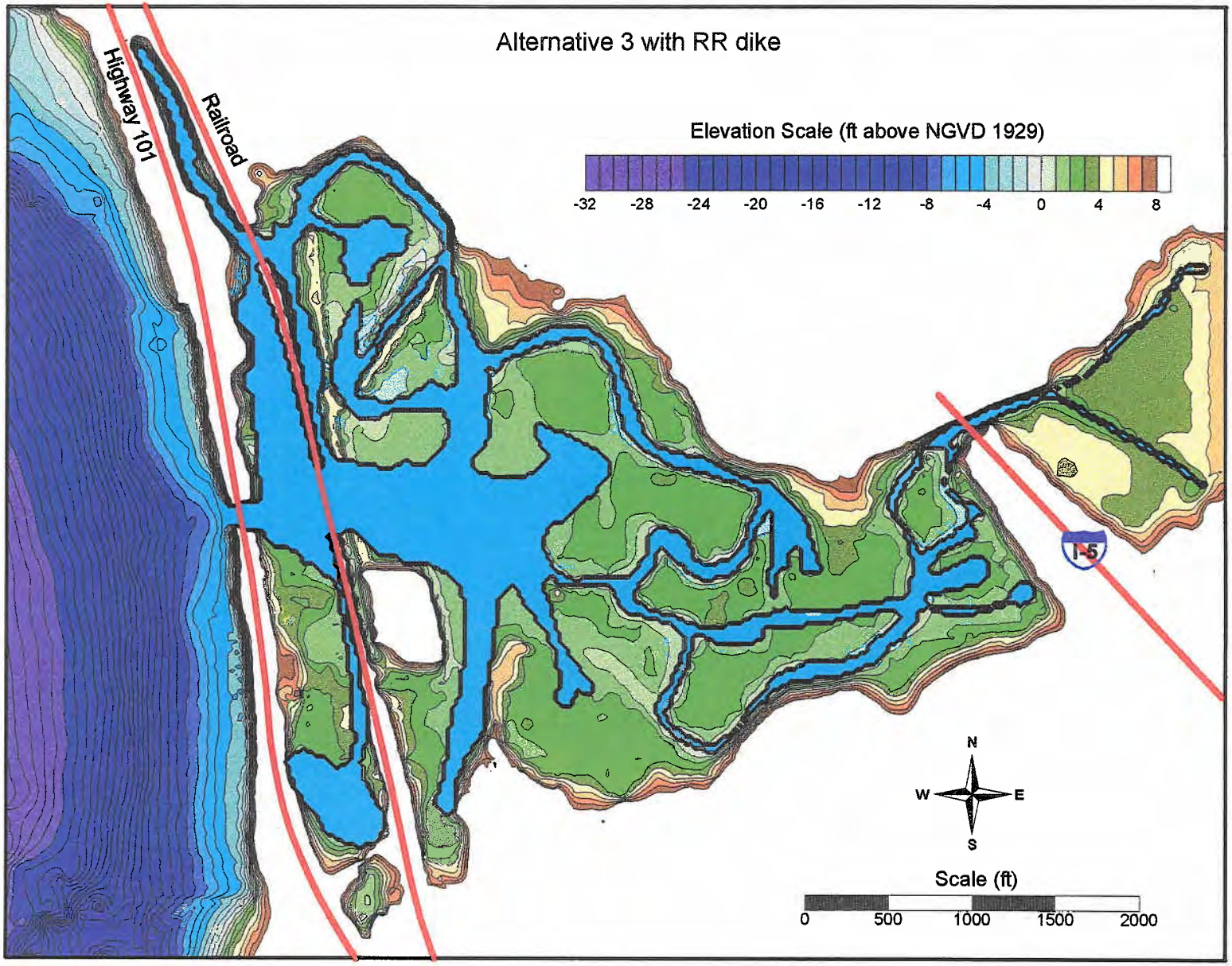


Figure B-5. Lagoon bathymetry after dredging for lagoon inlet Alternative 3 with railroad berm left in place.

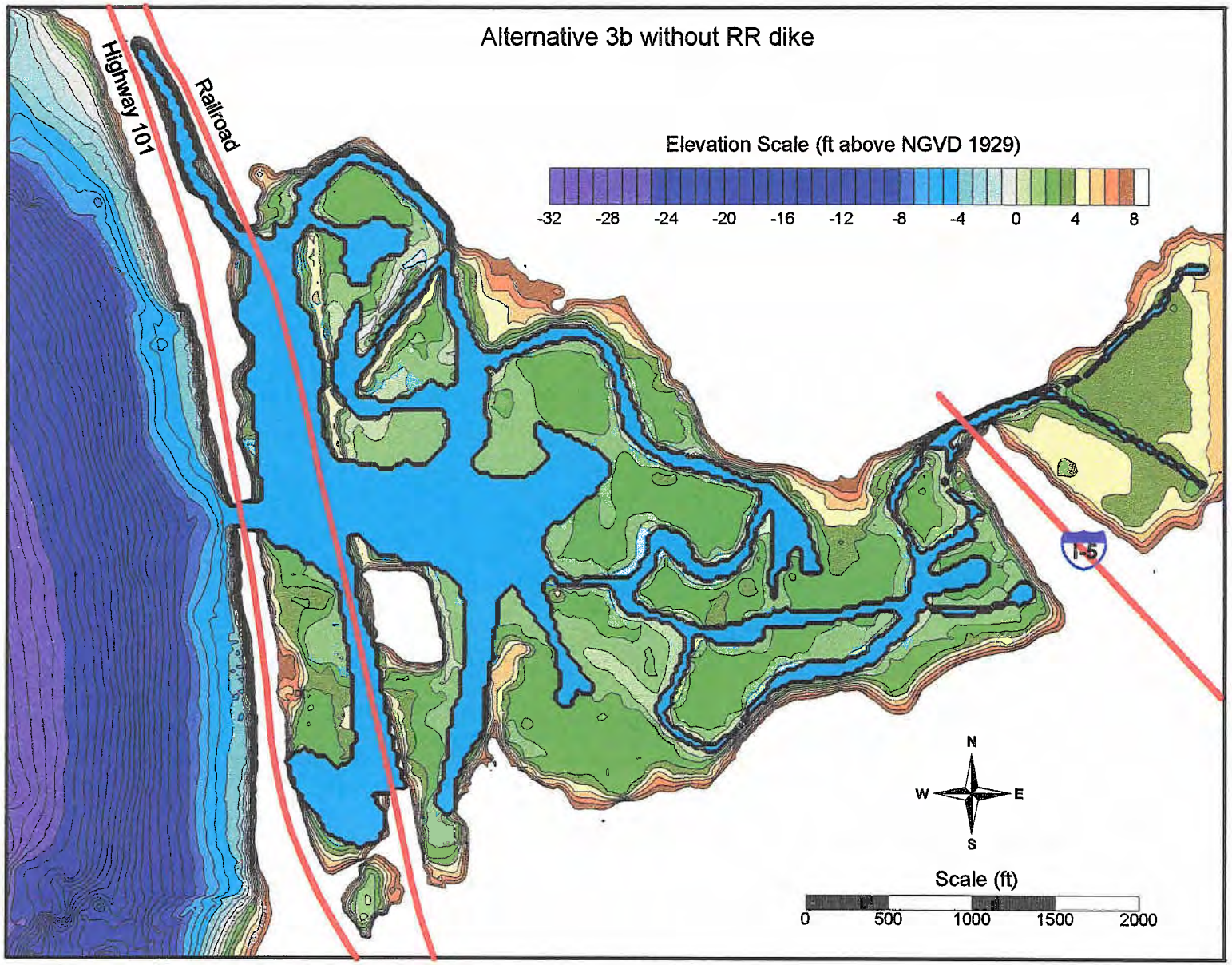


Figure B-6. Lagoon bathymetry after dredging for lagoon inlet Alternative 3 with railroad berm removed.

Status of Required Permits. Nine permits were identified in the 2001 restoration plan. Given the developmental stage of the project EIR, no action has been taken on these permits which include:

- San Diego Regional Water Quality Control Board Section - 401 Water Quality Certification,
- California Coastal Commission Coastal Development Permit;
- California State Lands Commission Application for Lease of State Lands;
- California Department of Fish and Game Streambed Alteration Agreement;
- U. S. Army Corps of Engineers – Sections 10 and 404 permits
- U.S. Fish and Wildlife Service Section 7 Consultation
- U.S. Environmental Protection Agency Concurrence with NEPA 404 Integration Process;
- U.S. National Marine Fisheries Service Concurrence with NEPA 404 Integration Process;
- State Historic Preservation Office compliance with Section 106 of the National Historic Preservation Act.

Habitat Distribution and Potential Impacts to Existing Habitats. The project EIR is currently in the developmental stages and final habitat distributions and associated impacts are not yet available.

Land Ownership. The CDFG and San Diego County Parks and Recreation Department are the primary land owners, but several small parcels remain in private ownership.

Ease of Compliance with California Coastal Commission Objectives and Criteria. San Elijo Lagoon, with its current inlet location and configuration, is periodically closed to regular tidal inundation and requires mechanical removal of sand and cobble. In order to ensure regular tidal flushing, the inlet must be moved or reconfigured in its existing location. Without such actions, the mouth will continue to close periodically, resulting in the need for continued maintenance. The inlet is currently constricted by the railroad which crosses the lagoon on an approximately 3,600-foot-long earthen berm. In order to increase tidal flushing to the west, central and east basins, either a portion of the berm must be removed and replaced with a bridge built on pilings, or several large-diameter culverts must be installed in the berm. Currently, the lagoon is very shallow and is filled with sediment accumulated from the watershed. Restoration of shallow subtidal area will require dredging and disposal of this sediment, much of which is unsuitable for ocean disposal and would require upland disposal. The uncertainty of dredge disposal and continuing sedimentation from upstream sources makes compliance with the specific CCC objectives and criteria uncertain. To date, there is no accepted plan for restoration. There is currently no projected time frame for implementing restoration.

BUENA VISTA LAGOON

Buena Vista Lagoon is located between the cities of Oceanside and Carlsbad in San Diego County. The lagoon is comprised of four basins as a result of road and railroad crossings. Constriction of tidal flows associated with these crossing in conjunction with increased sedimentation from upstream sources and decreased water quality has resulted in a degraded freshwater lagoon. A concrete weir built across the ocean inlet in 1972 controls the minimum water level in the lagoon.

The problem of accelerated sedimentation in the lagoon was acknowledged as early as the 1970s. In 1982, the Coastal Conservancy initiated a sediment control program in the lagoon's watershed. In 1983, a Joint Powers Committee, consisting of the cities of Ocean side, Carlsbad and Vista was established and a project to excavate sediment from the eastern end of the lagoon was undertaken. The Southern California Wetland Recovery Project funded the Buena Vista Lagoon Restoration Feasibility Analysis which was completed in 2004 (Everest International Consultants, 2004). The restoration feasibility analysis identified three primary restoration alternatives: the Freshwater Alternative; the Salt Water Alternative; and, the Mixed Water Alternative (see figures 1-1 and 5-3 of the feasibility analysis).

Status of Existing Plans. A restoration feasibility study was completed March 2004 with funding from the Coastal Conservancy. Three restoration alternatives were identified that would result in a range of restored tidal wetlands from 0 to 180 acres.

Status of Environmental Documentation. In 2007, the USFWS and CDFG issued a Notice of Intent to prepare an EIS. The Salt Water alternative was identified as the preferred alternative and the Freshwater Alternative and Mixed Water Alternative were identified as alternatives considered but rejected. A contractor was selected and work on the EIS was initiated; however, work on that document was halted and there is currently no environmental documentation for the proposed restoration.

Status of Required Permits. The following permits will be required prior to project approval and implementation

- U.S. Army Corps of Engineers Section 404 permit;
- U.S. Fish and Wildlife Service Section 7 Consultation;
- Regional Water Quality Control Board Section 401 Water Quality Certification;
- California Department of Fish and Game Streambed Alteration Agreement;
- California Coastal Commission Coastal Development Permit;
- San Diego County Air Pollution Control District dredge operation permit.

Due to the conceptual nature of the restoration feasibility plan, no applications for permits have been submitted.

Habitat Distribution. Due to the conceptual nature of the feasibility analysis, the individual habitats created under each alternative were not delineated. Rather, the hydrologic regime (freshwater, salt water, mixed water) of each alternative was evaluated.

Figure 1.1 Project Location

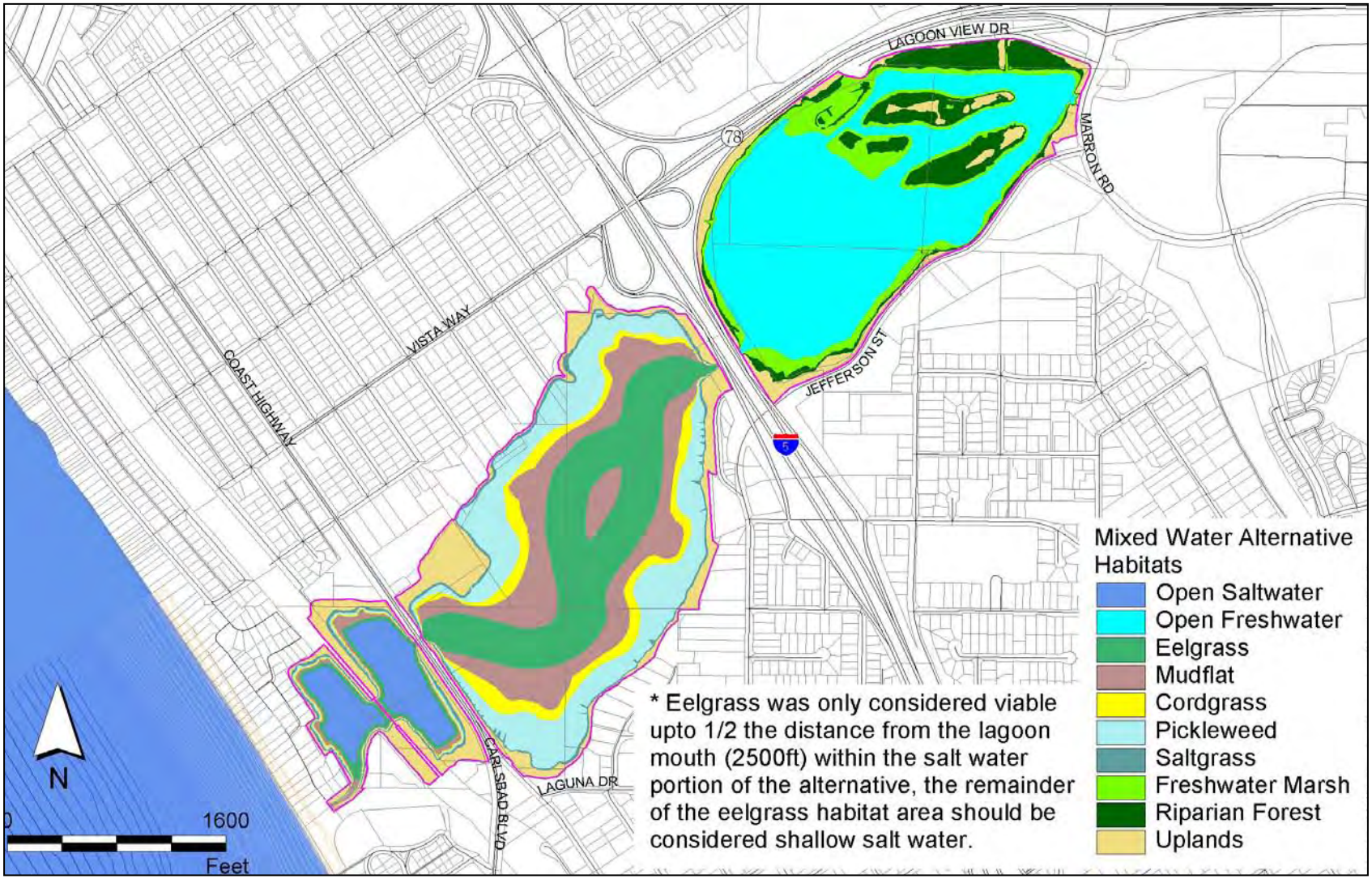


Figure 5.3 Habitat Distribution for the Mixed Water Alternative (Alternative 3) with Hydraulic Connection Scenario 2

Potential Impacts to Existing Habitats. The Freshwater Alternative would impact approximately 91 acres of freshwater wetlands and open water and associated soft bottom habitats. The Salt Water Alternative would impact approximately 226 acres of similar habitat. The Mixed Water Alternative would impact approximately 148 acres of open water, freshwater marsh and associated soft bottom habitat.

Land Ownership. The majority of the lagoon is owned and managed by the California Department of Fish and Game. However, various municipalities and private in-holdings complicate the restoration potential.

Ease of Compliance with California Coastal Commission Objectives and Criteria. The feasibility study completed in 2004 does not identify a preferred alternative, even on a conceptual basis of fresh water habitats versus salt water habitats. In the NOI for preparing the EIS, the USFWS and CDFG identified the Salt Water Alternative as the preferred alternative. However, preparation of the document was halted. Thus, the uncertainty associated with the preferred restoration alternative compromises the ability to comply with the requirements of the CCC. Two of the alternatives – the Freshwater Alternative and the Mixed Water Alternative – would not comply with the CCC requirements that tidally wetlands be created as mitigation. None of the alternatives comply with the Coastal Commission requirement that Poseidon's mitigation not impact existing wetlands. With the competing interests of public, resource agencies and other stakeholders, a preferred alternative may not be selected within the time frame set forth in the MLMP. Restoration of Buena Vista Lagoon will require dredging and disposal of millions of cubic yards of material, much of which will require upland disposal. Infrastructure in the form of road and railroad bridges will have to be modified to increase tidal influence to basins east of the ocean inlet. The restoration alternatives do not identify phasing where discrete units of restoration could be implemented. Thus, in its current form, the feasibility study is not likely to meet CCC criteria and objectives. As presented previously, the Regional Water Quality Control Board's approval of the MLMP required that Poseidon consider only wetlands located in San Diego County as potential mitigation sites. Restoration opportunities outside of San Diego County cannot be considered unless all opportunities within the county are determined to be infeasible. In accordance with the MLMP approved by the Coastal Commission prior to approval by the RWQCB, restoration opportunities at wetlands located in Orange, Los Angeles and Ventura counties are presented below.

HUNTINGTON BEACH WETLANDS

Wetland restoration planning at Huntington Beach Wetlands began in the mid-1980s with the inception of the Huntington Beach Wetlands Conservancy (HBWC). The HBWC and the California State Coastal Conservancy collaborated on the restoration of the 27-acre Talbert Marsh, a portion of the Huntington Beach Wetlands, in 1990. In 2005, a report entitled Development and Analysis of Restoration Alternatives was prepared for the HBWC and Coastal Conservancy (Moffatt & Nichol et al. 2005). In 2006, the same authors produced the Huntington Beach Wetlands Conceptual Restoration Plan that identified the preferred restoration plan. A Mitigated Negative Declaration for HBWC-owned lands was prepared

pursuant to CEQA in December 2007 and was adopted by the County of Orange in January 2008.

Huntington Beach Wetlands consist of Talbert Marsh (27 acre), Brookhurst Marsh (67 acres), Magnolia Marsh, including Upper Marsh (43 acres), and Newland Marsh (54 acres). As stated previously, Talbert Marsh was restored in 1990, although there has been some sediment deposition issues at the restored marsh, which is located at immediately east of the mouth of the Santa Ana River and is connected to the ocean via Talbert Ocean Channel. Talbert Ocean Channel is a manmade tidal inlet protected by armored jetties. Brookhurst Marsh was restored in 2008. The Magnolia Marsh component of Huntington Beach Wetlands is currently under construction (December 2009). Newland Marsh is the only component of the system that has not been restored. Newland Marsh is owned by the California Department of Transportation (Caltrans) and is not currently available for restoration by another entity; however, for the purposes of this analysis Newland Marsh is considered a potential site for Poseidon's mitigation requirements.

Status of Existing Plans. A conceptual restoration plan was completed April 10, 2006. A preferred restoration alternative was identified that included a total of 191 acres with approximately 54 acres of muted tidal wetlands planned for Newland Marsh see figures 1 and 3 of the conceptual restoration).

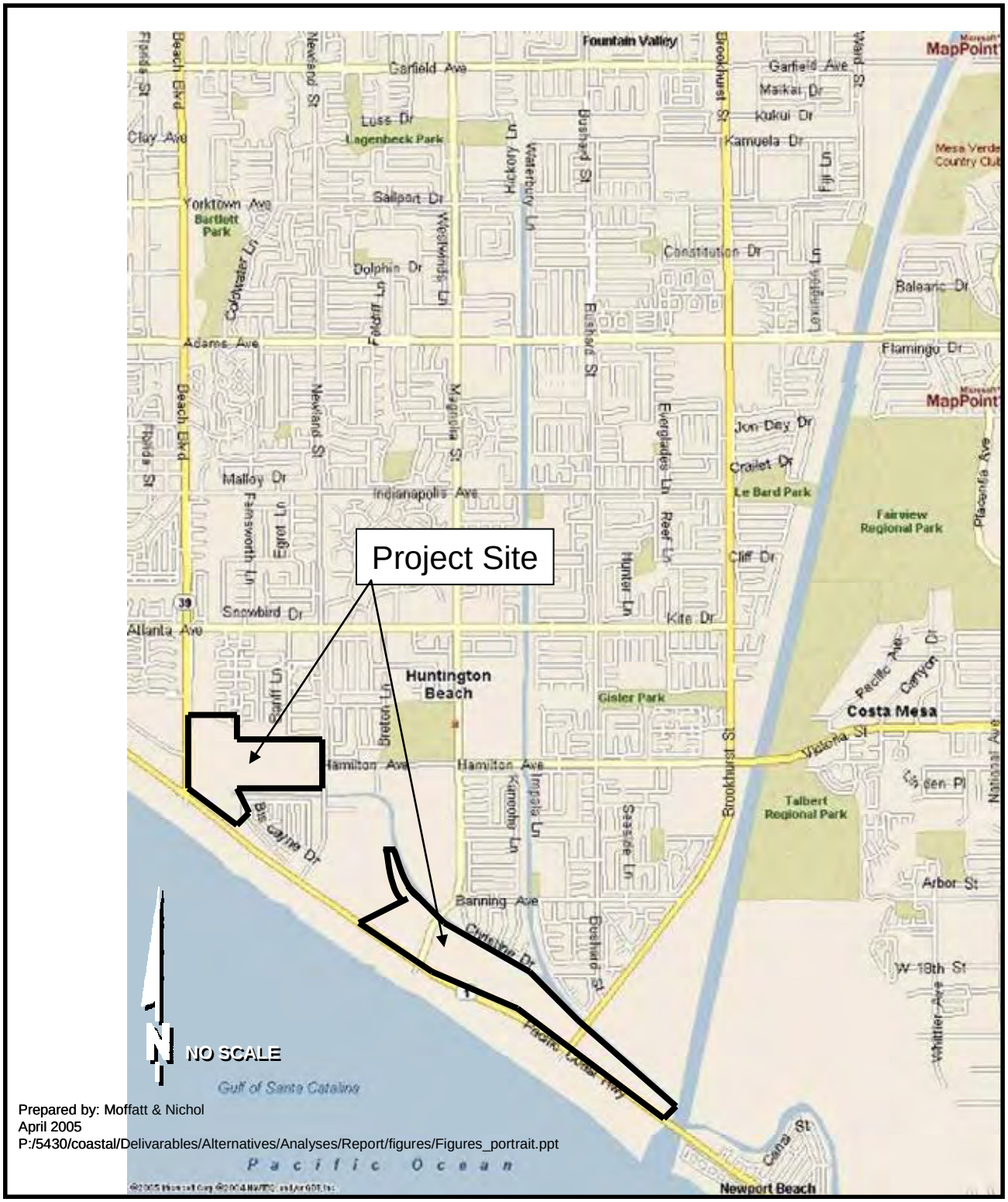
Status of Environmental Documentation. A Mitigated Negative Declaration for all HBWC-owned lands was prepared by the County of Orange in December 2007 and was adopted in January 2008. This MND did not include Newland Marsh, which is owned by Caltrans.

Status of Required Permits. Eight permits were identified in the conceptual restoration plan:

- City of Huntington Beach – Coastal Development Permit
- County of Orange Flood Control Agency - Encroachment Permit
- Regional Water Quality Control Board Section - 401 Water Quality Certification, Dewatering Permit;
- California Department of Parks and Recreation Encroachment Permit;
- California Coastal Commission Coastal Development Permit;
- California State Lands Commission Encroachment Permit;
- California Department of Fish and Game Streambed Alteration Agreement;
- U. S. Army Corps of Engineers – Sections 10 and 404 permits

All permits for restoration of HBWC-owned lands had been obtained at the time of the preparation of this document.

Figure 1 – Project Location Map



Huntington Beach Wetlands Conceptual Restoration Plan – Final Report	Project Location Map	Figure 1

Figure 3 – The Proposed Project

Prepared by: Merkel & Associates
April 2005
P:/

Huntington Beach Wetlands Conceptual Restoration Plan
Revised Final Report

The Proposed Project

Figure 3

Habitat Distribution. The distribution of habitats in the restored Newland Marsh is presented in Table 5.

Table 5. Existing and Proposed Conditions, Newland Marsh, Huntington Beach Wetlands, 2006.

Habitat Type	Existing Habitats (acres)	Proposed Habitats (acres)
Shallow Subtidal	10.0	10.7
Mudflat	0.0	6.1
Low Salt Marsh	0.0	5.4
Mid Salt Marsh	18.9	20.6
High Salt Marsh	0.0	3.3
Non-tidal Wetlands	20.6	0.0
Uplands	4.7	8.0
Total	54.2	54.2

Potential Impacts to Existing Habitats. The conceptual plan developed for Newland Marsh would require installing culverts to provide muted tidal influence, enlarging existing channels and creating new channels, and installing protective levees. Creating and enlarging channels would impact an undetermined area of existing non-tidal wetlands.

Land Ownership. Newland Marsh is owned by Caltrans.

Ease of Compliance with California Coastal Commission Objectives and Criteria. The Huntington Beach Wetlands, including Newland Marsh, are linear remnants of a formerly more extensive wetland area. They are bounded to the west by the Pacific Coast Highway and are crossed by surface streets. Thus, the wetlands are fragmented into the respective marsh components. Restoration of linear fragments of degraded wetlands may not meet the stringent standards imposed by the Coastal Commission. Furthermore, only muted tidal action will be introduced to Newland Marsh such that higher high tides and lower low tides will not be conveyed through the culverts. Muted tidal influence is suboptimal for wetland restoration.

The restoration will disturb existing non-tidal wetland habitat**.** Thus, Coastal Commission objectives and criteria requiring no impacts to exiting wetlands are not achievable. The site is owned by Caltrans and is not currently available for restoration by other entities.

ANAHEIM BAY

Anaheim Bay is located within the city limits of Seal Beach and Huntington Beach in Orange County. There are approximately 956 acres of wetland habitats associated with the Bay, nearly all of them contained within Seal Beach National Wildlife Refuge located within the boundaries of the Seal Beach Naval Weapons Station (see aerial photograph). Approximately 740 acres of the Wildlife Refuge are subject to regular, unobstructed tidal influence, including 565 acres of salt marsh, 60 acres of intertidal mudflats, and 115 acres of tidal channels and open water. In 1990, approximately 116 acres of wetlands adjacent to the Seal Beach National Wildlife Refuge were restored at Anaheim Bay as mitigation for impacts associated with construction of a 147-acre landfill at the Port of Long Beach.

Seal Beach National Wildlife Refuge in Anaheim Bay.

In 2007, the U.S. Fish and Wildlife Service (USFWS) published a Notice of Intent to prepare a Comprehensive Conservation Plan (CCP) for the refuge. The CCP is intended to act as a "blueprint" for management of the Refuge over the next 15 years. In August 2008, the USFWS published an update on the CCP. That update presented three draft alternatives for the CCP:

- Alternative A – No Action;
- Alternative B – Maximum Salt Marsh Restoration, Continue Current Public Use Program;
- Alternative C – Optimize Upland and Wetland Restoration, Improve Opportunities for Wildlife Observation (Preferred Alternative).

Under Alternative C, the preferred alternative, approximately 10 acres of coastal sage scrub habitat, 15 acres of wetland/upland transition habitat, and 8 acres of salt marsh would be restored. The selection of Alternative C as the preferred alternative is considered a draft decision, subject to a final decision during public review of the draft document.

Status of Existing Plans. Not available, pending completion of the CCP.

Status of Supporting Studies. Not available, pending completion of the CCP.

Status of Environmental Documentation. Not available. The CCP will be prepared as a joint CCP/Environmental Assessment (EA) pursuant to the national Environmental Protection Act (NEPA).

Status of Required Permits. Not available.

Habitat Distribution: Under the draft CCP, 10 acres of coastal sage scrub habitat, 15 acres of wetland/upland transition habitat, and 8 acres of salt marsh would be restored.

Potential Impacts to Existing Habitats. Not available.

Land Ownership. U.S. Navy.

Ease of Compliance with California Coastal Commission Objectives and Criteria.
The preferred alternative of the CCP includes restoration of approximately 8 acres of salt marsh, although it is not specified whether this restoration will be tidal or non-tidal. Regardless, restoration of 8 acres is not sufficient to meet Poseidon's mitigation requirements.

SANTA ANA RIVER

The Santa Ana River wetlands are located south of the Huntington Beach Wetlands across the Santa Ana River mouth. The area consists of approximately 170 acres of wetlands situated in four main sites within the greater Santa Ana River wetlands complex. It is estimated that the historic acreage of wetlands at the mouth of the river was 2,900 acres. The site has been degraded by agriculture, oil extraction activities and other human uses.

In 1987, the Marsh Restoration, Lower Santa Ana River Channel, Orange County, California (Simon Li & Associates 1987) was prepared for the U.S. Army Corps of Engineers (USACOE), Los Angeles District. The restoration plan identified three alternative restoration scenarios for a 92-acre portion of the wetlands owned by the USACOE. The restoration was subsequently implemented in 1989 as mitigation for biological impacts associated with the Lower Santa Ana River Improvement Project (see figure 1 of the restoration plan). In 1991, Orange County adopted an enhancement plan for South Talbert and Fairview/North Talbert parks, renamed Talbert Nature Preserve in 1995. In 1991, the Orange County Environmental Management Agency (OCEMA) developed a draft Local Coastal Plan (LCP) for restoration on land owned by Mobile Oil. OCEMA did complete processing of the LCP.

There have been no official wetland restoration plans formulated for the Santa Ana River Mouth wetlands since the 1990s. Any restoration activity at this site would require extensive study, land acquisition and infrastructure removal (primarily oil extraction infrastructure).

Status of Existing Plans. No current plan available.

Status of Environmental Documentation. Not available.

Status of Required Permits. Not available.

Habitat Distribution. Not available.

Potential Impacts to Existing Habitats. Not available.

Land Ownership. Restorable wetlands located to the north and east of the 92-acre restored site owned by Newport Oil Company.

Ease of Compliance with California Coastal Commission Objectives and Criteria. Given that there are no existing plans to restore additional habitat at the Santa Ana River mouth, compliance with CCC objectives and criteria cannot be evaluated at this time.

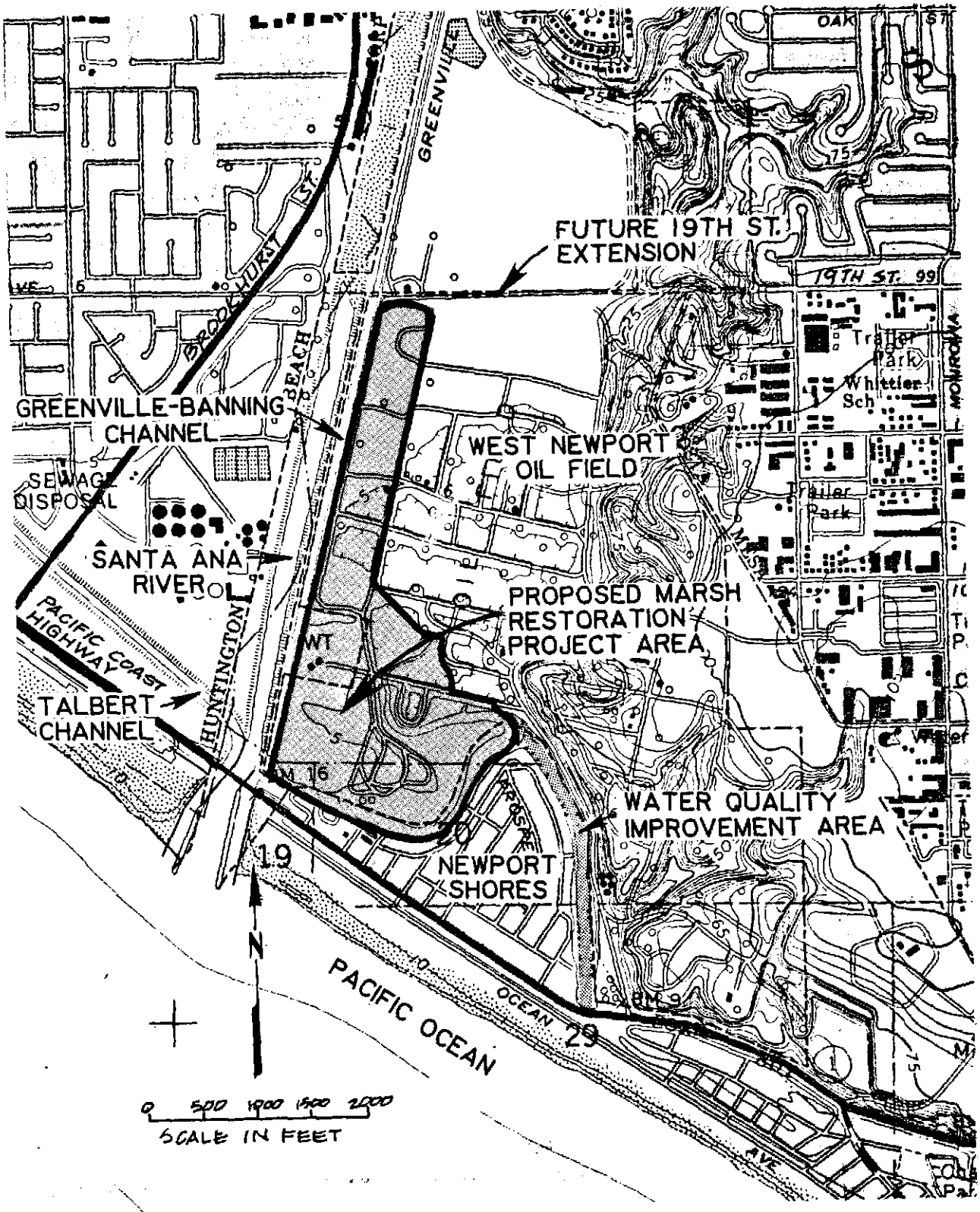


Figure 1 Project Vicinity

LOS CERRITOS WETLANDS

Los Cerritos Wetlands is a degraded relic wetland area flanking the lower San Gabriel River in Los Angeles County. A number of stakeholders have been involved with restoration planning of these wetlands. In 2006, a joint powers agreement was adopted to form the Los Cerritos Wetlands Authority (LCWA). This JPA consists of the City of Long Beach, the City of Seal Beach, Rivers and Mountains Conservancy, and the California State Coastal Conservancy. In 2005, a conceptual restoration plan for approximately 496 acres was prepared by Moffat & Nichol for California Earth Corps, a local stakeholder. The restoration plan includes primarily conceptual-level engineering and hydrology, but does not include analysis of biological resources or other resources.

Status of Existing Plans. A conceptual level restoration plan was prepared for approximately 496 acres. The conceptual restoration plan identifies three phases: Phase I (171.9 acres); Phase II (137 acres); and Phase 3 (187.2 acres) (see figures 1 and 5 of the conceptual restoration plan).

Status of Environmental Documentation. No Environmental Documentation is available. A CEQA document, presumably an EIR, would be required at the state level. Federal funding may require an analogous NEPA document.

Status of Required Permits. The permits required for restoration were not identified in the conceptual restoration plan. Permit requirements would be similar to those identified for Ormond Beach.

Habitat Distribution. The conceptual plan does not specify acreages of habitats to be created. Of the approximately 496 acres included in the restoration plan, potentially 25% (124 acres) would be restored as subtidal habitat; 55% (273 acres) as intertidal wetlands; and 20% (99) acres a supratidal habitat located above the mean high tide line. However, these numbers are conceptual only.

Land Ownership. Land ownership at Los Cerritos Wetlands is complicated and has been an impediment to a unified restoration strategy. The conceptual restoration plan identifies the following owners of the 496-acree planning area:

- 193 acres owned by Hellman Partners;
- 193 acres owned by Bixby Company ;
- 67 acres owned by Ernest Bryant;
- 38 acres owned by County of Orange;
- 5 acres owned by Los Alamitos Partners.

In 2006, the LCWA purchased the 67 acres owned by Ernest Bixby. On November 12, 2008, the Los Angeles (LA) Times reported that this land had been traded in a land swap to the City of Long Beach. The article quoted City of Long Beach officials as stating that this area would be set aside for restoration. On November 17, 2009, the LA Times reported that, through continued negotiations, the amount of land offered as a land swap had been reduced;

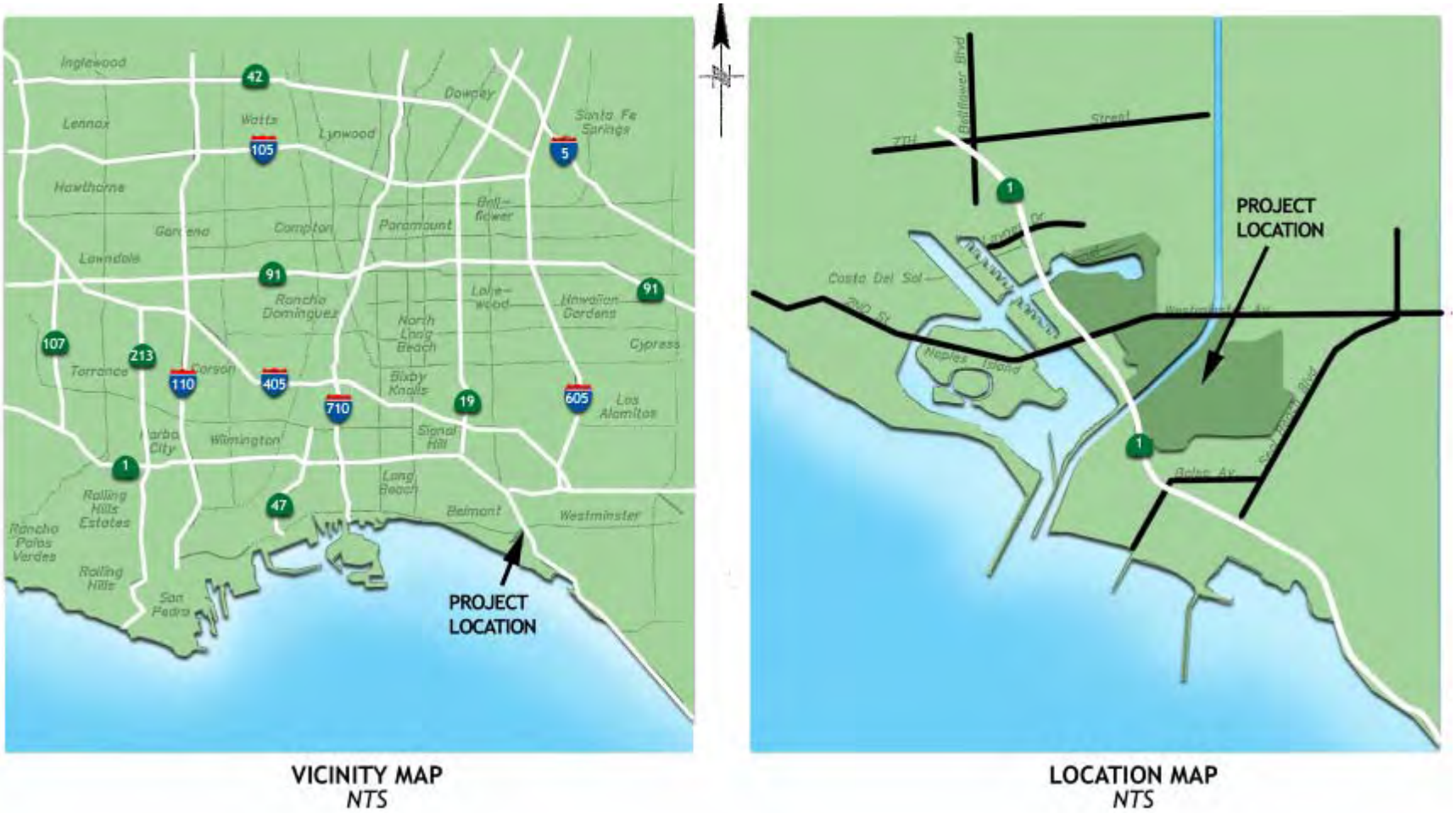


Figure 1 – Project Location

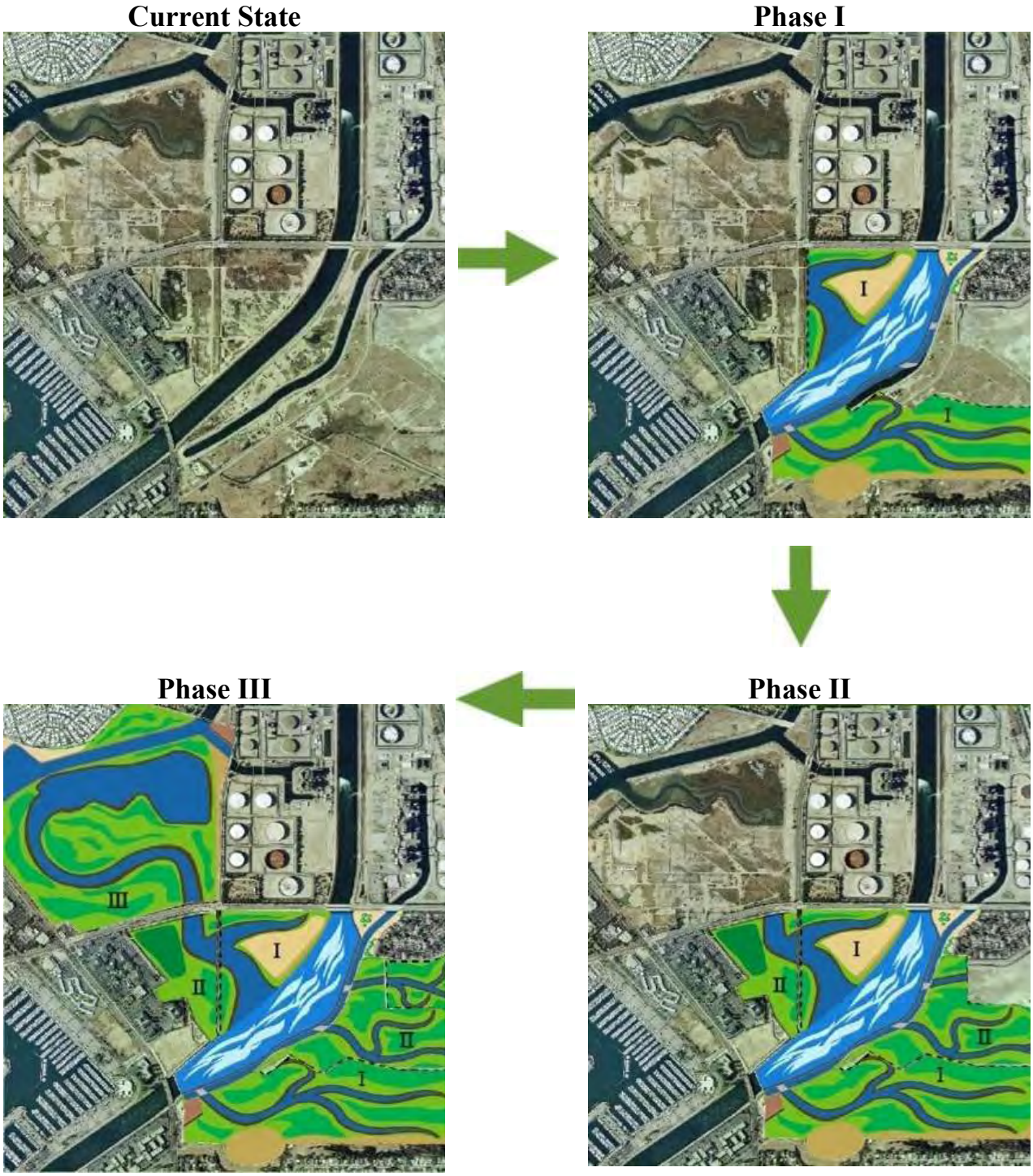


Figure 5. Los Cerritos Wetlands Conceptual Restoration Plan.

first to 52 acres, then to 38 acres, and that very high levels of PCBs had been detected within that 38-acre parcel. The presence of high levels of PCBs jeopardizes any restoration plans for this site.

Ease of Compliance with California Coastal Commission Objectives and Criteria. The presence of high levels of PCBs in at least a portion of Los Cerritos Wetlands reflects the uncertainty regarding eventual restoration of this site. Any proposed restoration would require extensive testing for contaminants, as well as planning, engineering, environmental documentation and permitting required for such projects. In addition to PCBs, the site has been impacted from oil extraction activities and the source of seawater for the existing remnant wetlands, Los Cerritos Channel, is used by two power plants for once-through cooling. The elevated water temperature associated with once-through cooling of existing power plants may influence the establishment of target habitats and the assemblage of species required by the CCC.

BALLONA WETLANDS

Ballona Wetlands, located south of Playa del Rey, is the last major wetland remaining in Los Angeles County (see figure 1-1). Efforts to preserve and restore this wetland have spanned approximately the last 30 years and have included the efforts of a host of non-profit organizations, state and federal resource agencies and other stakeholders. The project site includes about 600 acres owned by the State of California. In 2004, the Department of Fish and Game took title to approximately 540 acres of former wetlands. The State Lands Commission owns approximately 60 acres of created freshwater marsh and muted tidal salt marsh.

It is estimated that Ballona Wetlands once occupied more than 2,000 acres at the mouth of Ballona Creek. In the 1930s, Ballona Creek was channelized by the U.S. Army Corps of Engineers and Los Angeles Flood Control District. In the 1950s, construction of Marina del Rey converted coastal wetland and dunes into a marina. Dredge spoils from marina construction were deposited on undeveloped portions of Ballona Wetlands, raising the elevation and altering the soils of the site. Major infrastructure, including Jefferson, Culver and Lincoln boulevards, and electricity, water and gas utility lines transect the former wetlands, with significant impacts to hydrologic and habitat connectivity.

In 2005, the California State Coastal Conservancy funded the Ballona Wetlands Restoration Feasibility Study (PWA et al., 2008). This study culminated in the development of five restoration scenarios, ranging from minimal wetland creation and enhanced upland restoration to maximum wetland restoration that includes the removal of Ballona Creek Flood Control Channel and significant infrastructure modification.

N

0 255 510 1,020 1,530 2,040 2,550 Feet

figure 1-1

Ballona Wetlands Restoration

Project Area

Proj. # 1793

PWA

Status of Existing Plans. A restoration feasibility study was completed September 2008 with funding from the Coastal Conservancy. Five alternative restoration plans were developed for further consideration, including:

- Enhance existing habitat with minimal grading;
- Muted tidal wetland restoration within existing constraints;
- Full tidal wetland restoration, supporting all associated habitat types and requiring significant site alteration;
- Full tidal wetland and subtidal habitat restoration, providing a connection between these habitats with the project site, and requiring significant site alteration;
- Realignment of Ballona Creek, allowing interaction between the creek and wetland, and providing much more habitat and functional connectivity; and, requiring significant site alteration.

Status of Environmental Documentation.. The need for a project specific EIR has been identified. In late 2009, the Coastal Conservancy selected a contractor to prepare the EIR for the project, anticipated to begin early 2010.

Status of Required Permits. The following permits will be required prior to project approval and implementation:

- U.S. Army Corps of Engineers Section 404 permit;
- Regional Water Quality Control Board Section 401 Water Quality Certification;
- California Department of Fish and Game Streambed Alteration Agreement;
- California Coastal Commission Coastal Development Permit;
- California State lands Commission Encroachment Permit;
- Los Angeles County Air Pollution Control District dredge operation permit.

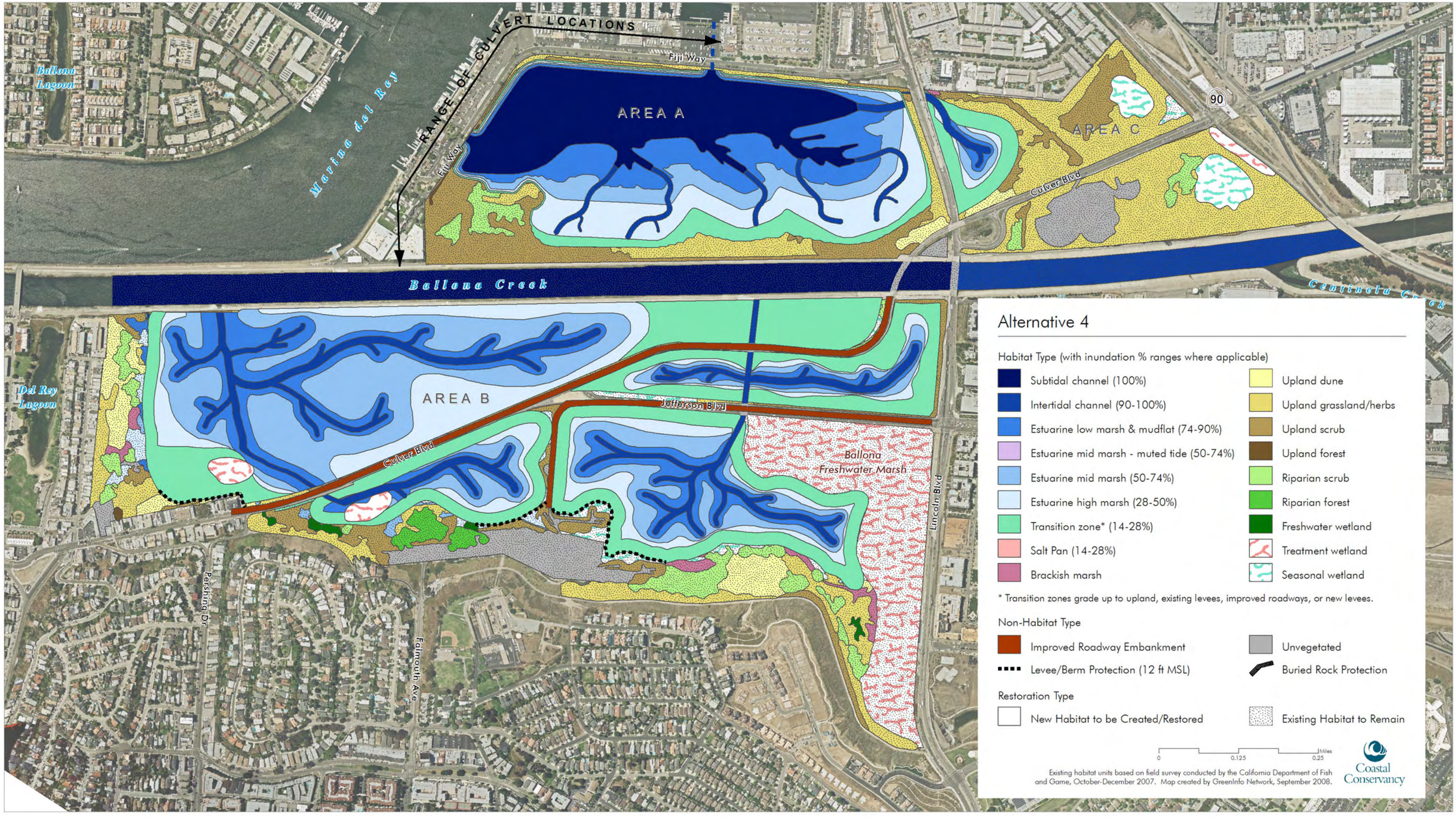
To date, there has been no action regarding acquisition of the identified permits. Two alternatives were selected for further analysis in the project EIR (see figs 2-7 and 2-9 of the feasibility study).

Habitat Distribution and Potential Impacts to Existing Habitats. The proposed habitat distribution for each of the five restoration alternatives is presented in Table 6**.** Impacts to existing habitats have not been analyzed to date. In general, alternatives 3-5 propose to create fully tidal estuarine habitat with a resultant loss of fresh water marsh/ riparian and upland habitats.

Ballona Wetlands
Restoration Project

FIGURE 2-7

Alternative 4 - Habitat Restoration



Ballona Wetlands
Restoration Project

FIGURE 2-9

Alternative 5 - Habitat Restoration

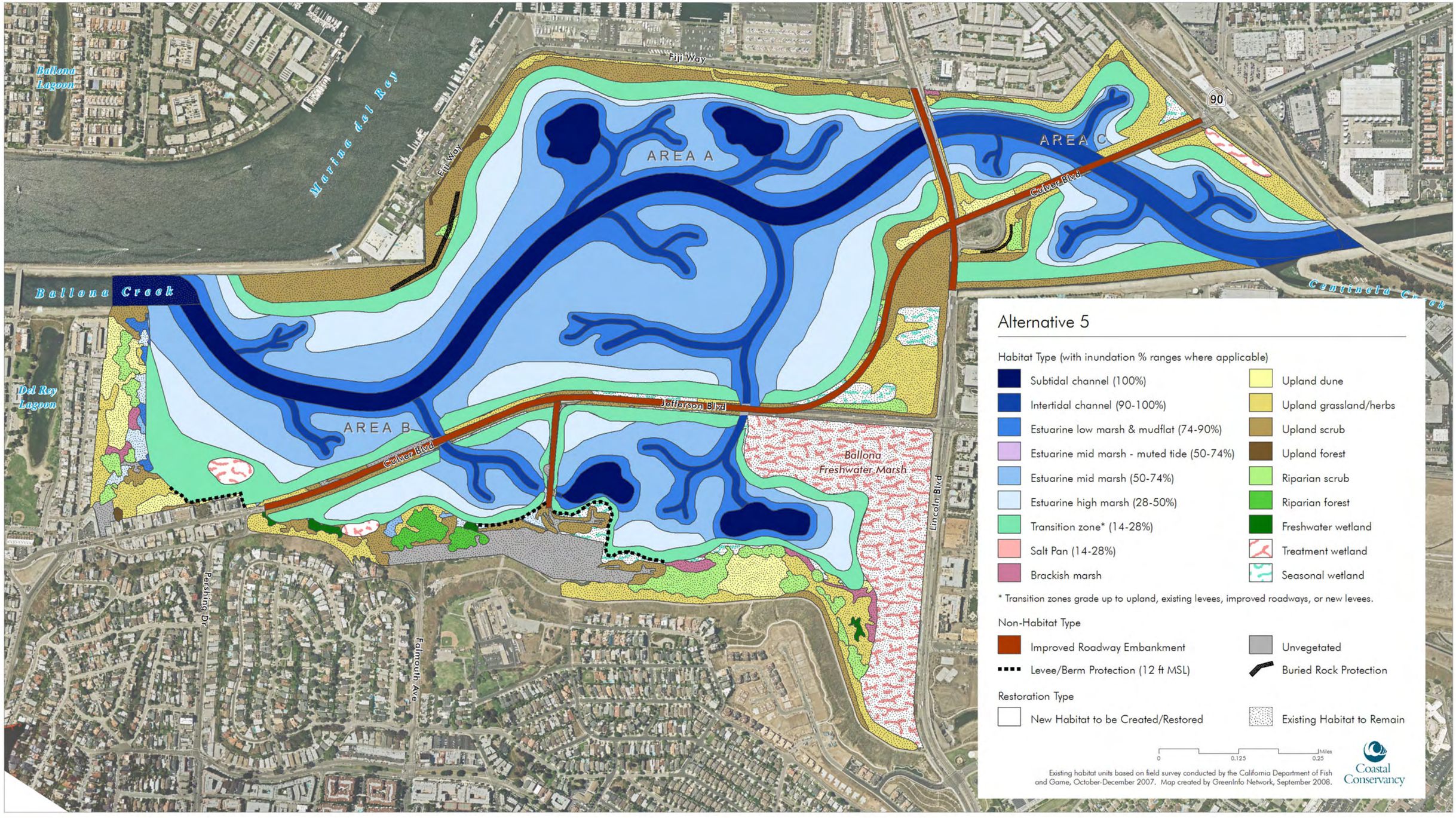


Table 6. Summary of Habitat Acreages by Alternative, Ballona Wetlands, 2009.

Habitat Type	Existing	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Subtidal	74.0	74.0	74.0	74.0	115.4	48.6
Intertidal Channel and Mudflat	1.7	10.4	11.7	20.4	40.6	26.2
Low Marsh	8.5*	66.0 (64.7*)	66.3 (37.0*)	102.0	87.6	131.0
Mid Marsh	17.6*	35.1 (34.3*)	38.6 (19.6*)	66.3	58.4	85.2
High Marsh	40.6*	18.6 (17.8*)	29.2 (10.2*)	66.3	58.4	85.2
Transitional Habitat	0.0	31.9	81.1	123.5	95.2	96.1
Brackish marsh	3.0	2.7	2.6	2.6	2.6	2.6
Total Estuarine	**167.9**	**238.7**	**303.5**	**455.0**	**458.2**	**474.8**

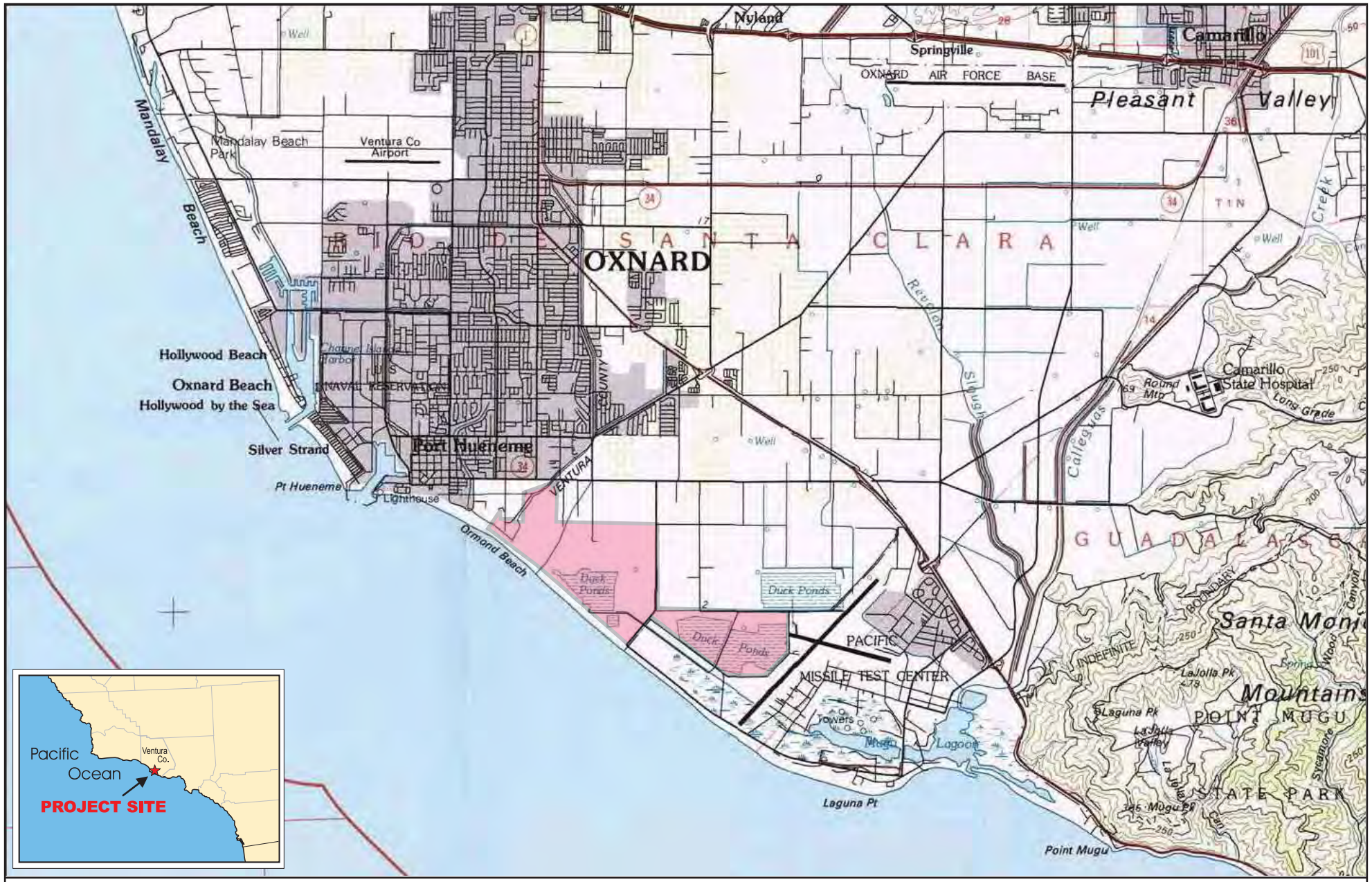
*Area of muted tidal influence

Land Ownership. All potentially restorable land is owned by the State of California.

Ease of Compliance with California Coastal Commission Objectives and Criteria. The feasibility study completed in 2008 does not identify a preferred alternative. Subsequently, two alternatives (4 and 5) were revised and proposed for further analysis in the project EIR. In addition, phasing has been proposed only for Alternative 5, such that compliance with the mitigation requirement of 55 acres of tidal wetlands by the CCC cannot be accomplished without considerable design effort. Currently, the site is dominated by disturbed upland habitats with a small muted tidal marsh and the fully-tidal, concrete-lined Ballona Flood Control Channel. Ballona's potential for restoration is high, as is the potential for eventually supporting the habitats and species required by the CCC. However, the lack of consensus by stakeholders on a restoration strategy suggests that selection of a preferred alternative and further refinement may not occur in the near future. Restoration of Ballona Wetlands will require excavation and disposal of millions of cubic yards of material. Infrastructure in the form of roads and bridges will have to be modified to increase tidal influence under some alternatives.

ORMOND BEACH

The Ormond Beach Restoration Project is a California State Coastal Conservancy-funded project located in Ventura County adjoining the cities of Port Hueneme and Oxnard (see figure 1-1). Approximately 1,500 acres of Ormond Beach is undeveloped and includes a mix of degraded wetlands, beach and dunes, agriculture, and mixed industry, including an abandoned metals-processing plant and an existing electricity generating plant. A 560-acre duck club with artificially maintained ponds and remnant intertidal habitat exists to the north of Ormond Beach. The goal of the Ormond Beach Restoration Project is the acquisition of approximately 1,100 acres at Ormond Beach and the 560 acres of the duck club for a total restoration of approximately 1,600 acres.



Aspen Environmental Group

Project Area

0 1,500 3,000
Scale in Miles

N

Figure 1-1
Regional Map

To date the Coastal Conservancy has acquired 540 acres at Ormond Beach. Prior to the planned restoration, the Conservancy must acquire 210–340 acres of the Southland Sod Farm. Sale of a portion (210 acres) of this farm has been offered by the owner, contingent upon completion of the City of Oxnard's Specific Plan for Ormond Beach.

The 50-acre Reliant Power Plant is situated on fill that was formerly coastal lagoon. This parcel divides the proposed restoration in half, obstructing potential hydrologic and biological connectivity. This plant is expected to cease operation within the next five years due to fundamental inefficiencies and adverse effects on marine life caused by its intake and outfall (P. Brand, Coastal Conservancy).

The 40-acre Halaco metals processing facility also occupies former coastal lagoon. The goal of the restoration plan is to acquire the Halaco property and restore the former wetlands after the EPA has remediated this Superfund site.

The acquisition of the Ventura County Duck Club is contingent upon the member owners being allowed to continue hunting on apportion of the 560-acre site. (P. Brand, Coastal Conservancy).

Status of Existing Plans. The Ormond Beach Restoration Feasibility Study, funded by the Coastal Conservancy, was completed in October 2009. Six possible alternatives for habitat restoration, enhancement and creation were identified, as well as a No Project Alternative.

Overall, the alternatives include three concepts: 1) creation of a new lagoon with a permanent ocean inlet (Alternative 1); 2) restoration of the project area's historic wetland habitat mosaic with intermittingly open inlets and seasonal ponds (Alternative 2); and 3) enhancement of existing habitats with minimal hydrologic and ground surface modifications (Alternative 3). Due to uncertainties regarding potential land acquisitions, two variants were developed for each alternative. The "unconstrained" alternatives assume that the Coastal Conservancy and its partners will be able to secure all of the candidate properties identified for the project, The "constrained" alternatives assume that some candidate properties will not be available in the foreseeable future. As such, the Feasibility Study identifies a maximum "project area" of 1,730 acres for unconstrained alternatives, and approximately 770-790 acres of constrained alternatives. Project alternatives are presented below:

Alternative 1 Unconstrained (Alternative 1U): Create New Tidal Lagoon;
Alternative 1 Constrained (Alternative 1C): Create New Tidal Lagoon;
Alternative 2 Unconstrained (Alternative 2U): Restore Seasonally Open Wetland Habitats/Ponds:
Alternative 2 Constrained (Alternative 2C): Restore Seasonally Open Wetland Habitats/Ponds:
Alternative 3 Unconstrained (Alternative 3U): Enhance Existing Non-tidal Wetlands Habitats:
Alternative 3 Constrained (Alternative 3C): Enhance Existing Non-tidal Wetlands Habitats.

These alternatives are considered preliminary and subject to further refinement. No preferred alternative was identified in the Feasibility Study. Alternative U1 is presented as an example of project alternatives (see figure 6-1 of the feasibility study).

Status of Environmental Documentation. No Environmental Documentation currently exists. The need for a project-specific EIR, as well as other high priority planning issues, has been identified. The EIR and other project analyses are pending.

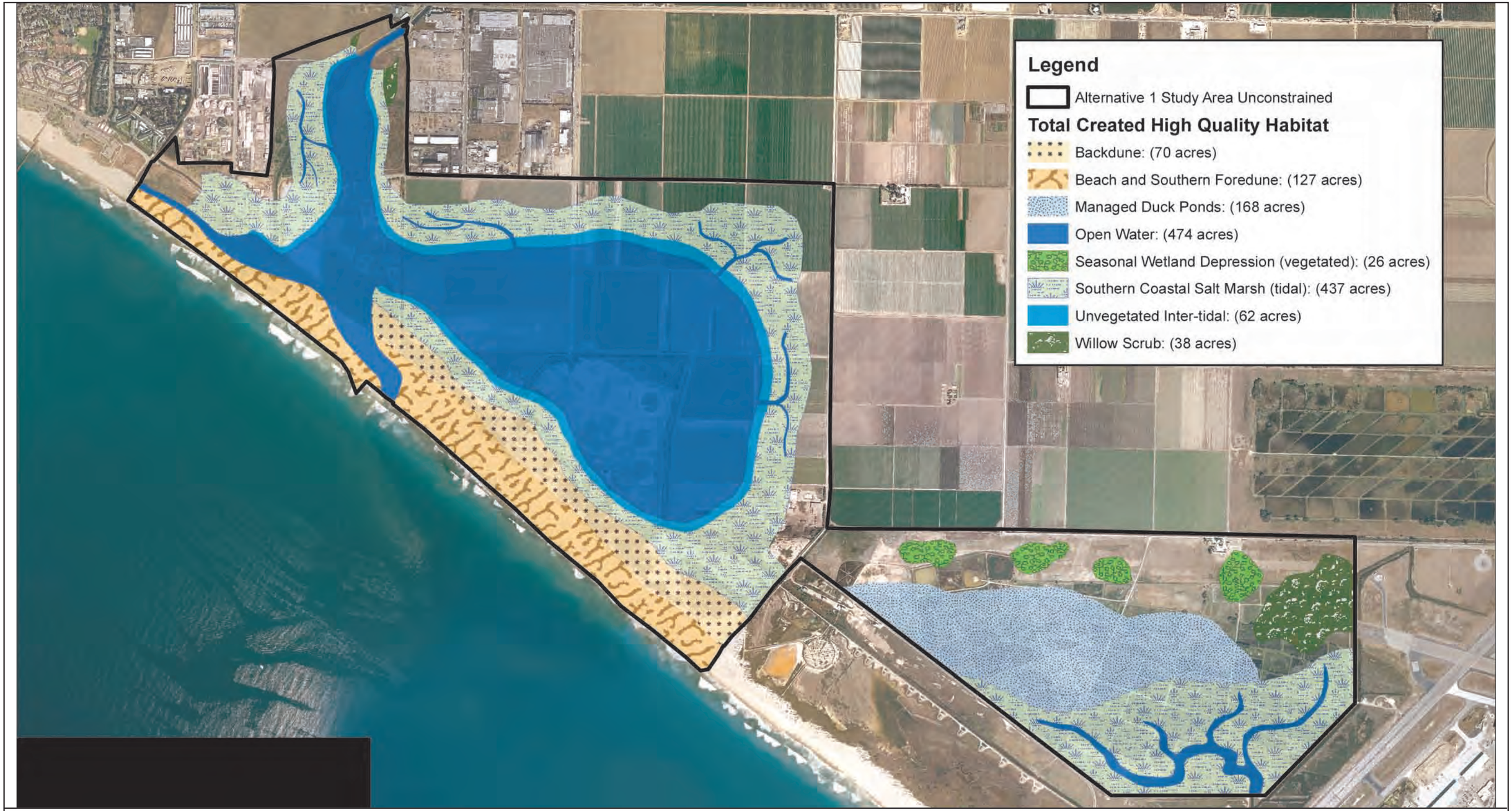
Status of Required Permits. Not available. It is anticipated that discretionary permits typically associated with coastal wetland restoration projects will be required, including but not limited to:

- U.S. Army Corps of Engineers Section 404 permit;
- Regional Water Quality Control Board Section 401 Water Quality Certification;
- California Department of Fish and Game Streambed Alteration Agreement;
- California Coastal Commission Coastal Development Permit;

Habitat Distribution and Potential Impacts to Existing Habitats. The Feasibility Study presents a complex and, admittedly, incomplete analysis of potential habitats to be created and habitats potentially impacted. These ultimately depend upon proposed habitat acquisitions and final planning. The Feasibility Study presents a breakdown of the restored, created or enhanced habitat types by alternative. Fifteen upland and wetland habitat types are identified and quantified. Creation, restoration and enhancement of intertidal wetlands, such as those required of Poseidon for mitigation, range from 437 acres (Alternative 1U) to 0 acres (Alternative 3C).

Land Ownership. See above.

Ease of Compliance with California Coastal Commission Objectives and Criteria. It is difficult to assess the potential for the Ormond Beach Restoration Plan to comply with Coastal Commission objectives and criteria given the level of information that is currently available. However, from the information presented in the Feasibility Study, it appears that the Coastal Commission requirement of creation/restoration of fully-tidal wetlands with a full complement of species and habitats found at reference wetlands may be difficult to achieve within the prescribed time period. As stated previously, no preferred alternative was presented in the Feasibility Study. The Feasibility Study identifies 30 short-term and long-term recommendations for further analysis required to refine the plan. The complexity of the project and associated land acquisitions suggests a long-term restoration approach. While this approach may be financially and ecologically sound, short-term restoration success as required of Poseidon by the Coastal Commission does not appear to be achievable. Furthermore, the project includes acquisition and remediation of an active Superfund site, a process that often takes a number of years and imposes unknown risks to restoration success.



Aspen Environmental Group

Source: Wetland Research Associates, 2009.

0 1,875 3,750
Scale in Feet

N

Figure 6-1
Extent of High Quality Habitat/Habitats Supporting Special Status Species for Alternative 1U

RANKING OF POTENTIAL MITIGATION SITES

Each potential wetland mitigation site was evaluated based on its ability to meet California Coastal Commission objectives and criteria and the imposed timeline, i.e. presentation of a final mitigation plan within 2 years. Not all of the categories presented in the description of each wetland were used in the ranking evaluation. For example, habitat distribution was not used in the ranking as some plans are conceptual and do not discuss habitat distribution in detail. Other plans are more specific but may present habitat distribution for the overall restoration compared to phased approaches that could provide discrete mitigation units. In addition, status of required permits was not used as none of the potential restoration sites is in the permit acquisition phase. Each site was ranked based on the following criteria:

- Status of the restoration plan;
- Status of environmental documentation;
- Land ownership;
- Ease of compliance with CCC objectives and criteria; and,
- Risk to Poseidon.

Status of Restoration Plan. The restoration plans summarized above exist at varying levels of completion. The more complete the restoration plan, the less time is required for refinement and implementation. The most complete plans are those that have been subjected to a feasibility-level analysis, although there is some variation in the content of a feasibility analysis. Most feasibility-level assessments have included preliminary design and engineering, land acquisition planning and impact assessment. Examples of feasibility-level analyses include Tijuana Estuary, San Dieguito Lagoon, Buena Vista Lagoon, Ballona Wetlands and Ormond Beach wetlands. The Otay River Floodplain Subarea of the San Diego Bay National Wildlife Refuge (SDBNWR), while lacking preliminary engineering plans, does include land acquisition, sediment disposal scenarios and impact assessment.

Less complete plans include "conceptual" plans which are often no more than pictures of potential restoration scenarios which lack preliminary engineering, or land acquisition. Examples include San Elijo Lagoon, Anaheim Bay, Santa Ana River mouth, and Los Cerritos Wetlands.

Some of the wetlands presented above lack even conceptual plans and are included in this assessment because they have been identified as having the potential for some as of yet unidentified restoration. Aqua Hedionda Lagoon currently lacks conceptual level restoration planning.

Status of Environmental Documentation. Typically, an EIR or EIS requires approximately 12 - 16 months to complete and adopt. Thus, those wetlands with well developed restoration plans or a programmatic level EIR or EIS would rank highest for this evaluation criterion. Only the SDBNWR restoration plans are included in a certified environmental document. The SDBNWR CCP/EIS is a programmatic document requiring project-specific supplemental CEQA, and possibly NEPA, documents.

Land Ownership. Restoration plans that require complex property acquisition present an uncertainty in terms of time frame and final restoration plan. In many cases, property acquisition attempts have been on-going for many years and remain uncertain. Several restoration sites are located on land owned by the State of California (see Ranking Table). San Dieguito Lagoon site is owned by the San Dieguito River Park JPA. Ormond Beach wetlands represent the greatest challenge in terms of land acquisition with much of the area included in the restoration plan currently in private ownership.

Ease of Compliance with CCC Objectives and Criteria. Use of this criterion to rank potential mitigation sites is somewhat subjective, but important to this analysis. It is not possible to predict with complete certainty the outcome of any wetland restoration at any site. The restoration requirements of the CCC are extremely rigorous and may not be achievable by any restoring any of the 12 sites considered here. Thus, each wetland was given a score of either "Unknown", "Moderate" or "Difficult" for this criterion, as there are no restoration plans that could be considered to easily meet these standards.

Any restoration plan that is conceptual, or is based on land acquisition and passive restoration, was determined to be "Unknown" or "Difficult" in terms of meeting the CCC mitigation criteria of November 14, 2008. Restoration sites that may be capable of meeting the CCC standards are rated as "Moderate" for this category. Four restoration sites received the score of moderate including: Ballona Wetlands, San Dieguito Lagoon, San Diego Bay National Wildlife Refuge, and Tijuana Estuary.

Risk to Poseidon. The risk to Poseidon from selecting any of the 12 sites as a mitigation site is also somewhat subjective. Like the "Ease of Compliance with CCC Objectives and Criteria" any restoration at any of the 12 sites analyzed confers some risk. A site was considered to be of relatively "Low" risk if it included a mix of desired wetland habitat types (e.g., intertidal), restoration would not impact existing wetlands as defined by the CCC, the land was intended for wetland restoration and the plan had a moderate probability of meeting CCC success criteria. A site is considered to be of "High" risk if it depends upon uncertain property acquisition, if the plan is conceptual or out-of-date, if the restoration is passive, if the plan evokes controversy regarding selection of a preferred alternative, or involves reconfiguration/relocation of significant infrastructure, such as bridges, inlet channels, and utilities. A site was considered "Moderate" risk if there was a complete or relatively complete restoration plan, the restoration plan was active and included the appropriate mix of habitat types, land acquisition was not the primary goal, the comparative ease of compliance with CCC goals and criteria was moderate. Based on these criteria, one site scored "Low" – The Otay River Floodplain Subarea of the San Diego Bay National Wildlife Refuge – and two sites scored "Moderate": San Dieguito Lagoon and Tijuana Estuary. Tijuana Estuary scored lower than the SDBNWR due to potential sedimentation issues and impacts to existing wetlands. San Dieguito Lagoon scored lower than SDNWR due to potential ownership issues with SCE.

Ranking. Based on the above criteria, two sites are ranked as Moderate. These include the Otay River Floodplain Subarea of the SDNWR and Tijuana Estuary. Only the San Diego Bay National Wildlife Refuge received a score of "Low" for potential risk to Poseidon. The final ranking of each wetland is presented briefly below and I summarized in Table 7.

- **Tijuana Estuary**. Tijuana Estuary also presents a significant opportunity for tidal wetland restoration. The feasibility study recently competed indentifies phases that are similar in size to Poseidon's restoration needs. Tijuana Estuary has been identified by CCC contract biologists as a reference site for the SONGS restoration at San Dieguito Lagoon, and has been identified as a reference site for Poseidon's mitigation, once finalized. Thus, the potential for meeting CCC objectives is relatively high. The California State Parks and California State Coastal Conservancy are partners in the proposed restoration; and preparation of a project EIR and permit acquisition may be accomplished within the require timeframe. However, sedimentation problems have not been completely addressed at Tijuana Estuary. Funding for maintenance of the Goat Canyon Sedimentation Basins is uncertain from year-to-year. Without annual removal of sediment from the basins, sediment flows through the basins into adjacent wetlands. Recent construction of the Border Fence project is expected to exacerbate sedimentation in the Tijuana River Valley. Furthermore, as currently planned, restoration will impact degraded wetland habitats and may not meet CCC requirements of Poseidon's mitigation site. This wetland received a ranking of "Moderate" as a potential mitigation site.

- **San Diego Bay National Wildlife Refuge**. The SDBNWR presents significant opportunity for tidal wetland restoration with over 650 acres of tidally-influenced restoration available at the South San Diego Bay Unit. The Otay River Floodplain Subarea provides the opportunity to restore areas that were formerly intertidal mudflats and salt marsh according to historical maps of south San Diego Bay. Thus, the potential for achieving successful restoration is high. Restoration can be accomplished with minimal impact to existing wetlands, i.e., only at the point of hydraulic connection to the Otay River. This wetland received a ranking of "High" as a potential mitigation site. Compliance of this restoration site with Coastal Commission goals and objectives is presented in Appendix A.

- **San Dieguito Lagoon.** Although conceptual in nature, the restoration plan developed by Poseidon for San Dieguito Lagoon has been designed to compliment the on-going SONGS restoration at the lagoon. The project has been designed specifically to meet Poseidon's mitigation requirements. The site affords a nearby sediment deposition site and currently includes access to the proposed restoration area. Although a final plan, environmental documents and permits are required, it is possible that these can be finalized within the prescribed timeframe. Poseidon was unable to reach an agreement with Southern California Edison regarding long-term ownership of the restored lands included in Poseidon's plans for this site. As a result, the San Dieguito River Park JPA has entered into a MOU with Caltrans and SANDAG to use the site as mitigation for impacts associated with the widening of Interstate 5. Thus, this wetland is no longer available as a restoration site for Poseidon and received a ranking of "Low".

- **Aqua Hedionda Lagoon.** There are currently no plans for restoration of Aqua Hedionda Lagoon that would meet the requirements of the Coastal Commission. This wetland received a ranking of "Low" as a potential mitigation site for Poseidon.

- **San Elijo Lagoon.** Restoration of San Elijo Lagoon will likely entail relocation of the current ocean inlet and associated infrastructure relocation, e.g., railroad and Highway 101 bridges. Development of restoration alternatives is in the initial stages, as is preparation of the project EIR. At present, restoration alternatives include primarily enhancement of existing habitats rather than creation of new wetland habitats. As such, the project will impact existing low quality wetlands in order to create higher quality habitats, i.e., wetlands with greater tidal influence. Such impacts are prohibited by CCC restoration criteria. Currently, restoration plans are being funded by SANDAG as part of a regional restoration effort. SANDAG and Poseidon objectives may be mutually exclusive. This wetland received a ranking of "Low" as a potential mitigation site for Poseidon.

- **Buena Vista Lagoon.** There is considerable uncertainty associated with the Buena Vista Lagoon restoration. Preparation of the project EIS has been suspended. There appears to be a lack of consensus among stakeholders regarding a preferred alternative. Substantial reconfiguration/relocation of infrastructure would be required. Conversion of one wetland habitat type - existing freshwater wetlands - to salt water wetlands does not satisfy CCC requirements that there be no impacts to existing wetlands. This wetland received a ranking of "Low" as a potential mitigation site for Poseidon.

- **Anaheim Bay.** The Seal Beach National Wildlife Refuge initiated preparation of a Comprehensive Conservation Plan (CCP) for the refuge in 2007. The preferred alternative identified in the project update in August 2008 included minimal salt marsh restoration and did not specify if this restoration was tidally influenced. As planned, restoration efforts for this wetland do not meet Poseidon's needs. This wetland received a ranking of "Low" as a potential mitigation site for Poseidon.

- **Santa Ana River Wetlands.** There are currently no restoration plans for the Santa Ana River mouth that can be evaluated in terms of Poseidon's mitigation requirements. At least some of the land is in private ownerships. This wetland received a ranking of "Low" as a potential mitigation site for Poseidon.

- **Huntington Beach Wetlands.** All of the components of the Huntington Beach Wetlands Restoration plan have been constructed or are in the process of being constructed, with the exception of Newland Marsh. Newland Marsh is approximately 54 acres in area and is owned by Caltrans. While Newland Marsh was included in conceptual level restoration plans, further planning has not been undertaken using public funds. Caltrans may desire to restore Newland Marsh as mitigation for impacts associated with current or future highway projects. Environmental documentation is currently lacking. This wetland received a ranking of "Low" as a potential mitigation site for Poseidon.

- **Ballona Wetlands.** The Ballona Wetlands restoration plan is in the feasibility stage. Two restoration alternatives were recently selected for further analysis in the project EIR/EIS. Construction phasing that might include an area similar to that needed as mitigation by Poseidon has not been included in the analysis. Both alternatives require some infrastructure improvement/relocation with one alternative requiring large-scale

infrastructure improvements. Preparation of a project EIR/EIS is in the initial stages. Thus, this wetland received a ranking of "Low" as a potential mitigation site for Poseidon.

- **Los Cerritos Wetland**. The Los Cerritos Wetlands restoration plan is conceptual in nature, requires acquisition of property, includes areas contaminated with PCBs and other areas of potential contamination, and requires large-scale infrastructure improvements. Detailed restoration plans and environmental documentation are lacking at this time. This wetland received a ranking of "Low" as a potential mitigation site for Poseidon.

- **Ormond Beach.** The feasibility study of the Ormond Beach restoration is complex, requiring acquisition of land from multiple owners. The preferred alternative was not identified in the feasibility study; however, passive restoration/enhancement is proposed in some alternatives and may be the only viable option for some habitats. The restoration site includes an EPA Superfund site (Halaco metals site) which will require remediation. The timeframe for restoration may be measured in decades rather than years which would not meet the CCC timing criterion. Environmental documentation is currently lacking. This wetland received a ranking of "Low" as a potential mitigation site for Poseidon.

Table 7. Ranking of Potential Mitigation Sites

Wetland	Status of Restoration Plan	Status of Environmental Documentation	Land Ownership	Ease of Compliance with CCC Objectives	Risk to Poseidon	Ranking
Tijuana Estuary	Feasibility Study	Needed	California State Parks	Moderate	Moderate	**Moderate**
San Diego Bay NWR Otay River Floodplain	Conceptual	Programmatic EIS completed	State Lands Commission	Moderate	Low	**High**
San Dieguito Lagoon	Conceptual	Needed	San Dieguito JPA	Moderate	*Not Applicable	**Low**
San Elijo Lagoon	Feasibility Study	Needed	State of California	Difficult	High	**Low**
Buena Vista Lagoon	Feasibility Study	Needed	State of California	Unknown	High	**Low**
Aqua Hedionda Lagoon	Not applicable	None	Cabrillo Power-CDFG	Non-compliant	High	**Low**
Anaheim Bay	CCP (in prep)	None	U.S. Navy	Difficult	High	**Low**
Santa Ana River	None	None	Private	Unknown	High	**Low**
Huntington Beach Wetlands (Newland Marsh)	Conceptual	Needed	Caltrans	Moderate	*Not Applicable	**Low**
Ballona Wetlands	Feasibility Study	Needed	State of California	Moderate	High	**Low**
Los Cerritos Wetlands	Conceptual Plan	Needed	Acquisition	Difficult	High	**Low**
Ormond Beach	Pending	Needed	Acquisition	Unknown	High	**Low**

* These wetlands are not currently available to Poseidon as a potential restoration sites.

NA = Not Available

Appendix A

Otay River Floodplain Site Compliance
with California Coastal Commission's
Goals and Objectives

1.0 PHASED IMPLEMENTATION

Phase I: Poseidon is to provide at least 37 acres of estuarine wetland restoration. Within two years of issuance of the desalination facility's coastal development permit (CDP), Poseidon is to submit a complete CDP application for a proposed restoration project, as described below.

Phase II: Poseidon is to provide an additional 29 acres of estuarine wetland restoration. Within five years of issuance of the Phase I CDP, Poseidon is to submit a complete CDP application proposing up to 29 acres of additional restoration, subject to reduction as described below.

2.0 SITE SELECTION

In consultation with Commission staff, the permittee shall select a wetland restoration site or sites for mitigation in accordance with the following process and terms.

Within 9 months of the effective date of this permit, the permittee shall submit the proposed site(s) and preliminary wetland restoration plan to the Commission for its review and approval or disapproval.

The location of the wetland restoration project(s) shall be within the Southern California Bight. The permittee shall select from sites including, but not limited to, the following eleven sites: Tijuana Estuary in San Diego County; San Dieguito River Valley in San Diego County; Agua Hedionda Lagoon in San Diego County; San Elijo Lagoon in San Diego County; Buena Vista Lagoon in San Diego County; Huntington Beach Wetland in Orange County, Anaheim Bay in Orange County, Santa Ana River in Orange County, Los Cerritos Wetland in Los Angeles County, Ballona Wetland in Los Angeles County, and Ormond Beach in Ventura County. The permittee may also consider any sites that may be recommended by the California Department of Fish & Game as high priority wetlands restoration projects. Other sites proposed by the permittee may be added to this list with the Executive Director's approval.

The basis for the selection shall be an evaluation of the site(s) against the minimum standards and objectives set forth in subsections 3.1 and 3.2 below. The permittee shall take into account and give serious consideration to the advice and recommendations of the Scientific Advisory Panel (SAP) established and convened by the Executive Director pursuant to Condition B.1.0. The permittee shall select the site(s) that meet~~s~~ the minimum standards and best meet~~s~~ the objectives.

3.0 PLAN REQUIREMENTS

In consultation with Commission staff, the permittee shall develop a wetland restoration plan for the wetland site(s) identified through the site selection process. The wetland restoration plan shall meet the minimum standards and incorporate as many as feasible of the objectives in subsections 3.1 and 3.2, respectively.

3.1 Minimum Standards

The wetland restoration project site(s) and preliminary plan(s) must meet the following minimum standards:

a. Location within Southern California Bight;

The selection of the Otay River Floodplain Subarea of the South San Diego Bay Unit of the San Diego Bay Wildlife Refuge satisfies the requirement that the mitigation site be located within the southern California bight.

b. Potential for restoration as tidal wetland, with extensive intertidal and subtidal areas;

The Otay River Floodplain Subarea has been proposed for restoration by the U.S. Fish and Wildlife Service (USFWS: San Diego Bay National Wildlife Refuge, Final Comprehensive Conservation Plan [CCP] and EIS 2006). The USFWS proposed two alternative restoration scenarios for the Otay River Floodplain in its 2006 CCP/EIS.

- **Option 1. Restoration Option 1 focused on a balance between restored wetland and restored upland habitats. Under this option, approximately 60 acres of upland habitat would be restored, 60 acres would be restored to intertidal salt marsh and mudflats, and 20 acres would be restored to freshwater wetlands.**

- **Option 2. Restoration Option 2 would restore approximately 90 acres of intertidal salt marsh and mudflat, 35 acres of native uplands and 15 acres of freshwater wetlands.**

Under both USFWS options, intertidal wetlands would be comprised of approximately 50% mudflat, 30% cordgrass (low marsh) and 20% pickleweed (mid-high marsh). Creation of subtidal habitat is also feasible, requiring modification of the conceptual design presented in the CCP/EIS.

Historic maps indicate that the area proposed for restoration was formerly intertidal mudflat and salt marsh that has been filled for agriculture and salt production. Thus, the potential for successful restoration is high.

c. Creates or substantially restores a minimum of 37 acres and up to at least 66 acres [all locations] acres of habitat similar to the affected habitats in Agua Hedionda Lagoon, excluding buffer zone and upland transition area;

The requirement of restoration of up to 66acres of habitat similar to that affected at Aqua Hedionda Lagoon can be accomplished at the Otay River Floodplain Subarea. Option 2presented in the CCP/EIS included more than 66 acres of tidally influenced wetlands.

d. Provides a buffer zone of a size adequate to ensure protection of wetland values, and at least 100 feet wide, as measured from the upland edge of the transition area.

The proposed restoration of the Otay River Floodplain Subarea can provide buffer zones in excess of 100-feet in all directions.

e. Any existing site contamination problems would be controlled or remediated and would not hinder restoration;

A limited field sampling program was conducted in 1989 that included collection of three surface soil (0.5 - 1 feet below ground surface) samples - two from agricultural fields and one from the former sewage treatment plant oxidation ponds formerly located on-site. All three soil samples were analyzed for chlorinated pesticides while the oxidation pond sample included additional analysis of selected metals.

Dichlorodiphenyltrichloroethane (DDT) and metabolites (dichlorodiphenyldichlor-oethylene [DDE] and dichlorodiphenyldichloroethane [DDD]) and toxaphene were detected in the samples collected from the agricultural fields. Concentrations of total DDT (including metabolites) were 2,200 parts-per-billion (ppb) and 4,050 ppb. Toxaphene was detected at 3,000 and 4,200 ppb. Arsenic, cadmium, chromium, copper, nickel, and lead were detected in the oxidation pond sample. Pesticides were not detected in the oxidation pond sample.

Additional surface soil testing was conducted in 1999 as part of the USFWS pre-acquisition activities. Organochlorine pesticide analyses were performed on 15 samples collected across the property. DDT and its metabolites were the primary pesticides detected. Detected concentrations of DDT ranged between 12 and 1,400 ppb. Detected concentrations of DDE ranged between 22 and 1,200 ppb. DDD was detected at concentrations between 8 and 1,100 ppb. Average detected concentrations for DDT, DDE, and DDD were 349, 503, and 413 ppb, respectively. Endrin aldehyde was the only other detected pesticide with a range of detected concentrations between 15 and 1,400 ppb.

The source of DDT is directly related to the historic use of this property for agricultural production, primarily tomatoes and other truck crops. A sewer treatment plant that operated within the Otay River floodplain between the mid 1950s and the early 1960s is considered the source of the various metals detected in some of soil samples.

On December 21, 2009, Poseidon conducted a screening level soil contaminants assessment in the project area. Four 15-foot-deep soil borings were collected in Pond 20a and four were collected in the former agricultural land adjacent to the Otay River. Only one sample, located near the Otay River, indicated the presence of DDT. Soils within and adjacent to Pond 20a showed little, if any, contamination. Thus, although former agricultural activities have resulted in high levels of DDT and derivatives on a portion of the property, it appears that there are uncontaminated areas that may be suitable for restoration. Further soil testing will be needed to determine the horizontal extent of DDT contamination.

f. Site preservation is guaranteed in perpetuity (through appropriate public agency or nonprofit ownership, or other means approved by the Executive Director), to protect against future degradation or incompatible land use;

The Otay River Floodplain Subarea of the South San Diego Bay Unit of the San Diego Bay National Wildlife Refuge is owned by the California State Lands Commission and leased to the USFWS exclusively for restoration of coastal wetlands and associated uplands[Both agencies preserve and protect lands for the public. Prior to restoration at the Otay River Floodplain, agreements will be adopted to guarantee preservation of the site in perpetuity.

g. Feasible methods are available to protect the long-term wetland values on the site(s), in perpetuity;

The San Diego Bay Wildlife Refuge is managed by the U.S. Fish and Wildlife Service. The USFWS will provide management of the restored wetlands to protect its ecological value in perpetuity.

h. Does not result in a net loss of existing wetlands; and

The proposed restoration entails the conversion of a former salt evaporation pond and former agricultural lands to intertidal salt marsh, mudflats and subtidal habitats. Only minimal impacts to existing wetlands will occur at the point of hydraulic connection to the Otay River. Thus, the project will not result in a net loss of existing wetlands.

i. Does not result in an adverse impact on endangered animal species or an adverse unmitigated impact on endangered plant species.

The CCP and EIS prepared for the project identified all endangered plant and animal species in the project location and the potential impacts associated from implementation of the preferred alternative. In general, the document presents the potential effects to endangered species associated with construction of the habitat restoration and the long-term effects of the habitat restoration. The document concludes that the potential for adverse effects to the Refuge's endangered and threatened species during restoration-related grading activities would be minimized by controlling the level of construction activity permitted in the vicinity of active nest areas, including restricting some activities to the non-breeding season; establishing construction boundaries that minimize impacts to native vegetation and sensitive habitat areas; and monitoring sensitive habitat areas during construction to assess actual disturbance levels and, where necessary, developing and implementing additional protective measures.

The long-term effects on threatened and endangered species of the restored habitats are considered beneficial.

3.2 Objectives

The following objectives represent the factors that will contribute to the overall value of the wetland. The selected site(s) shall be determined to achieve these objectives. These objectives shall also guide preparation of the restoration plan.

a. Provides maximum overall ecosystem benefits, e.g. maximum upland buffer, enhancement of downstream fish values, provides regionally scarce habitat, potential for local ecosystem diversity;

The proposed restoration of the Otay River Floodplain Subarea entails the conversion of a former solar evaporation pond and former agricultural fields to intertidal salt marsh and mudflats and subtidal habitats. Intertidal salt marsh, intertidal mudflat, and subtidal habitat are regionally scarce habitats targeted for restoration/creation in the southern California Bight. Located just upstream of San Diego Bay, the fisheries of the bay would be considered the downstream fishery. The fisheries of South San Diego Bay are recognized as a valuable resource that will be enhanced by the restoration process. The extensive shallow water habitat and eelgrass beds of the South Bay provide important habitat for these and a variety of fish, including midwater, schooling fishes, such as northern anchovies, slough anchovies, and topsmelt. These species, in turn, represent a major forage resource for predatory fish and avian species. The warmer, hypersaline waters of the South Bay also offer shelter for a number of fish species commonly encountered further south in the Eastern Subtropical and Tropical Pacific. The south end of San Diego Bay also functions as an important nursery area for juvenile California halibut and young spotted and barred sand bass.

The American Bird Conservancy has designated the South San Diego Bay Unit as a Globally Important Bird Area due to the presence of globally significant populations nesting gull-billed terns, and continentally significant populations of surf scoters, Caspian terns and western snowy plovers. The entire southern end of San Diego Bay has been recognized as a Western Hemisphere Shorebird Reserve Network Site. The proposed restoration has been designed to preserve and enhance this biological diversity.

b. Provides substantial fish habitat compatible with other wetland values at the site(s);

The conversion of the former evaporation pond and agricultural lands to intertidal salt marsh, mudflats and subtidal habitat will provide substantial fish habitat. The role of unvegetated tidal creeks and sloughs as breeding areas and nurseries for estuarine-dependent fishes has been well studied. The transient use of the intertidal salt marsh by species such as California killifish has likewise been demonstrated. These values will all be enhanced by the proposed project. Furthermore, the intertidal mudflats created by the project will provide breeding habitat for the goby species that are prevalent in Agua Hedionda Lagoon..

c. Provides a buffer zone of an average of at least 300 feet wide, and not less than 100 feet wide, as measured from the upland edge of the transition area.

The Otay River Floodplain Subarea is located in an isolated corner of South San Diego Bay with buffers exceeding 100 feet in all directions.

d. Provides maximum upland transition areas (in addition to buffer zones);

The proposed restoration is in the initial planning stages; however, there is ample area for incorporating transition zone habitats into the final restoration plan. The conceptual restoration plan presented in the CCP/EIS includes on-site disposal of some excavated soils, pending soil contamination studies. The soil will be used to create upland and transitional habitats.

e. Restoration involves minimum adverse impacts on existing functioning wetlands and other sensitive habitats;

The proposed restoration entails the conversion of a former salt evaporation pond and former agricultural lands to intertidal salt marsh, mudflats and subtidal habitats. Only minimal impacts to existing wetlands will occur at the point of hydraulic connection to the Otay River. The former salt evaporation pond and agricultural lands do not contain functioning wetlands or other sensitive habitats. Thus, the project will not result in impacts to existing wetlands and other sensitive habitats.

f. Site selection and restoration plan reflect a consideration of site specific and regional wetland restoration goals;

The following goals provided the guiding principles for the South San Diego Bay Unit. They are consistent with USFWS Refuge purposes, National Wildlife Refuge System goals, the NWRS Improvement Act, USFWS policies, and international treaties. These goals apply to all of the management alternatives evaluated for this Refuge Unit.

Goal 1: Protect, manage, enhance, and restore open water, coastal wetlands, and native upland habitat to benefit the native fish, wildlife, and plant species supported within the South San Diego Bay Unit.

Goal 2: Support recovery and protection efforts for the federally and state listed threatened and endangered species and species of concern that occur within the South San Diego Bay Unit.

Goal 3: Provide high quality foraging, resting, and breeding habitat for colonial nesting seabirds, migratory shorebirds and waterfowl, and salt marsh-dependent species.

Goal 4: Provide opportunities for compatible wildlife-dependent recreation and interpretation that foster public appreciation of the unique natural and cultural heritage of South San Diego Bay.

In addition, the CCP was prepared using the following documents as guidance:

- **All applicable USFWS threatened and endangered species recovery plans;**
- **Ecoregion Planning, as defined by the USFWS;**
- **Shorebird Conservation Planning, as defined by the U.S. Shorebird Conservation Plan;**
- **Waterbird Conservation, as defined by the North American Waterbird Conservation Plan;**
- **National Strategy for Coastal Restoration, as defined by Restore America's Estuaries and the National Oceanic and Atmospheric Administration**
- **Marine Protected Areas, as defined by Executive Order 13158;**
- **California Wildlife: Conservation Challenges, California's Wildlife Action Plan, as defined by the California department of Fish and Game; and,**
- **Regional restoration needs**

g. Restoration design is that most likely to produce and support wetland-dependent resources;

As stated above, the major goals of the proposed restoration is to protect, manage, enhance and restore open water, coastal wetlands and native upland to benefit native fish, wildlife and plant species supported within the refuge unit and to provide habitat for salt-marsh dependent species. The project has been designed to achieve the objective of producing and supporting wetland-dependent species.

h. Provides rare or endangered species habitat;

Goal 2, stated above, addresses the recovery and protection efforts for the federally and state listed threatened and endangered species and species of concern that occur within the South San Diego Bay Unit. The over-arching reason for the establishment of the South Bay unit was the preservation and recovery of threatened and endangered species, including the light-footed clapper rail, the California least tern and salt marsh bird's beak. The preferred restoration plan provides a diverse assemblage of wetland habitats, including cordgrass-dominated salt marsh – the preferred nesting and foraging habitat of the light-footed clapper rail - fishery resources that support the California least tern, and shallow subtidal habitat that provides nursery grounds for California halibut.

i. Provides for restoration of reproductively isolated populations of native California species;

As stated above, one of the primary reasons for acquiring the South San Diego Bay Unit was to preserve and restore habitat for the endangered light-footed clapper rail. Although these birds can fly, they rarely do so and migrate locally usually by walking or, occasionally, swimming. Thus, a clapper rail population within South San Diego Bay is essentially isolated from other southern California populations. As stated previously, restoration of the South San Diego Bay Unit will benefit the clapper rail and other threatened and endangered species. The restoration provide the opportunity to establish a population or populations of the endangered salt marsh bird's beak, a hemiparasitic plant that occurs in the upper elevations of salt marsh habitats. Populations of salt marsh bird's beak at other southern California wetlands are reproductively isolated from one another.

j. Results in an increase in the aggregate acreage of wetland in the Southern California Bight;

The proposed restoration of the Otay River Floodplain Subarea the will increase the aggregate acreage of tidal wetland in the Southern California Bight by approximately 66 acres, as required by the Coastal Commission and Regional Water Quality Control Board.

k. Requires minimum maintenance;

The proposed restoration of the former solar evaporation pond and former agricultural lands at the Otay River Floodplain Subarea would be accomplished by excavating to the elevation of adjacent intertidal habitats. There are no hard structures needed, such as jetties, as the site is not subject to coastal erosion or deposition by wave action. The Otay River is dammed upstream of the proposed restoration site, and does not convey a sediment load that would be potentially damaging to a subtidal- intertidal wetland. Thus, maintenance dredging is not anticipated. Once vegetation has become established, there is no anticipated need for planting or maintenance of exotic weed species.

l. Restoration project can be accomplished in a reasonably timely fashion; and,

It is anticipated that restoration of the Otay River Floodplain Subarea can be accomplished within the timeframes set forth in the MLMP.

m. Site(s) in proximity to the Carlsbad desalination facility.

The South San Diego Bay Unit of the San Diego Bay National Wildlife Refuge is located approximately 35 miles south of Aqua Hedionda Lagoon, the site of the Carlsbad Desalination Plant

3.3 Restrictions

a. The permittee may propose a wetland restoration project larger than the minimum necessary size specified in subsection 3.1(c) above, if biologically appropriate for the site(s), but the additional acreage must (1) be clearly identified, and (2) must not be the portion of the project best satisfying the standards and objectives listed above.

b. If the permittee jointly enters into a restoration project with another party: (1) the permittee's portion of the project must be clearly specified, (2) any other party involved cannot gain mitigation credit for the permittee's portion of the project, and (3) the permittee may not receive mitigation credit for the other party's portion of the project.

c. The permittee may propose to divide the mitigation requirement between a maximum of two wetland restoration sites, unless there is a compelling argument, approved by the Executive Director, that the standards and objectives of subsections 3.1 and 3.2 will be better met at more than two sites.

POSEIDON RESOURCES MARINE LIFE MITIGATION PLAN SUPPLEMENTAL ALTERNATIVES ANALYSIS OF CALIFORNIA COASTAL COMMISSION STANDARDS AND OBJECTIVES

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CONSULTING

Exhibit 7

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POSEIDON RESOURCES MARINE LIFE MITIGATION PLAN SUPPLEMENTAL ALTERNATIVES ANALYSIS OF CALIFORNIA COASTAL COMMISSION STANDARDS AND OBJECTIVES

INTRODUCTION

In August 2008, the California Coastal Commission (CCC) directed Poseidon Resources to evaluate 11 sites located in the Southern California Bight as potential mitigation sites for impacts associated with the operation of the proposed Carlsbad Desalination Plant located at Agua Hedionda Lagoon in northern San Diego County. This condition of the Marine Life Mitigation Plan (MLMP) also allowed evaluation of other sites if deemed a "high priority wetlands restoration project" by California Department of Fish and Game (CDFG). In January 2010, Poseidon submitted "Comparison of Selected Southern California Tidal Wetlands as Potential Sites for Mitigation of Impacts Associated with Poseidon Resources Proposed Carlsbad Desalination Plant" (Nordby Biological Consulting 2010). That document identified restoration of the Otay River floodplain located within the South Bay Unit of the U.S. Fish and Wildlife San Diego Bay National Wildlife Refuge as the preferred mitigation site. This site was subsequently supported by CDFG. As an appendix to the Nordby Biological Consulting 2010 report, minimum standards and objectives developed by the CCC in the MLMP were evaluated with regard to the Otay River floodplain site. The appendix concluded that the selection of the Otay River floodplain site met the objectives and goals developed by the CCC. Recently, CCC staff requested that this evaluation be expanded to include a number of additional sites, especially sites within northern San Diego County as these occur in closer proximity to the source of project impacts. These included seven of the original 11 sites designated in August 2008 and one additional site (Loma Alta Lagoon), presented below geographically from north to south. The Otay River Floodplain site has been included as well for comparison.

- Loma Alta Lagoon,
- Buena Vista Lagoon,
- Agua Hedionda Lagoon,
- Batiquitos Lagoon,
- San Elijo Lagoon,
- San Dieguito Lagoon,
- Los Peñasquitos Lagoon,
- Tijuana Estuary.

Coincidental to the submittal of Nordby Biological Consulting 2010, an independent assessment of restoration potential in northern San Diego County Lagoons was conducted that assessed potential mitigation sites for the proposed I-5 North Coast Corridor Project (WRA and AECOM December 2009). That report identified potential restoration opportunities at six of the eight sites presented above, including:

- Buena Vista Lagoon,
- Agua Hedionda Lagoon,

- Batiquitos Lagoon,
- San Elijo Lagoon,
- San Dieguito Lagoon,
- Los Peñasquitos Lagoon.

This document expands upon the analysis of CCC minimum standards and objectives as requested by the CCC. It is based on the information included in WRA and AECOM 2009 as well as that previously presented information contained in Nordby Biological Consulting 2010.

The potential mitigation area at each lagoon is presented below and summarized in Table 1.

LOMA ALTA LAGOON

3.1 Minimum Standards – Restoration of Loma Alta Lagoon

The wetland restoration project site(s) and preliminary plan(s) must meet the following minimum standards:

a. Location within Southern California Bight;

The selection of Loma Alta Lagoon satisfies the requirement that the mitigation site be located within the Southern California Bight.

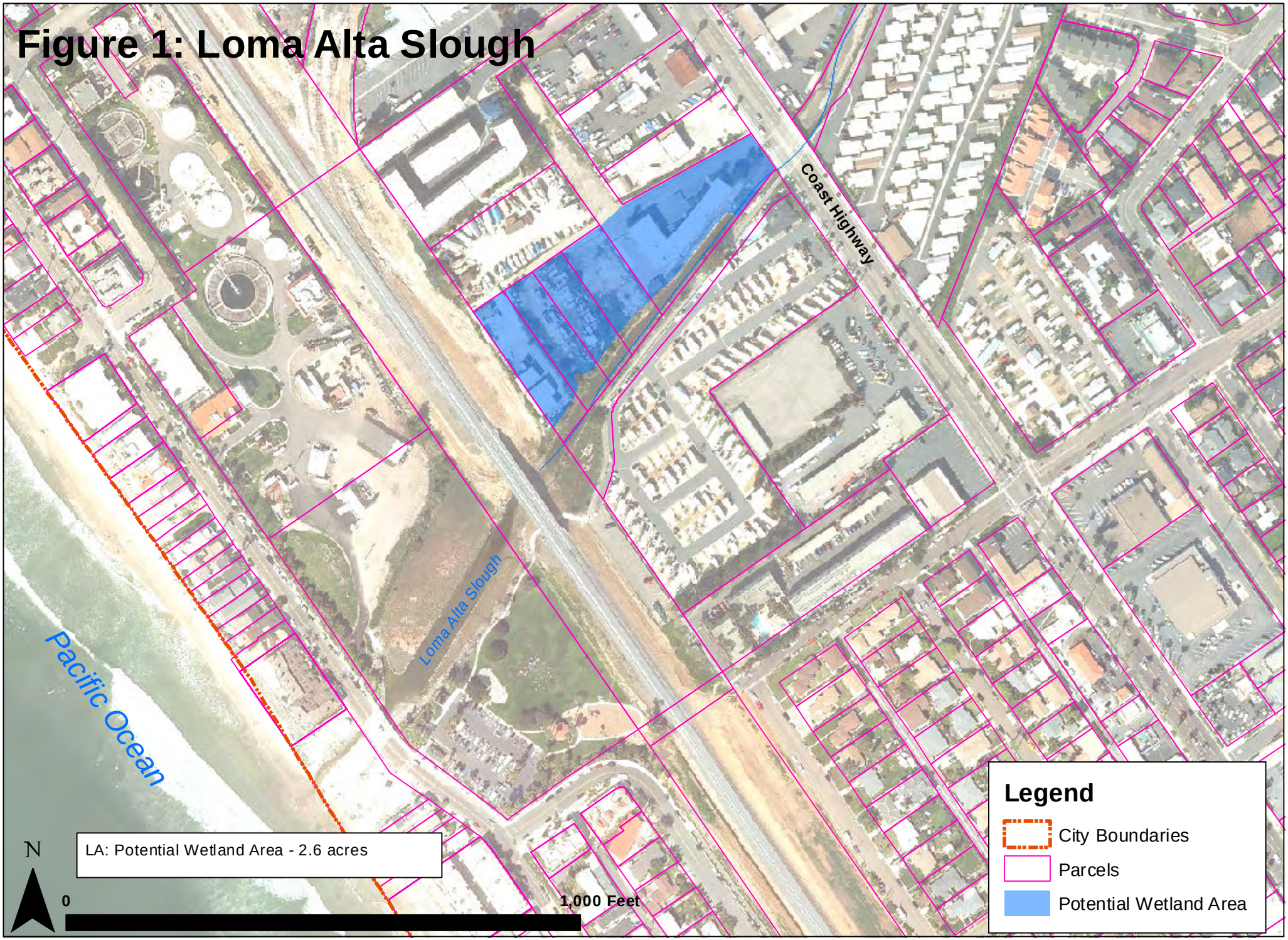
b. Potential for restoration as tidal wetland, with extensive intertidal and subtidal areas;

The City of Oceanside has proposed the restoration of Loma Alta Lagoon as mitigation for potential project impacts at Agua Hedionda Lagoon. The project would require acquisition of properties adjacent to Loma Alta Lagoon, development of a restoration plan, acquisition of necessary permits, and construction. The project consists of five parcels, three of which are owned by the City of Oceanside (2.62 total acres) and two privately owned parcels (0.89 acre; Figure 1). The City of Oceanside proposes that Poseidon acquire the two privately owned parcels and restore all five parcels for a total restoration of 3.01 acres. The remainder 0.5 acre would be needed to provide access to an adjacent parcel. Currently, Loma Alta Lagoon consists of 2 acres of restored wetlands.

The restoration proposed by the City of Oceanside is conceptual and does not include any preliminary or detailed design. Thus, it is unclear how much of the proposed 3.01-acre restoration would be restored as intertidal or subtidal habitat and how much potentially restorable area would be required to be designated as buffer or upland transition area; however, this restoration proposal does not meet the minimum standard of restoring extensive intertidal or subtidal areas.

c. Creates or substantially restores a minimum of 37 acres and up to at least 66 acres [all locations] of habitat similar to the affected habitats in Agua Hedionda Lagoon, excluding buffer zone and upland transition area;

Figure 1: Loma Alta Slough



As presented above, the conceptual plan for Loma Alta Lagoon proposes restoration of 3.01 acres of land that is currently upland. There are no details regarding the type of habitats to be created. Nonetheless, this proposal does not meet the minimum standard of substantially restoring a minimum of 37 acres and up to 66 acres of habitat similar to those affected at Agua Hedionda Lagoon.

d. Provides a buffer zone of a size adequate to ensure protection of wetland values, and at least 100 feet wide, as measured from the upland edge of the transition area.

The conceptual restoration proposed by the City of Oceanside does not include minimum buffer areas of 100 feet. The parcels proposed for acquisition and restoration abut developed areas of the city. Inclusion of the 100 foot buffer at the upland edge of the parcels would substantially reduce the total area available for restoration.

e. Any existing site contamination problems would be controlled or remediated and would not hinder restoration;

The conceptual restoration proposed by the City of Oceanside does not address potential contamination. Examination of commercially available aerial photographs suggests that some of the parcels may have been used as storage yards; thus, the potential for contamination may exist and would need to be evaluated prior to acquiring and restoring the parcels.

f. Site preservation is guaranteed in perpetuity (through appropriate public agency or nonprofit ownership, or other means approved by the Executive Director), to protect against future degradation or incompatible land use;

The project is located within the City of Oceanside. The City would be responsible for guaranteeing the protection of restored areas in perpetuity.

g. Feasible methods are available to protect the long-term wetland values on the site(s), in perpetuity;

The City of Oceanside currently manages and protects the existing resources of Loma Alta Lagoon. It is assumed that the City has methods available to protect the long-term values on-site.

h. Does not result in a net loss of existing wetlands;

The proposed project would not result in a net loss of wetland habitats.

i. Does not result in an adverse impact on endangered animal species or an adverse unmitigated impact on endangered plant species.

There are no available data on the presence/absence of endangered animal or plant species at Loma Alta Lagoon. Due to the current size of the lagoon (approximately 2 acres) it is

unlikely that endangered animal species are present. Any restoration plan would require site-specific focused surveys for endangered plants and animals.

3.2 Objectives

The following objectives represent the factors that will contribute to the overall value of the wetland. The selected site(s) shall be determined to achieve these objectives. These objectives shall also guide preparation of the restoration plan.

a. Provides maximum overall ecosystem benefits, e.g. maximum upland buffer, enhancement of downstream fish values, provides regionally scarce habitat, potential for local ecosystem diversity;

Restoration of a maximum of 3.01 acres, not including upland buffers, would provide minimal overall ecosystem benefits. Restoration to coastal salt marsh could provide a minimal increase in this regionally scarce habitat. Restoration to open water would not provide regionally scarce habitat but could enhance downstream fish values. The small area identified for restoration may significantly increase local ecosystem diversity increasing the area of restored lagoon from 2 acres to 5.01 acres.

b. Provides substantial fish habitat compatible with other wetland values at the site(s);

As presented above, the proposed restoration of Loma Alta Lagoon is conceptual only. Given the overall size of the restorable area (3.01 acres) it is unlikely that this site would provide substantial fish habitat as well as other wetland values.

c. Provides a buffer zone of an average of at least 300 feet wide, and not less than 100 feet wide, as measured from the upland edge of the transition area.

The proposed project is conceptual only and does not include buffers. Buffers averaging 300 feet in width would reduce the restorable 3.01 acres to a narrow strip of land adjacent to Loma Alta Creek that would be substantially less than the estimated 3.01 acres.

d. Provides maximum upland transition areas (in addition to buffer zones);

The proposed project is conceptual only and does not include buffers or upland transition areas. Inclusion of upland transition and buffers would effectively render restoration of wetland habitats infeasible at Loma Alta Lagoon.

e..Restoration involves minimum adverse impacts on existing functioning wetlands and other sensitive habitats;

The proposed project is conceptual only but could be designed to minimize impacts on existing functioning wetlands and other sensitive habitats.

f. Site selection and restoration plan reflect a consideration of site specific and regional wetland restoration goals;

The conceptual restoration proposed by the City of Oceanside is the only existing restoration plan for Loma Alta Lagoon and reflects the City's restoration goals rather than regional wetland goals.

g. Restoration design is that most likely to produce and support wetland-dependent resources;

The proposed project is conceptual only. Buffer and upland transition requirements would not result in a final plan that is most likely to produce and support wetland-dependent resources.

h. Provides rare or endangered species habitat;

The proposed project is conceptual only. Buffer and upland transition requirements would not result in a final plan that is most likely to support rare or endangered species.

i. Provides for restoration of reproductively isolated populations of native California species;

As the proposed project is conceptual only and would be subjected to the required minimum buffers and upland transition areas, it is unlikely that the project would provide for restoration of reproductively isolated populations of native California species.

j. Results in an increase in the aggregate acreage of wetland in the Southern California Bight;

Restoration of a maximum of 3.01 acres of wetland habitats would result in a minimal increase in the aggregate acreage of wetland in the Southern California Bight.

k. Requires minimum maintenance;

The proposed project is conceptual only. Maintenance requirements would need to be determined at a more detailed level of planning. It should be noted that the mouth of Loma Alta Lagoon is usually closed by a sand bar. Any long-term restoration of the site would likely require continual inlet maintenance thereby increasing the cost and reducing the feasibility of restoring a fraction of the 3.01 acres identified by the City of Oceanside.

l. Restoration project can be accomplished in a reasonably timely fashion; and,

Given the conceptual nature of the restoration proposal, the need for property acquisition, planning, pemitting, and required engineering and environmental review, it is unlikely that this project could be accomplished in a timely manner compared to sites that have undergone more rigorous analysis.

m. Site(s) in proximity to the Carlsbad desalination facility.

Loma Alta Lagoon is located approximately 5.5 miles north of Aqua Hedionda Lagoon, the site of the Carlsbad Desalination Plant

BUENA VISTA LAGOON

3.1 Minimum Standards – Restoration of Buena Vista Lagoon

The wetland restoration project site(s) and preliminary plan(s) must meet the following minimum standards:

a. Location within Southern California Bight;

The selection of Buena Vista Lagoon satisfies the requirement that the mitigation site be located within the southern California Bight.

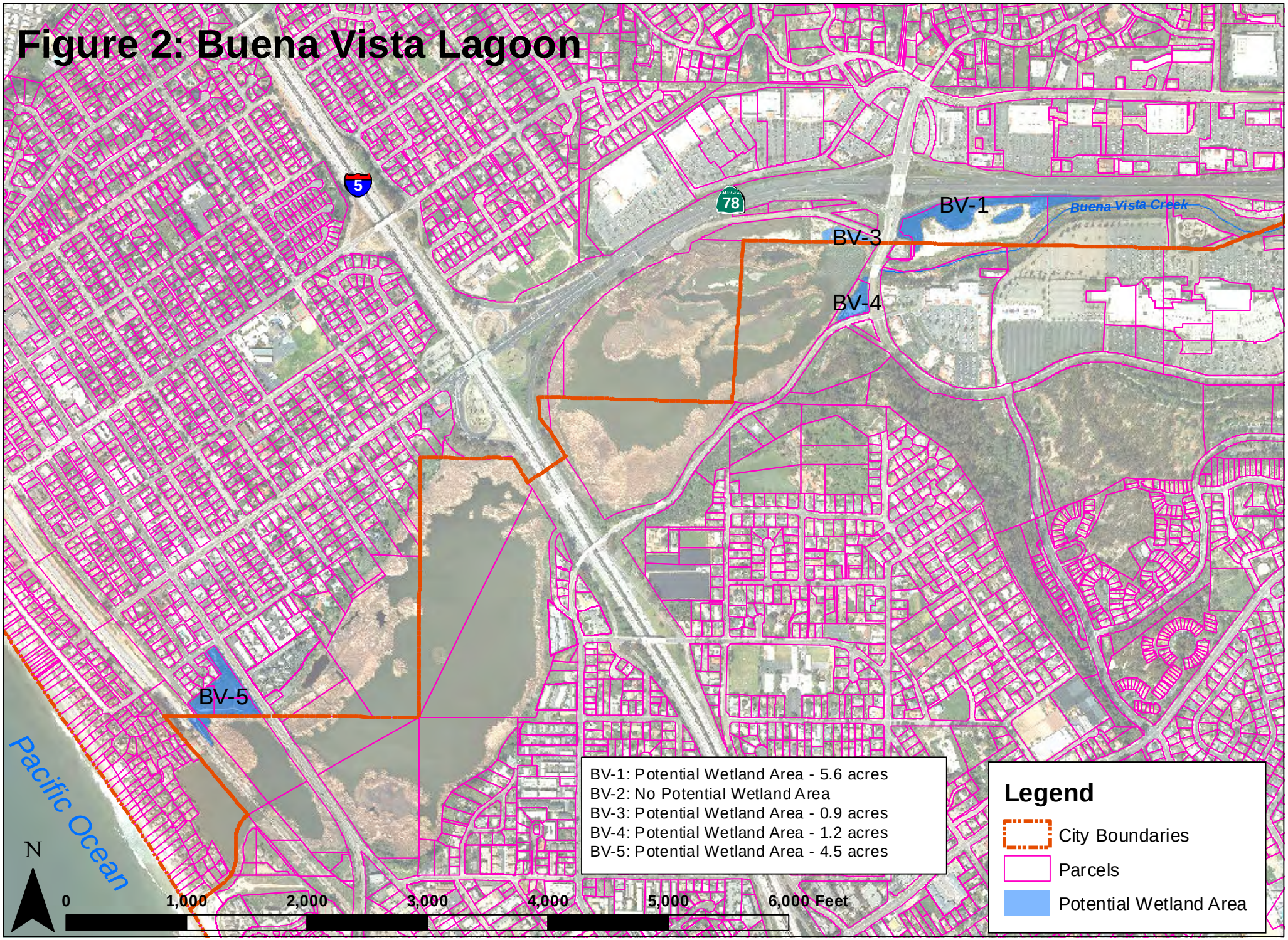
b. Potential for restoration as tidal wetland, with extensive intertidal and subtidal areas;

Previous analyses of wetland restoration opportunities in Southern California (Nordby Biological Consulting 2010; WRA and AECOM 2009) have documented that large-scale restoration of Buena Vista Lagoon is currently in the planning stages. Conceptual, schematic designs have been developed for three major restoration alternatives: the No Action (existing conditions) alternative; a freshwater-dominated system alternative; and a saltwater-dominated system alternative (Buena Vista Lagoon Restoration Feasibility Analysis, Everest International Consultants 2006). Both reports conclude that a preferred alternative has not yet been selected and that there is a lack of consensus among stakeholders that continues to delay selection of the preferred alternative.

While Buena Vista Lagoon holds promise as a restoration site, the lack of "conventional restoration" opportunities, as defined by WRA and AECOM (2009) diminishes its suitability as a mitigation site for potential impacts associated with the Carlsbad Desalination Facility. Conventional restoration includes creation of wetland in upland habitats and/or restoration of historic wetland areas that have been filled (WRA and AECOM 2009). In the case of Buena Vista Lagoon, historic hydraulic modifications have reduced the extent of tidal influence in the lagoon resulting in a system dominated by freshwater wetlands (Everest International Consultants 2006). However, the lagoon has not been filled and little opportunity exists for conventional restoration of upland habitats. Conversion from one wetland type (freshwater) to another wetland type (saltwater) is not considered conventional restoration and is not appropriate for Poseidon's mitigation requirements.

Recognizing that the large-scale restoration planning currently being conducted for Buena Vista Lagoon would not be considered conventional restoration, WRA and AECOM (2009) focused on smaller areas within the lagoon that could be restored conventionally. Six potential restoration sites varying in area from 0.9 acre to 5.6 acres and totaling 12.2 acres were indentified (Figure 2). Of those six potential restoration sites, two received a mitigation potential score of 5, two received a score of 3, and two received a score of 2, on a scale of 1-5 with 1 being the highest possible score. Sites BV-4 and BV-5 received the highest scores (2) for restorability. These two sites totaled 5.7 acres of potential conventional restoration.

Figure 2: Buena Vista Lagoon



c. Creates or substantially restores a minimum of 37 acres and up to at least 66 acres [all locations] acres of habitat similar to the affected habitats in Agua Hedionda Lagoon, excluding buffer zone and upland transition area;

As presented above, restoration of a maximum of 12.2 acres, with a high potential restoration maximum of 5.7 acres, does not meet this minimum standard.

d. Provides a buffer zone of a size adequate to ensure protection of wetland values, and at least 100 feet wide, as measured from the upland edge of the transition area.

The areas proposed by WRA and AECOM as potential restoration sites and their adequacy to provide a minimum buffer of 100 feet are summarized below.

- **Site BV-1 (5.6 acres conventional restoration, mitigation potential score = 3) is located immediately adjacent to Vista Way and does not provide the minimum buffer of 100 feet;**
- **Site BV -2 (0 acres conventional restoration, mitigation potential score = 5) is located immediately adjacent to Vista Way and does not provide the minimum buffer of 100 feet;**
- **Sites BV-3a and BV-3b (0.0 and 0.9 acres conventional restoration, respectively, mitigation potential scores = 5 and 3, respectively), appear to meet the minimum buffer criterion;**
- **Sites BV-4 and BV-5 (1.2 and 4.5 acres, respectively, mitigation potential scores of 2) are located immediately adjacent to developed areas and do not provide the minimum 100-ft buffer.**
-

In summary, the areas within Buena Vista Lagoon with highest potential for restoration according to WRA and AECOM (2009) do not meet the minimum goals for a 100-foot buffer zone.

e. Any existing site contamination problems would be controlled or remediated and would not hinder restoration;

There is no evidence provided in WRA and AECOM (2009) or the Buena Vista Lagoon Restoration Feasibility Analysis (Everest International Consultants, 2006) that there are site contamination problems at Buena Vista Lagoon; however, neither study presents specific data on site conditions.

f. Site preservation is guaranteed in perpetuity (through appropriate public agency or nonprofit ownership, or other means approved by the Executive Director), to protect against future degradation or incompatible land use;

Site BV-1 is privately owned and at this time cannot be expected to be protected or guaranteed in perpetuity. The site would need to be purchased and conveyed to an entity that could provide such protection.

Sites BV-, BV -3a and 3b, and BV-4 are owned by the State of California (WRA and AECOM 2009). Prior to any restoration at Buena Vista Lagoon, agreements with the State of California would have to be adopted to guarantee preservation of the site in perpetuity.

Site BV-5 is primarily in privately ownership and at this time cannot be expected to be protected or guaranteed in perpetuity. The site would need to be purchased and conveyed to an entity that could provide such protection.

g. Feasible methods are available to protect the long-term wetland values on the site(s), in perpetuity;

The Buena Vista Ecological Reserve is owned and managed by California Department of Fish and Game who would be required to provide management of any restored wetlands and to protect its ecological value in perpetuity.

h. Does not result in a net loss of existing wetlands;

Restoration of the maximum 12.2 acres with 5.7 acres of high restoration potential identified at Buena Vista Lagoon could be accomplished without resulting in a net loss of existing wetlands;

i. Does not result in an adverse impact on endangered animal species or an adverse unmitigated impact on endangered plant species.

Buena Vista Lagoon wetland habitats have been documented to support breeding populations of the state listed endangered Belding's savannah sparrow (*Passerculus sandwichensis beldingi*) and the state and federal listed endangered light-footed clapper rail (*Rallus longirostris levipes*). The Buena Vista Lagoon Restoration Feasibility Analysis (Everest International Consultants, 2006) acknowledges that restoration of the lagoon may impact these species; however, as that study is conceptual, potential impacts to sensitive species cannot be determined at this time.

3.2 Objectives

The following objectives represent the factors that will contribute to the overall value of the wetland. The selected site(s) shall be determined to achieve these objectives. These objectives shall also guide preparation of the restoration plan.

a. Provides maximum overall ecosystem benefits, e.g. maximum upland buffer, enhancement of downstream fish values, provides regionally scarce habitat, potential for local ecosystem diversity;

Restoration of a maximum 12.2 acres with 5.7 acres of high restoration potential identified at Buena Vista Lagoon would provide minimal overall ecosystem benefits. The potential restoration sites are located along the upland fringe of the lagoon adjacent major roads and

development. The potential restoration sites with the highest potential for restoration do not provide for minimum buffers. The lagoon currently supports a freshwater fishery that attracts local fishing enthusiasts and restoration of existing upland to additional freshwater marsh would add little value to downstream fisheries. The potential restoration of freshwater wetlands would not substantially increase regionally scarce habitat as freshwater wetlands are not regionally scarce compared to salt marsh or other estuarine habitats. The small area identified for restoration would not substantially increase local ecosystem diversity.

b. Provides substantial fish habitat compatible with other wetland values at the site(s);

The restoration of a maximum 12.2 acres with 5.7 acres of high restoration potential identified at Buena Vista Lagoon is conceptual only and lacks preliminary design. Assuming that the sites would be restored to freshwater marsh would not provide substantial fish habitat. Assuming that the sites were restored to open water would result in an increase in potential increase in fish habitat; however, connecting the restored areas to exiting freshwater habitat may result in additional impacts that would require mitigation.

c. Provides a buffer zone of an average of at least 300 feet wide, and not less than 100 feet wide, as measured from the upland edge of the transition area.

See project goals, item d above.

d. Provides maximum upland transition areas (in addition to buffer zones);

Although the potential restoration sites at Buena Vista Lagoon identified by WRA and AECOM (2009) are conceptual only, their location within existing freshwater marsh habitat and adjacency to developed areas precludes creation of upland transition areas.

e Restoration involves minimum adverse impacts on existing functioning wetlands and other sensitive habitats;

Although the potential restoration sites at Buena Vista Lagoon identified by WRA and AECOM (2009) are conceptual only, it is feasible that these areas could be restored with minimum impact on existing wetlands and other sensitive habitats.

f. Site selection and restoration plan reflect a consideration of site specific and regional wetland restoration goals;

The selection of the areas identified in Buena Vista Lagoon by WRA and AECOM (2009) reflect the need to mitigate for impacts associated with the proposed I-5 North Coast Corridor Project and do not consider site-specific restoration goals. The potential restoration is conceptual and does not include preliminary or advanced planning. As stated previously, site-specific restoration goals and plans are being developed for the

Lagoon. Restoration of the maximum 12.2 acres identified would not substantially contribute to these restoration goals.

g. Restoration design is that most likely to produce and support wetland-dependent resources;

As stated above, the areas identified for potential restoration are very conceptual and do not include preliminary design. Thus, this objective cannot be evaluated for Buena Vista Lagoon.

h. Provides rare or endangered species habitat;

As stated above, the areas identified for potential restoration are conceptual only and do not include preliminary design. Thus this objective cannot be evaluated for Buena Vista Lagoon.

i. Provides for restoration of reproductively isolated populations of native California species;

As stated above, the areas identified for potential restoration are conceptual only and do not include preliminary design. Thus this objective cannot be evaluated for Buena Vista Lagoon.

j. Results in an increase in the aggregate acreage of wetland in the Southern California Bight;

The maximum of 12.2 acres identified for restoration would result in a slight increase in the aggregate acreage of wetland in the Southern California Bight.

k. Requires minimum maintenance;

As stated above, the areas identified for potential restoration are conceptual only and do not include preliminary design. Thus this objective cannot be evaluated for Buena Vista Lagoon.

l. Restoration project can be accomplished in a reasonably timely fashion; and,

As no plans have been developed for restoration of the 12.2 acres of maximum potential restoration, lands with high potential for restoration are privately owned, and there are no agreements providing protection in perpetuity, it is unlikely that the restoration identified for Buena Vista Lagoon can be accomplished in a timely manner when compared to other sites that have undergone feasibility analyses and other more detailed planning.

m. Site(s) in proximity to the Carlsbad desalination facility.

Buena Vista Lagoon is located approximately 3.5 miles north of Aqua Hedionda Lagoon, the site of the Carlsbad Desalination Plant

AGUA HEDIONDA LAGOON

3.1 Minimum Standards – Restoration of Aqua Hedionda Lagoon

The wetland restoration project site(s) and preliminary plan(s) must meet the following minimum standards:

a. Location within Southern California Bight;

The selection of Aqua Hedionda Lagoon satisfies the requirement that the mitigation site be located within the southern California Bight.

b. Potential for restoration as tidal wetland, with extensive intertidal and subtidal areas;

Agua Hedionda Lagoon offers limited opportunities for "conventional restoration" as defined by WRA and AECOM (2009). Conventional restoration includes creation of wetland in upland habitats and/or restoration of historic wetland areas that have been filled. This type of restoration typically involves the removal of fill materials and/or restoration of wetland hydrology to sites that are currently uplands.

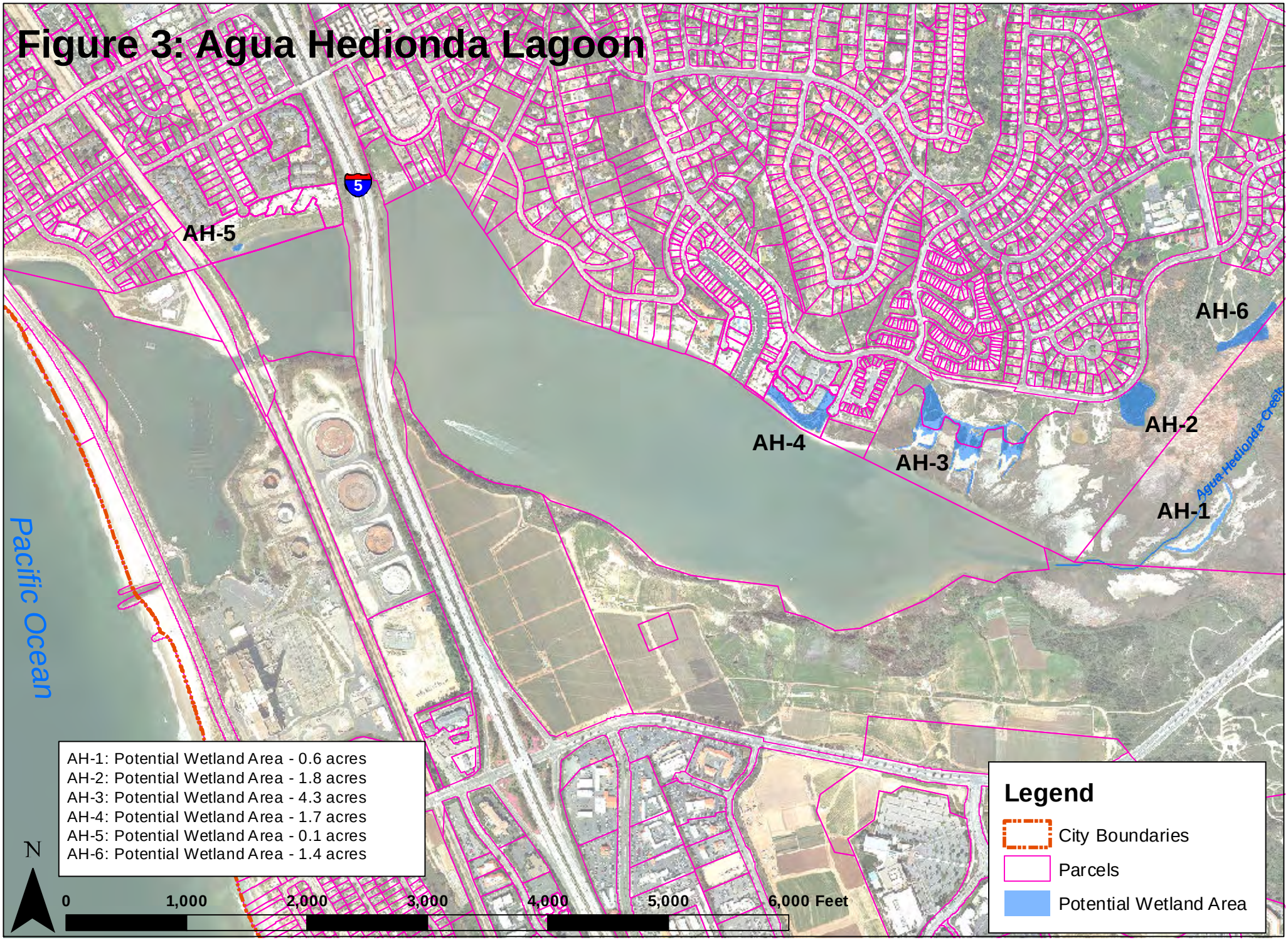
In their assessment of potential coastal wetland restoration sites for the proposed I-5 North Coast Corridor Project, WRA and AECOM (2009) identified a six separate areas totaling 9.9 acres of potential conventional restoration at Aqua Hedionda Lagoon (Figure 3). Of the 9.9 total acres, 9.3 acres were determined to have high restoration potential (mitigation potential scores of 1 or 2 on a scale of 1-5 with 1 being the highest). These opportunities consist primarily of berms and trails in the eastern portion of the lagoon. These areas and their mitigation potential for Poseidon are presented below.

AH-1. AH-1 consists of 0.6 acres located in the southeastern portion of the lagoon on land owned by State of California. AH-1 was determined to have a restoration potential of 4 (WRA and AECOM 2009). The authors of that document determined that the majority of the site was likely a jurisdictional wetland and that access would likely result in impacts to existing wetlands. As this land is likely jurisdictional wetland, it is not considered to be available to Poseidon for mitigation purposes.

AH-2. AH-2 consists of 1.8 acres located in the northeastern portion of the lagoon on lands owned by State of California. AH-2 was determined to have a restoration potential of 1 (WRA and AECOM 2009). AH-2 occurs within an area designated as critical habitat for coastal California gnatcatcher (*Polioptila californica californica*). It is unclear how this designation affects the availability of this parcel for restoration by Poseidon.

AH-3. AH-3 consists of 4.3 acres located in the northeastern portion of the lagoon on lands recently purchased by Caltrans for mitigation purposes. This parcel is, therefore, not available to Poseidon for restoration.

Figure 3: Agua Hedionda Lagoon



AH-4. AH-4 consists of 1.7 acres located in the northeastern portion of the lagoon on privately owned land. AH-4 was determined to have a restoration potential of 1 (WRA and AECOM 2009). Assuming the private owner is willing to sell, this parcel may be available for restoration by Poseidon.

AH-5. AH-5 consists of 0.1 acre located in the northwestern portion of the lagoon on privately owned land. AH-5 was determined to have a restoration potential of 1 (WRA and AECOM 2009). Assuming the private owner is willing to sell, this parcel may be available for restoration by Poseidon.

AH-6. AH-6 consists of 1.4 acres located in the northeastern portion of the lagoon on land owned by the State of California. AH-6 was determined to have a restoration potential of 2 (WRA and AECOM 2009). This parcel may be available for restoration by Poseidon.

In summary, there is a maximum of 5 acres (AH-2, AH-4, AH-5 and AH-6) that may be available to Poseidon for conventional restoration at Aqua Hedionda Lagoon. Potential restrictions to wetland restoration on parcel AH-2 due to its designation as coastal California gnatcatcher critical habitat may reduce this availability to 3.2 acres. Some of these parcels are constrained in the form of current ownership.

c. Creates or substantially restores a minimum of 37 acres and up to at least 66 acres [all locations] acres of habitat similar to the affected habitats in Agua Hedionda Lagoon, excluding buffer zone and upland transition area;

As demonstrated above, restoration of a maximum of 3.2 - 5.0 acres does not meet this minimum standard.

d. Provides a buffer zone of a size adequate to ensure protection of wetland values, and at least 100 feet wide, as measured from the upland edge of the transition area.

Of the sites available to Poseidon, only site AH-6 totaling a maximum restoration area of 1.4 acres would satisfy the minimum buffer requirement of 100 feet. All other sites within Aqua Hedionda Lagoon abut roads and development. Reconfiguring the parcels to include required minimum buffers would further reduce the 3.2 – 5.0 acres available for restoration.

e. Any existing site contamination problems would be controlled or remediated and would not hinder restoration;

The potential for contamination at the sites available to Poseidon for mitigation is unknown.

f. Site preservation is guaranteed in perpetuity (through appropriate public agency or nonprofit ownership, or other means approved by the Executive Director), to protect against future degradation or incompatible land use;

The maximum 3.2 – 5.0 acres of restoration available to Poseidon at Aqua Hedionda Lagoon are located within lands owned by the State of California and private entities. Prior to any restoration at Aqua Hedionda Lagoon, lands would have to be acquired and agreements adopted to guarantee preservation of the site in perpetuity.

g. Feasible methods are available to protect the long-term wetland values on the site(s), in perpetuity;

The majority of the northeastern portion of Aqua Hedionda Lagoon is owned by the State of California under the direction of CDFG who would be required to provide management of any restored wetlands and to protect its ecological value in perpetuity.

h. Does not result in a net loss of existing wetlands;

The restoration of a maximum 3.2 – 5.0 acres identified at Aqua Hedionda Lagoon is conceptual only and lacks preliminary design. It is unknown if any impacts to existing wetlands would be incurred during restoration activities; however, it is unlikely that restoration activities would result in a net loss of wetland habitat.

i. Does not result in an adverse impact on endangered animal species or an adverse unmitigated impact on endangered plant species.

Aqua Hedionda Lagoon wetland habitats have been documented to support breeding populations of the state listed endangered Belding's savannah sparrow (*Passerculus sandwichensis beldingi*) and the state and federal listed endangered light-footed clapper rail (*Rallus longirostris levipes*). Without site-specific focused surveys, potential impacts to sensitive wildlife species from restoration activities cannot be determined at this time. There are no state or federal endangered plant species reported from the lagoon (WRA and AECOM 2009).

3.2 Objectives

The following objectives represent the factors that will contribute to the overall value of the wetland. The selected site(s) shall be determined to achieve these objectives. These objectives shall also guide preparation of the restoration plan.

a. Provides maximum overall ecosystem benefits, e.g. maximum upland buffer, enhancement of downstream fish values, provides regionally scarce habitat, potential for local ecosystem diversity;

Restoration of a maximum of 3.2 - 5.0 acres would provide minimal overall ecosystem benefits. Access to potential restoration sites could impact existing wetlands, requiring additional mitigation and reducing credit for restoration. Restoration to coastal salt marsh could provide regionally scarce habitat. Restoration to open water would not provide regionally scarce habitat but could enhance downstream fish values. The small area

identified for restoration would not include upland buffer habitat or significantly increase local ecosystem diversity.

b. Provides substantial fish habitat compatible with other wetland values at the site(s);

The restoration of a maximum 3.2 -5.0 acres identified at Aqua Hedionda Lagoon is conceptual only and lacks preliminary design. Assuming that the sites would be restored to coastal salt marsh would not provide substantial fish habitat. Assuming that the sites were restored to open water would result in a minimal potential increase in fish habitat; however, restoration to open water would reduce the area for restoration to wetland habitat.

c. Provides a buffer zone of an average of at least 300 feet wide, and not less than 100 feet wide, as measured from the upland edge of the transition area.

Of the sites available to Poseidon, only site AH-6 totaling a maximum restoration area of 1.4 acres would satisfy the objective of a 300-foot buffer and the minimum buffer requirement of 100 feet. All other sites within Aqua Hedionda Lagoon abut roads and development. Incorporation of required buffers would reduce the small area available for restoration.

d. Provides maximum upland transition areas (in addition to buffer zones);

None of the sites available to Poseidon could accommodate upland transition areas without reducing the area for wetland restoration to a fraction of the estimated 3.2 – 5.0 acres.

e. Restoration involves minimum adverse impacts on existing functioning wetlands and other sensitive habitats;

The restoration of a maximum 3.2 – 5.0 acres identified at Aqua Hedionda Lagoon is conceptual only and lacks preliminary design. It is unknown if any impacts to existing wetlands or other sensitive habitats would be incurred during restoration activities. It is assumed that detailed design plans would minimize such impacts.

f. Site selection and restoration plan reflect a consideration of site specific and regional wetland restoration goals;

The selection of the potential restoration sites at Aqua Hedionda Lagoon identified by WRA and AECOM (2009) reflect the need to mitigate for impacts associated with the proposed I-5 North Coast Corridor Project and do not consider site-specific restoration goals. With the exception of the recent purchase of AH-3 by Caltrans with the intention of restoration, there are no site-specific restoration plans for Aqua Hedionda Lagoon identified by WRA and AECOM (2009) or in other studies of restoration opportunities within the region, e.g., Nordby Biological Consulting 2010.

g. Restoration design is that most likely to produce and support wetland-dependent resources;

The areas identified for potential restoration are conceptual only and do not include preliminary design. Thus this objective cannot be evaluated for the sites identified for Aqua Hedionda Lagoon by WRA and AECOM (2009).

h. Provides rare or endangered species habitat;

As stated above, the areas identified for potential restoration are conceptual only and do not include preliminary design. Thus this objective cannot be evaluated for the sites identified for Aqua Hedionda Lagoon by WRA and AECOM (2009).

i. Provides for restoration of reproductively isolated populations of native California species;

As stated above, the areas identified for potential restoration are conceptual only and do not include preliminary design. Thus this objective cannot be evaluated for the sites identified for Aqua Hedionda Lagoon by WRA and AECOM (2009).

j. Results in an increase in the aggregate acreage of wetland in the Southern California Bight;

The maximum of 3.2 - 5.0 acres identified for restoration would result in a minimal increase in the region's wetland habitats.

k. Requires minimum maintenance;

As stated above, the areas identified for potential restoration are conceptual only and do not include preliminary design. Thus this objective cannot be evaluated for the sites identified for Aqua Hedionda Lagoon by WRA and AECOM (2009).

l. Restoration project can be accomplished in a reasonably timely fashion; and,

As no plans have been developed for land acquisition and/or restoration of the 3.2 - 5.0 acres of restoration available to Poseidon, it is unlikely that any project in Aqua Hedionda Lagoon can be accomplished in a timely manner when compared to other sites that have undergone feasibility analyses and occur only on public property.

m. Site(s) in proximity to the Carlsbad desalination facility.

NA

BATIQUITOS LAGOON

3.1 Minimum Standards – Restoration of Batiquitos Lagoon

The wetland restoration project site(s) and preliminary plan(s) must meet the following minimum standards:

a. Location within Southern California Bight;

The selection of Batiquitos Lagoon satisfies the requirement that the mitigation site be located within the southern California Bight.

b. Potential for restoration as tidal wetland, with extensive intertidal and subtidal areas;

Batiquitos Lagoon underwent large-scale restoration between 1989 and 1996 (WRA and AECOM 2009). The primary restoration activities included construction of a new tidal inlet, construction of a new Pacific Coast Highway bridge, construction of five tern/plover nesting areas and the excavation of 3 million cubic yards of sediment. Other restoration activities included planting of salt marsh vegetation and eelgrass habitat. Having undergone this large-scale restoration, further opportunities for conventional restoration are limited.

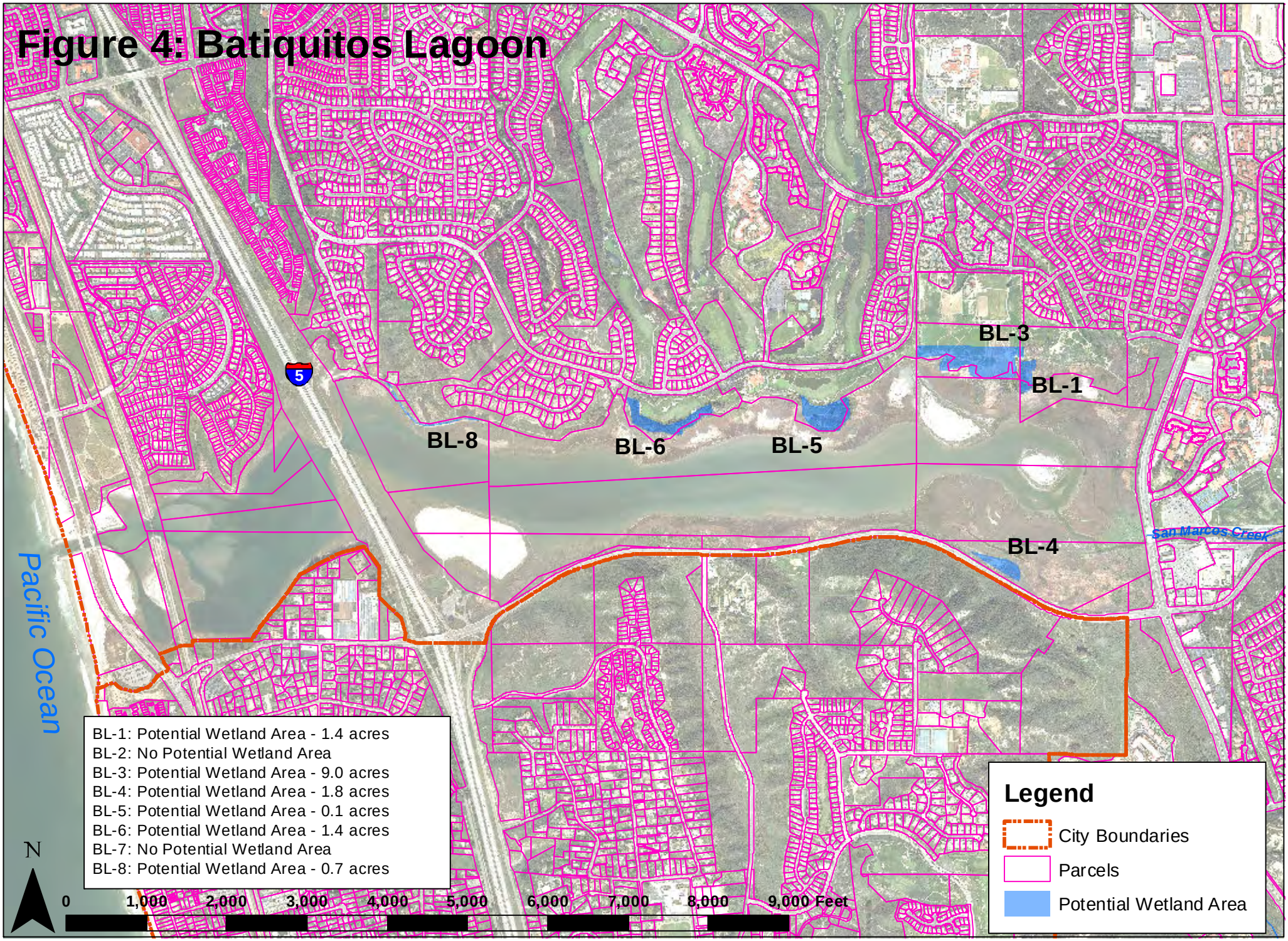
The primary opportunities for conventional tidal wetland restoration at Batiquitos Lagoon exist on the northern banks of the lagoon east of I-5 (Figure 4). Overall, six viable potential restoration sites totaling 14.4 acres were identified for Batiquitos Lagoon (WRA and AECOM (2009). Two sites (BL-2 and BL-7) were rejected after field reconnaissance. Of the six potential sites identified, five sites occurring on the northeastern banks of the lagoon totaling 12.6 acres were considered to have a high restoration potential. These areas and their mitigation potential for Poseidon are presented below.

- **BL-1. BL-1 consists of 1.4 acres owned by the Batiquitos Lagoon Foundation. This site was ranked 2 in terms of restoration potential, although WRA and AECOM acknowledged that "…some areas may be within USACE, CCC, and/or CDFG jurisdiction." It is uncertain how much of the 1.4 acres could credited toward Poseidon's mitigation needs. For this analysis, it is assumed that the entire 1.4 acres is available to Poseidon.**

- **BL-3. BL-3 includes 9.0 acres of privately-owned land. This site was ranked 1 in terms of restoration potential. All 9.0 acres are potentially available to Poseidon.**

- **BL-4. This site consists of 1.4 acres owned by the State of California. WRA and AECOM (2009) determined that most of the site is jurisdictional and is subject inundation by high tides. Thus, this site, ranked 4 in terms of restoration potential, provides little opportunity for Poseidon.**

Figure 4: Batiquitos Lagoon



- **BL-5. BL-5 consists of 0.1 acre of land that appears to be owned by an entity designated in the WRA and AECOM 2009 report as "Environmental Trust" (WRA and AECOM 2009). It is assumed that this refers to the now-defunct non-profit group The Environmental Trust (TET), although the designation is not further defined in the report. Ownership by the defunct TET could be problematic as sale or transfer could be subject to legal ramifications pending bankruptcy by the TET. This site was ranked 2 in terms of restoration potential, although WRA and AECOM acknowledged that "…some areas may be within USACE, CCC, and/or CDFG jurisdiction." Given the initial area of 0.1 acre and potential ownership issues, it may be concluded that this parcel holds very little opportunity for Poseidon's mitigation requirements.**

- **BL-6. This site consists of 1.4 acres of land owned by the now-defunct TET. This site was ranked 1 in terms of restoration potential, although WRA and AECOM acknowledged that "…some areas may be in CCC jurisdiction." Some of this area may be available to Poseidon for mitigation; however, ownership by the defunct TET could be problematic. Given ownership by the TET and the uncertainty regarding jurisdictional status, it may be concluded that this parcel holds very little opportunity for Poseidon's mitigation requirements.**

- **BL-8. BL-8 consists of 0.7 acre that appears to be owned by the defunct TET (WRA and AECOM 2009). This site was ranked 2 in terms of restoration and may be considered available for Poseidon's mitigation requirements.**

Assuming that lands owned by the TET and other private concerns could be purchased, there is a maximum of about 12.5 acres that could be available to Poseidon for mitigation.

c. Creates or substantially restores a minimum of 37 acres and up to at least 66 acres [all locations] acres of habitat similar to the affected habitats in Agua Hedionda Lagoon, excluding buffer zone and upland transition area;

As presented above, restoration of a maximum of 12.5 acres, with a potential reduction of that maximum due to impacts jurisdictional wetlands, does not meet this minimum standard. Required buffers would further reduce the area available.

d. Provides a buffer zone of a size adequate to ensure protection of wetland values, and at least 100 feet wide, as measured from the upland edge of the transition area.

Sites BL-1 and BL-3 appear to satisfy the minimum 100-foot buffer standard. Sites BL-5 and BL-6 abut the Aviara golf course and community and would likely have to be reduced in area to accommodate minimum buffers. Site BL-4 abuts La Costa Avenue and would have to be reconfigured to accommodate the minimum buffer, resulting in a reduced area for restoration. Site BL-8 abuts the Aviara golf course and community and cannot accommodate the 100-foot minimum buffer. Thus, less than the maximum 12.5 acres presented above would be available for restoration once buffers are included.

e Any existing site contamination problems would be controlled or remediated and would not hinder restoration;

There is no evidence to suggest that there are site contamination issues at Batiquitos Lagoon; however site-specific information on the parcels identified by WRA and AECOM 2009 is lacking.

f. Site preservation is guaranteed in perpetuity (through appropriate public agency or nonprofit ownership, or other means approved by the Executive Director), to protect against future degradation or incompatible land use;

The maximum 12.5 acres of restoration identified within Batiquitos Lagoon are owned by both public and private entities. For those lands owned by the State of California, agreements with the state would have to be adopted to guarantee preservation of the site in perpetuity. For those lands owned privately or by the defunct TET, acquisition and agreements with the state would need to be adopted.

g. Feasible methods are available to protect the long-term wetland values on the site(s), in perpetuity;

The majority of Batiquitos Lagoon is managed by CDFG who would be required to provide management of any restored wetlands and to protect its ecological value in perpetuity.

h. Does not result in a net loss of existing wetlands;

The restoration of the maximum 12.5 acres identified at Batiquitos Lagoon would not result in a net loss of existing wetlands.

i. Does not result in an adverse impact on endangered animal species or an adverse unmitigated impact on endangered plant species.

The WRA and AECOM (2009) identified four special status wildlife species with breeding populations at Batiquitos Lagoon. These include the light-footed clapper rail, Belding's savannah sparrow, the state and federal listed endangered California least tern (*Sternula antillarum browni*), and the federally threatened western snowy plover (*Charadrius alexandrinus nivosus*). No state or federal listed endangered plant species were identified. Site-specific surveys would be required to determine presence/absence of any endangered species and any impacts associated with restoration activities; however, it is assumed that impacts to sensitive species could be avoided.

3.2 Objectives

The following objectives represent the factors that will contribute to the overall value of the wetland. The selected site(s) shall be determined to achieve these objectives. These objectives shall also guide preparation of the restoration plan.

a. Provides maximum overall ecosystem benefits, e.g. maximum upland buffer, enhancement of downstream fish values, provides regionally scarce habitat, potential for local ecosystem diversity;

Restoration of a maximum of 12.5 acres would provide moderate overall ecosystem benefits. Restoration of the parcels identified by WRA and AECOM (2009) could impact existing wetlands and the requirements of minimum buffers would further reduce restorable area. The largest site, BL-3 (9.0 acres) is described as existing upland that could be excavated to promote tidal action. Thus, this site could provide enhancement of downstream fish values and regionally scarce habitat, such as salt marsh and mudflat. The small area identified for restoration would not maximize upland buffer habitat or significantly increase local ecosystem diversity.

b. Provides substantial fish habitat compatible with other wetland values at the site(s);

The maximum of 12.5 acres identified for potential restoration could provide moderate habitat for fish; however, the primary opportunities for restoration, BL-3, BL-5 and BL-6, are not contiguous with the open water habitat of the lagoon. Each site would have to excavated to create low intertidal or subtidal habitat and would have to be connected to the open water of the lagoon in order to create fish habitat. This would preclude restoration of regionally scarce habitats, such as salt marsh and mudflat.

c. Provides a buffer zone of an average of at least 300 feet wide, and not less than 100 feet wide, as measured from the upland edge of the transition area.

Site BL-1 appears to satisfy the minimum 100-foot buffer standard and could accommodate a 300-foot buffer. Site BL-3 would have to be reconfigured to accommodate a 300-foot buffer with a corresponding decrease in area available for restoration. Sites BL-5 and BL-6 abut the Aviara golf course and community and would likely have to be reduced in area to accommodate 100-foot or 300- foot buffers. Site BL-4 abuts La Costa Avenue and would have to be refigured to accommodate the minimum buffer, resulting in a reduced area for restoration. Site BL-8 cannot accommodate a 100-foot or 300-foot buffer. Sites BL-4, BL-6 and BL-7 could not accommodate a 300-foot buffer. Thus, less than the maximum 12.5 acres presented above would be available for restoration.

d. Provides maximum upland transition areas (in addition to buffer zones);

Although the potential restoration sites identified by WRA and AECOM (2009) are only conceptual in nature, designing the restoration to maximize upland habitat would result in a corresponding loss of area to be restored to coastal wetland.

e..Restoration involves minimum adverse impacts on existing functioning wetlands and other sensitive habitats;

As stated above, restoration of a maximum of 12.5 acres may result in impacts to existing wetlands. While these impacts may be minimized, they could require mitigation which

would reduce benefits to the overall system, or avoidance would reduce the area available for restoration.

f. Site selection and restoration plan reflect a consideration of site specific and regional wetland restoration goals;

The selection of the 12.6 acres identified by WRA and AECOM (2009) reflect the need to mitigate for impacts associated with the proposed I-5 North Coast Corridor Project. The potential restoration is conceptual and does not include preliminary or advanced planning. As the lagoon has undergone large-scale restoration, site-specific restoration plans are lacking.

g. Restoration design is that most likely to produce and support wetland-dependent resources;

As stated above, the areas identified for potential restoration are very conceptual and do not include preliminary design. Thus this objective cannot be evaluated for Batiquitos Lagoon.

h. Provides rare or endangered species habitat;

As stated above, the areas identified for potential restoration are conceptual only and do not include preliminary design. Thus this objective cannot be evaluated for Los Batiquitos Lagoon.

i. Provides for restoration of reproductively isolated populations of native California species;

As stated above, the areas identified for potential restoration are conceptual only and do not include preliminary design. Thus this objective cannot be evaluated for Los Batiquitos Lagoon.

j. Results in an increase in the aggregate acreage of wetland in the Southern California Bight;

While it is possible that the maximum of 12.5 or 12.6 acres identified for restoration would result in a slight increase in the aggregate acreage of wetland in the Southern California Bight, it is unlikely that a net of 12.6 acres would result from restoration efforts. Thus, implementation of this restoration would result in a very minor increase in the region's wetland habitats.

k. Requires minimum maintenance;

As stated above, the areas identified for potential restoration are conceptual only and do not include preliminary design. Thus this objective cannot be evaluated for Los Batiquitos Lagoon.

l. Restoration project can be accomplished in a reasonably timely fashion; and,

As no plans have been developed for restoration of the 12.6 acres of maximum potential restoration, and the proposed conventional restoration would require acquisition and implementation of protection agreements, it is unlikely that any project in Batiquitos Lagoon can be accomplished in a timely manner when compared to other sites that have undergone feasibility analyses.

m. Site(s) in proximity to the Carlsbad desalination facility.

Batiquitos Lagoon is located approximately 9 miles south of Aqua Hedionda Lagoon, the site of the Carlsbad Desalination Plant

SAN ELIJO LAGOON

3.1 Minimum Standards – Restoration of San Elijo Lagoon

The wetland restoration project site(s) and preliminary plan(s) must meet the following minimum standards:

a. Location within Southern California Bight;

The selection of San Elijo Lagoon satisfies the requirement that the mitigation site be located within the southern California Bight.

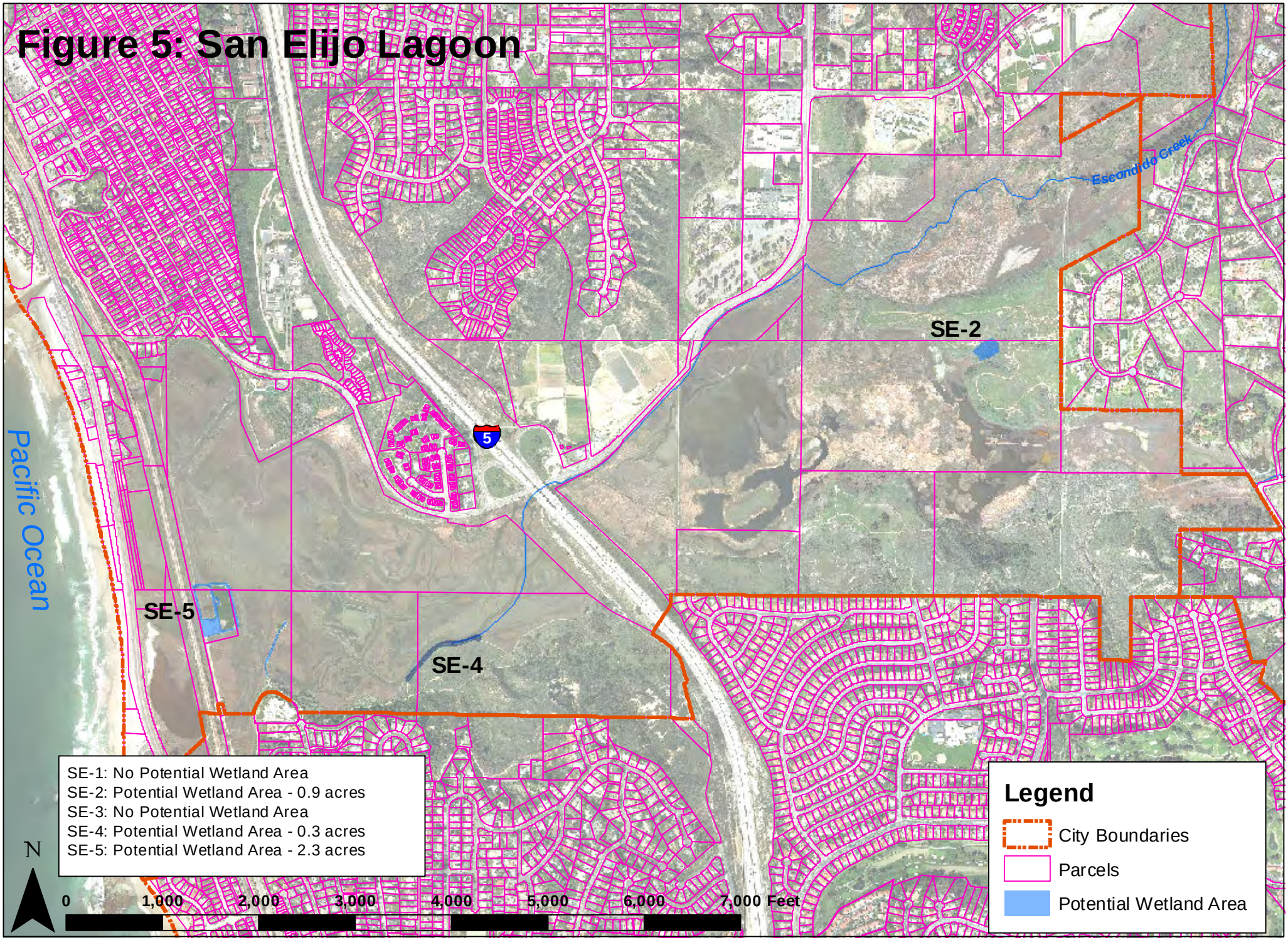
b. Potential for restoration as tidal wetland, with extensive intertidal and subtidal areas;

San Elijo Lagoon is currently being studied for large-scale restoration with funding from SANDAG, Caltrans and the California State Coastal Conservancy. Restoration alternatives have been developed ranging from preservation of existing conditions to relocation of the lagoon inlet coupled with extensive grading of the lagoon basins. In addition, replacement of the existing Pacific Coast Highway and MTS railroad bridges is being considered. These alternatives are being analyzed with preparation of a project EIR/EIS scheduled to begin in 2011. The project focus is on restoring wetlands through increased tidal prism, not on "conventional restoration" as defined by WRA and AECOM (2009). Using the definitions of WRA and AECOM (2009), this type of restoration would be considered "hydrodynamic restoration". In the case of San Elijo Lagoon, most of the existing habitat within the lagoon boundaries is currently considered jurisdictional wetland, although the current tidal inlet results in a muted tidal prism within the lagoon. Restoration alternatives may increase tidal prism within the lagoon resulting in a more functional coastal wetland system; however, the restoration would not create wetlands from uplands, but would convert muted wetlands to fully tidal wetlands. Thus, the assignment of restoration credits is unclear and has not yet been determined by the stakeholder agencies. Regardless of restoration credits, conversion of one wetland type to another is not appropriate for Poseidon's mitigation requirements.

Given this large-scale planning process, there is little opportunity for conventional restoration at San Elijo Lagoon. WRA and AECOM (2009) identified three potential restoration sites within the lagoon with a combined area of 3.5 acres (Figure 5). All three sites were ranked either `1 or 2 in terms of restoration potential. These areas and their mitigation potential for Poseidon are presented below.

- **SE-2. SE-2 consists of 0.9 acre owned by the County of San Diego. This site was ranked 2 in terms of restoration potential, although WRA and AECOM acknowledged: "(The) majority of the site is 30' above wetlands areas, minor opportunity in small draw, but vegetation is in good shape. Site access may be impeded by steep slopes…".**

Figure 5: San Elijo Lagoon



Excavation of 30 feet of soil (or less excavation in an undefined "draw" at the base of the bluff) to create less than one acre of wetlands is considered prohibitively expensive for the restoration benefit obtained. Furthermore, the area is in the eastern end of San Elijo Lagoon in an area dominated by freshwater marsh that is isolated from tidal inundation. As this standard specifies restoration of tidal wetlands, it does not appear that this site can meet that standard. For this analysis, it is assumed that restoration of this site is infeasible and unavailable to Poseidon.

- **SE-4. SE-4 includes 0.3 acre owned by the County of San Diego. This site was ranked 2 in terms of restoration potential. , although WRA and AECOM acknowledged that "(The) site consists of high quality transitional habitat with known occurrences of gnatcatcher nearby. Tidal action can be promoted with minimal excavation, but impacts to coastal sage scrub from excavation and access may occur." Given the quality of upland habitat, is assumed that restoration is infeasible and that this site is unavailable to Poseidon.**

- **SE-5. SE-5 consists of 2.3 acres of land owned by the San Elijo Lagoon Conservancy. This site is an abandoned waste treatment plant. WRA and AECOM (2009) ranked this site as 1 in terms of restoration potential.**

The current large-scale restoration planning effort has identified the majority of the former wastewater treatment plant area as a bird nesting site for the restored lagoon. It is estimated that approximately 0.75 acre would be available to Poseidon for restoration.

Given the existing habitat values and the planned use of the former wastewater treatment plant there is approximately 0.75 acres of potential restoration available to Poseidon at San Elijo Lagoon.

c. Creates or substantially restores a minimum of 37 acres and up to at least 66 acres [all locations] acres of habitat similar to the affected habitats in Agua Hedionda Lagoon, excluding buffer zone and upland transition area;

As presented above, restoration of a maximum of 3.5 acres identified by WRA and AECOM (2009) or the 0.75 acre determined above, do not meet this minimum standard.

d. Provides a buffer zone of a size adequate to ensure protection of wetland values, and at least 100 feet wide, as measured from the upland edge of the transition area.

Site SE-2 meets this minimum standard. Site SE-3 occurs within upland transition habitat and would result in a loss of this habitat. Site SE-5 is surrounded by wetland and a buffer cannot be accommodated, as defined, from the upland edge of the transition area.

e. Any existing site contamination problems would be controlled or remediated and would not hinder restoration;

There are potential contamination issues associated with the restoration of San Elijo Lagoon, especially at the site of the former wastewater treatment plant. As the majority of the former plant is planned as a bird nesting area, potential contamination would be controlled or remediated as part of the large-scale restoration effort.

f. Site preservation is guaranteed in perpetuity (through appropriate public agency or nonprofit ownership, or other means approved by the Executive Director), to protect against future degradation or incompatible land use;

The majority of the lagoon is owned by the State of California and the County of San Diego (WRA and AECOM 2009). Although there is very little potential area for restoration at San Elijo Lagoon, any restoration would require agreements with the state and county to guarantee preservation of the site in perpetuity

g. Feasible methods are available to protect the long-term wetland values on the site(s), in perpetuity;

The majority of San Elijo Lagoon is owned by the State of California and the County of San Diego who would be required to provide management of any restored wetlands and to protect its ecological value in perpetuity.

h. Does not result in a net loss of existing wetlands;

Although there is minimal area available at San Elijo Lagoon for conventional wetland restoration, there would not be a net loss of existing wetlands associated with restoration.

i. Does not result in an adverse impact on endangered animal species or an adverse unmitigated impact on endangered plant species.

The WRA and AECOM (2009) identified four special status wildlife species at San Elijo Lagoon and assumed their populations to be extant. These included the light-footed clapper rail, Belding's savannah sparrow, California least tern and the state listed threatened and fully-protected California black rail (*Laterallus jamaicensis coturniculus*), although most wetland biologists consider the black rail to be extinct. No state or federal listed endangered plant species were identified. Site-specific surveys would be required to determine presence/absence of any endangered species and any impacts associated with restoration activities.

3.2 Objectives

The following objectives represent the factors that will contribute to the overall value of the wetland. The selected site(s) shall be determined to achieve these objectives. These objectives shall also guide preparation of the restoration plan.

a. Provides maximum overall ecosystem benefits, e.g. maximum upland buffer, enhancement of downstream fish values, provides regionally scarce habitat, potential for local ecosystem diversity;

Restoration of a maximum of 3.5 acres and a minimum of 0.75 acre would provide minimal overall ecosystem benefits. Restoration of the parcels identified by WRA and AECOM (2009) could impact existing transition areas and the requirements of minimum buffers would eliminate some potentially restorable areas. The small area identified for restoration would not and cannot maximize upland buffer habitat or significantly increase local ecosystem diversity.

b. Provides substantial fish habitat compatible with other wetland values at the site(s);

The maximum of 3.5 acres and minimum of 0.75 acre identified for potential restoration would not provide substantial habitat for fish and would impact sensitive upland resources.

c. Provides a buffer zone of an average of at least 300 feet wide, and not less than 100 feet wide, as measured from the upland edge of the transition area.

Site SE-2 may meet this minimum standard. Site SE-3 occurs within upland transition habitat and would result in a loss of this habitat. Site SE-5 is surrounded by wetland and a buffer cannot be accommodated, as defined, from the upland edge of the transition area.

d. Provides maximum upland transition areas (in addition to buffer zones);

Although the potential restoration sites identified by WRA and AECOM (2009) are only conceptual in nature, there is little opportunity for upland transition area except at SE-2.

e..Restoration involves minimum adverse impacts on existing functioning wetlands and other sensitive habitats;

As stated above, SE-4 consists of high quality transition habitat that would be converted to wetland habitat. Impacts to wetlands at the three sites identified by WRA and AECOM (2009) would be minimal.

f. Site selection and restoration plan reflect a consideration of site specific and regional wetland restoration goals;

The selection of the 3.5 acres identified by WRA and AECOM (2009) reflect the need to mitigate for impacts associated with the proposed I-5 North Coast Corridor Project. The potential restoration is conceptual and does not include preliminary or advanced planning. As San Elijo Lagoon is being analyzed for large-scale hydrodynamic restoration there is little opportunity for Poseidon to mitigate at this site for impacts associated with the Carlsbad Desalination Plant.

g. Restoration design is that most likely to produce and support wetland-dependent resources;

As stated above, the areas identified for potential restoration are very conceptual and do not include preliminary design. Thus this objective cannot be evaluated for San Elijo Lagoon.

h. Provides rare or endangered species habitat;

As stated above, the areas identified for potential restoration are conceptual only and do not include preliminary design. Thus this objective cannot be evaluated for San Elijo Lagoon.

i. Provides for restoration of reproductively isolated populations of native California species;

As stated above, the areas identified for potential restoration are conceptual only and do not include preliminary design. Thus this objective cannot be evaluated for San Elijo Lagoon.

j. Results in an increase in the aggregate acreage of wetland in the Southern California Bight;

Restoration of a maximum of 3.5 acres or a minimum of 0.75 acre identified above would result in a minimal increase in the aggregate acreage of wetland in the Southern California Bight.

k. Requires minimum maintenance;

As stated above, the areas identified for potential restoration are conceptual only and do not include preliminary design. Thus this objective cannot be evaluated for San Elijo Lagoon.

l. Restoration project can be accomplished in a reasonably timely fashion; and,

As no plans have been developed for restoration of the maximum 3.5 acres of potential restoration, and the proposed conventional restoration would require acquisition and implementation of protection agreements, it is unlikely that any project in San Elijo Lagoon can be accomplished in a timely manner when compared to other sites that have undergone more detailed feasibility analyses.

m. Site(s) in proximity to the Carlsbad desalination facility.

San Elijo Lagoon is located approximately 20 miles south of Aqua Hedionda Lagoon, the site of the Carlsbad Desalination Plant

SAN DIEGUITO LAGOON

3.1 Minimum Standards – Restoration of San Dieguito Lagoon

The wetland restoration project site(s) and preliminary plan(s) must meet the following minimum standards:

a. Location within Southern California Bight;

The selection of San Dieguito Lagoon satisfies the requirement that the mitigation site be located within the southern California Bight.

b. Potential for restoration as tidal wetland, with extensive intertidal and subtidal areas;

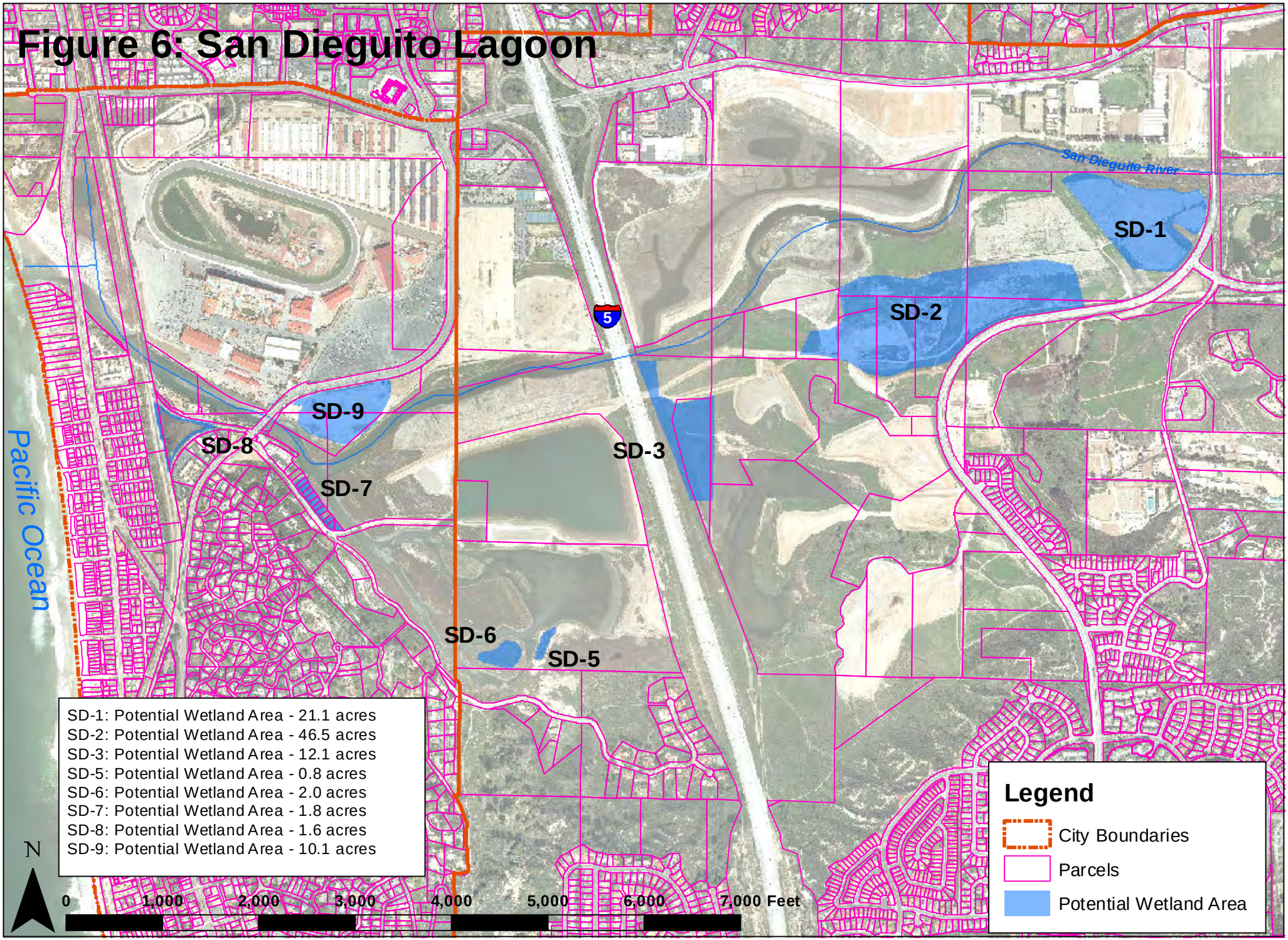
San Diegutio Lagoon is currently undergoing a large-scale wetland restoration project funded by Southern California Edison (SCE) as mitigation for impacts associated with the operation of the San Onofre Nuclear Generating Station (SONGS). The restoration includes 115 acres of tidal wetlands and maintenance in perpetuity of the mouth of the inlet for which SCE received 35 acres of wetland restoration credit. Despite this large-scale restoration project, San Dieguito Lagoon offers substantial additional opportunities for "conventional restoration" as defined by WRA and AECOM (2009). Conventional restoration includes creation of wetland in upland habitats and/or restoration of historic wetland areas that have been filled. This type of restoration typically involves the removal of fill materials and/or restoration of wetland hydrology to sites that are currently uplands.

In their assessment of potential coastal wetland restoration sites for the proposed I-5 North Coast Corridor Project, WRA and AECOM (2009) identified a nine separate areas totaling 96 acres of potential conventional restoration at San Dieguito Lagoon (Figure 6). Of the 96 total acres, 73.8 acres were determined to have high restoration potential (mitigation potential scores of 1 or 2 on a scale of 1-5 with 1 being the highest). These opportunities consisted of upland areas along the banks of the San Dieguito River and within the CDFG Ecological Reserve in the southwestern portion of the lagoon. These areas and their mitigation potential for Poseidon are presented below.

SD-1. SD-1 consists of 21.1 acres located on the eastern portion of the former Boudreau property immediately west of El Camino Real on lands owned by the San Dieguito River Park Joint Powers Authority (JPA). SD-1 was determined to have a mitigation potential of 1 (WRA and AECOM 2009). The JPA has entered into a Memorandum of Understanding with Caltrans and SANDAG to restore wetland and upland habitats on this parcel. Thus, it is not available at this time for Poseidon's mitigation requirements.

SD-2. SD-2 is located west of SD-1 on lands owned by the JPA. It consists of approximately 46.5 acres of former agricultural land. SD-2 was determined to have a mitigation potential of 1 (WRA and AECOM 2009). Like SD-1, the JPA has entered into a Memorandum of Understanding with Caltrans and SANDAG to restore wetland and

Figure 6: San Dieguito Lagoon



upland habitats on this parcel. Thus, it is not available at this time for Poseidon's mitigation requirements.

SD-3. SD-3 consists of 12.1 acres located immediately east of Interstate-5 (I-5) south of the San Dieguito River. The land is owned by the 22nd Agricultural District and the City of San Diego (M. Josselyn, pers. comm.). This parcel was originally included in Southern California Edison's San Dieguito Lagoon Restoration, currently under construction. SD-3 was determined to have a restoration potential of 3 (WRA and AECOM 2009). The location of this site immediately adjacent to I-5 introduces uncertainty regarding potential impacts from the widening of I-5 as proposed by the I-5 North Coast Corridor Project. CCC requirements of a minimum buffer of 100 feet and a preferred buffer of 300 feet would reduce the area available for restoration. This area is owned by the 22nd Agricultural District and the City of San Diego who have indicated their intent to use it for mitigation for their purposes. Therefore, SD-3 is unavailable to Poseidon for their mitigation requirements.

SD-4. SD-4 was rejected by WRA and AECOM (2009) as a mitigation site as it is situated in the floodplain of the San Dieguito River and provides protection for the SCE restoration.

SD-5 and SD-6. These parcels are located on the CDFG Ecological reserve lands west of I-5 and south of the San Dieguito River. SD-5 consists of 0.8 acre and SD-6 consists of 2 acres. These areas are upland disposal sites for previous restoration activities, commonly referred to as the "Fishhook" restoration and occur adjacent to natural and restored wetland habitats. SD-5 is ranked 1 and SD-6 is ranked 2 in terms of restoration potential (WRA and AECOM 2009). Access to both areas would be difficult and would likely result in impacts to existing wetlands requiring additional mitigation and reducing mitigation credit for these sites. SD-6 is located on an island and would require construction of an access bridge or access by water-based equipment. Although it is unlikely that a total of 2.8 acres could be credited toward mitigation, these areas are available to Poseidon for mitigation.

SD-7. SD-7 is located northeast and immediately adjacent to San Dieguito Racetrack View Drive. SD-7 is 1.8 acres in size consisting of 16 small parcels owned by five different entities, both public and private. Although WRA and AECOM (2009) rank the mitigation potential for this site as high (1), the report acknowledges that water lines buried within this parcel may make restoration difficult. Although restoration of this site would require acquisition of 16 parcels and would net a maximum of 1.8 acres, SD-7 is available to Poseidon for mitigation.

SD-8. SD-8 is located in a triangle of land bounded by the Metropolitan Transit System (MTS) rail line to the west, the San Dieguito River to the north and private parcels along Jimmy Durante Boulevard to the west. The WRA and AECOM (2009) report states that this site is mostly existing wetlands with only the edges available to create "a slightly larger wetland area." of approximately 1.6 acres. WRA and AECOM (2009) rank the mitigation potential of this site as 1; however, they acknowledge that the site is owned by MTS which may use it for their mitigation needs. Thus, its availability to Poseidon is unknown.

SD-9. SD-9 consists of a "temporary" parking lot for the San Diego County Fairgrounds located south of Jimmy Durante Boulevard and north of the San Dieguito River on lands owned by the 22nd Agricultural District. The site consists of 10.1 acres and was ranked moderate in terms of mitigation potential (3) by WRA an AECOM (2209). This parking lot has been a source of contention among various state agencies for many years. At this time, there is no indication that the 22nd Agricultural District would make this parcel available to Poseidon for mitigation.

In summary, there is a maximum of 4.6 acres (SD-5, SD-6 and SD-7) that may be available to Poseidon for conventional restoration at San Dieguito Lagoon. These parcels are constrained in the form of utilities and current ownership.

c. Creates or substantially restores a minimum of 37 acres and up to at least 66 acres [all locations] acres of habitat similar to the affected habitats in Agua Hedionda Lagoon, excluding buffer zone and upland transition area;

As demonstrated above, restoration of a maximum of 4.6 acres, with a potential reduction of that maximum due to impacts associated with access, does not meet this minimum standard.

d. Provides a buffer zone of a size adequate to ensure protection of wetland values, and at least 100 feet wide, as measured from the upland edge of the transition area.

Of the sites available to Poseidon, only sites SD-5 and SD-6 totaling a maximum restoration area of 2.8 acres would satisfy the minimum buffer requirement of 100 feet. All other sites within San Dieguito Lagoon abut roads and development. Restoration of SD-9 could be configured to provide a minimum 100-ft buffer; however, that would substantially reduce the 10.1 acres available.

e. Any existing site contamination problems would be controlled or remediated and would not hinder restoration;

The potential for contamination at the sites available to Poseidon for mitigation is unknown.

f. Site preservation is guaranteed in perpetuity (through appropriate public agency or nonprofit ownership, or other means approved by the Executive Director), to protect against future degradation or incompatible land use;

The maximum 4.6 acres of restoration available to Poseidon at San Dieguito Lagoon are located within lands owned by the State of California and private entities. Prior to any restoration at San Dieguito Lagoon, lands would have to be acquired and agreements adopted to guarantee preservation of the site in perpetuity.

g. Feasible methods are available to protect the long-term wetland values on the site(s), in perpetuity;

The majority of San Dieguito Lagoon is owned by public agencies, such as CDFG and the JPA, who would be required to provide management of any restored wetlands and to protect its ecological value in perpetuity. Thus, there exist feasible methods to accomplish this goal.

h. Does not result in a net loss of existing wetlands;

Restoration of the maximum 4.6 acres available to Poseidon at San Dieguito Lagoon would require access to isolated parcels that could result in additional impacts to existing wetlands requiring additional mitigation. Thus, while restoration of these parcels may not result in a net loss of existing wetlands, it is unlikely that the restoration of the maximum of 4.6 acres would be fully credited as mitigation for impacts associated with the Carlsbad desalination Project.

i. Does not result in an adverse impact on endangered animal species or an adverse unmitigated impact on endangered plant species.

San Dieguito Lagoon and San Dieguito River wetland habitats have been documented to support breeding populations of the state listed endangered Belding's savannah sparrow and the state and federal listed endangered light-footed clapper rail. Without site-specific focused surveys, potential impacts to sensitive wildlife species from restoration activities cannot be determined at this time. There are no state or federal endangered plant species reported from the lagoon (WRA and AECOM 2009).

3.2 Objectives

The following objectives represent the factors that will contribute to the overall value of the wetland. The selected site(s) shall be determined to achieve these objectives. These objectives shall also guide preparation of the restoration plan.

a. Provides maximum overall ecosystem benefits, e.g. maximum upland buffer, enhancement of downstream fish values, provides regionally scarce habitat, potential for local ecosystem diversity;

Restoration of a maximum of 4.6 acres would provide minimal overall ecosystem benefits. Access would likely impact existing wetlands, requiring additional mitigation and reducing credit for restoration. Restoration to coastal salt marsh could provide regionally scarce habitat. Restoration to open water would not provide regionally scarce habitat but could enhance downstream fish values. The small area identified for restoration would not include upland buffer habitat or significantly increase local ecosystem diversity.

b. Provides substantial fish habitat compatible with other wetland values at the site(s);

The restoration of a maximum 4.6 acres identified at San Dieguito Lagoon is conceptual only and lacks preliminary design. Assuming that the sites would be restored to coastal salt marsh would not provide substantial fish habitat. Assuming that the sites were restored to open water would result in an increase in potential increase in fish habitat; however, restoration to open water would reduce the area for restoration to wetland habitat.

c. Provides a buffer zone of an average of at least 300 feet wide, and not less than 100 feet wide, as measured from the upland edge of the transition area.

Of the sites available to Poseidon, only sites SD-5 and SD-6 would meet this objective.

d. Provides maximum upland transition areas (in addition to buffer zones);

None of the sites available to Poseidon could accommodate upland transition areas without rendering wetland restoration infeasible.

e. Restoration involves minimum adverse impacts on existing functioning wetlands and other sensitive habitats;

As stated above, restoration of SD-6 would require construction of an access road and could require construction of an access bridge which would impact existing wetlands. Restoration of SD-5 would require construction of an access road. Both actions would require mitigation which would reduce or negate any benefit to the overall system. Restoration of SD-7 could be accomplished without impacting sensitive habitats.

f. Site selection and restoration plan reflect a consideration of site specific and regional wetland restoration goals;

The selection of the potential restoration sites at San Dieguito Lagoon identified by WRA and AECOM (2009) reflect the need to mitigate for impacts associated with the proposed I-5 North Coast Corridor Project and do not consider site-specific restoration goals. The potential restoration is conceptual and does not include preliminary or advanced planning. WRA and AECOM 2009 cite site-specific restoration goals for San Dieguito Lagoon as consisting of restoration of public lands held by the JPA. As stated previously, those lands are not available to Poseidon for restoration.

g. Restoration design is that most likely to produce and support wetland-dependent resources;

The areas identified for potential restoration are conceptual only and do not include preliminary design. Thus this objective cannot be evaluated for San Dieguito Lagoon.

h. Provides rare or endangered species habitat;

As stated above, the areas identified for potential restoration are conceptual only and do not include preliminary design. Thus this objective cannot be evaluated for San Dieguito Lagoon.

i. Provides for restoration of reproductively isolated populations of native California species;

As stated above, the areas identified for potential restoration are conceptual only and do not include preliminary design. Thus this objective cannot be evaluated for San Dieguito Lagoon.

j. Results in an increase in the aggregate acreage of wetland in the Southern California Bight;

While it is possible that the maximum of 4.6 acres identified for restoration would result in a slight increase in the aggregate acreage of wetland in the Southern California Bight, it is unlikely that a net of 4.6 acres would result from restoration efforts. Thus, implementation of this restoration would result in a minimal increase in the region's wetland habitats.

k. Requires minimum maintenance;

As stated above, the areas identified for potential restoration are conceptual only and do not include preliminary design. Thus this objective cannot be evaluated for San Dieguito Lagoon.

l. Restoration project can be accomplished in a reasonably timely fashion; and,

As no plans have been developed for land acquisition and restoration of the 4.6 acres of restoration available to Poseidon, it is unlikely that any project in San Dieguito Lagoon can be accomplished in a timely manner when compared to other sites that have undergone feasibility analyses and occur on public property.

m. Site(s) in proximity to the Carlsbad desalination facility.

San Dieguito Lagoon is located approximately 25 miles south of Aqua Hedionda Lagoon, the site of the Carlsbad Desalination Plant

LOS PEÑASQUITOS LAGOON

3.1 Minimum Standards – Restoration of Los Peñasquitos Lagoon

The wetland restoration project site(s) and preliminary plan(s) must meet the following minimum standards:

a. Location within Southern California Bight;

The selection of Los Peñasquitos Lagoon satisfies the requirement that the mitigation site be located within the southern California Bight.

b. Potential for restoration as tidal wetland, with extensive intertidal and subtidal areas;

Los Peñasquitos Lagoon offers very limited opportunity for "conventional restoration" as defined by WRA and AECOM (2009). Conventional restoration includes creation of wetland in upland habitats and/or restoration of historic wetland areas that have been filled. This type of restoration typically involves the removal of fill materials and/or restoration of wetland hydrology to sites that are currently uplands.

In their assessment of potential coastal wetland restoration sites for the proposed I-5 North Coast Corridor Project, WRA and AECOM (2009) identified a total of 8.6 acres of potential conventional restoration at Los Peñasquitos Lagoon (Figure 7). These opportunities consisted of removal of existing berms and the conversion of low-quality upland or ruderal habitat in areas along the southern portion of the lagoon study area. The authors concluded:

"There is very limited opportunity for wetland creation with the Study Area, and those areas indentified are far outside the existing tidal influence. Additionally, access to these areas is very limited and access trails would likely have to be cut, which would require mitigation for their temporary impact. Enhancement opportunities through the removal of invasive plant species may serve as more beneficial for the lagoon system; however, this approach will not generate any wetland mitigation credits."

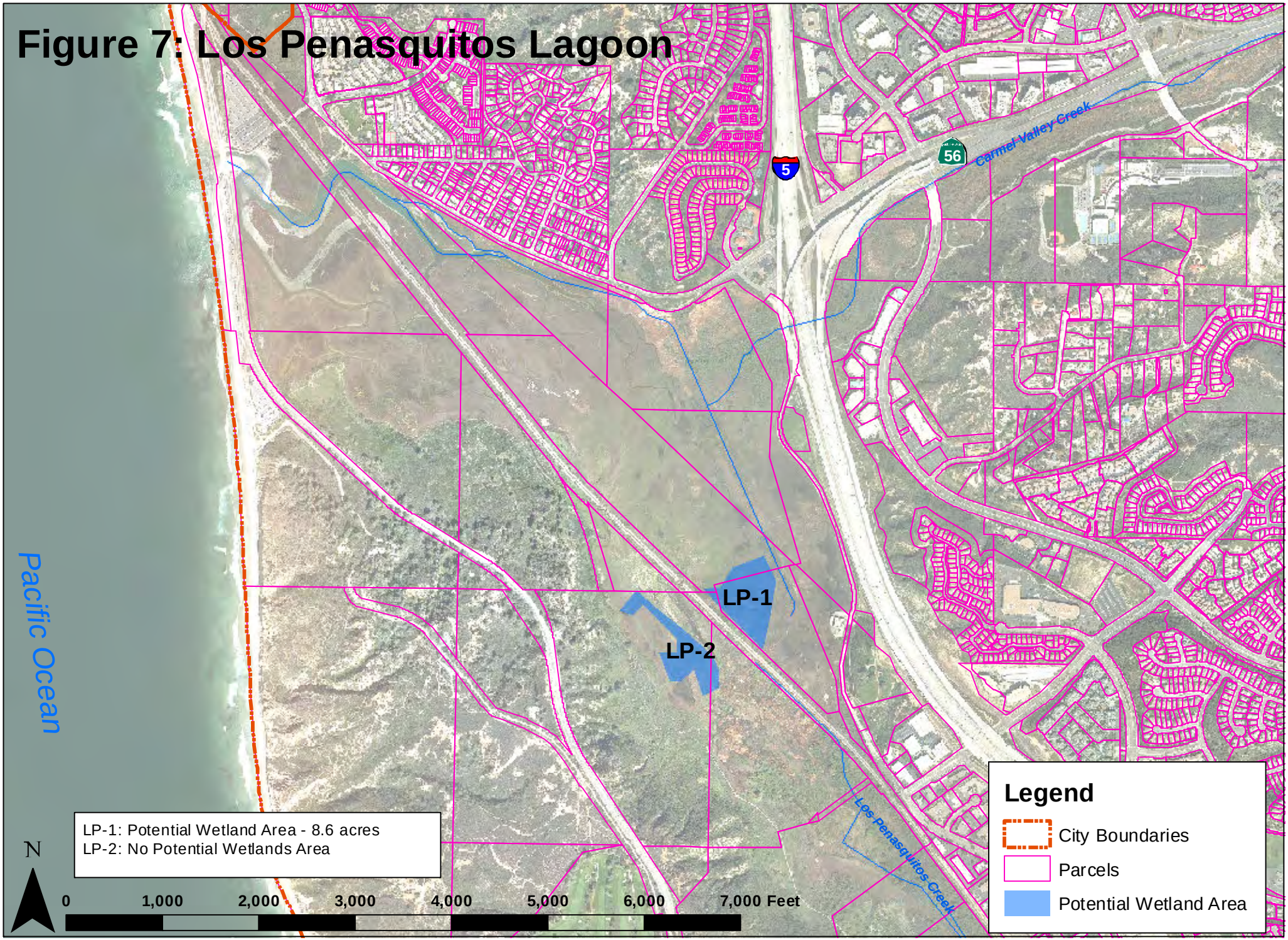
On a scale of 1-5 with 1 the highest, the potential mitigation sites at Los Peñasquitos Lagoon scored 4 (WRA and AECOM 2009)

c. Creates or substantially restores a minimum of 37 acres and up to at least 66 acres [all locations] acres of habitat similar to the affected habitats in Agua Hedionda Lagoon, excluding buffer zone and upland transition area;

As stated above, restoration of a maximum of 8.6 acres, with a potential reduction of that maximum due to impacts associated with access, does not meet this minimum standard.

d. Provides a buffer zone of a size adequate to ensure protection of wetland values, and at least 100 feet wide, as measured from the upland edge of the transition area.

Figure 7: Los Penasquitos Lagoon



The proposed restoration sites identified by WRA and AECOM (2009) at Los Peñasquitos Lagoon would satisfy the minimum buffer requirement of 100 feet; however, that buffer would be measured from the edge of restored wetland 100 feet into existing wetland.

e. Any existing site contamination problems would be controlled or remediated and would not hinder restoration;

There is no evidence provided in WRA and AECOM (2009) or the Los Peñasquitos Lagoon Enhancement Plan and Program (Los Peñasquitos Lagoon Foundation and State Coastal Conservancy 1985) that there are site contamination problems at Los Peñasquitos Lagoon.

f. Site preservation is guaranteed in perpetuity (through appropriate public agency or nonprofit ownership, or other means approved by the Executive Director), to protect against future degradation or incompatible land use;

The maximum 8.6 acres of restoration identified within Los Peñasquitos Lagoon (WRA and AECOM 2009) are located within lands owned by the State of California (Torrey Pines State Reserve). Prior to any restoration at Los Peñasquitos Lagoon, agreements with the State of California would have to be adopted to guarantee preservation of the site in perpetuity.

g. Feasible methods are available to protect the long-term wetland values on the site(s), in perpetuity;

Los Peñasquitos Lagoon is managed by California State Parks who would be required to provide management of any restored wetlands and to protect its ecological value in perpetuity.

h. Does not result in a net loss of existing wetlands;

Restoration of the maximum 8.6 acres identified at Los Peñasquitos Lagoon would require access to isolated parcels that could result in additional impacts to existing wetlands requiring additional mitigation for those impacts. Thus, while restoration of these parcels may not result in a net loss of existing wetlands, it is unlikely that the restoration of the maximum of 8.6 acres would be fully credited as mitigation for impacts associated with the Carlsbad desalination Project.

i. Does not result in an adverse impact on endangered animal species or an adverse unmitigated impact on endangered plant species.

The WRA and AECOM (2009) study does not identify any endangered plant or animal species in the immediate vicinity of the proposed maximum 8.6 acres of potential restoration in the lagoon. Site-specific surveys would be required to determine presence/absence of any endangered species and any impacts associated with restoration activities.

3.2 Objectives

The following objectives represent the factors that will contribute to the overall value of the wetland. The selected site(s) shall be determined to achieve these objectives. These objectives shall also guide preparation of the restoration plan.

a. Provides maximum overall ecosystem benefits, e.g. maximum upland buffer, enhancement of downstream fish values, provides regionally scarce habitat, potential for local ecosystem diversity;

Restoration of a maximum of 8.6 acres located far from existing tidal action would provide minimal overall ecosystem benefits. Access would likely impact existing wetlands and extending tidal channels to the restored sites in order to provide tidal action and enhance fisheries values would result in additional impacts to existing wetlands. The area identified for restoration occurs in association with the freshwater emergent wetlands that dominate the southern portion of Los Peñasquitos Lagoon. Freshwater wetlands are not regionally scarce compared to salt marsh or other estuarine habitats. Connecting restored areas to tidal channels would result in the conversion of freshwater marsh habitat to brackish or salt marsh habitat. The small area identified for restoration would not include upland buffer habitat or significantly increase local ecosystem diversity.

b. Provides substantial fish habitat compatible with other wetland values at the site(s);

The maximum of 8.6 acres identified for potential restoration would not provide substantial habitat for fish due to the isolated nature of the restoration sites. The potential restoration sites occur far from existing tidal action in an area that is mapped as freshwater marsh habitat. Restoration of the isolated parcels without tidal connection would not provide fish habitat. Extending existing tidal channels to the restoration sites would impact exiting wetlands requiring additional mitigation and would not provide substantial fish habitat as the existing terminal tidal channels of the lagoon are choked with sediment and do not support robust fish populations.

c. Provides a buffer zone of an average of at least 300 feet wide, and not less than 100 feet wide, as measured from the upland edge of the transition area.

The 8.6 acres identified for potential restoration are located in the southern portion of the lagoon and provide buffers of greater than 300 feet in all directions; however, that buffer would be measured from the edge of restored wetland 300 feet into existing wetland.

d. Provides maximum upland transition areas (in addition to buffer zones);

Although the potential restoration sites identified by WRA and AECOM (2009) are only conceptual in nature, their location within existing freshwater marsh habitat precludes creation of upland transition areas without significant impacts to existing wetland habitats.

e. Restoration involves minimum adverse impacts on existing functioning wetlands and other sensitive habitats;

As stated above, restoration of the 8.6 acres would require construction of access roads which would impact existing wetlands. Extension of tidal channel to the restoration sites would result in significant impacts to existing wetlands. Both actions would require mitigation which would reduce or negate any benefit to the overall system.

f. Site selection and restoration plan reflect a consideration of site specific and regional wetland restoration goals;

The selection of the 8.6 acres identified by WRA and AECOM (2009) reflect the need to mitigate for impacts associated with the proposed I-5 North Coast Corridor Project and do not consider site-specific restoration goals. The potential restoration is conceptual and does not include preliminary or advanced planning. WRA and AECOM cite site-specific restoration goals for Los Peñasquitos Lagoon as consisting of reduction of sediment to the system, curtailing freshwater input, and maintaining the opening of the lagoon mouth. Restoration of the 8.6 acres identified would not substantially contribute to these restoration goals.

g. Restoration design is that most likely to produce and support wetland-dependent resources;

As stated above, the areas identified for potential restoration are very conceptual and do not include preliminary design. Thus this objective cannot be evaluated for Los Peñasquitos Lagoon.

h. Provides rare or endangered species habitat;

As stated above, the areas identified for potential restoration are conceptual only and do not include preliminary design. Thus this objective cannot be evaluated for Los Peñasquitos Lagoon.

i. Provides for restoration of reproductively isolated populations of native California species;

As stated above, the areas identified for potential restoration are conceptual only and do not include preliminary design. Thus this objective cannot be evaluated for Los Peñasquitos Lagoon.

j. Results in an increase in the aggregate acreage of wetland in the Southern California Bight;

While it is possible that the maximum of 8.6 acres identified for restoration would result in a slight increase in the aggregate acreage of wetland in the Southern California Bight, it is unlikely that a net of 8.6 acres would result from restoration efforts. Thus, implementation of this restoration would result in a minor increase in the region's wetland habitats.

k. Requires minimum maintenance;

As stated above, the areas identified for potential restoration are conceptual only and do not include preliminary design. Thus this objective cannot be evaluated for Los Peñasquitos Lagoon.

l. Restoration project can be accomplished in a reasonably timely fashion; and,

As no plans have been developed for restoration of the 8.6 acres of maximum potential restoration it is unlikely that any project in Los Peñasquitos Lagoon can be accomplished in a timely manner when compared to other sites that have undergone feasibility analyses.

m. Site(s) in proximity to the Carlsbad desalination facility.

Los Peñasquitos Lagoon is located approximately 30 miles south of Aqua Hedionda Lagoon, the site of the Carlsbad Desalination Plant

TIJUANA ESTUARY

3.1 Minimum Standards – Restoration of Tijuana Estuary

The wetland restoration project site(s) and preliminary plan(s) must meet the following minimum standards:

a. Location within Southern California Bight;

The selection of Tijuana Estuary satisfies the requirement that the mitigation site be located within the southern California Bight.

b. Potential for restoration as tidal wetland, with extensive intertidal and subtidal areas;

A large-scale restoration plan was developed for Tijuana Estuary in 2008 (Tijuana Estuary – Friendship Marsh Restoration Feasibility and Design Study, Tierra Environmental Services 2008). The feasibility and design study included approximately 250-acres of conventional restoration in the south arm of the estuary on lands owned by California State Parks. The study proposed that restoration be phased over time due to the size of the proposed restoration. Five phases were identified as presented below. Each phase could be constructed independently of other phases. Phase 3 (75 acres) is proposed to provide area sufficient to meet Poseidon's mitigation requirements (Figure 8).

Tijuana Estuary Restoration Project - Proposed Phasing and Habitat Distribution, March 2008.

Phase	Habitat (acres)					
	Open Water	Mudflat	Low Salt Marsh	Mid-High Salt Marsh	Transition	Total
1	22.9	6.1	4.1	3.1	2.5	38.7
2	7.7	6.1	10.8	12.7	0	37.3
3	13.0	18.3	23.7	19.9	0	74.9
4	5.5	11.5	5.5	9.2	0	31.7
5	12.0	18.5	15.9	16.3	4.6	67.3
total	61.1	60.5	60.0	61.2	7.1	250

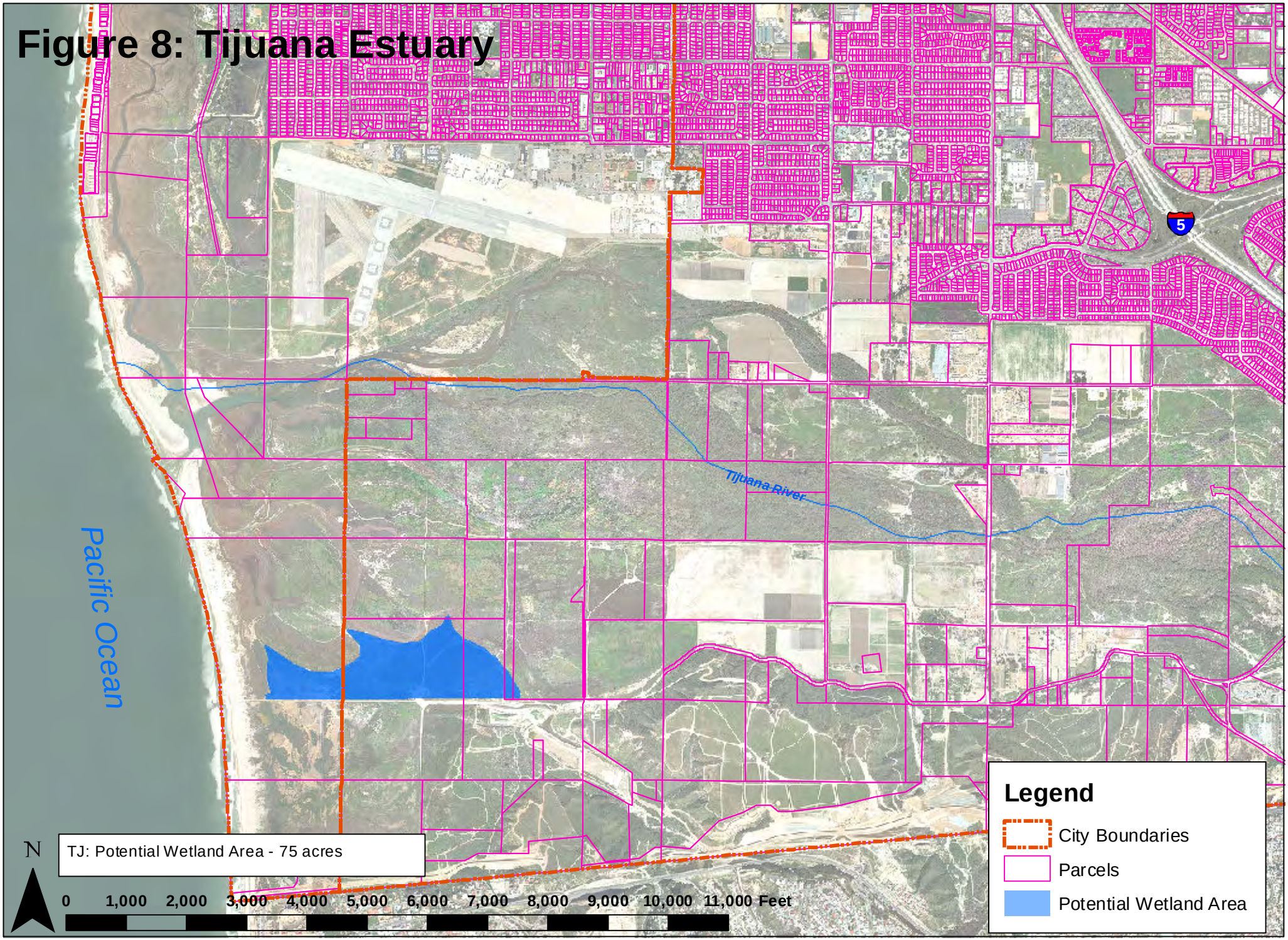
The proposed restoration includes extensive intertidal and subtidal areas and thus complies with this minimum standard.

WRA and AECOM (2009) examined restoration potential for north San Diego County Lagoons only. Thus, the feasibility and design study represents the most current available assessment of potential restoration at Tijuana Estuary.

c. Creates or substantially restores a minimum of 37 acres and up to at least 66 acres [all locations] acres of habitat similar to the affected habitats in Agua Hedionda Lagoon, excluding buffer zone and upland transition area;

As presented above, the feasibility and design study proposes restoration of 250 acres of habitat similar to the affected habitats in Agua Hedionda Lagoon. Each proposed phase restores a minimum of 37 acres and two phases exceed 66 acres.

Figure 8: Tijuana Estuary



d. Provides a buffer zone of a size adequate to ensure protection of wetland values, and at least 100 feet wide, as measured from the upland edge of the transition area.

The proposed restoration is located within the boundaries of Border Field State Park in the southwestern corner of the U.S. Monument Road, the access road to Border Field State Park, defines the southern and eastern boundaries of the proposed restoration. As planned, transition zone habitat and high marsh would be restored up to Monument Road; however, final design could incorporate a minimum buffer of 100 feet as measured from the upland edge of the transition area.

e. Any existing site contamination problems would be controlled or remediated and would not hinder restoration;

Subsurface soils analyses conducted for the feasibility and design study identified DDT and its derivatives in near-surface samples collected within the proposed restoration footprint. These soils would have to be disposed in a landfill designated for contaminated soils. It is anticipated that this could be accomplished successfully and would not hinder restoration.

f. Site preservation is guaranteed in perpetuity (through appropriate public agency or nonprofit ownership, or other means approved by the Executive Director), to protect against future degradation or incompatible land use;

The project is located within the boundaries of Border Field State Park owned and managed by California State Parks. California State Parks and the California State Coastal Conservancy have partnered on the restoration of the estuary. California State parks would be responsible for guaranteeing the protection of restored areas in perpetuity.

g. Feasible methods are available to protect the long-term wetland values on the site(s), in perpetuity;

California State Parks has the authority to provide long-term protection of wetland values of the portion of Tijuana Estuary that occurs within its boundaries.

h. Does not result in a net loss of existing wetlands;

Although the project as proposed would incur impacts to degraded wetland habitats, the project overall results in a net increase in wetland habitats.

i. Does not result in an adverse impact on endangered animal species or an adverse unmitigated impact on endangered plant species.

The project would result in impacts to occupied Belding's savannah sparrow habitat; however, those impacts are considered mitigable. There are no state or federal listed endangered plant species located within the project footprint.

3.2 Objectives

The following objectives represent the factors that will contribute to the overall value of the wetland. The selected site(s) shall be determined to achieve these objectives. These objectives shall also guide preparation of the restoration plan.

a. Provides maximum overall ecosystem benefits, e.g. maximum upland buffer, enhancement of downstream fish values, provides regionally scarce habitat, potential for local ecosystem diversity;

Restoration of 250 acres, including 61 acres of open water/subtidal habitat, 60.5 acres of mudflat, 60 acres of low marsh, 61 acres of mid-high salt marsh and 7 acres of transition habitat would provide maximum ecosystem benefits, provide enhancement of downstream fish values, provide regionally scarce habitat and increase local ecosystem diversity. Restoration of 66 acres as required of Poseidon would also provide substantial ecosystem benefits, including buffers, fish values, and regionally scarce habitat.

b. Provides substantial fish habitat compatible with other wetland values at the site(s);

Restoration of the required 66 acres could include restored open water/ subtidal habitat that would provide substantial habitat for fish compatible with other wetland values.

c. Provides a buffer zone of an average of at least 300 feet wide, and not less than 100 feet wide, as measured from the upland edge of the transition area.

As presented above, the project is located within the boundaries of Border Field State Park and can accommodate a minimum buffer of 100 feet and in most cases, buffers well exceeding 300 feet; however, not all buffers can be measured from the upland edge of the transition area as transition area is rare or lacking in many portions of the site.

d. Provides maximum upland transition areas (in addition to buffer zones);

The feasibility and design study focused on restoration of wetland habitats. Transition habitats comprise approximately 7 acres of the 250-acre restoration. Final restoration plans for the required 66 acres required of Poseidon could accommodate more transition area. There is considerable existing upland habitat in the Tijuana River Valley in general and specifically in Border Field State Park.

e..Restoration involves minimum adverse impacts on existing functioning wetlands and other sensitive habitats;

The restoration plan was designed to minimize impacts to existing functioning wetlands and other sensitive habitats. However, each proposed phase impacts some degraded wetland habitats. The CCC's interpretation of "functioning" wetlands will determine the potential for this site to serves as mitigation for Poseidon.

f. Site selection and restoration plan reflect a consideration of site specific and regional wetland restoration goals;

The feasibility and design study is the site-specific restoration plan for Tijuana Estuary and was developed to comply with regional wetland restoration goals.

g. Restoration design is that most likely to produce and support wetland-dependent resources;

The feasibility and design study was designed to maximize support of wetland-dependent species.

h. Provides rare or endangered species habitat;

The feasibility and design study included specific goals for increasing the local populations of rare or endangered species, e.g., light-footed clapper rail and Belding's savannah sparrow.

i. Provides for restoration of reproductively isolated populations of native California species;

As stated above, the feasibility and design study included specific goals for increasing the local populations of rare or endangered species, e.g., light-footed clapper rail and Belding's savannah sparrow.

j. Results in an increase in the aggregate acreage of wetland in the Southern California Bight;

Restoration of a maximum of 250 acres of wetland habitats would result in an increase in the aggregate acreage of wetland in the Southern California Bight.

k. Requires minimum maintenance;

The feasibility and design study was designed to minimize maintenance. In order to minimize sedimentation to the restored site and the potential need for sediment removal, a protective berm and weir were designed at the northern end of the project to protect against sediment borne by the Tijuana River during flood events, including the 100-year flood event.

l. Restoration project can be accomplished in a reasonably timely fashion; and,

A phase or phases of the proposed restoration could be accomplished in a reasonably timely fashion given the level of planning in the feasibility and design study.

m. Site(s) in proximity to the Carlsbad desalination facility.

Tijuana Estuary is located approximately 50 miles south of Aqua Hedionda Lagoon, the site of the Carlsbad Desalination Plant

OTAY RIVER FLOODPLAIN

3.1 Minimum Standards

The wetland restoration project site(s) and preliminary plan(s) must meet the following minimum standards:

a. Location within Southern California Bight;

The selection of the Otay River Floodplain Subarea of the South San Diego Bay Unit of the San Diego Bay Wildlife Refuge satisfies the requirement that the mitigation site be located within the southern California bight.

b. Potential for restoration as tidal wetland, with extensive intertidal and subtidal areas;

The Otay River Floodplain Subarea has been proposed for restoration by the U.S. Fish and Wildlife Service (USFWS: San Diego Bay National Wildlife Refuge, Final Comprehensive Conservation Plan [CCP] and EIS 2006). The CCP/EIS indentified an area of approximately 105 acres that could be restored, including wetlands, uplands and transition habitats (Figure 9). The USFWS proposed two alternative restoration scenarios for the Otay River Floodplain in its 2006 CCP/EIS.

- **Option 1. Restoration Option 1 focused on a balance between restored wetland and restored upland habitats. Under this option, approximately 60 acres of upland habitat would be restored, 60 acres would be restored to intertidal salt marsh and mudflats, and 20 acres would be restored to freshwater wetlands.**

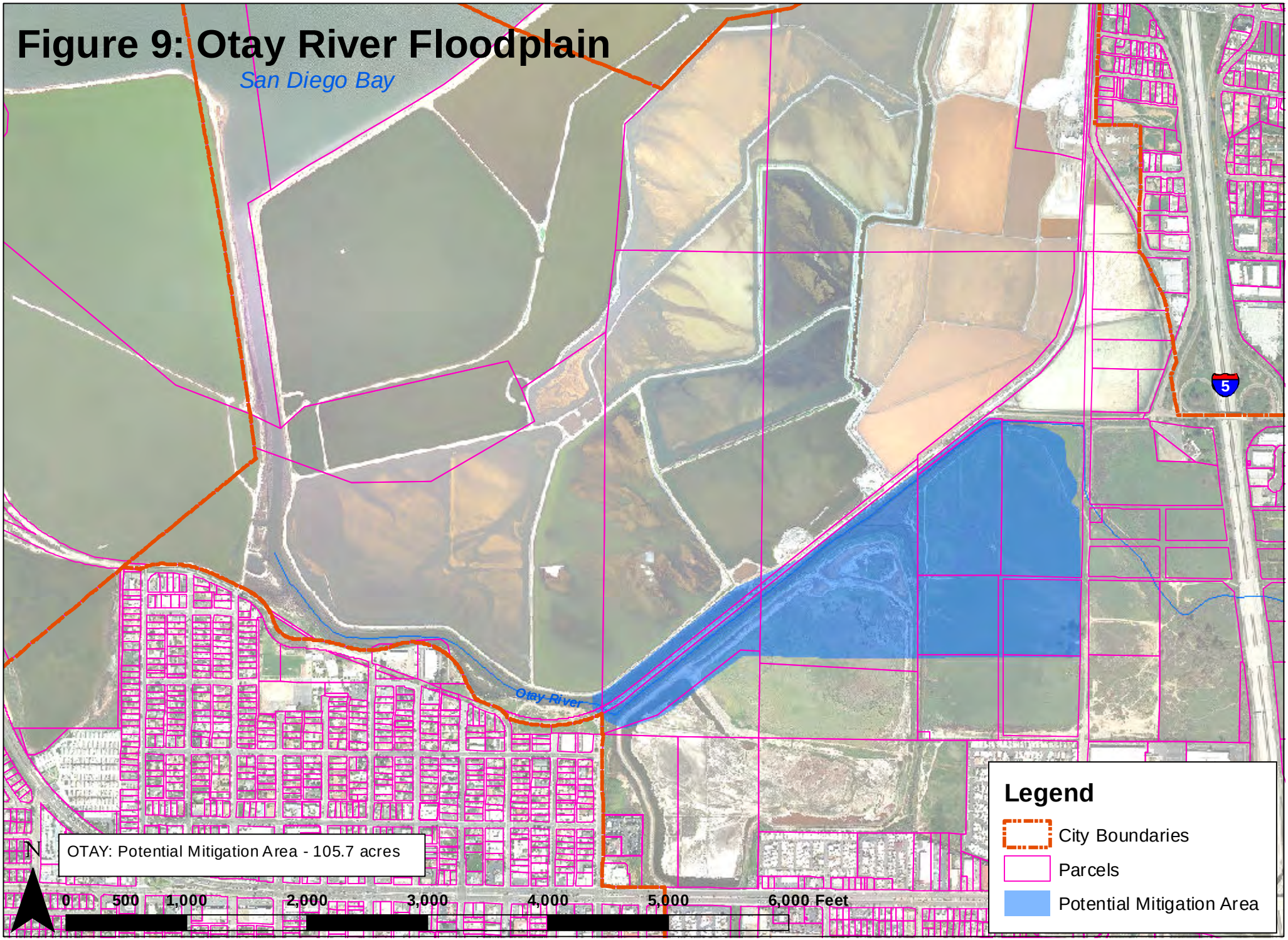
- **Option 2. Restoration Option 2 would restore approximately 90 acres of intertidal salt marsh and mudflat, 35 acres of native uplands and 15 acres of freshwater wetlands.**

Under both USFWS options, intertidal wetlands would be comprised of approximately 50% mudflat, 30% cordgrass (low marsh) and 20% pickleweed (mid-high marsh). Creation of subtidal habitat is also feasible, requiring modification of the conceptual design presented in the CCP/EIS.

Historic maps indicate that the area proposed for restoration was formerly intertidal mudflat and salt marsh that has been filled for agriculture and salt production. Thus, the potential for successful restoration is high.

c. Creates or substantially restores a minimum of 37 acres and up to at least 66 acres [all locations] acres of habitat similar to the affected habitats in Agua Hedionda Lagoon, excluding buffer zone and upland transition area;

Figure 9: Otay River Floodplain



The requirement of restoration of up to 66 acres of habitat similar to that affected at Aqua Hedionda Lagoon can be accomplished at the Otay River Floodplain Subarea. Option 2 presented in the CCP/EIS included more than 66 acres of tidally influenced wetlands.

d. Provides a buffer zone of a size adequate to ensure protection of wetland values, and at least 100 feet wide, as measured from the upland edge of the transition area.

The proposed restoration of the Otay River Floodplain Subarea can provide buffer zones in excess of 100-feet in all directions.

e. Any existing site contamination problems would be controlled or remediated and would not hinder restoration;

A limited field sampling program was conducted in 1989 that included collection of three surface soil (0.5 - 1 feet below ground surface) samples - two from agricultural fields and one from the former sewage treatment plant oxidation ponds formerly located on-site. All three soil samples were analyzed for chlorinated pesticides while the oxidation pond sample included additional analysis of selected metals.

Dichlorodiphenyltrichloroethane (DDT) and metabolites (dichlorodiphenyldichlor-oethylene [DDE] and dichlorodiphenyldichloroethane [DDD]) and toxaphene were detected in the samples collected from the agricultural fields. Concentrations of total DDT (including metabolites) were 2,200 parts-per-billion (ppb) and 4,050 ppb. Toxaphene was detected at 3,000 and 4,200 ppb. Arsenic, cadmium, chromium, copper, nickel, and lead were detected in the oxidation pond sample. Pesticides were not detected in the oxidation pond sample.

Additional surface soil testing was conducted in 1999 as part of the USFWS pre-acquisition activities. Organochlorine pesticide analyses were performed on 15 samples collected across the property. DDT and its metabolites were the primary pesticides detected. Detected concentrations of DDT ranged between 12 and 1,400 ppb. Detected concentrations of DDE ranged between 22 and 1,200 ppb. DDD was detected at concentrations between 8 and 1,100 ppb. Average detected concentrations for DDT, DDE, and DDD were 349, 503, and 413 ppb, respectively. Endrin aldehyde was the only other detected pesticide with a range of detected concentrations between 15 and 1,400 ppb.

The source of DDT is directly related to the historic use of this property for agricultural production, primarily tomatoes and other truck crops. A sewer treatment plant that operated within the Otay River floodplain between the mid 1950s and the early 1960s is considered the source of the various metals detected in some of soil samples.

On December 21, 2009, Poseidon conducted a screening level soil contaminants assessment in the project area. Four 15-foot-deep soil borings were collected in Pond 20a and four were collected in the former agricultural land adjacent to the Otay River. Only one sample, located near the Otay River, indicated the presence of DDT. Soils within and adjacent to Pond 20a showed little, if any, contamination. Thus, although former

agricultural activities have resulted in high levels of DDT and derivatives on a portion of the property, it appears that there are uncontaminated areas that may be suitable for restoration. Further soil testing will be needed to determine the horizontal extent of DDT contamination.

f. Site preservation is guaranteed in perpetuity (through appropriate public agency or nonprofit ownership, or other means approved by the Executive Director), to protect against future degradation or incompatible land use;

The Otay River Floodplain Subarea of the South San Diego Bay Unit of the San Diego Bay National Wildlife Refuge is owned by the California State Lands Commission and leased to the USFWS exclusively for restoration of coastal wetlands and associated uplands[Both agencies preserve and protect lands for the public. Prior to restoration at the Otay River Floodplain, agreements will be adopted to guarantee preservation of the site in perpetuity.

g. Feasible methods are available to protect the long-term wetland values on the site(s), in perpetuity;

The San Diego Bay Wildlife Refuge is managed by the U.S. Fish and Wildlife Service. The USFWS will provide management of the restored wetlands to protect its ecological value in perpetuity.

h. Does not result in a net loss of existing wetlands; and

The proposed restoration entails the conversion of a former salt evaporation pond and former agricultural lands to intertidal salt marsh, mudflats and subtidal habitats. Only minimal impacts to existing wetlands will occur at the point of hydraulic connection to the Otay River. Thus, the project will not result in a net loss of existing wetlands.

i. Does not result in an adverse impact on endangered animal species or an adverse unmitigated impact on endangered plant species.

The CCP and EIS prepared for the project identified all endangered plant and animal species in the project location and the potential impacts associated from implementation of the preferred alternative. In general, the document presents the potential effects to endangered species associated with construction of the habitat restoration and the long-term effects of the habitat restoration. The document concludes that the potential for adverse effects to the Refuge's endangered and threatened species during restoration-related grading activities would be minimized by controlling the level of construction activity permitted in the vicinity of active nest areas, including restricting some activities to the non-breeding season; establishing construction boundaries that minimize impacts to native vegetation and sensitive habitat areas; and monitoring sensitive habitat areas during construction to assess actual disturbance levels and, where necessary, developing and implementing additional protective measures.

The long-term effects on threatened and endangered species of the restored habitats are considered beneficial.

3.2 Objectives

The following objectives represent the factors that will contribute to the overall value of the wetland. The selected site(s) shall be determined to achieve these objectives. These objectives shall also guide preparation of the restoration plan.

a. Provides maximum overall ecosystem benefits, e.g. maximum upland buffer, enhancement of downstream fish values, provides regionally scarce habitat, potential for local ecosystem diversity;

The proposed restoration of the Otay River Floodplain Subarea entails the conversion of a former solar evaporation pond and former agricultural fields to intertidal salt marsh and mudflats and subtidal habitats. Intertidal salt marsh, intertidal mudflat, and subtidal habitat are regionally scarce habitats targeted for restoration/creation in the southern California Bight. Located just upstream of San Diego Bay, the fisheries of the bay would be considered the downstream fishery. The fisheries of South San Diego Bay are recognized as a valuable resource that will be enhanced by the restoration process. The extensive shallow water habitat and eelgrass beds of the South Bay provide important habitat for these and a variety of fish, including midwater, schooling fishes, such as northern anchovies, slough anchovies, and topsmelt. These species, in turn, represent a major forage resource for predatory fish and avian species. The warmer, hypersaline waters of the South Bay also offer shelter for a number of fish species commonly encountered further south in the Eastern Subtropical and Tropical Pacific. The south end of San Diego Bay also functions as an important nursery area for juvenile California halibut and young spotted and barred sand bass.

The American Bird Conservancy has designated the South San Diego Bay Unit as a Globally Important Bird Area due to the presence of globally significant populations nesting gull-billed terns, and continentally significant populations of surf scoters, Caspian terns and western snowy plovers. The entire southern end of San Diego Bay has been recognized as a Western Hemisphere Shorebird Reserve Network Site. The proposed restoration has been designed to preserve and enhance this biological diversity.

b. Provides substantial fish habitat compatible with other wetland values at the site(s);

The conversion of the former evaporation pond and agricultural lands to intertidal salt marsh, mudflats and subtidal habitat will provide substantial fish habitat. The role of unvegetated tidal creeks and sloughs as breeding areas and nurseries for estuarine-dependent fishes has been well studied. The transient use of the intertidal salt marsh by species such as California killifish has likewise been demonstrated. These values will all be enhanced by the proposed project. Furthermore, the intertidal mudflats created by the project will provide breeding habitat for the goby species that are prevalent in Agua Hedionda Lagoon.

c. Provides a buffer zone of an average of at least 300 feet wide, and not less than 100 feet wide, as measured from the upland edge of the transition area.

The Otay River Floodplain Subarea is located in an isolated corner of South San Diego Bay with buffers exceeding 100 feet in all directions.

d. Provides maximum upland transition areas (in addition to buffer zones);

The proposed restoration is in the initial planning stages; however, there is ample area for incorporating transition zone habitats into the final restoration plan. The conceptual restoration plan presented in the CCP/EIS includes on-site disposal of some excavated soils, pending soil contamination studies. The soil will be used to create upland and transitional habitats.

e. Restoration involves minimum adverse impacts on existing functioning wetlands and other sensitive habitats;

The proposed restoration entails the conversion of a former salt evaporation pond and former agricultural lands to intertidal salt marsh, mudflats and subtidal habitats. Only minimal impacts to existing wetlands will occur at the point of hydraulic connection to the Otay River. The former salt evaporation pond and agricultural lands do not contain functioning wetlands or other sensitive habitats. Thus, the project will not result in impacts to existing wetlands and other sensitive habitats.

f. Site selection and restoration plan reflect a consideration of site specific and regional wetland restoration goals;

The following goals provided the guiding principles for the South San Diego Bay Unit. They are consistent with USFWS Refuge purposes, National Wildlife Refuge System goals, the NWRS Improvement Act, USFWS policies, and international treaties. These goals apply to all of the management alternatives evaluated for this Refuge Unit.

Goal 1: Protect, manage, enhance, and restore open water, coastal wetlands, and native upland habitat to benefit the native fish, wildlife, and plant species supported within the South San Diego Bay Unit.

Goal 2: Support recovery and protection efforts for the federally and state listed threatened and endangered species and species of concern that occur within the South San Diego Bay Unit.

Goal 3: Provide high quality foraging, resting, and breeding habitat for colonial nesting seabirds, migratory shorebirds and waterfowl, and salt marsh-dependent species.

Goal 4: Provide opportunities for compatible wildlife-dependent recreation and interpretation that foster public appreciation of the unique natural and cultural

heritage of South San Diego Bay.

In addition, the CCP was prepared using the following documents as guidance:

- **All applicable USFWS threatened and endangered species recovery plans;**
- **Ecoregion Planning, as defined by the USFWS;**
- **Shorebird Conservation Planning, as defined by the U.S. Shorebird Conservation Plan;**
- **Waterbird Conservation, as defined by the North American Waterbird Conservation Plan;**
- **National Strategy for Coastal Restoration, as defined by Restore America's Estuaries and the National Oceanic and Atmospheric Administration**
- **Marine Protected Areas, as defined by Executive Order 13158;**
- **California Wildlife: Conservation Challenges, California's Wildlife Action Plan, as defined by the California department of Fish and Game; and,**
- **Regional restoration needs**

g. Restoration design is that most likely to produce and support wetland-dependent resources;

As stated above, the major goals of the proposed restoration is to protect, manage, enhance and restore open water, coastal wetlands and native upland to benefit native fish, wildlife and plant species supported within the refuge unit and to provide habitat for salt-marsh dependent species. The project has been designed to achieve the objective of producing and supporting wetland-dependent species.

h. Provides rare or endangered species habitat;

Goal 2, stated above, addresses the recovery and protection efforts for the federally and state listed threatened and endangered species and species of concern that occur within the South San Diego Bay Unit. The over-arching reason for the establishment of the South Bay unit was the preservation and recovery of threatened and endangered species, including the light-footed clapper rail, the California least tern and salt marsh bird's beak. The preferred restoration plan provides a diverse assemblage of wetland habitats, including cordgrass-dominated salt marsh – the preferred nesting and foraging habitat of the light-footed clapper rail - fishery resources that support the California least tern, and shallow subtidal habitat that provides nursery grounds for California halibut.

i. Provides for restoration of reproductively isolated populations of native California species;

As stated above, one of the primary reasons for acquiring the South San Diego Bay Unit was to preserve and restore habitat for the endangered light-footed clapper rail. Although these birds can fly, they rarely do so and migrate locally usually by walking or, occasionally, swimming. Thus, a clapper rail population within South San Diego Bay is essentially isolated from other southern California populations. As stated previously, restoration of the South San Diego Bay Unit will benefit the clapper rail and other threatened and endangered species. The restoration provide the opportunity to establish a population or populations of the endangered salt marsh bird's beak, a hemiparasitic plant that occurs in the upper elevations of salt marsh habitats. Populations of salt marsh bird's beak at other southern California wetlands are reproductively isolated from one another.

j. Results in an increase in the aggregate acreage of wetland in the Southern California Bight;

The proposed restoration of the Otay River Floodplain Subarea the will increase the aggregate acreage of tidal wetland in the Southern California Bight by approximately 66 acres, as required by the Coastal Commission and Regional Water Quality Control Board.

k. Requires minimum maintenance;

The proposed restoration of the former solar evaporation pond and former agricultural lands at the Otay River Floodplain Subarea would be accomplished by excavating to the elevation of adjacent intertidal habitats. There are no hard structures needed, such as jetties, as the site is not subject to coastal erosion or deposition by wave action. The Otay River is dammed upstream of the proposed restoration site, and does not convey a sediment load that would be potentially damaging to a subtidal- intertidal wetland. Thus, maintenance dredging is not anticipated. Once vegetation has become established, there is no anticipated need for planting or maintenance of exotic weed species.

l. Restoration project can be accomplished in a reasonably timely fashion; and,

It is anticipated that restoration of the Otay River Floodplain Subarea can be accomplished within the timeframes set forth in the MLMP.

m. Site(s) in proximity to the Carlsbad desalination facility.

The South San Diego Bay Unit of the San Diego Bay National Wildlife Refuge is located approximately 35 miles south of Aqua Hedionda Lagoon, the site of the Carlsbad Desalination Plant.

Summary Table. Table 1 summarizes the compliance of each potential mitigation site with California Coastal Commission standards and objectives. The potential mitigation sites are arranged by their ability to meet the standards and objectives rather than geographically. When a site is considered noncompliant it is shaded. All standards and objectives for which no information was available (NA) were considered compliant.

Table 1. Summary of Compliance with CCC Standards and Objectives

	Loma Alta Lagoon	Buena Vista Lagoon	Aqua Hedionda Lagoon	Batiquitos Lagoon	San Elijo Lagoon	San Dieguito Lagoon	Los Peñasquitos Lagoon	Tijuana Estuary	Otay River
MINIMUM STANDARDS									
Location in S. California Bight	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Preserved in perpetuity?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Protected in perpetuity?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Does not result in net loss of wetlands	Does not	Does not	Does not	Does not	Does not	Does not	Does not	Does not	Does not
Not hindered by contamination	NA	NA	NA	NA	Not hindered	NA	NA	Not hindered	Not Hindered
Does not Impact endangered species?	NA	May impact	NA	NA	NA	NA	NA	No, but mitigable	No
Provides minimum buffer of 100 feet	No	No	No	No	Yes	Yes	Yes	Yes	Yes
Restores extensive intertidal and subtidal habitat	No	No	No	No	No	No	No	Yes	Yes
Restores minimum 37 to 66 acres similar to AHL	No	No	No	No	No	No	No	Yes	Yes

	Loma Alta Lagoon	Buena Vista Lagoon	Aqua Hedionda Lagoon	Batiquitos Lagoon	San Elijo Lagoon	San Dieguito Lagoon	Los Peñasquitos Lagoon	Tijuana Estuary	Otay River
OBJECTIVES									
Maximizes support of wetland dependent species	NA	NA	NA	NA	NA	NA	NA	Yes	Yes
Provides rare an endangered species habitat	NA	NA	NA	NA	NA	NA	NA	Yes	Yes
Restores reproductively isolated populations	NA	NA	NA	NA	NA	NA	NA	Yes	Yes
Increases aggregate wetland acreage	Minor increase	Minor increase	Minor increase	Minor increase	Minor increase	Minor increase	Minor increase	Yes	Yes
Requires minimal maintenance	NA	NA	NA	NA	NA	NA	NA	Requires Protective Berm	Yes
Minimizes impacts to wetlands and sensitive habitats	Yes	Yes	Yes	Yes	Yes	No	No	Impacts disturbed wetlands	Yes
Provides average buffer of 300’	No	No	No	No	No	Some sites	Yes	Most areas	Most areas
Considers site-specific restoration goals	No	No	No	No	No	No	No	Yes	Yes

	Loma Alta Lagoon	**Buena Vista Lagoon**	**Aqua Hedionda Lagoon**	**Batiquitos Lagoon**	**San Elijo Lagoon**	**San Dieguito Lagoon**	**Los Peñasquitos Lagoon**	**Tijuana Estuary**	**Otay River**
Provides maximum ecosystem benefit	No	No	No	No	No	No	No	Yes	Yes
Provides substantial fish habitat	No	No	No	No	No	No	No	Yes	Yes
Can be accomplished in a timely manner	No	No	No	No	No	No	No	Yes	Yes
Provides maximum transition area	No	No	No	No	No	No	No	No	No
Proximity to Carlsbad Desalination Plant	3.5 miles	5 miles	0 miles	9 miles	20 miles	25 miles	30 miles	50 miles	35 miles

NA = Information not available.

TECHNICAL MEMORANDUM
POSEIDON TIDAL WETLAND RESTORATION PLAN

ALTERNATIVES ANALYSIS:
OPPORTUNITIES FOR MEETING
POSEIDON MARINE LIFE MITIGATION PLAN REQUIREMENTS

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January 17, 2011

Purpose of Technical Memorandum

The purpose of this technical memorandum is to evaluate and rank the potential San Diego County mitigation sites that were reviewed by Poseidon Resources to meet their compliance with Special Condition 8 of the Coastal Development Permit No. E-06-013.

Specifically, Poseidon Resources requested that I review materials prepared by Poseidon and its contractors and provide an independent review of the potential for Poseidon to meet its mitigation requirements within San Diego County.

CDP Permit Requirements

Special Condition 8 (as revised in September 2009) requires that Poseidon Resources provide 66.4 acres of tidal wetland in one or two phases of construction (an initial phase of at least 42.5 acres followed by up to 23.9 acres). The any restoration site must meet a set of 9 minimum standards and any restoration plan must meet a set of 13 objectives. As a result, a successful restoration plan is contingent upon achieving compliance with both the minimum standards and the objectives. Ultimately, the success of the plan is to be judged in relation to four Long-term Physical Standards and six Biological Performance Standards.

San Diego County Lagoons Considered

The following sites are considered in my analysis for the project:

- Loma Alta Lagoon
- Agua Hedionda Lagoon
- Buena Vista Lagoon
- Batiquitos Lagoon

Exhibit 8

- San Elijo Lagoon
- San Dieguito Lagoon
- Los Penasquitos Lagoon
- Lower Otay River Floodplain
- Tijuana Estuary

The current status of these sites in meeting the CCC requirements have been reviewed extensively in reports submitted by Nordby Biological Consulting (2010 and 2011) and this information along with my professional experience at these sites was used to rank each of the sites.

I used a ranking scale of 1 to 5 in my analysis. Rank order was assigned as follows:

1 = Site clearly meets this criteria without substantial issues
2 = Site meets this criteria with some minor exceptions
3 = Site can generally meet this criteria; however, there may be substantial exceptions
4 = Site does not meet this criteria without significant modification of the criteria by Commission
5 = Site cannot meet this criteria

The specific definitions used for the rankings are given in Table 1. This table is based on the descriptions provided for the minimum standards and restoration objectives within the CCC permit. I understand that some criteria may be more significant than others and that some criteria refer to both the site selection and to the later restoration design; however, I did not do any weighting of the criteria in my analysis.

In order to meet the overall permit condition, only those areas that meet both the minimum requirements and objectives and have sufficient acreage to be considered as either a Phase I or Phase II project are feasible. In cases where a site is scored as 5, this is a threshold requirement that cannot be met at the site and therefore it eliminates that site from further consideration. A site that is scored as 3 or 4 will require that the Commission change their minimum standards and objectives for the project.

The ranking for each of the lagoons using this scoring system is provided in (Table 2). The assessment was based on potential project(s) that could be accomplished within each of the lagoons as described by Nordby Biological Consulting (2010 a, b)[1] and in WRA/AECOM (2009)[2]. A brief synopsis of the project type being considered for each of the lagoons is given below:

Loma Alta: Restoration potential for 3 acres of coastal salt marsh on small lagoon

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1 a. Comparison of Selected Southern California Tidal Wetlands as Potential Sites for Mitigation of Impacts Associated with Poseidon Resources Proposed Carlsbad Desalination Plant. January 2010. 52pp. with appendices
b. Supplemental Analysis of CCC Standards and Objectives. January 2011. 51pp.

2 San Diego Regional Lagoon Overview. Phase 1 Planning Study. I-5 North Coast Corridor Project. San Diego County, California. December 2009. 75pp with appendices

Buena Vista:	Tidal restoration of whole or part of Buena Vista Lagoon to provide for improved marine fish habitat as described in Buena Vista Lagoon Feasibility Study
Agua Hedionda:	Restoration of small perimeter areas to coastal salt marsh habitat as described in WRA/AECOM (2009). Excludes AH-3 which is being used by others.
Batiquitos Lagoon:	Restoration of small perimeter areas to coastal salt marsh habitat as described in WRA/AECOM (2009).
San Dieguito Lagoon	Restoration of small parcels outside of approved plan but are potentially available for restoration as described in WRA/AECOM (2009). Excludes lands not available or being used by others.
San Elijo Lagoon	Restoration of wetlands to be determined as part of overall restoration plan currently being developed by the San Elijo Lagoon Conservancy.
Los Penasquitos:	Restoration of areas as identified in WRA/AECOM (2009)
Otay River Floodplain:	Restoration of up to 66 acres of tidal habitat as contemplated in the September 2010 Memorandum of Understanding between the U.S. Fish & Wildlife Service and Poseidon
Tijuana:	Restoration of up to 66 acres of tidal habitat as part of the Friendship Marsh restoration plan.

Minimum Standards

Based on meeting the minimum standards, the Lower Otay River floodplain and the Tijuana Estuary are favored, especially in achieving the Phase I and Phase II acreage requirements. Neither site would have any minimum standards that could not be met or require modification of the Commission's requirements. The presence of listed species at Tijuana Estuary (e.g. light footed clapper rail and Belding's savannah sparrow) may affect the restoration implementation; however, there would be a net increase in habitat for these species after restoration.

San Elijo Lagoon and Buena Vista Lagoon, the third and fourth ranked lagoons in terms of meeting the minimum standards, could potentially provide enhancement of existing wetland habitat in the range of 66 acres. However, both projects would convert existing wetlands to another habitat type and would require that the Commission alter its mitigation requirements and determine that the enhancement of existing tidal wetlands (in the case of San Elijo Lagoon) or the conversion of existing freshwater wetlands to tidal wetlands (in the case of Buena Vista) met the definition of "substantially restores" in the context of the minimum standards. The

Commission, in my opinion, is not likely to accept conversion of existing wetlands, even if beneficial, as meeting Poseidon's mitigation requirements.

All other sites could not meet the minimum acreage requirements for either Phase I or II and therefore have a fatal flaw that would require the Commission to alter its mitigation requirements. Because the available acreage at the other sites is significantly lower than required, the Commission would need to revise its approach and institute an alternative means to achieve the total acreage requirement among many sites. This would likely cause further delay in meeting the Commission time requirements as it would necessitate working with multiple organizations, landowners, and interested parties. In addition, it would present difficulty for the Commission when monitoring multiple sites in conjunction with determining suitable reference areas for each of these sites.

In addition to the inability to meet the acreage requirements, these other lagoons have fatal flaws in that they could not provide sufficient buffers, their location within areas of existing nearby development limits the ability to assure long-term protection, and restoration to a diverse habitat mix would not be possible.

Restoration Objectives

When ranked in accordance with the restoration objectives, both the Lower Otay River floodplain and Tijuana Estuary are highly ranked and are the only sites where all objectives could be met without revision.

Restoration of San Elijo Lagoon is ranked third in terms of meeting restoration objectives, but has two significant constraints. Since the project is an enhancement of existing tidal habitats, it would not result in any substantial increase in the aggregate wetland habitat. It would also be difficult to ascertain what improvements to marine fish production are occurring as it is currently a tidal wetland. Because there is no consensus on an enhancement alternative at this time, it could not be completed in time to meet CCC requirements as stated in the permit conditions.

The restoration of smaller parcels in San Dieguito Lagoon ranks fourth in terms of meeting the restoration objectives; however, the areas that are currently available are not sufficient to meet the acreage requirement and are outside the areas that have been previously approved under the Master Plan EIR/EIS. As a result they would take considerable time for approval. In addition, many of the properties are owned by others and are not available to Poseidon for restoration purposes. At any rate, its restoration would not meet the minimum requirements of either Phase I or Phase II.

The other lagoons have varying degrees of compliance with the restoration objectives; however, in most instances they would not meet two or more of the objectives. The primary constraints relate to the inability to provide substantial fish benefits due to their location on the periphery of the tidal basins, the limited increase in aggregate wetland acreage, the inability to provide for sufficient buffer or upland transitional areas, and the lack of suitable plans to be considered in a timely manner.

Overall ranking

The Lower Otay River floodplain and the Tijuana Estuary ranked the highest when considering the minimum standards and restoration objectives and did not have any fatal flaws.

Implementation of a restoration plan for San Elijo Lagoon was ranked third overall; however, no final plan is available at this time to determine what the project will be. It is likely to involve some degree of modification of tidal circulation, but will not result in substantial increase in wetland or fish habitat. Because of these uncertainties, it will not meet the time line for Commission approval. In addition, this site would not meet the restoration objective that the site must result in an aggregate increase in wetland acreage in the Southern California Bight.

San Dieguito Lagoon was ranked 4th overall. Poseidon initially considered a project at San Dieguito, but was not able to reach a long-term agreement with the Joint Powers Authority to undertake restoration there. Subsequently, the California Department of Transportation entered into an agreement with the JPA for restoration in the area that Poseidon was considering. The remaining areas are relatively small in comparison to the minimum requirements and are unlikely to be available in a timely manner.

Buena Vista Lagoon, the fifth overall ranked lagoon, could potentially provide enhancement of existing wetland habitat in the range of 66 acres, assuming that either the full tidal or mixed water restoration alternatives were selected and the Commission determined that the conversion was “substantial restoration”. However, this site would not result in any aggregate increase in wetland acreage in the Southern California Bight, is surrounded by development such that buffers and upland transition areas are limited, and will require inlet maintenance. Therefore, it would not satisfy the CCC’s restoration objectives.

Other projects within San Diego County lagoons are very limited in size and therefore do not contribute to a substantial increase in wetland acreage. They also have significant limitations in meeting other project objectives especially as it relates to maximization of ecosystem benefits and substantial fish habitat creation.

Table 3 presents an analysis of the more significant threshold criteria, in my opinion, necessary for the sites to be selected to meet the Poseidon mitigation requirements. All sites can provide tidal habitat restoration; however, because some sites have small areas or are located on the fringe of the wetland area, it will not be possible to provide the range of habitats such as subtidal, intertidal, and tidal channels necessary to result in substantial fish habitat. In addition, for some of these smaller areas such as Agua Hedionda and Loma Alta, the surrounding land uses affect the ability to provide sufficient buffer and upland transition zone habitat to protect wetland values.

The restoration objective to create a net increase in wetland acreage is a key element to promote additional marine fish production. Both San Elijo Lagoon and Buena Vista Lagoon fail to meet this criterion as they will only result in the conversion of existing habitat to fully tidal habitat.

Land availability affects the ultimate feasibility of the project and the timeliness of meeting the Commission mitigation requirements. Although San Dieguito Lagoon was Poseidon’s choice initially, the land was not made available by the JPA. The remaining parcels are also owned by other parties that are not interested in selling for mitigation purposes.

In conclusion, based on meeting the minimum standards and the restoration objectives, the lower Otay River floodplain can best accomplish the goals as set forth under the CCC permit. The Tijuana Estuary is close in overall score; however, it will likely have some impacts to existing wetlands, will require some mitigation for endangered species, and will have additional maintenance requirements should the inlet to the ocean close. These issues and the fact that no substantial design work has been implemented as of yet may result in not meeting the CCC time requirements.

Table 1. Ranking definitions as applied to each of the minimum standards and restoration objectives. Definitions given for 1, 3, and 5 scores. Scores between these represent intermediate conditions to the definitions given in each box.

CRITERA	RANKING SCORES		
	1	3	5
STANDARDS			
Location	San Diego County	Southern California	Outside S. California
Restoration to tidal wetland with extensive intertidal and subtidal	Significant mixture of tidal and subtidal habitats	Tidal marsh with some channels and mudflat	Only tidal marsh
Create or substantially restore			
Phase I (42.5 acres)	Creates acreage requirement	Restoration or enhancement of tidal action to meet acreage requirement	Does not meet acreage requirement
Phase II (23.9 acres)	Creates acreage requirement	Restoration or enhancement of tidal action to meet acreage requirement	Does not meet acreage requirement
Buffer zone of adequate size with minimum of 100 feet	Always meets minimum buffer requirement	Meets buffer requirement 50% of time	Cannot meet distance requirement
Minimal contamination does not hinder restoration	No contamination	Potential for contamination	Contaminated site that affects restoration
Preservation guaranteed	Agreements in place to assure preservation	Land currently private; requires land acquisition or easement	Not possible to assure preservation
Feasible methods to protect long-term values on site	Land uses compatible with habitat protection	Some potential for future development on or adjacent to site(s)	Adjacent land uses incompatible with habitat values
No net loss of wetlands	No net loss of wetlands		Net decrease in wetlands to implement restoration
No adverse impact on ESA species	No adverse impacts to ESA species	Mitigation available to compensate for ESA species impacts	Unavoidable loss of habitat for ESA species
OBJECTIVES			
Maximum overall ecosystem benefits including uplands and downstream	Contributes to substantial improvement in adjacent ecosystem	Improvements to adjacent ecosystem in some aspects	Provides minimal benefit to adjacent ecosystem
Substantial fish benefits	Substantial increase in marine fish productivity	Contributes to fish productivity	No contribution to fish productivity
Buffer zone with average of 300 feet, not less than 100 feet	Meets requirement	Will require some exceptions to requirements	Cannot meet requirements in any portion
Maximum upland transition areas	Provides upland transition zone beyond buffer	Some upland transition zone within buffer	No additional upland transition zones outside of buffer
Minimum wetland impacts to existing functional	No impacts to existing wetlands	Converts some existing wetlands to another	Relies on conversion of existing wetlands to

CRITERA	RANKING SCORES		
	1	3	5
wetlands		habitat type	tidal habitats
Site specific and regional goals	Meets established regional and site specific restoration goals	Meets generalized goals for habitat restoration	Does not reflect regional or local restoration goals
Produce and support wetland-dependent resource	Provides breeding and foraging habitat for wetland species	Provides some support habitat for wetland species	Limited to no breeding or foraging habitat
Provides ESA species habitat	Supports several ESA species	Limited support for ESA species	No support for ESA species
Reproductively isolated native species	Reproductive habitat for restricted native species	Limited habitat potential for restricted native species	Does not support restricted native species
Increase in aggregate acreage of wetland	Substantial increase (>30 acres) of wetland habitat	Some increase in wetland habitat (>10 acres)	No increase in aggregate wetland habitat
Requires minimum maintenance	No maintenance required	Infrequent maintenance	Yearly maintenance required
Timely fashion to meet CCC requirements	Complete within required time frame	Uncertainty as to compliance with time frame	No likelihood of meeting time frames
Proximity to Carlsbad facility	In San Diego County	Outside San Diego County; but in Orange County	Other Counties

Table 2. Ranking of scale of 1 (best) to 5 (worst) of the ability of each of these sites in meeting the minimum standards and objectives for Special Condition 8. Rankings of 5 are highlighted in red as failure to meet these requirements make these locations unsuitable and rankings of 4 are highlighted in yellow as a change would be required by the Commission such that this site could be considered.

Criteria	Loma Alta	Buena Vista	Agua Hedionda	Batiquitos Lagoon	San Dieguito Lagoon	San Elijo Lagoon	Los Penasquitos	Lower Otay River	Tijuana (Friendship)
MINIMUM STANDARDS									
Location	1	1	1	1	1	1	1	1	1
Restoration to tidal wetland with extensive intertidal and subtidal areas	5	1	5	3	3	1	4	1	1
Create or substantially restore									
Phase I	5	3	5	5	5	3	5	1	1
Phase II	5	3	5	5	5	3	5	1	1
Buffer zone of adequate size	5	3	5	4	3	2	5	1	1
Minimal contamination	2	2	1	1	2	1	2	2	2
Preservation opportunity	3	1	3	3	1	1	3	1	1
Protect over long-term	3	2	3	1	1	1	1	1	1
No net loss of wetlands	1	1	1	1	1	1	1	1	1
No adverse impact on ESA species	1	3	2	2	2	2	1	1	3
TOTAL	31	20	31	26	24	16	28	11	13
RANK	8.5	4	8.5	6	5	3	7	1	2
OBJECTIVES									
Maximum ecosystem benefits	4	2	3	3	3	1	2	1	1
Substantial fish benefits	5	2	5	5	4	2	5	1	2
Buffer zone	5	3	5	4	2	2	1	1	1
Upland Transition Areas	5	5	5	4	3	1	5	1	1
Minimum wetland impacts	1	4	2	3	3	3	3	1	2

Criteria	Loma Alta	Buena Vista	Agua Hedionda	Batiquitos Lagoon	San Dieguito Lagoon	San Elijo Lagoon	Los Penasquitos	Lower Otay River	Tijuana (Friendship)
Site specific and regional goals	4	3	4	4	2	2	3	1	1
Produce wetland-dependent resource	3	2	2	2	2	2	2	1	1
Provides rare species habitat	4	3	3	2	2	3	2	1	1
Reproductively isolated native species	4	2	4	3	3	2	3	1	1
Increase in aggregate acreage of wetland	4	5	4	3	4	5	5	1	1
Requires minimum maintenance	4	5	1	1	1	3	1	2	2
Timely fashion to meet CCC requirements	5	5	5	5	4	5	5	1	2
Proximity to Carlsbad facility	1	1	1	1	1	1	1	1	1
TOTAL	48	42	44	40	34	32	38	14	17
RANK	9	7	8	6	4	3	5	1	2
COMBINED RANK	9	5	8	6.5	4	3	6.5	1	2

Table 3. Evaluation of ability of sites to meet significant standards and objectives.

Lagoon	Opportunity for tidal restoration	Substantial tidal restoration for fish habitat	Buffer and upland transition zone sufficient to protect restored areas	Net increase in aggregate tidal wetland acreage	Land available to Poseidon	Acreage Available	Timely completion
Loma Alta							
Buena Vista							
Agua Hedionda							
Batiquitos Lagoon							
San Dieguito Lagoon							
San Elijo Lagoon							
Los Penasquitos							
Lower Otay River							
Tijuana (Friendship)							

Proposed Backup Site – Poseidon Resources Wetland Mitigation

California Coastal Commission (CCC) staff has requested that Poseidon Resources (Poseidon) present a recommendation for a primary and secondary or back-up site for their mitigation requirements as specified in the Marine Life Mitigation Plan (MLMP) approved August 2008. Previously, Poseidon recommended the Otay River Floodplain Subarea of the South San Diego Bay Unit of the San Diego Bay National Wildlife Refuge as the primary choice for conducting the required mitigation. Poseidon proposes that Tijuana Estuary be considered as the secondary or back-up site for mitigation.

Project Location. Tijuana Estuary is located in the southwestern corner of the U.S. in San Diego County (see Figure 2-1).

Rationale for Selection as Back-up Site. Tijuana Estuary may serve as Poseidon's back-up site in the event that restoration of the Otay River Floodplain is determined to be infeasible. Tijuana Estuary was ranked second highest, after the Otay River Floodplain site, in terms of mitigation potential in a comparison of seven north San Diego County sites, Tijuana Estuary and the Otay River Floodplain (Nordby Biological Consulting (January 2011); Dr. Michael Josselyn (January 17, 2011).

This analysis was conducted for Poseidon to respond to the CCC staff's request to assess potential mitigation sites (Nordby Biological Consulting January 2011 Exhibit A). This analysis compared the ability of each wetland site to meet the minimum standards and objectives for mitigation developed by CCC staff. All north San Diego County sites failed to meet the minimum standards and objectives. Tijuana Estuary met all of the minimum standards and all but two of the objectives. Key standards and objectives that served to differentiate Tijuana Estuary from north San Diego County sites included:

- Potential for restoration as tidal wetland, with extensive intertidal and subtidal areas;
- Potential to provide for substantial fish benefits;
- Creates or substantially restores a minimum of 37 acres and up to at least 66 acres of habitat similar to the affected habitats in Agua Hedionda Lagoon, excluding buffer zone and upland transition area;
- Provides a buffer zone of a size adequate to ensure protection of wetland values, and at least 100 feet wide, as measured from the upland edge of the transition area.

Existing Restoration Plan for Back-up Site. In 2004, the California State Coastal Conservancy funded a study of large-scale restoration of Tijuana Estuary. Completed in 2007, the Tijuana Estuary – Friendship Marsh Restoration Feasibility and Design Study (Feasibility and Design Study; Tierra Environmental Services 2007) identified seven site-specific restoration goals including:

- Increase tidal prism;

Exhibit 9

- Restore areas of former salt marsh, tidal channel and mudflat affected by sedimentation to the maximum extent possible;
- Restore barrier beach and dunes;
- Increase habitat for endangered species;
- Increase area of undisturbed transition zone;
- Incorporate a berm to prevent sudden loss of restored habitat from flood event; and,
- Incorporate research and adaptive management.

Several of these site-specific goals are relevant to CCC standards and objectives, including:

- Restore areas of former salt marsh, tidal channel and mudflat,
- Increase habitat for endangered species;
- Increase area of undisturbed transition zone;

The Feasibility and Design Study identified a preferred restoration alternative comprised of approximately 250 acres located in the south arm of the estuary (see Figure 4-2 of the Feasibility and Design Study). The 250-acre preferred alternative is located on lands owned by California State Parks (CSP) and the U.S. Fish and Wildlife Service (USFWS). The southern arm of the estuary has been impacted by sedimentation from Mexico over the last several decades resulting in loss and degradation of once functional tidal wetlands. Poseidon has initiated informal discussions with CSP and the USFWS regarding their mitigation policies or use of their lands for Poseidon's mitigation needs. Both agencies have agreed informally to consider use of the southern arm of the estuary as a potential mitigation site for Poseidon.

The Feasibility and Design Study identified five phases for implementing the 250-acre restoration. The five phases and the distribution of habitats within each phase are presented below.

Tijuana Estuary Restoration Project - Proposed Phasing and Habitat Distribution, March 2007.

Phase	**Habitat (acres)**					
	Open Water	**Mudflat**	**Low Salt Marsh**	**Mid-High Salt Marsh**	**Transition**	**Total**
1	22.9	6.1	4.1	3.1	2.5	38.7
2	7.7	6.1	10.8	12.7	0	37.3
3	**13.0**	**18.3**	**23.7**	**19.9**	**0**	**74.9**
4	5.5	11.5	5.5	9.2	0	31.7
5	12.0	18.5	15.9	16.3	4.6	67.3
total	61.1	60.5	60.0	61.2	7.1	250

Proposed Potential Back-up Site. Based on the total acreage of each phase and potential impacts to existing degraded wetland habitats, Phase 3 totaling approximately 75 acres was selected as a potential back-up for Poseidon's mitigation requirements (see Figure 12-11 of the Feasibility and Design Study). It should be noted that each restoration phase can be constructed in any order and that Phase 3 is not dependent upon prior construction of phases 1 and 2. Some modification of Phase 3 would be necessary in order to fully meet Poseidon's mitigation needs; however, it represents a reasonable surrogate.

Site Constraints. While the Feasibility and Design Study identified potential opportunities for restoration and mitigation, there are constraints associated with the plan that could affect the CCC's approval of this site as an alternative to the Otay River Floodplain site. These include:

- Construction of the protective berm;
- Potential impacts to existing degraded wetlands;
- Sediment within the project footprint; and
- Inlet stability.

Berm and Weir. As part of the Feasibility and Design Study, Dr. Howard Chang conducted an analysis of the flood hydrology of the Tijuana River and associated erosion and sedimentation as these factors could affect the long-term integrity of the restored area. He concluded that an earthen berm and weir would be required to protect the restored area from deposition and scour in manner similar to the restoration design for San Dieguito Lagoon currently being constructed by Southern California Edison. This berm would be approximately 7,000 feet long and connect to exiting levees within the river valley. The berm would be approximately 10 feet high. A 700-foot-long armored weir would be built into the berm at an elevation of approximately 7.5 feet. This weir would allow floods higher than the 10-year event to enter the restored marsh. Water entering the marsh would have an average flow velocity of less than three feet per second, and thus would not result in scour of the restored marsh. Only suspended sediment load would be transported into the restored marsh which would result in minimal sedimentation. The proposed berm would impact approximately 3,500 linear feet of existing disturbed and undisturbed coastal salt marsh. As the restoration proposed in the Feasibility and Design Study has not been elevated to a final design study, no action has been requested of the resource agencies with jurisdiction over these habitats. Thus, the status of this project feature is uncertain.

Impacts to Degraded and Undisturbed Wetlands. The Feasibility and Design Study developed a restoration plan that was considered to be "self-mitigating" in that impacts to existing wetlands associated with each phase were offset by wetland restoration in non-wetland habitats at a ratio greater than 1:1. Impacts associated with Phase 3 include 0.56 acre of undisturbed salt marsh and 16.8 acres of degraded salt marsh as well other wetland and non-wetland habitats (see Table 12-27 from the Feasibility and Design Study). The CCC would need to review the proposed plan and determine that Poseidon would receive credit for restoring these degraded habitats to more functional habitats in order to comply with the MLMP's objective that the site result in an increase in the aggregate acreage of wetland in the Southern California Bight. As degraded wetland habitats occur throughout the southern arm of the estuary, design of a restoration project that does not impact these habitats could be difficult.

Sediment within the Project Footprint. The primary source of sedimentation in the south arm of Tijuana Estuary has been Goat Canyon Creek. Goat Canyon Creek has a transborder watershed, 90% of which is located in Mexico. The Goat Canyon Enhancement Project, constructed in 2005, is a series of sedimentation basins designed to capture sediment before it enters the estuary. While this has alleviated the source of the sedimentation, substantial amounts of sediment exist within the project footprint from sedimentation events that occurred prior to construction of the sedimentation basins. It is estimated that this sediment will remain mobile for many years. The Feasibility and Design Study accommodated this sediment by over-

excavating subtidal habitat in the vicinity of Goat Canyon. However, with specific habitat requirements contained in its permit, this approach may not be available to Poseidon. Thus sediment within the system poses a risk to successful mitigation.

Inlet Stability. The inlet to Tijuana Estuary has closed only once in recent history, in 1984. However, the inlet is bifurcated into south and north tidal channels carrying tidal water to the northern and southern arms of the estuary. The southern channel is more susceptible to closure due to the reduced tidal prism in this part of the estuary – a direct result of decades of sediment deposition. The southern channel closes more frequently, most recently in January 2010. Although the channel was reopened by mechanical means from the beach with little or no impacts to wetlands, the stability of the tidal inlet remains a risk to restoration. Closure at a more sensitive location could impact sensitive wetland resources and affect restoration success, as defined by the CCC.

Water Quality. The Tijuana River and Tijuana Estuary have been subjected to renegade wastewater flows from the City of Tijuana, Mexico, for over 70 years with an estimated average of 10-12 million gallons per day in the late 1980s (Nordby, C.S. and J.B. Zedler 1991. Responses of Fish and Macrobenthic Assemblages to Hydrologic Disturbances in Tijuana Estuary and Los Peñasquitos Lagoon, California. *Estuaries* 14 No 1). While infrastructure improvements in both the U.S. and Mexico since that time have improved conditions, wastewater from Tijuana still impacts the system, especially during the rainy season when Tijuana's sewerage system is overwhelmed. Although these renegade flows include pathogens that have been shown to pose human health risks, no direct link to the health of the wetlands of Tijuana Estuary has been demonstrated.

Sustainability. Certain aspects of Tijauna Estuary as a back-up site for Poseidon's mitigation needs suggest that restoration there would be less sustainable than restoration at the Otay River Floodplain. Those aspects include sedimentation and inlet stability discussed above, but moreover include the unpredictability of the Tijuana River watershed. The Tijuana River watershed covers approximately 1,731 square miles with nearly 75% occurring in Mexico. Three reservoirs regulate 71% of the total watershed (Chang, H. as cited in Tierra Environmental Services. 2007. Tijuana Estuary – Friendship Marsh Restoration Feasibility and Design Study). Two of these occur in the U.S. – Morena and Barrett reservoirs (combined capacity of 96,000 acre-feet) and one in Mexico - Rodriguez reservoir (capacity 110,000 acre-feet). In the past, Mexico has released water from Rodriquez reservoir when it is at or near capacity. These releases have not been coordinated with water or resource managers in the U.S. Prolonged reservoir draw down has been shown to impact coastal salt marsh vegetation. Prolonged release of water from El Capitan Reservoir in the U.S. in 1980 resulted in a shift of vegetative dominance from Pacific pickleweed (*Sarcocornia pacifica*) to cattail (*Typha domigensis*) in the salt marsh at the mouth of the San Diego River. (Zedler, J.B. 1982. The Ecology of Southern California Coastal Salt Marshes: A Community Profile. U.S. Fish & Wildlife Service FWS/OBS-81/54.) In addition, prolonged freshwater releases have been shown to affect fish and invertebrate populations in southern California lagoons and estuaries. Nordby and Zedler (1991 *Ibid*) concluded that increased freshwater input resulted in reduced species richness and abundance, populations skewed toward young animals, and dominance by species with early reproductive maturity and prolonged spawning periods at Tijuana Estuary and Los Peñasquitos

Lagoon. Inability to control hydrologic events within the greater part of the watershed coupled with a dynamic sediment environment pose uncertainty for a sustainable restoration at Tijuana Estuary.

By contrast, the watershed of the Otay River is approximately 160 square miles all of which occurs within the U.S. Lower Otay Dam and Lake controls approximately 60% of the watershed (100 square miles) such that the watershed below the Lower Otay Dam and the Otay River Mouth consists of approximately 60 square miles. The reservoir capacity is about 50,000 acre-feet. Lower Otay is operated by the City of San Diego as a drinking water reservoir and is the terminus of the 2nd San Diego Aqueduct. Water is released only after very large rain events and is managed to minimize downstream impacts.

Request. As demonstrated in the reports from Nordby Biological Consulting (January 2011) and Dr. Michael Josselyn (January 17, 2011), the Otay River Floodplain site is a superior site for wetland mitigation that best achieves the MLMP's minimum standards and objectives. Both studies also have determined that the Tijuana Estuary site is the next best site to meet the MLMP's minimum standards and objectives. CCC staff and the SAP are requested to review this proposal and concur with Poseidon's proposed primary and secondary sites.

FIGURE 2-1 **Regional Location Map**

FIGURE 4-2 **Alternative B (Preferred) Restoration Plan and Habitat Configurations**

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RICK ENGINEERING COMPANY

PREPARED BY GIS SERVICES DIVISION

FIGURE 12-11

Alternative 3A

Table 12-27. Project Impacts by Proposed Phase

	Phase 1 – 39 acres			Phase 2 - 37.3 acres			Phase 3 – 74.9 acres			Phase 4 – 31.7 acres			Phase 5 – 67.3 acres		
	Impact			Impact			Impact			Impact			Impact		
	Pristine	Disturbed	Creation	Pristine	Disturbed	Creation	Pristine	Disturbed	Creation	Pristine	Disturbed	Creation	Pristine	Disturbed	Creation
Tidal Open Water			22.9	0.02		7.7			13			5.5			12
Channel															
Mudflat			6.1			6.1			18.3			11.5			18.5
Low Salt			4.1			10.8			23.7			5.5			15.9
Mid-High Salt			3.1			12.7			19.9			9.2			16.3
High Salt															
Salt Marsh Subtotal	***0.06***	***4.93***	***7.2***	***1.34***	***12.46***	***23.5***	***0.56***	***16.79***	***43.6***		***17.14***	***14.7***		***7.53***	***32.2***
Brackish Marsh							0.01							45.33	
Salt Marsh Fleabane Scrub				0.49			0.07								
Salt Panne		0.36						4.47			13.08			2.48	
Mule-fat Scrub		22.73					1.84	13.97			0.22			8.06	
Southern Willow Scrub								0.89							
Saltbush Scrub								2.72							
Tamarisk Scrub								0.45							
Ruderal		7.67			0.32			8.46						3.66	
Transition			2.5	4.14											4.6
Non-native Grassland				17.49											
Upland		1.99						20.23			0.14				
Developed														0.06	
Disturbed		1.02			1.55			4.55			1.19				
Total	**0.06**	**38.7**	**38.7**	**23.03**	**14.33**	**37.3**	**2.48**	**72.53**	**74.9**		**31.77**	**31.7**		**67.12**	**67.3**
Total Impact	**38.76**			**37.36**			**75.01**			**31.77**			**67.12**		

STATE OF CALIFORNIA ARNOLD SCHWARZENEGGER, *Governor*

CALIFORNIA STATE LANDS COMMISSION
100 Howe Avenue, Suite 100-South
Sacramento, CA 95825-8202

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California Relay Service from TDD Phone **1-800-735-2929**
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October 12, 2010

The Honorable Bonnie Neely, Chair
and Commissioners
California Coastal Commission
45 Fremont Street, Suite 2000
San Francisco, CA 94105-2219

Dear Chair Neely and Coastal Commissioners:

The California State Lands Commission (CSLC) staff has recently learned that at your October 15, 2010 meeting, you will take up a Condition Compliance (CDP No. E-06-013, Special Condition 8) addressing Poseidon Resources' submittal of a proposed mitigation site and preliminary restoration plan as required by its approved Marine Life Mitigation Plan (MLMP). The MLMP, in turn, was a condition for the Coastal Commission's November 2007 approval of Poseidon Resources' Carlsbad Desalination project.

Poseidon Resources is proposing to meet its wetland mitigation requirement at the Otay River Floodplain in the San Diego Bay National Wildlife Refuge (NWR) on lands managed by the U.S. Fish and Wildlife Service (USFWS). Section 4.3.1 (Land Ownership/Restrictions on Use of Site) of the Coastal Commission staff report, indicates that the "MLMP requires that site preservation be guaranteed in perpetuity." This section also states "although the USFWS manages the entire [proposed mitigation] site, it owns just part of the land. The western portion of the site was purchased by the State Lands Commission...and is leased to USFWS for their use as part of the San Diego Bay NWR."

As of the date of this letter, the CSLC has not been approached by USFWS or Poseidon Resources about the proposed mitigation plan or the use of the public trust lands currently under lease to USFWS as part of this proposed mitigation plan. Please note that any such project undertaken by Poseidon Resources in the USFWS leasehold will require Commission approval.

Additionally, while there is no prohibition against using these lands for wetland mitigation, the common law, Public Trust Doctrine prevents the State Lands Commission from dedicating any public trust lands for any purpose "in perpetuity." We have entered into 49-year leases, the maximum term allowed under our regulations, for

Exhibit 10

other mitigation projects, including the one previously approved for the USFWS. Furthermore, there is no prohibition against entering into another 49-year lease upon expiration of the current 49-year lease.

Sincerely,

Brian Bugsch, Chief
Land Management Division

Coastal Conservancy

September 21, 2010

Commissioner Bonnie Neely, Chair
California Coastal Commission
45 Fremont Street, Suite 2000
San Francisco, CA 94105-2219

Re: Condition compliance for Commission-approved CDP Application No. E-06-013

Dear Chairperson Neely:

Your staff requests the Coastal Conservancy's approval for the proposed use of certain San Diego Bay National Wildlife Refuge property (San Diego County Assessor's Parcel Nos. 622-151-01, 621-030-18; 20, 622-120-18) (the "Property") as a mitigation site for the Poseidon Resources ("Poseidon") desalination plant in Carlsbad, California (the "project"). This letter provides our approval for use of this Property as a mitigation site, subject to two conditions: 1. Prior to Coastal Commission final approval of the Poseidon Project, the Conservancy shall review and approve the final mitigation plans to determine their consistency with the Memorandum of Agreement, Lower Otay River Wetlands Enhancement Plan and the Comprehensive Conservation Plan for the Refuge; and 2. Poseidon Resources shall acquire an interest in the Property sufficient to ensure implementation of its mitigation project.

Background:
As part of its project before the Commission, Poseidon proposes to restore wetlands in the South San Diego Bay Unit of the San Diego Bay National Wildlife Refuge ("Refuge") as mitigation for its project construction impacts. The proposed site for this mitigation is property purchased with funding from the Conservancy; the property currently is held by the U.S. Fish and Wildlife Service ("Service") as part of the Refuge.

Prior to transfer of the Property to the Service, the Conservancy , the Service and the Southwest Wetlands Interpretive Association entered into a Memorandum of Agreement, dated January 27, 2000, restricting the Property uses to wetland and riparian restoration and preservation, and public access as more particularly described in the Lower Otay River Wetlands Enhancement Plan, adopted by the Conservancy in October 1989 ("Enhancement Plan") and the funding conditions of the Conservancy's authorization and its grant agreement no. 98-098 ("Conservancy's grant agreement") The Enhancement Plan identified a preferred restoration alternative for the Property. The Enhancement Plan recommendations were subsequently modified and incorporated into the Comprehensive Conservation Plan ("CCP") for the Refuge in August 2006.

The Conservancy's grant agreement contains a prohibition against use of the Property for mitigation purposes without prior approval of the Conservancy's Executive Officer. The review by the Conservancy's Executive Officer considers, on a case-by-case basis, whether the mitigation would provide a benefit which would not

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Exhibit 11

otherwise enure to the property acquired (or restored) with Conservancy funding. This evaluation protects the public's investment in and expectation that state funding will provide additional protection and conservation of the environment. This is in contrast to mitigation, which is used to substitute or compensate for adverse environmental effects; yet, the mitigation project might not provide additional environmental benefits.

Discussion:
In this matter, the Conservancy's Executive Officer must provide consent to the use of the Property for Poseidon's proposed mitigation project. The CCP for the Refuge contains measures to improve the Property which are similar to the mitigation measures for Poseidon's project. Thus, use of the Property for Poseidon's mitigation would advance the Conservancy's programmatic goals for the Property.

However, we understand that Poseidon's mitigation plans are in draft form and the Property must be approved as a mitigation site by the Commission before Poseidon will finalize the plans. Therefore, our approval is subject to the condition that, prior to Commission final approval of the Poseidon project, the Conservancy's Executive Officer shall review and consider approval of the final mitigation plans to determine their consistency with the MOA, CCP and Enhancement Plan. This conditional approval to use the Property as a mitigation site shall not be interpreted as support for Poseidon's proposed desalination plant project. Rather, the Conservancy recognizes the responsibility of the Commission and other regulatory agencies to provide approval for Poseidon's project.

We also wish to acknowledge for the record an additional problematic issue with respect to use of property acquired or restored with public funds for mitigation requirements. Mitigation requirements do not include compensation for the use of the property where the mitigation will take place. In the private market, this fee would be captured in the negotiation between the landowner and the project applicant/mitigator. For example, if the proposed mitigation project were taking place on private land, Poseidon would need to purchase the property or pay a fee for its use. But where mitigation projects take place on public land, capturing this cost is not as simple.

The Conservancy recognizes that the public should be compensated for the use of property purchased with public funds for private mitigation projects. We request as an additional condition to our approval for use of the Property for Poseidon's mitigation project, that Poseidon compensate the State of California, on behalf of the Conservancy, for the use of the Property as a mitigation site. Specifically, Poseidon should acquire an interest in the Property sufficient for it to implement its mitigation project. The cost of this interest would be based on a state-approved appraisal. The interest in the Property sufficient for Poseidon's mitigation project would be established by the Service, Conservancy and Poseidon and could be a lease, license, easement or other possessory interest.

Thank you for your consideration of this matter. Please contact me or Megan Cooper, Conservancy project manager, mcooper@scc.ca.gov, if you have any questions.

Sincerely,

Sam Schuchat
Executive Officer

cc: Andy Yuen, Project Leader, San Diego National Wildlife Refuge Complex

Dynegy South Bay, LLC
990 Bay Boulevard
Chula Vista, CA 91911

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COASTAL COMMISSION

DYNEGY

January 10, 2010

Alison Dettmer
Energy and Ocean Resources Division
California Coastal Commission
45 Fremont Street, Suite 2000
San Francisco, CA 94105-2219

RE: South Bay Power Plant - Permanent Shutdown

Dear Ms. Dettmer:

Dynegy South Bay, LLC (Dynegy) hereby provides this courtesy notification to the California Coastal Commission that the South Bay Power Plant has been permanently shutdown. All operations ceased as of January 1, 2011.

The South Bay Power Plant has held in the past, various permits issued by the California Coastal Commission for development and operations at the plant. We request your office amend its South Bay Power Plant file to reflect the shutdown of the Plant.

If you have any questions, please call Barb Irwin, Director of West Region Environmental at (217) 519-4035.

Sincerely,

Leonard J. Cigainero
Plant Manager

cc: Barb Irwin - Dynegy

Exhibit 12

October 15, 2010

Via Fed-Ex & E-mail

Mr. Randy Hickok
Managing Director Asset Management & Trading
Dynegy, Inc.
4140 Dublin Boulevard, Suite 100
Dublin, CA 94568

Dear Mr. Hickok:

By letter dated September 29, 2010, the California Independent System Operator Corporation (ISO) notified Dynegy, Inc. that it was extending the Reliability Must Run (RMR) Agreement applicable to Dynegy's South Bay Units 1, 2 and the CT (collectively, the South Bay units). Since then, the ISO has received new information about projected power demand in the San Diego local area, showing that local power requirements are lower than the California Energy Commission (CEC) had previously projected in its 2009 forecasts used in the ISO's 2011 Local Capacity Technical Analysis for 2011 and 2012. Additionally, on September 27, 2010, the San Diego area experienced a record peak demand of 4,684 MW. ISO staff analyzed the weather conditions behind this peak load event in light of the lower CEC forecast. This analysis reinforces the ISO's confidence in the accuracy of the recent, lower power demand projections for the area.

For these reasons, the ISO is pleased to inform Dynegy of its decision to rescind the September 29, 2010 notice of extension and the RMR status of the South Bay units will, therefore, terminate on December 31, 2010. We understand that RMR designation caused Dynegy some concern given, among other things, the age of the facilities and the community's long-standing desire and expectation to see the units closed and removed. With this notice, Dynegy is now free to proceed with decommissioning and demolition in accordance with its lease agreement with the Port of San Diego beginning January 1, 2011.

As you know, on June 11, 2010, the ISO filed a petition for review of the decision of the California Regional Water Quality Board for the San Diego Region denying an administrative extension of the National Pollutant Discharge Elimination System (NPDES) permit for South Bay Units 1 and 2. We will take steps promptly to withdraw that petition.

As you also know, a hearing on Dynegy's pending NPDES permit application for operation beyond December 31, 2010 is scheduled for November 17, 2010. We will be submitting comments on Monday, October 18, indicating that the ISO has reassessed the local reliability

Exhibit 13

need for the South Bay units beyond 2010 and has determined that these units are no longer needed for RMR service beyond the current contract year.

The ISO appreciates the RMR service the South Bay units have provided over the years and we are pleased to be able to release them from service at the end of this year.

Sincerely,

Steve Berberich
Vice President and Chief Operating Officer

SBB/ag

cc: Joseph M. Paul (Dynegy, Inc.)
Daniel P. Thompson (Dynegy, Inc.)
R. Alan Padgett (Dynegy, Inc.)
James Walsh (SDG&E)
Victor Kruger (SDG&E)
Larry Chaset (CPUC)
The Honorable Cheryl Cox (City of Chula Vista)

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K. Casey
A. Ulmer
C. Mamandur
P. Pettingill
G. Vanpelt
G. DeShazo
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A. Bhaumik
D. Timson
R. Kott
G. Grotta
J. Chipman

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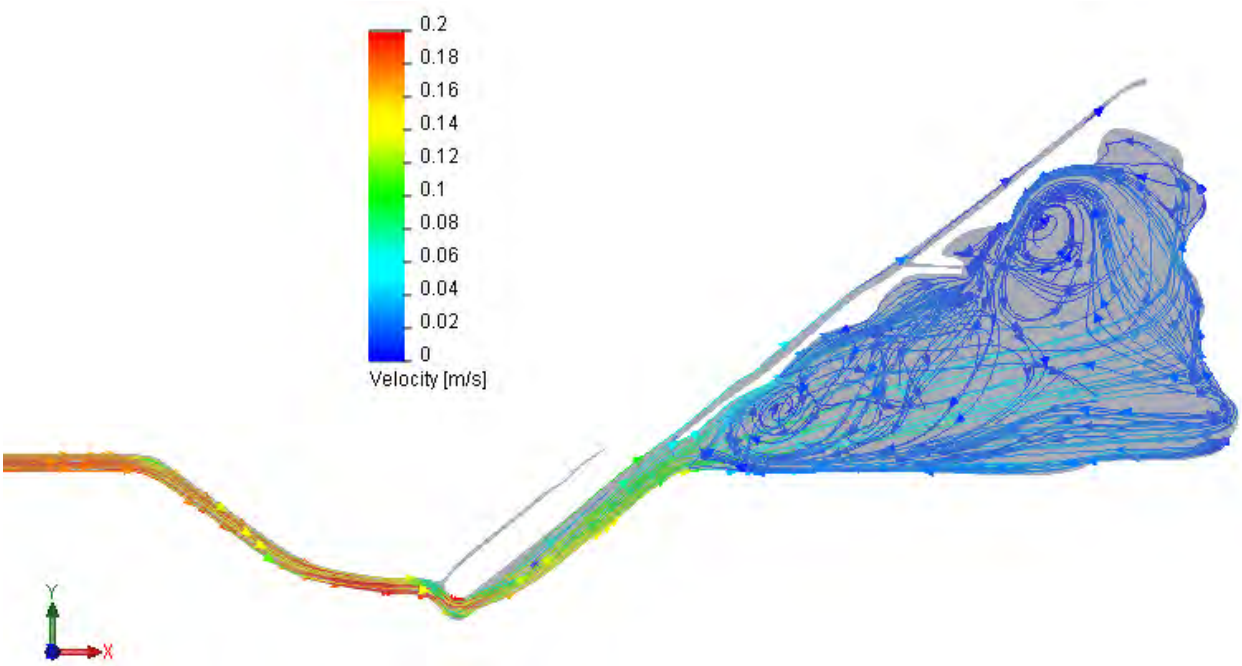
Cabinet: Operations Support
Folder: Reliability Contracts\LARS\ 2011 LARS\Notices\
Filename: 100929 Dynegy South Bay RMR Extension

Tidal Hydraulics of Wetlands Restoration Alternatives In the Otay River Flood Plain, Carlsbad Desalination Project Marine Life Mitigation Plan

by
Scott A. Jenkins, Ph. D. *
& Joseph Wasyl



Submitted by:
Dr. Scott A Jenkins Consulting
14765 Kalapana St.
Poway, CA 92064

Submitted to:
Poseidon Resources, Suite 2020
501 West Broadway
San Diego, CA
9 September 2010

Exhibit 14

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ABSTRACT

This is a hydrodynamic feasibility study of conceptual site plans for a proposed wetland restoration site. This study employs a well-tested and peer-reviewed hydrodynamic model to evaluate the tidal hydraulics of three alternative tidal basin and channel concepts for Poseidon's Marine Life Mitigation Plan in the Otay River floodplain. The proposed new tidal basin would occupy a land parcel known as *Otay River Floodplain* and would have a triangular foot print and receive its marine source water from south San Diego Bay through a connection with the Otay River. There are three grading concepts being considered for this triangular basin: *Alternative-1* is graded for an approximately prototypic balance between subtidal and intertidal habitat and is referred to as a *mixed-habitat plan*; *Alternative-2* is graded for an emphasis on subtidal habitat and is referred to as a *maximum subtidal plan*; while the grading of Alternative-3 emphasizes intertidal habitat and is referred to as a *maximum intertidal plan*. The estimated minimum subtidal acreage needed to meet fish productivity requirements of Poseidon's Marine Life Mitigation Plan is 11 acres; while the minimum required acreage of restored tidal wetland is 66 acres.

The model, analysis methods, and supporting data bases used herein are the same as those utilized in the Environmental Impact Report/Environmental Impact Statement (EIR/EIS) for the San Dieguito Wetland Restoration Project, (EIR/EIS, 2000), and for the preparation of the San Dieguito Wetlands Restoration Project, Final Restoration Plan, (SCE, 2005). Monitoring data for the newly completed San Dieguito Lagoon Restoration Project was also used to calibrate tidal hydraulics model. San Dieguito Lagoon was selected as a proxy for the restoration alternatives because of morphologic similarities: in particular, both restoration sites have a long "goose-neck" feeder channel connecting source water to interior tidal basins of comparable acreage and distance from the source water. Habitat surveys conducted during the San Dieguito Lagoon Restoration Project by Josselyn & Whelchel (1999) were also used to develop functional relationships between habitat breaks and amounts of time for wetting and drying (hydroperiod functions). These relationships were used to transpose tidal hydraulics model output into calculations of acreage of various wetland habitat types created by the three restoration alternatives. Calculations of habitat creation were based on long-term tidal hydraulics

simulations using tidal forcing at the mouth of the Otay River based on the 1980-2009 period of record for San Diego Bay tides measured by the NOAA tide gage #941-0170 located at the Navy Pier.

Table ES-1 summarizes habitat creation computed from the long term tidal hydraulics simulations of the three restoration alternatives. Inspection of Table ES-1 reveals that all of the alternatives create significantly more than the required minimum of 66 acres of tidally influenced wetland, achieving maximum areas of salt water inundation of between 82.6 acres and 82.8 acres. In this regard, the restoration designs provide a safety margin in habitat creation of about 17.6 acres – 17.8 acres or about 27%. Furthermore, all of the restoration alternatives provide significantly more than the minimum 11 acres of subtidal habitat required for fish production. Alternative-1 provides on average 18.5 acres of subtidal habitat, and is never less than 16.9 acres. Thus the critical threshold for adequate fish productivity (11 acres of subtidal habitat) is satisfied with a safety margin of at least 5.9 acres. Alternative-2 provides on average 32.8 acres of subtidal habitat while it is never less than 31.3 acres. Hence Alternative-2 (the maximum sub-tidal plan) provides substantially more subtidal habitat than Alternative-1 by a factor of 1.9, and easily exceeds the critical threshold for adequate fish productivity (11 acres of subtidal habitat) with a safety margin of at least 20.3 acres. Alternative-3 provides on average 14.8 acres of subtidal habitat and is never less than 14.3 acres, a safety margin of at least 3.3 acres.

Hydrodynamic simulations of tidal exchange and dilution rates give residence time estimates of τ_1 = 3.75 days for Alternative-1; τ_2 = 3.29 days for Alternative-2; and for Alternative-3, a residence time estimate of τ_3 = 3.93 days. Residence times for all three restoration alternatives are comparable to those measured or calculated for healthy tidal lagoon systems such as the W-1 tidal basin in the newly restored San Dieguito Lagoon (Coastal Environments, 2009) and in the East Basin at Agua Hedionda Lagoon (Elwany, et. al., 2005).

Tidal exchange simulated during spring tides show for all three restoration alternatives that Otay River channel velocities generally remain less than the threshold of sediment motion (0.6 ft/sec or 0.18 m/s) and greater than the deposition threshold (0.27 ft/ sec or 0.08 m/sec) and consequently, an equilibrium channel is achieved with the native sediments. There is sediment

[*]Table ES-1: Habitat Creation for Restoration Alternatives in the Otay River Floodplain

Habitat Areas	Alternative -1 (Mixed Habitat)	Alternative -2 (Max Subtidal)	Alternative -3 (Max Intertidal)
Perpetual Sub-Tidal (acres)	16.92	31.27	14.27
Mean Sub-Tidal (acres)	18.50	32.80	14.81
Frequently Flooded Mud Flat (acres)	27.73	13.63	25.24
Frequently Exposed Mud Flat (acres)	8.90	6.31	11.17
Low Salt Marsh (acres)	7.55	9.29	11.81
Mid Salt Marsh (acres)	12.80	10.55	13.35
High Salt Marsh (acres)	7.51	10.50	5.71
Transitional Habitat (acres)	1.22	1.24	1.24
Maximum Intertidal Area (acres)	65.71	51.52	68.52
Maximum Area of Salt Water Inundation (acres)	82.63	82.79	82.79
Mean Intertidal Area (acres)	42.07	29.81	45.22
Mean Area of Salt Water Inundation (acres)	60.57	62.61	60.03

[*]These acreages based on the following exposure times for each habitat type:

Subtidal Exposure < 0%;

0% < **Frequently Flooded Mud Flat Exposure** < 50%;

50% < **Frequently Exposed Mud Flat Exposure** < 61.8%

61.8% < **Low Salt Marsh Exposure** < 81.7%

81.7% < **Mid Salt Marsh Exposure** < 96.2%

96.2% < **High Salt Marsh Exposure** < 99.8%

99.8% < **Transitional Exposure** < 100%

transport down channel but not deposition, and hence a maximum likelihood of self-maintaining channel. Furthermore, the inlet channel and the mouth of the Otay River are not subject to littoral transport by shoaling ocean waves, as South San Diego Bay provides complete sheltering from high energy shoaling swells. Consequently, the inlet channel is not likely to infill or close from sand influx in the source water, making the site significantly easier to maintain. But, there is one isolated erosion concern, and that occurs during flooding spring tides in Alternative-2 along the narrower east/west reach. Because of the larger tidal prism of this alternative, the channel currents accelerate to 0.2 m/sec (0.66 ft/sec) before entering the Alternative-2 tidal basin. This exceeds the 0.18 m/s (0.6 ft/sec) threshold of motion for the 0.3 mm sized native sediments, and erosion will occur and persist until the channel cross sectional area is enlarged sufficiently to lower local channel currents to less than 0.18 m/s (0.6 ft/sec). If Alternative-2 is selected for final design, it would be appropriate to provide additional grading to this reach of channel to enlarge its cross section.

Tidal Hydraulics of Wetlands Restoration Alternatives in the Otay River Flood Plain, Carlsbad Desalination Project Marine Life Mitigation Plan

By:Scott A. Jenkins, Ph.D., & Joseph Wasyl

1) Introduction:

This study investigates the tidal hydraulics of three wetlands restoration alternatives located in the lower floodplain of the Otay River in south San Diego Bay, CA, (see Figure 1). The restoration alternatives involve creation of a new tidal basin on a parcel of land known as *Otay River Floodplain* shown in Figure 2, which is located south of the Otay River between Ponds 20 & 22 and the Interstate 5 (cf. Figure 1). The proposed new tidal basin would have a triangular foot print and would receive its marine source water from south San Diego Bay through a connection with the Otay River at the western vertex of this triangular basin, (see Figure 3). There are three grading alternatives being considered for this triangular basin: *Alternative-1* is graded for an approximately prototypic balance between subtidal and intertidal habitat and is referred to as a *mixed-habitat plan*; *Alternative-2* is graded for an emphasis on subtidal habitat and is referred to as a *maximum subtidal plan*; while the grading of Alternative-3 emphasizes intertidal habitat and is referred to as a *maximum intertidal plan*. The objective of this study is to perform hydrodynamic simulation of the tidal exchange that would occur in each of these restoration alternatives, and make quantitative evaluation of the acreages of each habitat type that would be created. The hydrodynamic simulations will also asses the velocities of tidal flows and the stability and potential maintenance requirements of the approximately 7,000 ft long river channel that connects the new tidal basin with south San Diego Bay.

The computer models used in this study are finite element types. The tidal hydraulics model is the research model, *TIDE_FEM*, [Inman & Jenkins, 1996] and the littoral transport model is TIDE_FEM/SEDXPORT**.** TIDE_FEM was built from some well-studied and proven computational methods and numerical architecture that have been successful in predicting shallow water tidal propagation in Massachusetts Bay [Connor & Wang, 1974] and estuaries in Rhode Island, [Wang, 1975], and have been reviewed in basic text books [Weiyan, 1992] and

Figure 1: Otay River floodplain in south San Diego Bay, CA.

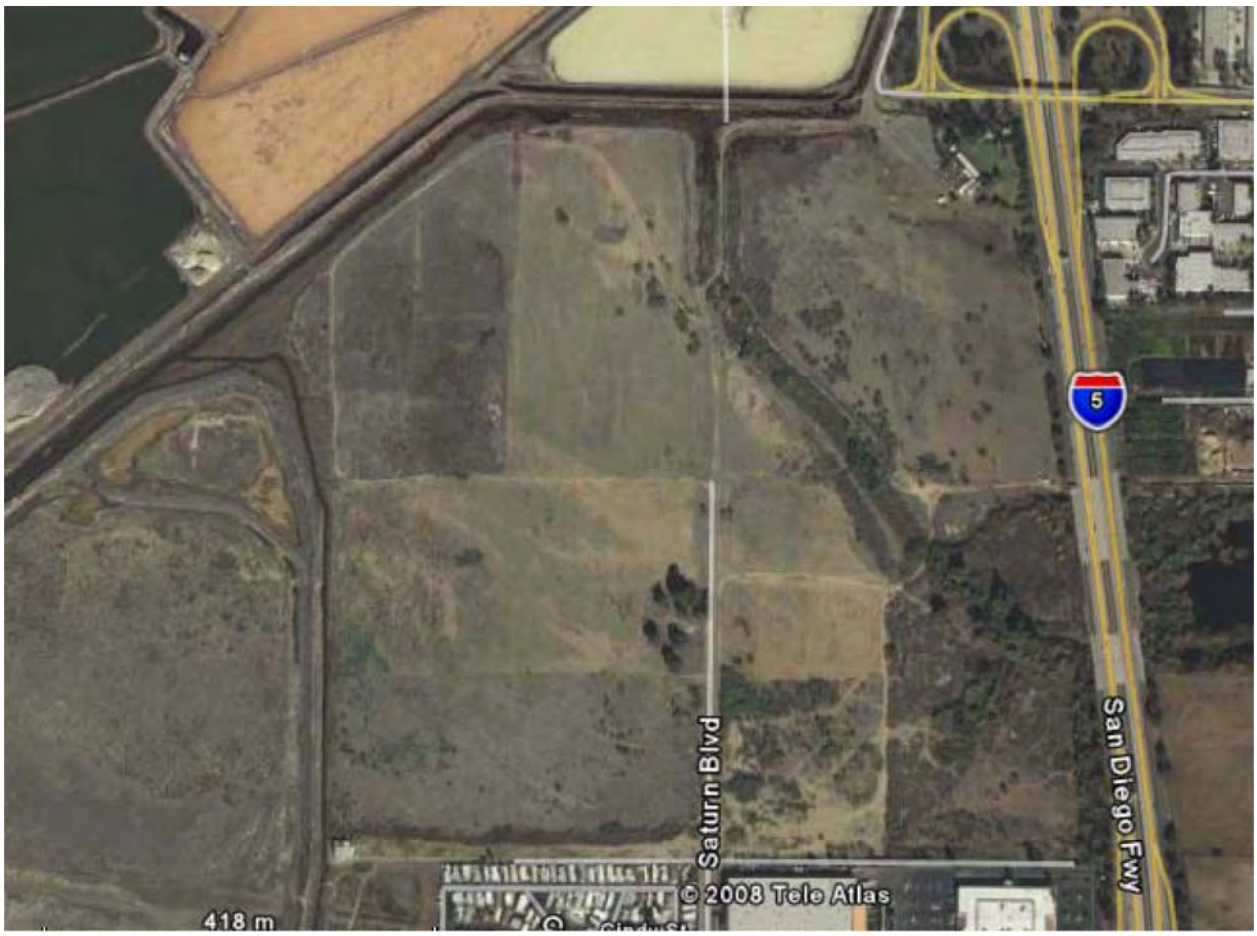

Figure 2: Otay River floodplain, site of the wetland restoration alternatives.

Figure 3: Schematic of the proposed new tidal basin to be constructed in the Otay River floodplain and connected at it western end to the lower reach of the Otay River.

symposia on the subject, e.g., Gallagher (1981). A discussion of the physics of TIDE_FEM is given in Jenkins and Wasyl (2003 & 2005).

In its most recent version, the TIDE_FEM/TIDE_FEM/SEDXPORT modeling system has been integrated into the Navy's Coastal Water Clarity Model and the Littoral Remote Sensing Simulator (LRSS) (see Hammond, et al., 1995). The TIDE_FEM/SEDXPORT code has been validated in mid-to-inner shelf waters (see Hammond, et al., 1995; Schoonmaker, et al., 1994). A detailed description of the architecture and codes of the TIDE_FEM/SEDXPORT is given in Jenkins and Wasyl (2005) that is available on-line at the University of California digital library at: http://repositories.cdlib.org/sio/techreport/58/.

Validation of the TIDE_FEM/SEDXPORT code was shown by three independent methods: 1) direct measurement of suspended particle transport and particle size distributions by means of a laser particle sizer; 2) measurements of water column optical properties; and, 3)

comparison of computed stratified plume dispersion patterns with LANDSAT imagery. Besides being validated in coastal waters of Southern California, the TIDE_FEM/SEDXPORT modeling system has been extensively peer reviewed. Although some of the early peer review was confidential and occurred inside the Office of Naval Research and the Naval Research Laboratory, the following is a listing of 5 independent peer review episodes of TIDE_FEM/SEDXPORT that were conducted by 9 independent experts and can be found in the public records of the State Water Resources Control Board, the California Coastal Commission and the City of Huntington Beach.

1997- Reviewing Agency: State Water Resources Control Board
Project: NPDES 316 a/b Permit renewal, Scripps Beach, Carlsbad, CA
Reviewer: Dr. Andrew Lissner, SAIC, La Jolla, CA

1998- Reviewing Agency: California Coastal Commission
Project: Coastal Development Permit, San Dieguito Lagoon Restoration
Reviewers: Prof. Ashish Mehta, University of Florida, Gainesville;
Prof. Paul Komar, Oregon State University, Corvallis;
Prof. Peter Goodwin, University of Idaho, Moscow

2000- Reviewing Agency: California Coastal Commission
Project: Coastal Development Permit, Crystal Cove Development
Reviewers: Prof. Robert Wiegel, University of California, Berkeley;
Dr.Ron Noble, Noble Engineers, Irvine, CA

2002- Reviewing Agency: California Coastal Commission
Project: Coastal Development Permit, Dana Point Headland Reserve
Reviewers: Prof. Robert Wiegel, University of California, Berkeley;
Dr. Richard Seymour, University of California, San Diego

2003- Reviewing Agency: City of Huntington Beach
Project: EIR Certification, Poseidon Desalination Project
Reviewer: Prof. Stanley Grant, University of California, Irvine

Lagoon water levels and tidal currents are studied using numerical transport models that are run over a historic surrogate time period for which environmental forcing is well-known. In all such *boundary value problems* input variables are divided between two general classes,

forcing functions and boundary conditions. The primary forcing function is San Diego Bay water level variation. The important boundary conditions are basin and feeder channel bathymetry, sediment grain size, and river channel scour configurations. Input for San Diego Bay water level variations are discussed below in Section 2.1. The remaining variables are site specific and will be dealt with separately for Alternative-1 in Section 3.1, Alternative-2 in Section 4.1 and Alternative-3 in Sections 5.1.

2) Source Water Forcing, Properties and Calibration

Source water for the proposed new tidal basin in the Otay River floodplain is San Diego Bay water that engages in tidal intrusion up the Otay River. The tidal range in south San Diego Bay and the quality of that source water are critical to achieving a functioning salt water wetland at the Otay River floodplain site. One special attribute of this site is that the inlet channel and the mouth of the Otay River are not subject to littoral transport by shoaling ocean waves, as south San Diego Bay provides complete sheltering from high energy shoaling swells. Consequently, the inlet channel is not likely to infill or close from sand influx in the source water, making the site significantly easier to maintain.

2.1 San Diego Bay Water Level Variation: The flow of sea water into and out of the Otay River Channel is driven by the time variation in San Diego Bay water level. San Diego Bay level variations for the 1980-2009 simulation period were obtained from the nearest tide gage, located at the Navy Pier in San Diego Bay. This tide gage (NOAA #941-0170) was last leveled using the 1983-2001 tidal epoch. Elevations of tidal datums referred to NGVD29 are given in the second column of Table 1 and compared with tides on the open coast in the third column based on the Scripps Pier tide gage (NOAA #941-0230). Tidal data in Table 1 indicates that tidal ranges in San Diego Bay are greater than those found on the open coast. Mean diurnal tidal ranges are 5.72 ft as compared to 5.33 ft on the open coast, an increase of 0.39 ft of diurnal range in San Diego Bay. The extreme water level range is 11.23 ft in San Diego Bay as compared to 10.51 ft on the open coast, an increase of 0.72 ft of extreme range in the bay. All high water datum in the bay exceed those on the open coast and all the low water level datum are lower in the bay than on the open coast. This occurs because San Diego Bay is a resonant tidal system

Table 1: San Diego Bay & Coastal Ocean Tidal Datums, 1983-2001 Tidal Epoch

	San Diego Bay Tides: NOAA #941-0170 Navy Pier	Coastal Ocean Tides NOAA# 941-0230 Scripps Pier La Jolla
HIGHEST OBSERVED WATER LEVEL	5.63 ft NGVD	5.35 ft NGVD
MEAN HIGHER HIGH WATER (MHHW)	3.21 ft NGVD	3.03 ft NGVD
MEAN HIGH WATER (MHW)	2.48 ft NGVD	2.30 ft NGVD
MEAN TIDE LEVEL (MTL)	0.45 ft NGVD	0.46 ft NGVD
MEAN LOW WATER (MLW)	-1.67 ft NGVD	-1.39 ft NGVD
MEAN LOWER LOW WATER (MLLW)	-2.51 ft NGVD	-2.30 ft NGVD
LOWEST OBSERVED WATER LEVEL	-5.60 ft NGVD	-5.16 ft NGVD

where higher harmonics of the K1 lunar-solar diurnal tidal constituent and the M2 principal lunar semi-diurnal tidal constituent are bathymetrical trapped in the bay, leading to a build up in tidal amplitude. The tidal resonance of San Diego Bay provides additional tidal energy for forcing tidal inundation of the proposed tidal basin in the Otay River floodplain, and is another attribute of this site that increases the chance of achieving a sustainable functioning wetland restoration.

A 30-year simulation time period of San Diego Bay tides, 1980-2009, was used to drive the model in the present analysis. This period was chosen because it represents the longest unbroken record for which there existed the simultaneous availability of a number of critical input data sets, in particular an unbroken verified ocean water level record. This time period is sufficiently long to characterize and capture the effects of climate variability, and contained a number of significant climate cycles, including the warm/wet El Niño events of 1980, 1983,

1993, 1995 and 1997, as well as the cool/dry La Niña events of 1986-88 and 2000-01. These climate events embedded in the 1980-2009 period of record assure that the hydrodynamic simulations were able to account for the effects of climate cycle extremes on ocean water levels and ultimately on tidal inundation of the restoration project.

In order to use of observations of historic San Diego Bay water levels in hydraulic modeling exercises we must reconstruct the water level time series at time steps much shorter than the observation intervals (6 minutes). Reconstruction of water level variations at 2 second time step intervals is necessary for achieving stable modeling simulations of the hydraulic response of the lagoon. The ocean water levels were reconstructed at 2 second time step intervals from astronomic tidal constituents for the Navy Pier using daily offsets to the astronomic tidal elevations to compensate for sea level anomalies (see Flick & Cayan, 1984) and achieve agreement with the daily high and low water elevations measured by the Navy Pier tide gage. These daily offsets were obtained by a minimization of the mean squared error between the predicted and measured water level. The short time step reconstruction from tidal constituents with daily offsets was accomplished with the TID_DAYS program, detailed in Jenkins and Wasyl (2005).

For representative spring-neap cycle analysis of tidal circulation in the proposed Otay River floodplain tidal basin, the record was searched for a two-day block having the maximum and minimum diurnal range and for another two-day block whose diurnal range most closely matches the 5.72 ft. range between the MHHW and MLLW of the 1980-2009 tidal epoch. Once these two-day blocks were identified at six minute time step intervals, they were subsequently reassembled in $\Delta t = 2$ sec. time step intervals to produce the tidal forcing functions used in the high resolution tidal circulation analysis of each alternative design.

2.2 San Diego Bay Water Quality: The Southwest Wetland Interpretive Association (SWIA) has operated a self recording water quality monitoring station since 2007 at the mouth of the Otay River at the location noted in yellow in Figure 1. This monitoring station (referred to as the Otay River Sonde) has recorded salinity and dissolved oxygen at 15 minute intervals from December 2007 through April 2010. Figure 4 gives the temporal variation of the salinity in parts per thousand (ppt) recorded by the sonde during this period, while Figure 5 gives the dissolved

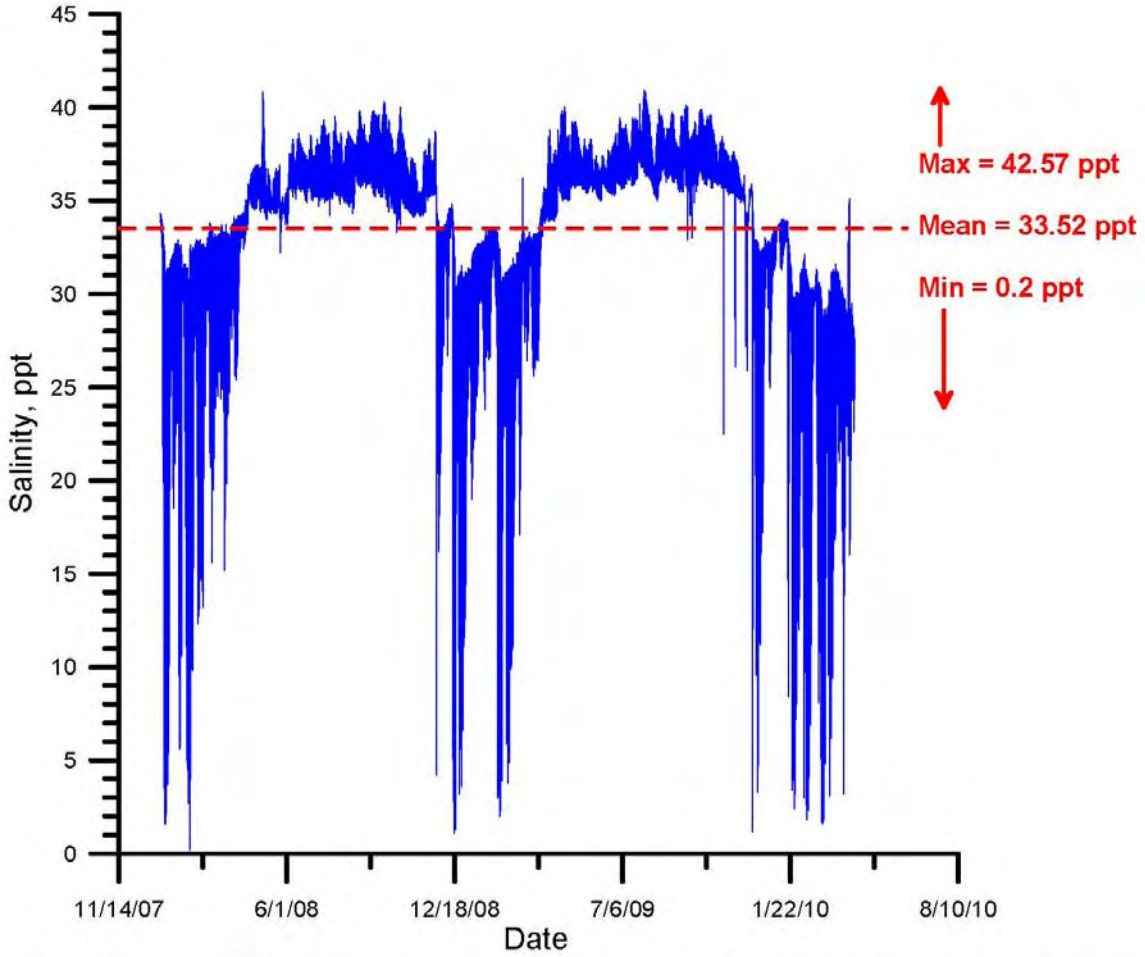

Figure 4: Salinity variation Otay River mouth, from Otay Sonde data base, 2007-2010.

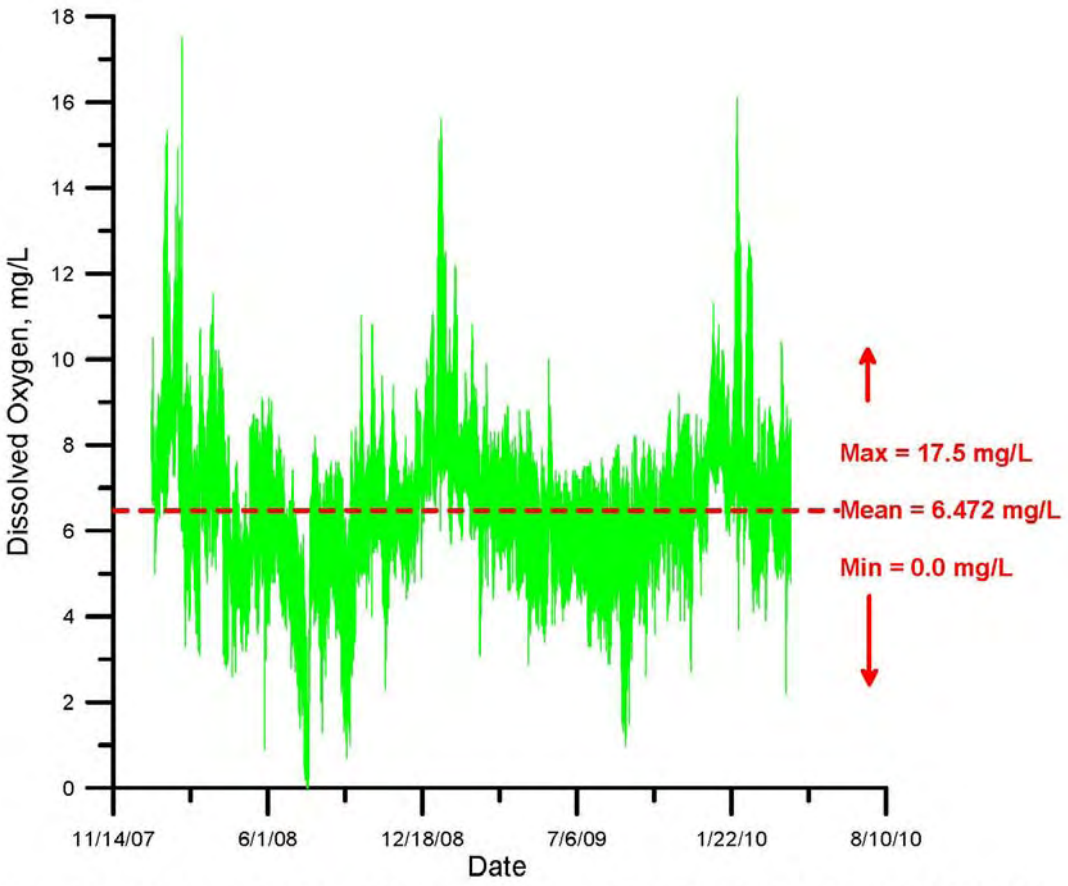

Figure 5: Dissolved oxygen variation Otay River mouth, from Otay Sonde data base, 2007-2010.

oxygen in mg/L. The maximum salinity reached during the dry, evaporative summer months is 42.57 ppt, while the minimum salinity during wet winter periods reaches as low as 0.2 ppt, but the average salinity is 33.52 ppt, identical to the average salinity recorded on the open coast at Scripps Pier. These salinity ranges are comparable to what has been measured in the San Dieguito Lagoon on the open coast by Boland (1998), and are suitable for sustaining a healthy functioning salt water wetland. The dissolved oxygen readings (DO) in Figure 5 show a maximum DO reached during the wet, winter months of 17.5 mg/L, while the minimum DO occurs during summer and can reach 0.0 mg/L. However, the average DO is 6.47 mg/L, about the same as found in nearshore waters along the open coast as measured at Scripps Pier. DO readings at the Otay River sonde are roughly equivalent to what Boland (1998) reported for San Dieguito Lagoon. Percent departures from the mean for salinity and DO are compared in

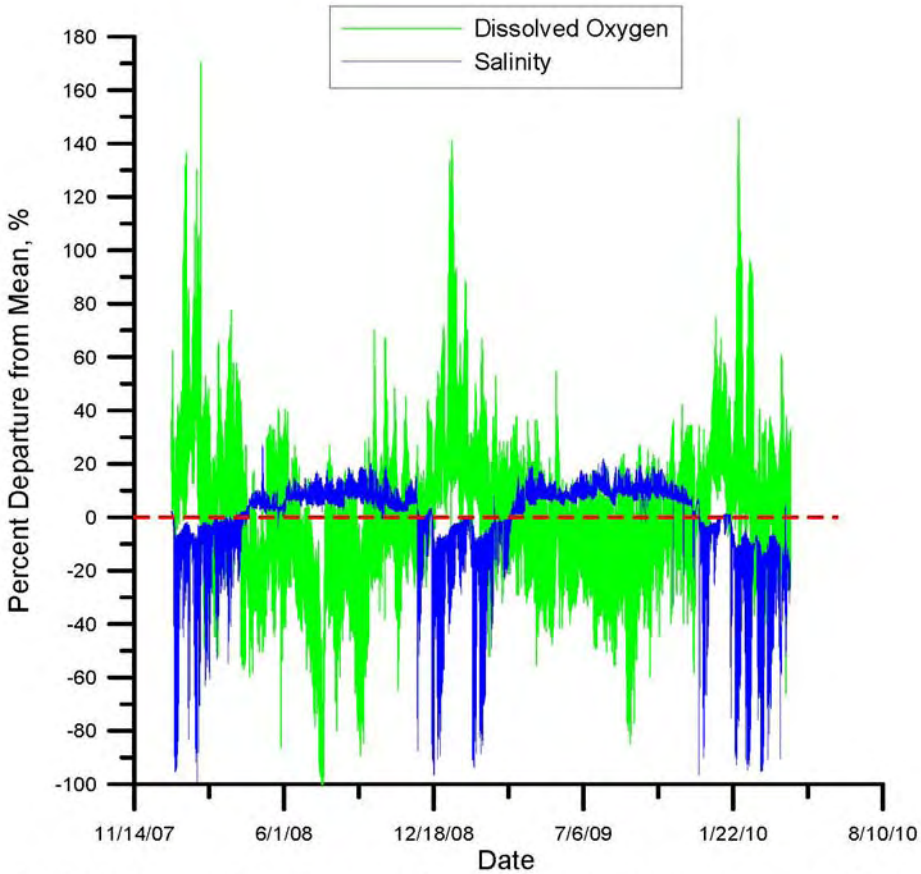

Figure 6: Variation in departures from the mean for salinity and dissolved oxygen in Otay River mouth, from Otay Sonde data base, 2007-2010.

Figure 6 indicating that DO maximums occur when Otay River flooding occurs and the salinity is depressed to minimum values, and conversely, DO minimums occur during warm evaporative months in summer when south San Diego Bay waters turn hyper saline. Regardless, variability in salinity and dissolved oxygen at the Otay River sonde are within normal limits of a healthy functioning salt water wetland.

2.3 Model Calibration: We use monitoring data for the newly completed San Dieguito Lagoon Restoration Project to calibrate the TIDE_FEM tidal hydraulics model; and then use that calibration to simulate tidal inundation of the three wetland restoration alternatives in the Otay River flood plain. The San Dieguito Lagoon monitoring data was collected by Coastal Environments (2009) during September 2009. We select the W-16 tidal basin at San Dieguito Lagoon as a proxy for the proposed tidal basin in the Otay River floodplain because of

morphologic similarities between the two cases: in particular both have a long “goose-neck” feeder channel connecting source water to interior tidal basins of comparable acreage and distance from the source water.

Spring, neap and mean tidal range simulations of the tidal hydraulics of San Dieguito Lagoon were performed using astronomic tidal forcing functions at = 2 sec time step intervals for the period 1980-2007, as discussed in Section 2.1. Computed water surface elevations and depth averaged velocities from the global solution matrix were converted to lagoon waterline contours and flow trajectories. Calibrations for determining the appropriate Manning factors and eddy viscosities were performed by running the TIDE_FEM model on the San Dieguito bathymetry file and comparing calculated water surface elevations in the W-16 tidal basins against water level measurements by Coastal Environments (2009) during the monitoring period of 14-18 September 2009. Iterative selection of Manning factor n_0 = 0.03511 and an eddy viscosity of ε = 7.129 ft^2/sec gave calculations of water surface elevation and inlet that reproduced the measured values to within 2% over the 2009 monitoring period at San Dieguito Lagoon.

Figure 7 provides a quantitative assessment of predictive skill of the calibrated model using water level measurements in the newly created W-16 Tidal Basin located east of I-5 off the north bank of the San Dieguito River. Here we compare W-16 Tidal Basin water level variations predicted by the model (purple trace) with the water level measurements (black crosses) during the post-construction monitoring of the Edison Plan by Coastal Environments, (2005). The W-16 Basin water level variations are found to lag the ocean water levels by as much as 3.79 hr during the mid-range tides of the monitoring period. High tide water levels equal or exceed those in the ocean due to trapping of higher harmonics of the K1 lunar-solar diurnal tidal constituent and the M2 principal lunar semi-diurnal tidal constituent, similar to what occurs in San Diego Bay. However, low tide water levels in the W-16 basin never drop below + 1.49 ft NGVD and are well above ocean low tide water levels due to frictional impedance and depth limiting travel time of the tidal wave propagation in the long sinuous feeder channels that connect the W-16 tidal basin with the ocean. Low tide levels in W-16 could fall no lower than +0.23 ft NGVD due to the present elevation of the hard channel bottom under the I-5 bridge. The amplitudes and degree of

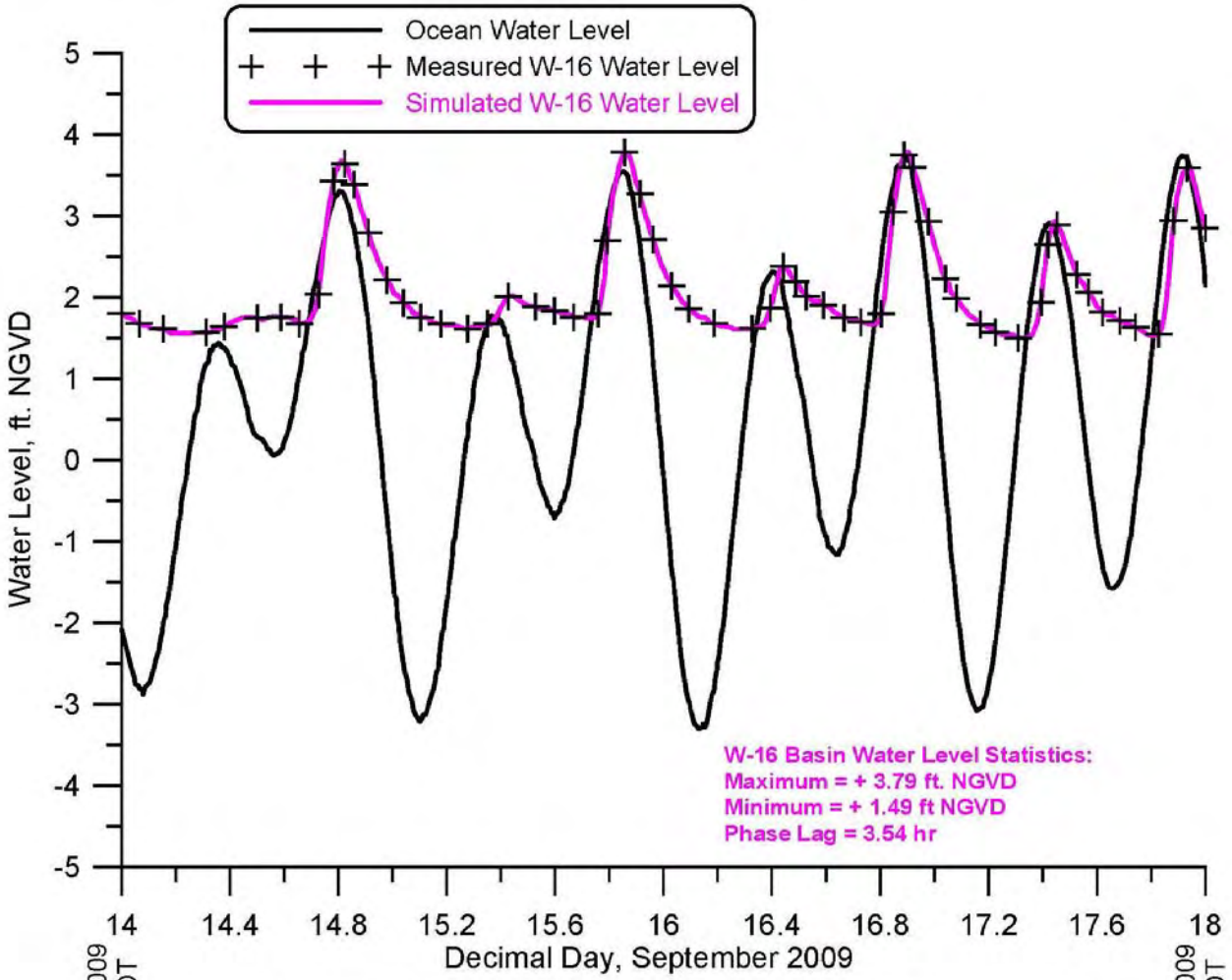

Figure 7. Water level calibration based on the W-16 tidal basin measurements, San Dieguito Lagoon, 14 - 18 September 2009. Ocean water level (black) compared to measured W-16 basin water levels (black crosses) vs calibrated model simulation (red). Measurements by Coastal Environments (2009).

non-linearity in the W-16 Basin water level time series are accurately simulated by the model and closely duplicate those features observed in the measured lagoon tides.

In Figure 7, the calibration error appears to exhibit a systematic tendency. When amplitude errors occur, they tend to over estimate the water elevation of the LLW tidal stage and under estimate the water elevation of the HHW tidal stage. Although these errors are quite small and may be considered high predictive skill, this error mode is consistent with *bathymetry errors* in which depth has been under estimated, Weiyan (1992). Bathymetry errors are the most common cause of modeling errors.

3) Tidal Hydraulics Analysis of Restoration Alternative-1

Figure 8 details the elevation contours of the Alternative-1 tidal basin merged with the Otay River bathymetry. The Alternative-1 tidal basin was designed by Nordby Biological and KTU+A to satisfy mitigation requirements placed upon Poseidon Resources Corporation by the California Coastal Commission (CCC) and San Diego Regional Water Quality Control Board (RWQCB). The design concept for Alternative-1 is based on achieving sufficient subtidal acreage to meet the fish productivity requirements of the RWQCB mitigation requirements while maintaining an appropriate balance with intertidal habitat to achieve maximum biodiversity of an optimal salt water wetland. It is therefore referred to as the *mixed-habitat plan*. The estimated minimum subtidal acreage to meet fish productivity requirements of the RWQCB mitigation is 11 acres; while the minimum required acreage of restored tidal wetland is 66 acres.

3.1 Bathymetric Input for Alternative-1 : Grading contours for Alternative-1 were provided in 0.5 ft intervals between -6.0 ft NGVD and + 6 ft NGVD by KTU+A. The TIDE_FEM tidal hydraulics model presented in Jenkins and Inman (1999) was gridded for a computational mesh of Alternative-1 built off the Figure 8 bathymetry. Of particular interest to the finite element mesh is the *hydraulic friction slope coefficient*, S_{fj}, providing tidal muting effects. Two separate formulations are used. One is given for the 3-node triangular elements situated in the interior of the mesh which do not experience successive wetting and drying during each tide cycle. The other formulation is for the elements situated along the wet and dry boundaries of the lagoon. These have been formulated as 3-node triangular elements with one

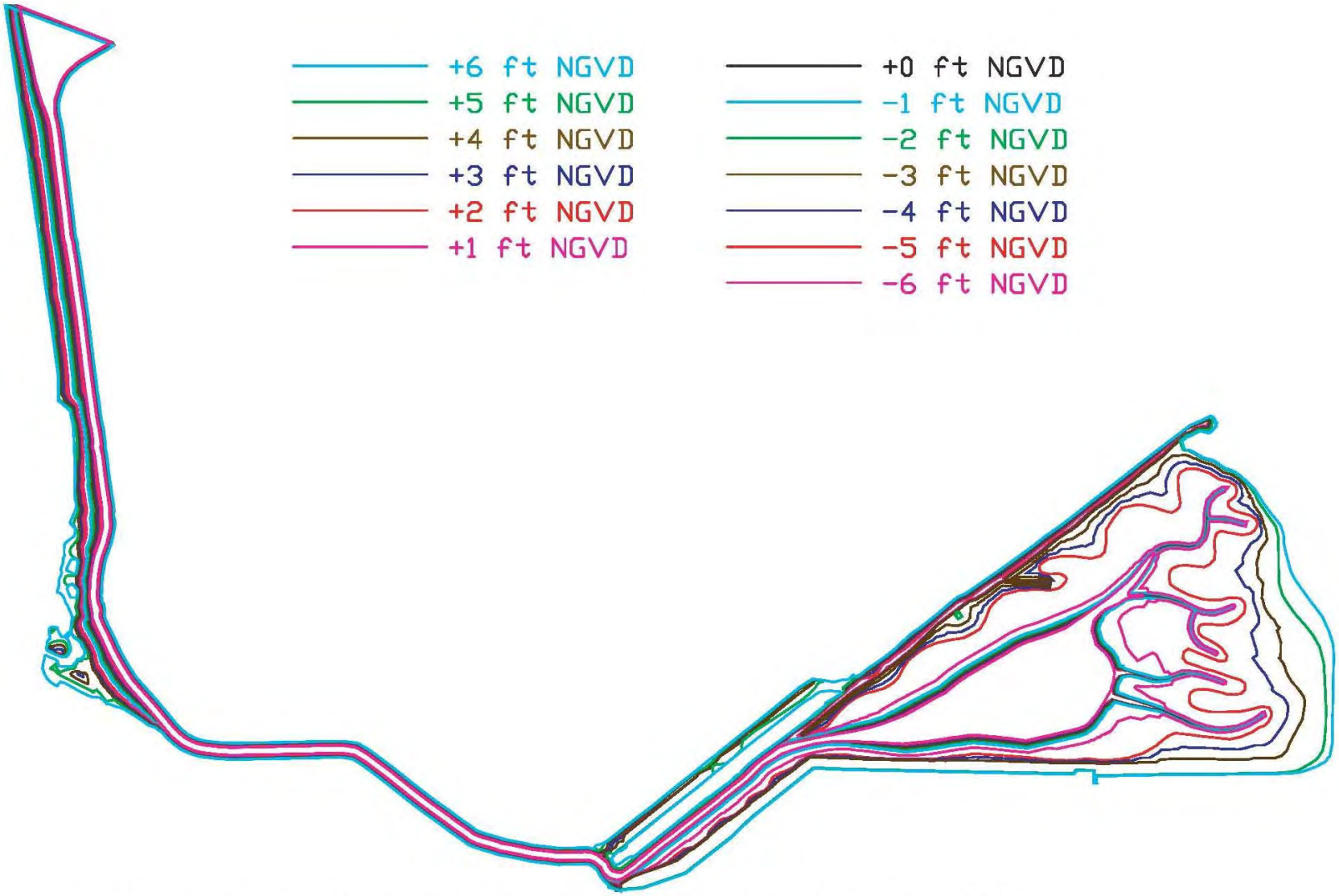

Figure 8. Contours for proposed Otay River tidal basin, Alternative-1, ft. NGVD.

curved side based upon the cubic-spline matrices developed by Weiyan (1992). These two sets of elements were assembled into a computational mesh of the lagoon conforming to the + 6 ft. NGVD contour in Figure 8. The wet-dry boundary coordinates of the curved waterline, (x', y'), are linearly interpolated for any given water elevation from the contours stored in the tidal basin and feeder channel bathymetry file.

Aside from gridding the TIDE_FEM tidal model, stage area and storage rating functions were calculated from the bathymetric contours of Figure 8. Figure 9a gives the stage area function of the Alternative-1 tidal basin in isolation, while Figure 9b gives the storage rating function of the tidal basin merged with the tidally influenced lower reach of the Otay River. The stage area and storage rating functions are used in the initialization of the TIDE_FEM tidal hydraulics model in order to enforce mass conservation in the tidal inundation simulations (see Jenkins and Inman, 1999). The initialization involves fitting a series of high-order polynomials to the areas and volumes of the stage area function in Figure 9a and the storage rating function in Figure 9b, respectively. To accommodate possible future sea level rise the polynomial fits were carried up to a daylight contour chosen at +6.0 ft NGVD, even though the tidal inundation in San Diego Bay has never been observed above +5.63 ft NGVD. A ninth-order polynomial was fitted to the stage area function in Figure 9a with a coefficient of determination of $r^2 = 0.979$ while a fifth- order polynomial was fitted to the storage rating function in Figure 9b with a coefficient of determination of $r^2 = 0.998$.

For tidal inundation up to the historic extreme high water level of San Diego Bay (EHW = +5.63 ft NGVD, upper red dashed line in Figure 9a), Alternative-1 could provide as much as 82.6 acres of tidally influenced wetland and high salt marsh. In subsequent tidal hydraulics simulations, we will find that Alternative-1 provides on average 18.5 acres of subtidal habitat (lower dashed blue line in Figure 9a); while the amount of subtidal habitat is never less than 16.9 acres (lower dashed red line in Figure 9a). Thus the critical threshold for adequate fish productivity (11 acres of subtidal habitat) is satisfied with a safety margin of 5.9 acres. The maximum volume of San Diego Bay water that is exchanged with the Alternative-1 tidal basin is 515 acre-ft during an extreme high water event (dashed red line limits in Figure 9b), and the average diurnal tidal prism of Alternative-1 is 235 acre-ft (dashed blue line limits in Figure 9b).

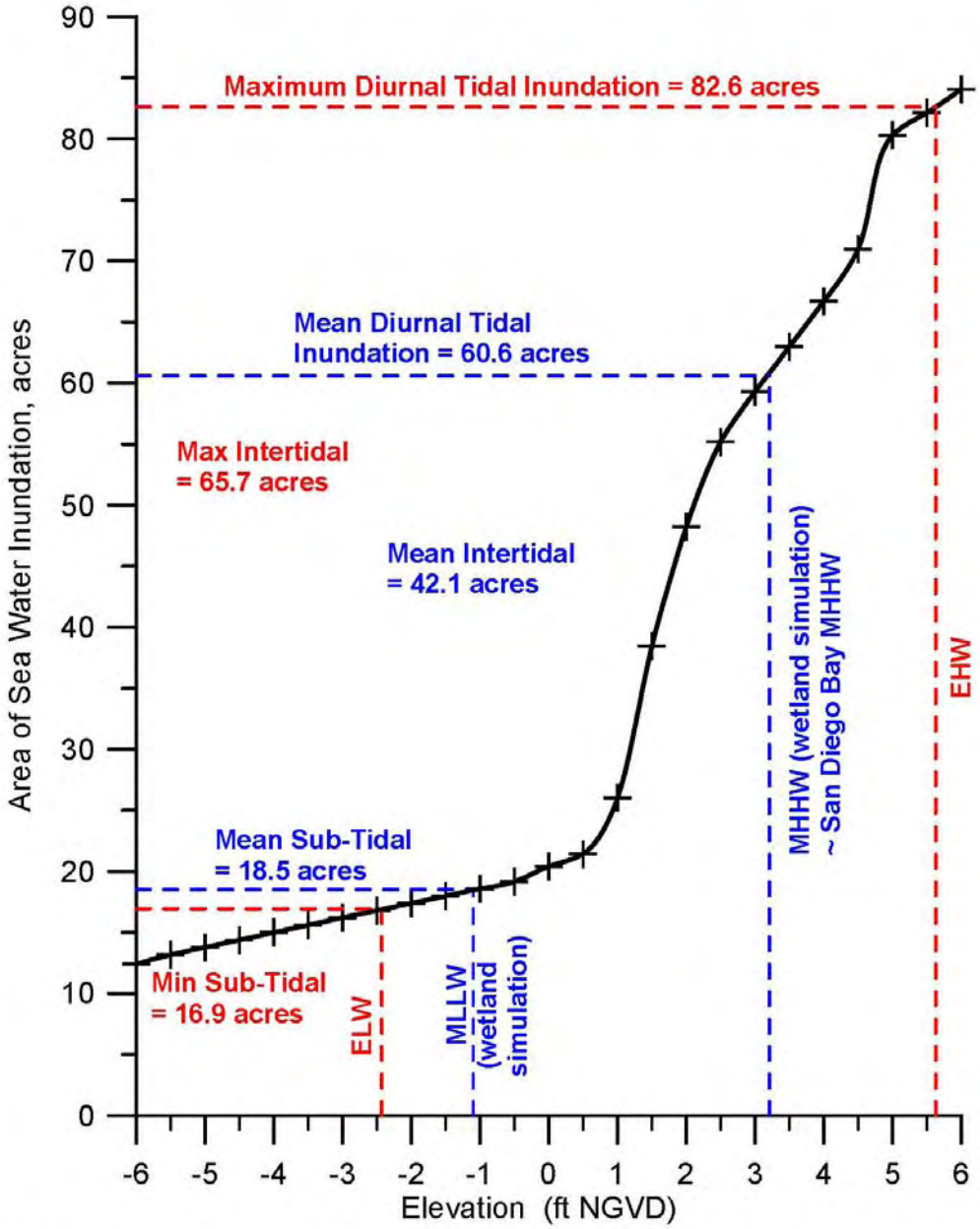

Figure 9a. Stage area function of the tidal basin for Alternative-1 Otay Wetland Restoration Project. Water level data from NOAA tide gage #941-0170, Navy Pier, San Diego Bay.

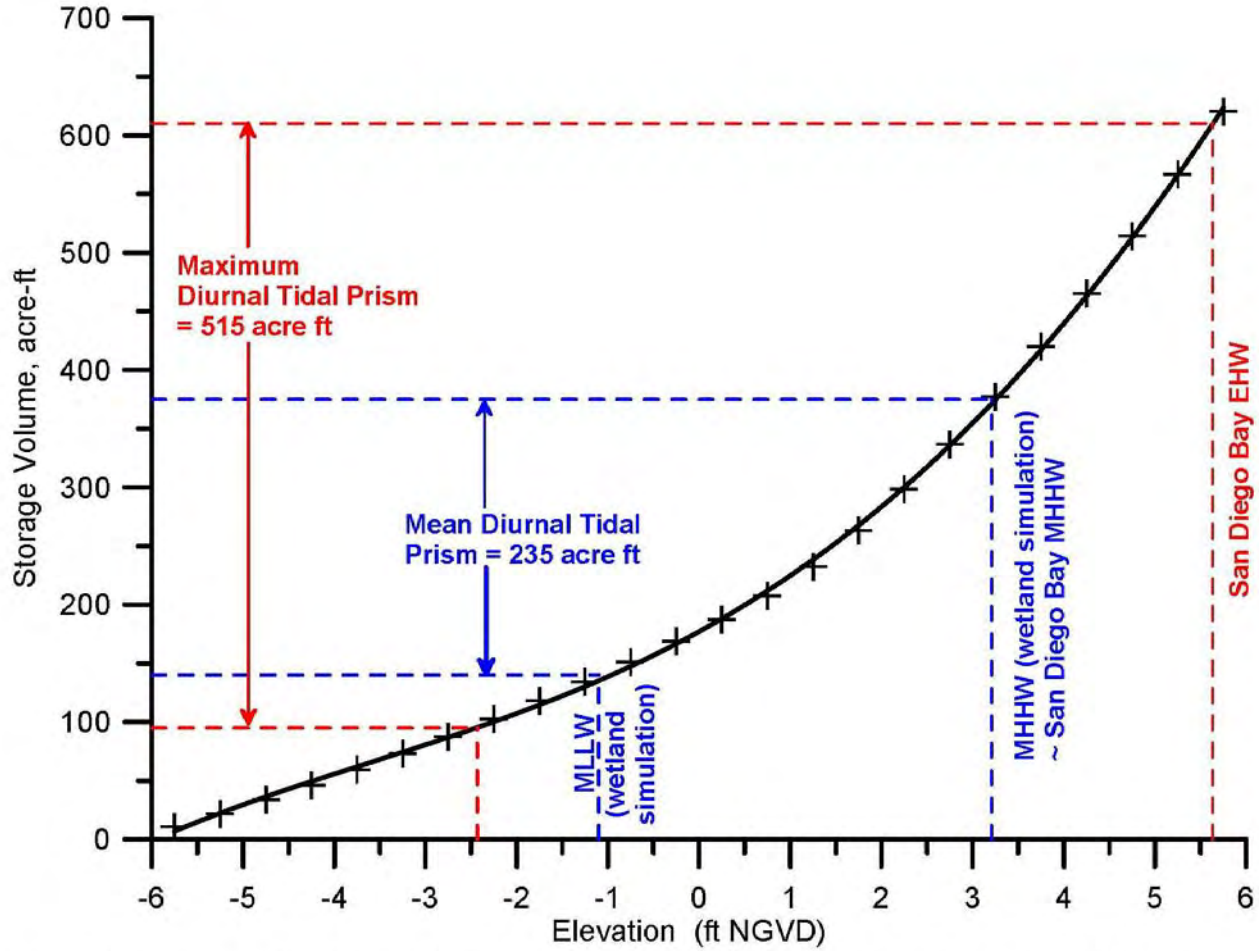

Figure 9b. Storage rating function of the tidal basin and Otay River feeder channel for Alternative - 1 of the Otay Wetland Restoration Project. Water level data from NOAA tide gage 941-0170, Navy Pier, San Diego Bay.

3.2 Alternative-1 Tidal Flow Simulations: The TIDE_FEM grid of Alternative-1 at MHHW is nested in the farfield of south San Diego Bay as shown in Figure 10, and was subjected to 30 years of historic tidal forcing using the 1980-2009 period of record for verified water level data from the NOAA tide gage #941-0170 at the Navy Pier in San Diego Bay. The TIDE_FEM model is driven by San Diego Bay water level variations at the mouth of the Otay River located where the flood/ebb double headed arrow is shown in Figure 10. Figure 11 gives the flow trajectories and depth averaged tidal currents computed by the calibrated TIDE_FEM model during spring flooding tides on 18 September 2009. Velocities of tidal currents are portrayed according to the color coded velocity scale appearing in both the upper and lower panel of Figure 11. Maximum flooding spring tidal currents in the deeper sections of the inlet channel (north/south reach of the Otay River near its mouth) are about 0.10 m/sec (0.33 ft/sec), and then accelerate in the narrower east/west reach to 0.18 m/sec (0.59 ft/sec) before entering the Alternative-1 tidal basin. Flood tide currents entering the tidal basin initially form a well defined jet at the west bank with speeds of about 0.08 m/s (0.26 ft/sec). This entry jet quickly diverges into a complex set of counter rotating eddies that populate the interior of the tidal basin. Eddy speeds in the tidal basin are on the order of 0.02 m/sec (0.07 ft/sec), insufficient to transport fine sand but an important stirring mechanism for mixing the tidal basin water mass to maintain high oxygen levels and to sustain fine silt and clay sized sediment particles in suspension.

Figure 12 shows the TIDE_FEM grid of Alternative-1 at MLLW nested in the farfield of south San Diego Bay, while Figure 13 gives the flow trajectories and depth averaged tidal currents computed by the TIDE_FEM model during spring ebbing tides on 18 September 2009. The wetted area of the tidal basin in Figure 13 is significantly reduced relative to the flood tide area in Figure 11, due to the lower water levels acting on the stage area curve in Figure 9a. In Figure 13 creeping flow drains from the complex of dendritic channels on the east side of the basin, forming a feeder current across the main body of the basin with speeds on the order of -0.06 m/sec (-0.19 ft/sec) to -0.08 m/sec (-0.26 ft/sec). This feeder current evacuates the tidal

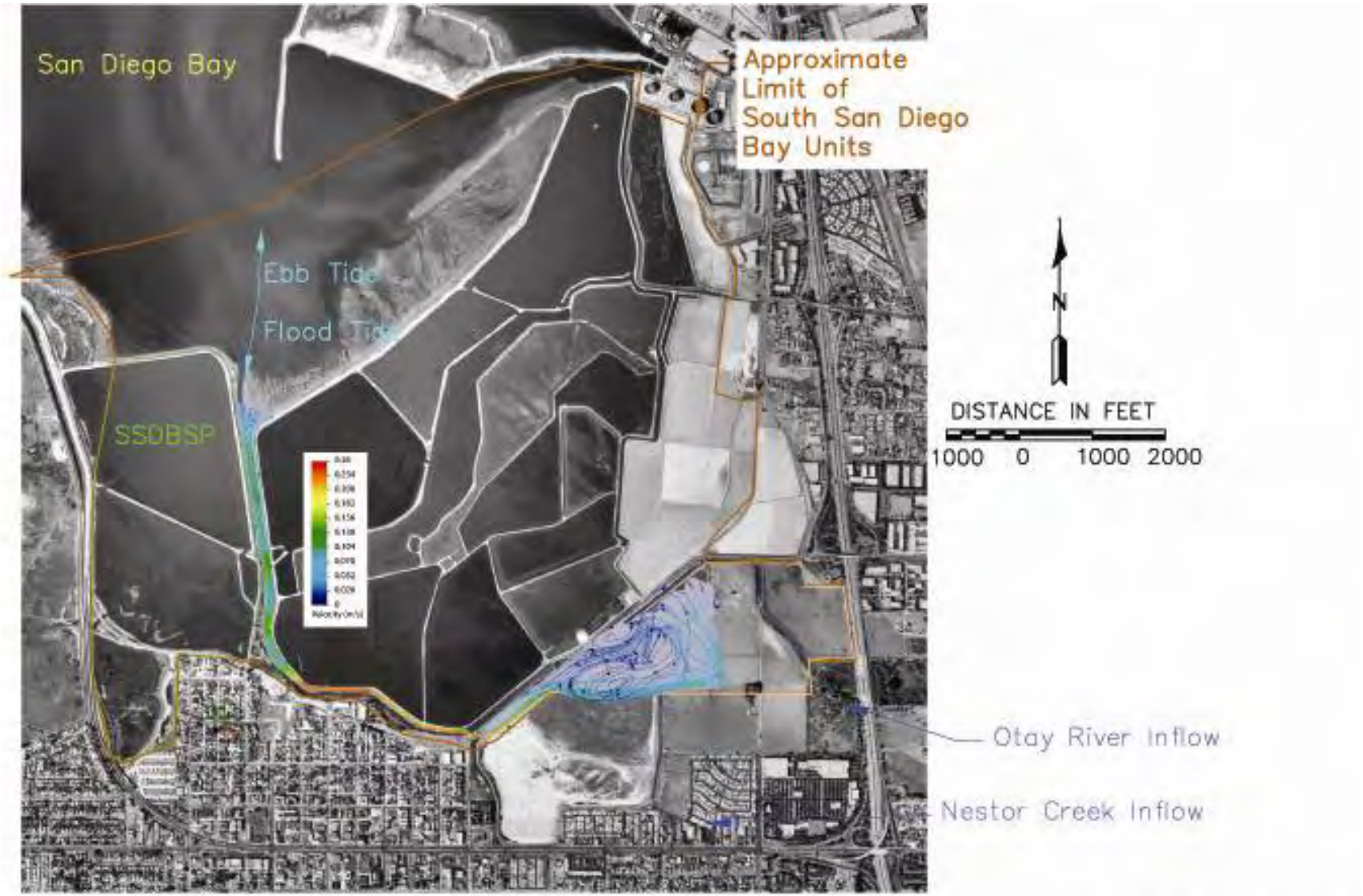

Figure 10. Far field of hydrodynamic simulation of mean flood tide flow into proposed Otay River tidal basin.

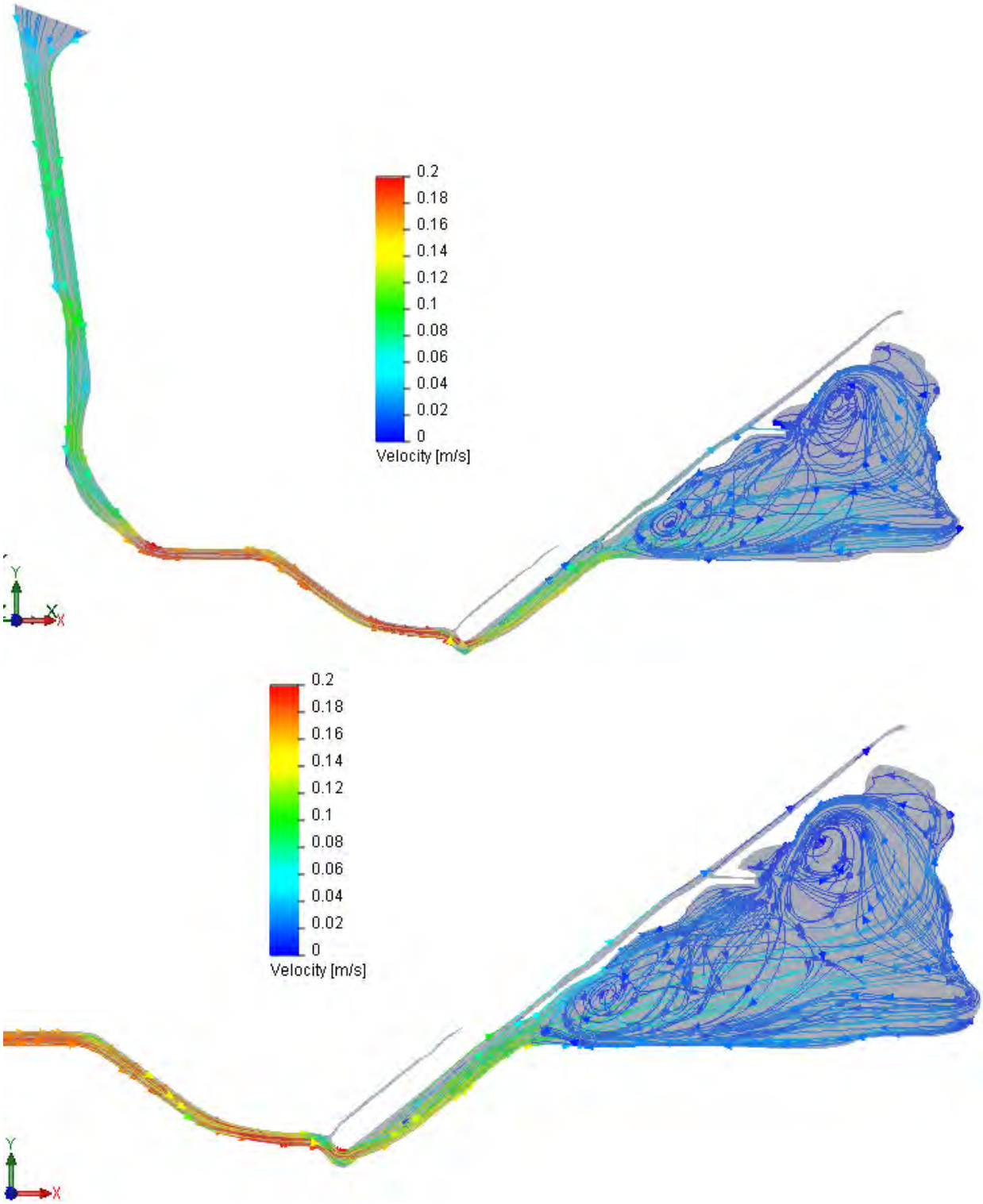

Figure 11: Hydrodynamic simulation of maximum flood flow during spring tides for Alternative-1, Otay Wetlands Restoration Project, based on San Diego Bay tides 18 September, 2009.

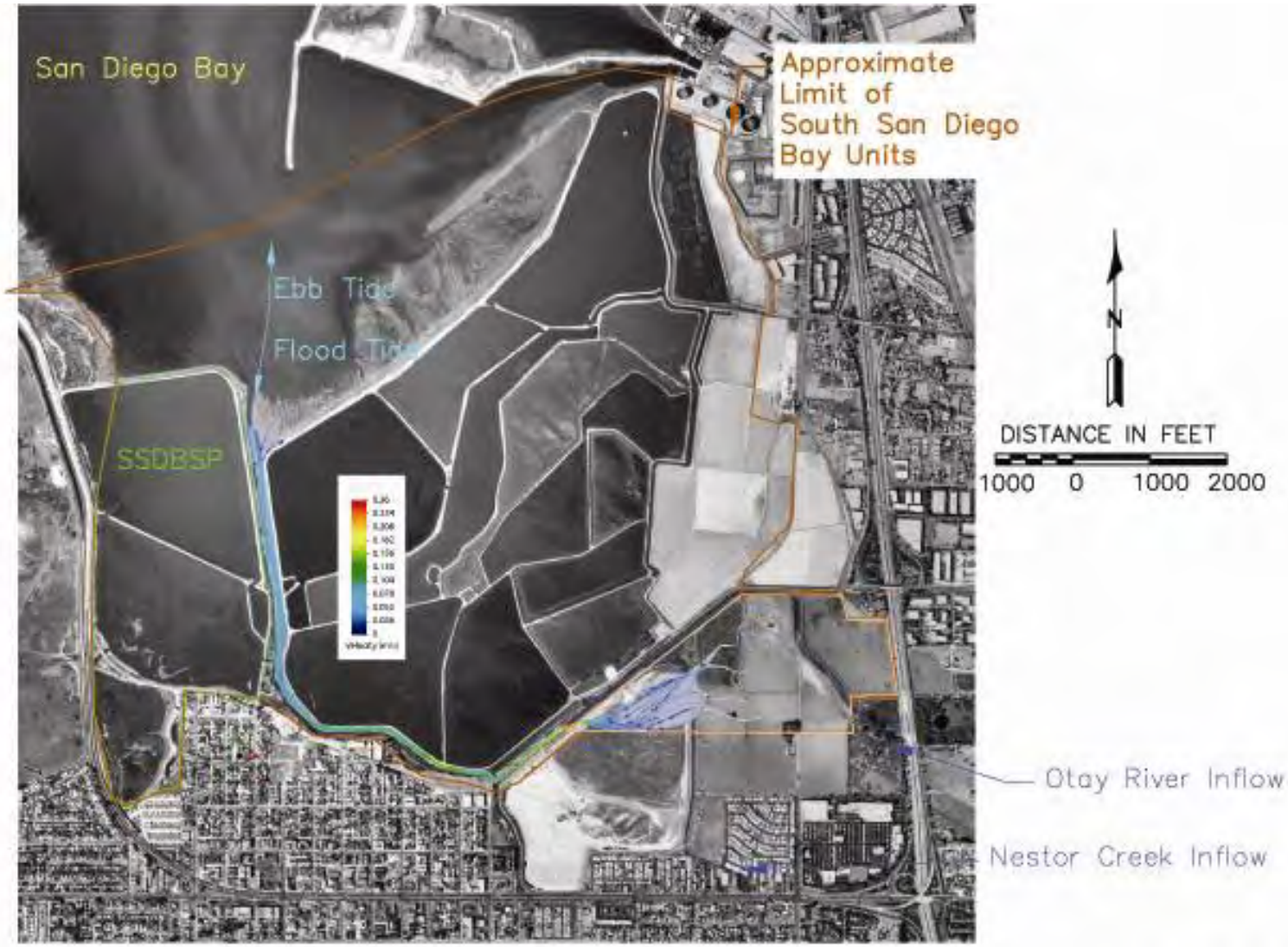

Figure 12. Far field of hydrodynamic simulation of mean ebb tide flow out of proposed Otay River tidal basin.

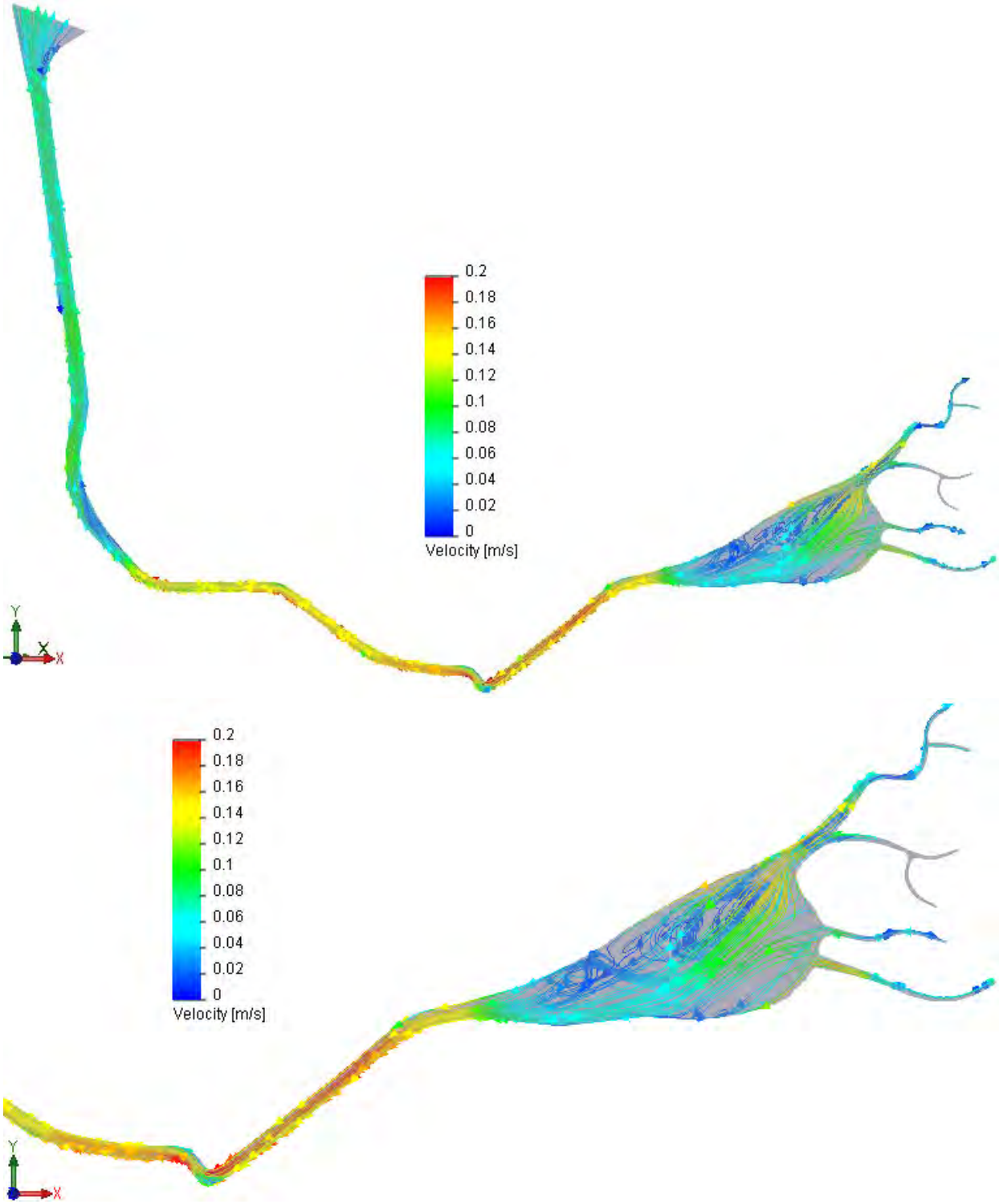

Figure 13: Hydrodynamic simulation of maximum ebb flow during spring tides for Alternative-1 of the Otay Wetlands Restoration Project, based on San Diego Bay tides 18 September, 2009.

basin and then accelerates to -0.16 m/sec (-0.52 ft/sec) as it passes through the pinch point under the railroad bridge in the narrow east/west reach of channel. (We adopt the convention of negative velocities for ebb tide flows and positive velocities for flood tide flows.) Ebb flow in the channel then decelerates to -0.10 m/sec (-0.33 ft/sec) in the deeper north/south reach before discharging into San Diego Bay.

Similar flow patterns to Figures 11 & 13 are found in the Alternative-1 tidal basin during mean range tides and neap tides in Appendix A. The flow trajectories and depth averaged tidal currents during mean range flood and ebb tides are found in Figures A1 & A2, while the neap tide flows are shown in Figures A3 & A4.

Water elevations in the Alternative-1 tidal basin are shown in Figure 14a for spring tides that occurred during 14-18 September, 2009, the same time period used for the model calibration with the proxy tidal system at San Dieguito Lagoon in Figure 7. Figure 14a provides a comparison between the Alternative-1 tidal basin water level variations predicted by the model (red trace) versus the actual San Diego Bay water level measurements (green) reported the Navy Pier tide gage #941-0170. The Alternative-1 tidal basin water level variations in red are found to lag the Bay water levels by as much as 27 minutes at higher high water (HHW) levels on flooding tides while this phase lag averages 2.46 hours at lower low water (LLW) level during ebb tides. Lower low water levels in the Alternative-1 tidal basin are as much as 2.48 ft above Bay water levels. Thus the Alternative-1 tidal basin does not fully drain on ebbing tides due to the long phase lag in reaching lower low water levels. The failure to completely drain on ebb tide is what ultimately limits the tidal range and tidal prism of Alternative-1, but is an unavoidable consequence to frictional impedance and depth limited tidal propagation speeds down the 7,000 ft long channel that connects the Alternative-1 tidal basin with the Bay.

Higher high water levels in the Alternative-1 tidal basin sometimes exceed those in the Bay by as much as +0.31 ft, (Figure 14a), due to a trapped tidal modes (standing wave) typical of lagoons with large tidal basins and multiple choke point linkages to the ocean tides (Lamb, 1932; LeBlond & Mysak, 1978). Figure 14b shows these trapped modes are higher harmonics of the K1 lunar-solar diurnal tidal constituent and the M2 principal lunar semi-diurnal tidal constituent.

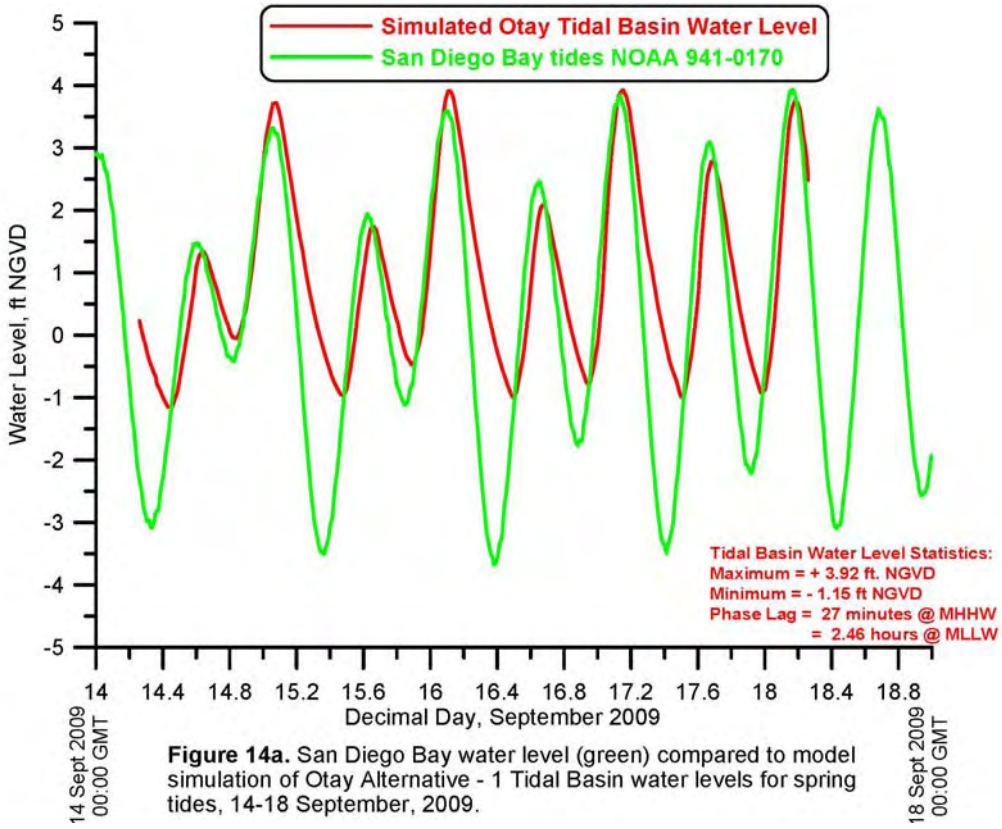

Figure 14a. San Diego Bay water level (green) compared to model simulation of Otay Alternative - 1 Tidal Basin water levels for spring tides, 14-18 September, 2009.

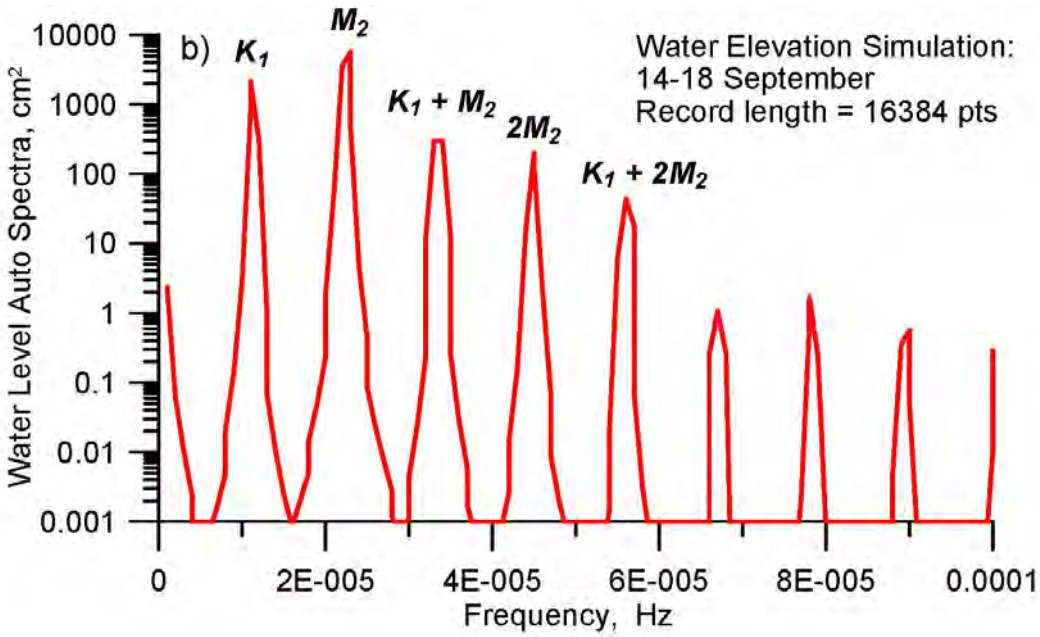

Figure 14b. Auto spectra of water level in the tidal basin of Alternative -1, Otay River Wetland Restoration Project.

Figure 14b plots the auto spectra of the Alternative-1 tidal basin tides and shows the predominant energy is centered on a diurnal frequency of the K1 lunar-solar diurnal tidal constituent at $f_{K1} = 1.16079 \text{ x } 10^{-5}$ Hz and the M2 principal lunar semi-diurnal tidal constituent, $f_{M2} = 2.2365 \text{ x } 10^{-5}$ Hz. The higher harmonics that lead to elevated basin high tide levels are a baroclinic *resonance* formed by a *triad* at the sum of the frequencies of the K1 and M2 barotropic tides, ie a diurnal third harmonic at a frequency $f_3 = f_{K1} + f_{M2} = 3.3973 \text{ x } 10^{-5}$ Hz. This diurnal third harmonic is a baroclinic tide excited by the barotropic K1 and M2 tides interacting with the bottom topography, principally the long inlet channel to the Alternative-1 tidal basin. Another baroclinic resonance apparent in the spectra of the ocean tides in Figure 14b is a second harmonic of the barotropic M2 tide appearing at a frequency of $2 f_{M2} = 4.4730 \text{ x } 10^{-5}$ Hz. An additional non-linear resonance appears as a triad formed by the sum of the K1 barotropic mode and the baroclinic second harmonic of the M2 tide, $f_{K1} + 2 f_{M2} = 5.6338 \text{ x } 10^{-5}$ Hz. Apparently this mode is excited by non-linear tidal interaction with the tidal basin and channel bathymetry.

3.3 Alternative-1 Hydroperiod Simulations: The hydroperiod function gives the percentage of exposure for each elevation throughout the full range of lagoon water level variation. This is the primary physical factor limiting the type of habitat that will thrive at a particular elevation in the lagoon. The San Diego Bay water levels for the 1980-2009 period of record were used to drive the TIDE_FEM model at the mouth of the Otay River in order to solve for the time series of the water level variation in the Alternative-1 tidal basin based on the stage area and storage rating functions in Figures 9a & b. The computations involved N_o = 2,629,800 time steps, each 6 minutes in length, in order to sweep the 30 year period of record. At each time step the average basin water elevation, $\hat{\eta}$ was calculated from the ensemble average of the solutions at the nodes in the computational mesh. Conditional if statements and counting loops inserted into the TIDE_FEM code would count the number time steps, N, for which the average lagoon water elevation was less than a particular elevation, Z_i. The percent time that elevation Z_i was exposed over the period of record was calculated as:

$$E_i = \frac{100\%}{N_o} \sum N(\hat{\eta} < Z_i)$$

The green line in Figures 15 shows the hydroperiod function calculated for the Alternative-1 tidal basin. Water levels in the Alternative-1 tidal basin reached an extreme high water level of +5.63 ft NGVD in response to San Diego Bay water levels on 13 November 1997, while extreme low water in the Alternative-1 tidal basin dropped to – 2.43 ft NGVD in response to 10 January 2009 water levels in the Bay. The elevations dividing the various sub-tidal and intertidal habitat types are based on the 1992 biological survey and supporting literature data as detailed in Josselyn & Whelchel (1999). These elevations were mapped into the corresponding exposure percentages for each habitat type using the hydroperiod function computed for the existing San Dieguito Lagoon at the time of the biological survey. From this procedure, the following exposure times were assigned to each habitat break:

Subtitidal Exposure < 0%;

0% < Frequently Flooded Mud Flat Exposure < 50%;

50% < Frequently Exposed Mud Flat Exposure < 61.8%

61.8% < Low Salt Marsh Exposure < 81.7%

81.7% < Mid Salt Marsh Exposure < 96.2%

96.2% < High Salt Marsh Exposure < 99.8%

99.8% < Transitional Exposure < 100%

We can map the elevations of the habitat breaks from the hydroperiod function in Figure 15 against the stage area function Figure 9a to estimate the acreages of each habitat type that would populate Alternative-1 tidal basin. This procedure gives the minimum subtidal and maximum intertidal habitat types since the hydroperiod function is based on the full range of water level variation over long periods of time (1980-2009 period of record). By that procedure, the minimum (perpetual) sub-tidal area of the Alternative-1 tidal basin is 16.92 acres; there are maximum of 27.73 acres of frequently flooded mud flat; 8.90 acres of frequently exposed mud flat; 7.55 acres of low salt marsh; 12.80 acres of mid salt marsh; 7.51 acres of high salt marsh;

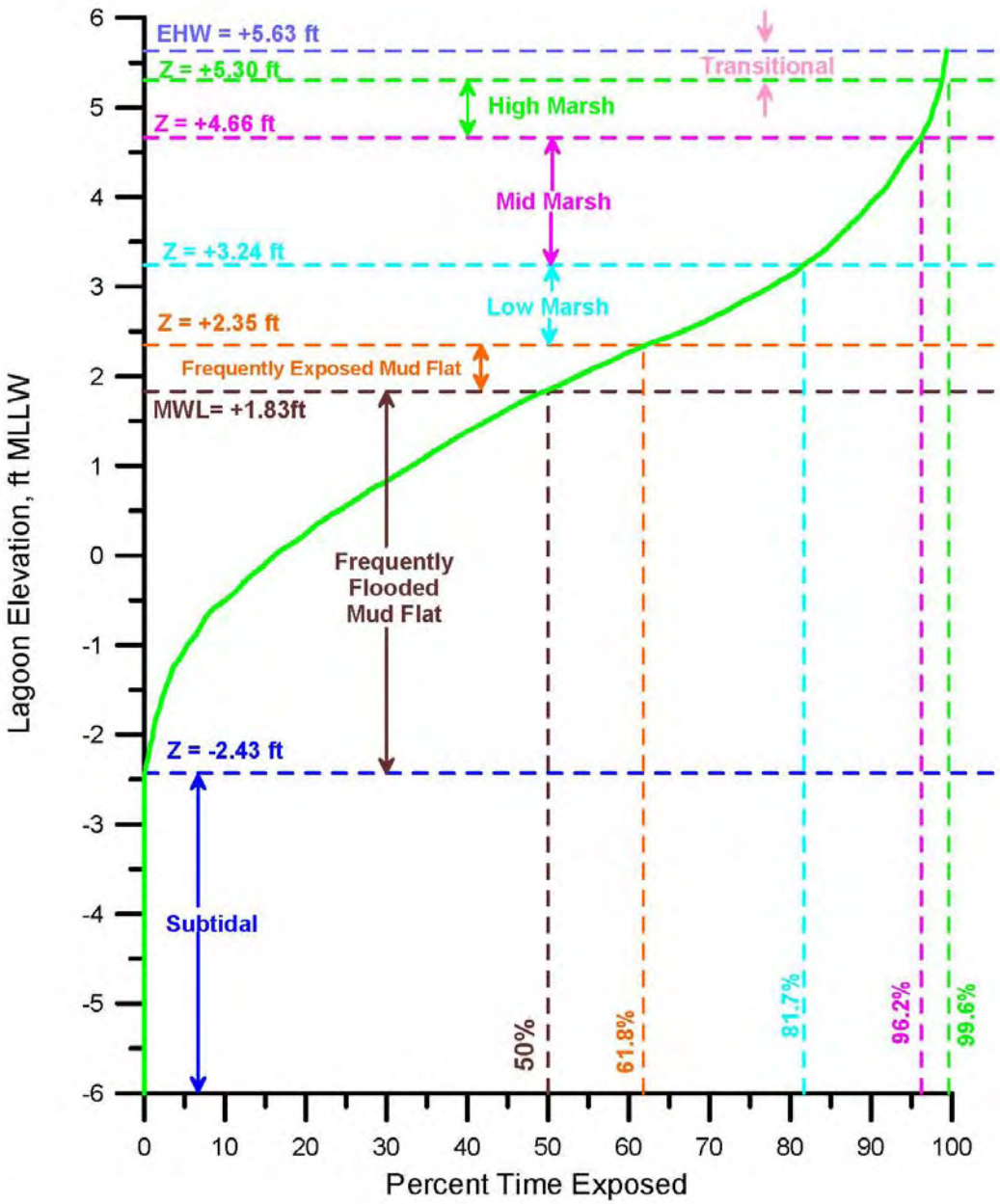

Figure 15. Hydroperiod function of the tidal basin for Alternative -1 Otay Wetland Restoration Project. Based on water level data from NOAA tide gage #941-0170, Navy Pier, San Diego Bay.

and 1.22 acres of transitional habitat. The maximum area inundated by salt water at extreme high water is 82.63 acres with at most 65.71 acres of intertidal habitat that experiences tidal inundation at least once in the period of record. An average of 60.57 acres experiences tidal inundation up to MHHW resulting in an average of 42.07 acres of intertidal habitat and 18.50acres of sub-tidal habitat.

3.4 Alternative-1 Tidal Scour and Erosion: The tidal currents calculated in the lower Otay River and feeder channel during spring tides (cf Figures 11 & 13; A1-A4) are compared against grain size data to estimate the potential for scour and erosion. A 1985 geotechnical investigation of the Otay River Floodplain was conducted by GEOCON in 1985 that included boring locations and some gradation curves in the lower Otay River channel. Figure 16a gives the grain size distribution from one such boring, indicating the river channel sediments are fairly well sorted (due to hydraulic sorting during river floods and perhaps relict wave action) with a median grain size of D_{50} = 0.3 mm. Comparing this median grain size against the Hjulstrom Curve in Figure 16b indicates these river channel sediments have a threshold of motion of 0.6 ft/sec (0.18 m/s). Tidal current speeds between 0.27 ft/ sec (0.08 m/sec) and 0.6 ft/sec would lead to bed load transport but not erosion. Erosion and scour would only occur for tidal currents that exceed 0.6 ft/sec, while currents less 0.27 ft/sec would yield deposition.

Comparing these current speed thresholds to the tidal currents predicted in the Alterntive-1 channel during spring tides (Section 3.2) we conclude the only potentially problematic areas are at the two pinch points in the east/west reach of channel during flooding tides (Figure 11). Here local currents speed reach but do not exceed the threshold of motion of 0.6 ft/sec (0.18 m/s). However, without exceedence, erosion does not occur since the sedimentary bed remains in a steady state of bed load transport. Everywhere else along the channel with Alternative-1, speeds remain less than 0.6 ft/sec (0.18 m/s) and greater than 0.27 ft/ sec (0.08 m/sec) during both flooding and ebbing flow. Thus and equilibrium channel is achieved,

wherein there is sediment transport down channel but not deposition, and hence a maximum

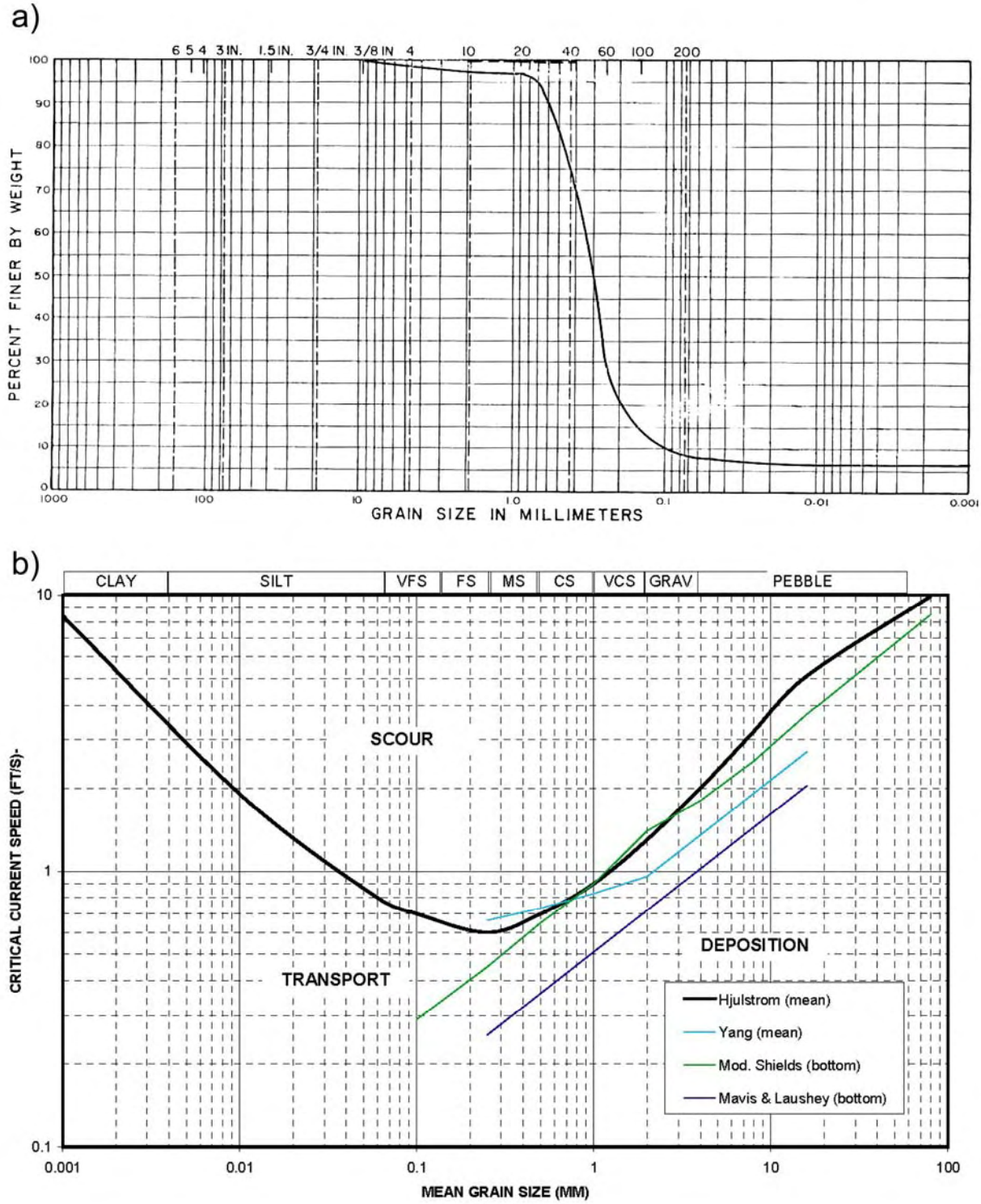

Figure 16. a) Grain size distribution, lower Otay River Channel, [data from GEOCON,1985] b) Critical current speeds for quartz sediment as a function of mean grain size, [from Everest,2007].

likelihood of self-maintaining channel.

4) Tidal Hydraulics Analysis of Restoration Alternative-2

Figure 17 details the elevation contours of the Alternative-2 tidal basin merged with the Otay River bathymetry. The Alternative-2 tidal basin was designed by Nordby Biological and KTU+A to satisfy mitigation requirements placed upon Poseidon Resources Corporation by the CCC and RWQCB. The design concept for Alternative-2 is based on achieving maximum subtidal acreage to meet the fish productivity requirements of the RWQCB mitigation requirements while maintaining sufficient intertidal habitat to achieve adequate biodiversity for a fully functional salt water wetland. It is therefore referred to as the *maximum subtidal- plan*. The estimated minimum subtidal acreage to meet fish productivity requirements of the RWQCB mitigation requirement is 11 acres; while the minimum required acreage of restored tidal wetland is 66 acres.

4.1 Bathymetric Input for Alternative-2: Gridding Alternative-2 for the TIDE_FEM model followed the same 3-node element descretization of the grading contours that was detailed in Section 3.1 for Alternative-1. Figure 18 gives the stage area function of the Alternative-2 tidal basin in isolation. For tidal inundation up to the historic extreme high water level of San Diego Bay (EHW = +5.63 ft NGVD, upper red dashed line in Figure 18), Alternative-2 could provide as much as 82.8 acres of tidally influenced wetland and high salt marsh. We will find that Alternative-2 provides on average 32.8 acres of subtidal habitat (lower dashed blue line in Figure 18); while the amount of subtidal habitat is never less than 31.3 acres (lower dashed red line in Figure 9a). Thus Alternative-2 (the maximum sub-tidal plan) provides substantially more subtidal habitat than Alternative-1 by a factor of 1.9, and easily exceeds the critical threshold for adequate fish productivity (11 acres of subtidal habitat) with a safety margin of at least 20.3 acres. The storage rating function for Alternative-2 in Figure 19 shows that the maximum volume of San Diego Bay water that is exchanged with the Alternative-2 tidal basin is 577 acre-ft during

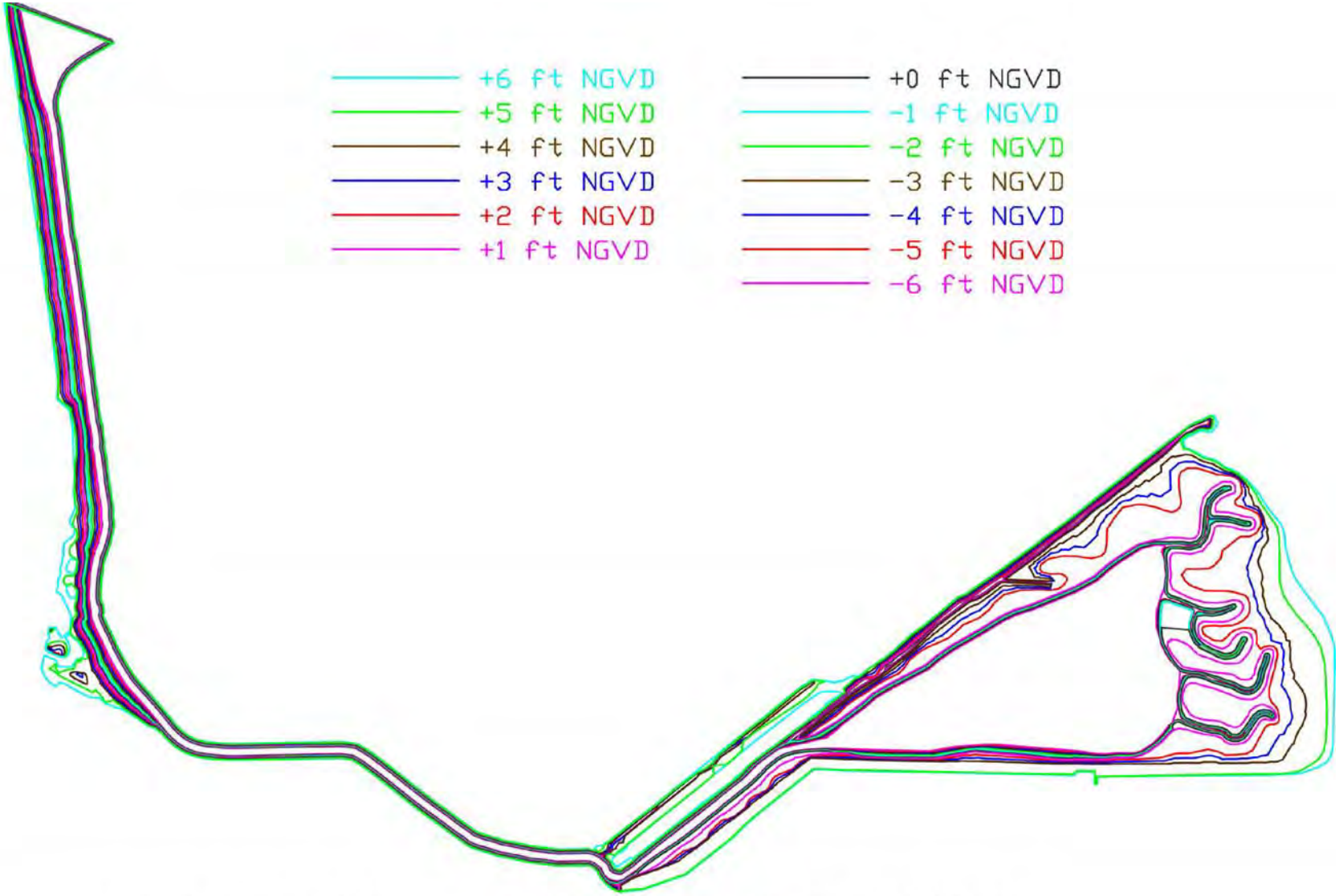

Figure 17. Contours for proposed Otay River tidal basin, Alternative-2, ft. NGVD.

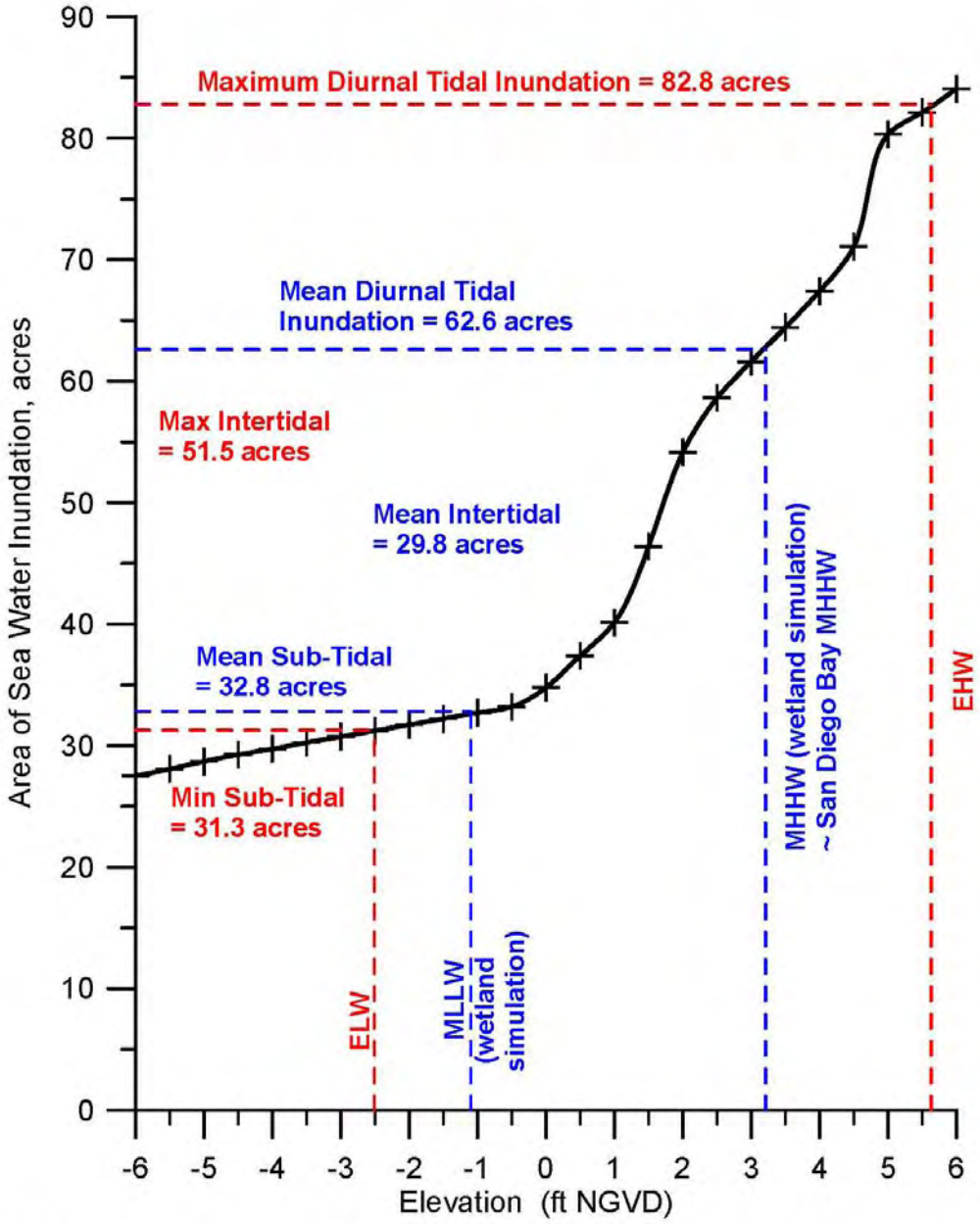

Figure 18. Stage area function of the tidal basin for Alternative-2 Otay Wetland Restoration Project. Water level data from NOAA tide gage #941-0170, Navy Pier, San Diego Bay.

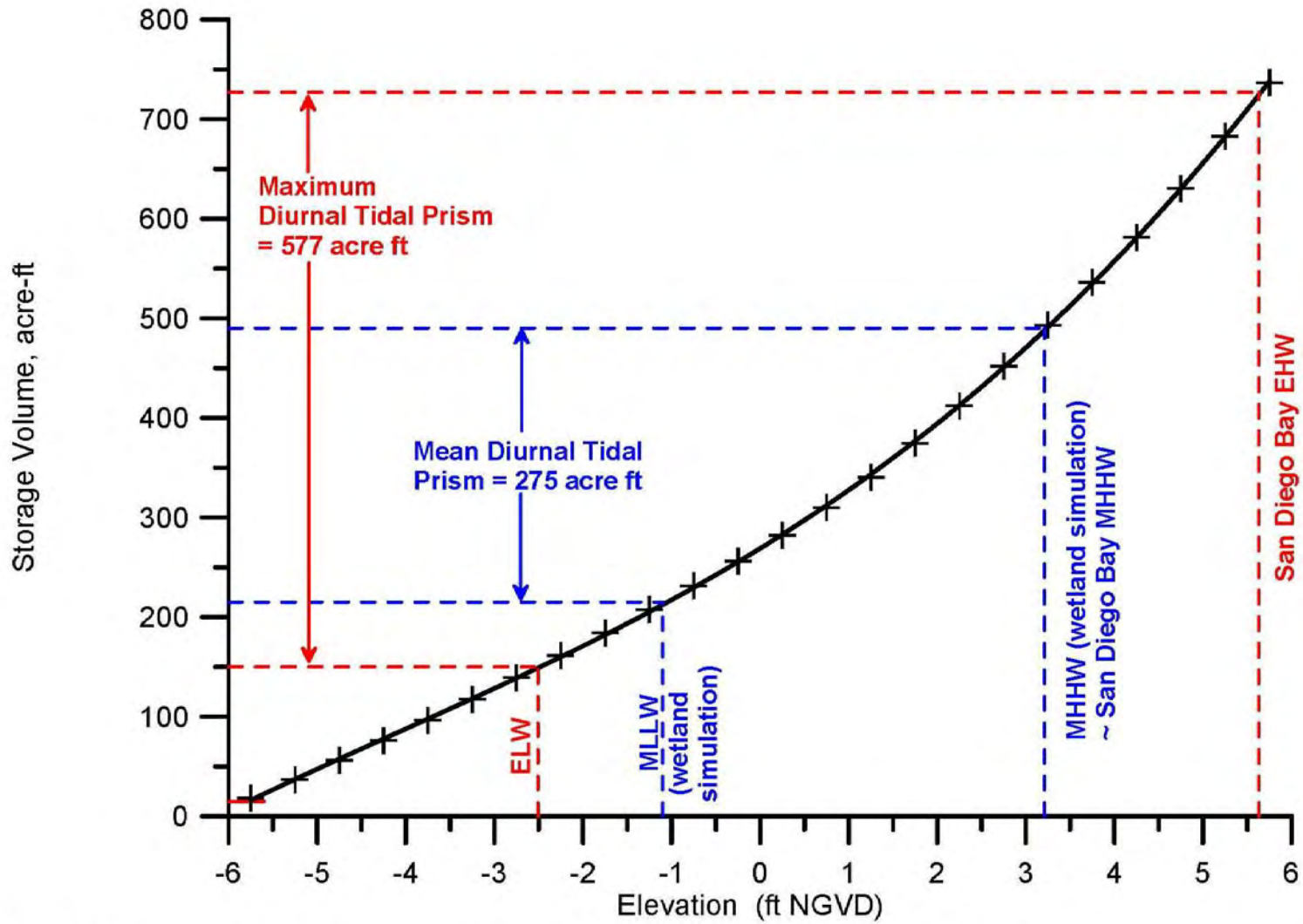

Figure 19. Storage rating function of the tidal basin and Otay River feeder channel for Alternative - 2 of the Otay Wetland Restoration Project. Water level data from NOAA tide gage 941-0170, Navy Pier, San Diego Bay.

an extreme high water event (dashed red line limits in Figure 19). The average diurnal tidal prism of Alternative-2 is 275 acre-ft (dashed blue line limits in Figure 19). Thus Alternative-2 has about 12%-17% more tidal prism than Alternative-1, (depending on tidal range), thereby giving it more flow energy to transport nutrients and sediment alike.

4.2 Alternative-2 Tidal Flow Simulations: Figure 20 gives the flow trajectories and depth averaged tidal currents in Alternative-2 as computed by the calibrated TIDE_FEM model during spring flooding tides on 18 September 2009. Maximum flooding spring tidal currents in the deeper sections of the inlet channel (north/south reach of the Otay River near its mouth) are about 0.11 m/sec (0.36 ft/sec), and then accelerate in the narrower east/west reach to 0.2 m/sec (0.66 ft/sec) before entering the Alternative-2 tidal basin. Flood tide currents entering the tidal basin initially form a well-defined jet along the south bank with speeds of about 0.08 m/s (0.26 ft/sec). This boundary current quickly diverges into a large central counter-clockwise gyre in the center of the tidal basin. Thus the flood tide basin current system in Figure-20 is more well-ordered than was found for Alternative-1 in Figure 11. Gyre speeds in the tidal basin are on the order of 0.02 m/sec (0.07 ft/sec), insufficient to transport fine sand but an important stirring mechanism for mixing the tidal basin water mass to maintain high oxygen levels and to sustain fine silt and clay sized sediment particles in suspension.

Figure 21 gives the flow trajectories and depth-averaged tidal currents in Alternative-2 computed by the TIDE_FEM model during spring ebbing tides on 18 September 2009. The wetted area of the tidal basin in Figure 21 is significantly reduced relative to the flood tide area in Figure 20, due to the lower water levels acting on the stage area curve in Figure 18. In Figure 21, drainage from the complex of dendritic channels on the east side of the basin forms a pair of spiral eddies in the eastern end of the sub-tidal basin of Alternatie-2. The spiral eddies unravel in the central portion of the subtidal basin forming a broad band of creeping flow that evacuates the basin. The spiral eddies and creeping flow band across the main body of the basin have speeds on the order of -0.02 m/sec (-0.07 ft/sec). At the west end of the subtidal basin in Figure 21, a feeder current forms that evacuates the tidal basin and then accelerates to -0.18 m/sec (-0.59 ft/sec) as it passes through the pinch point under the railroad bridge in the narrow east/west reach of channel. Ebb flow in the channel then decelerates to -0.11 m/sec (-0.36 ft/sec) in the deeper

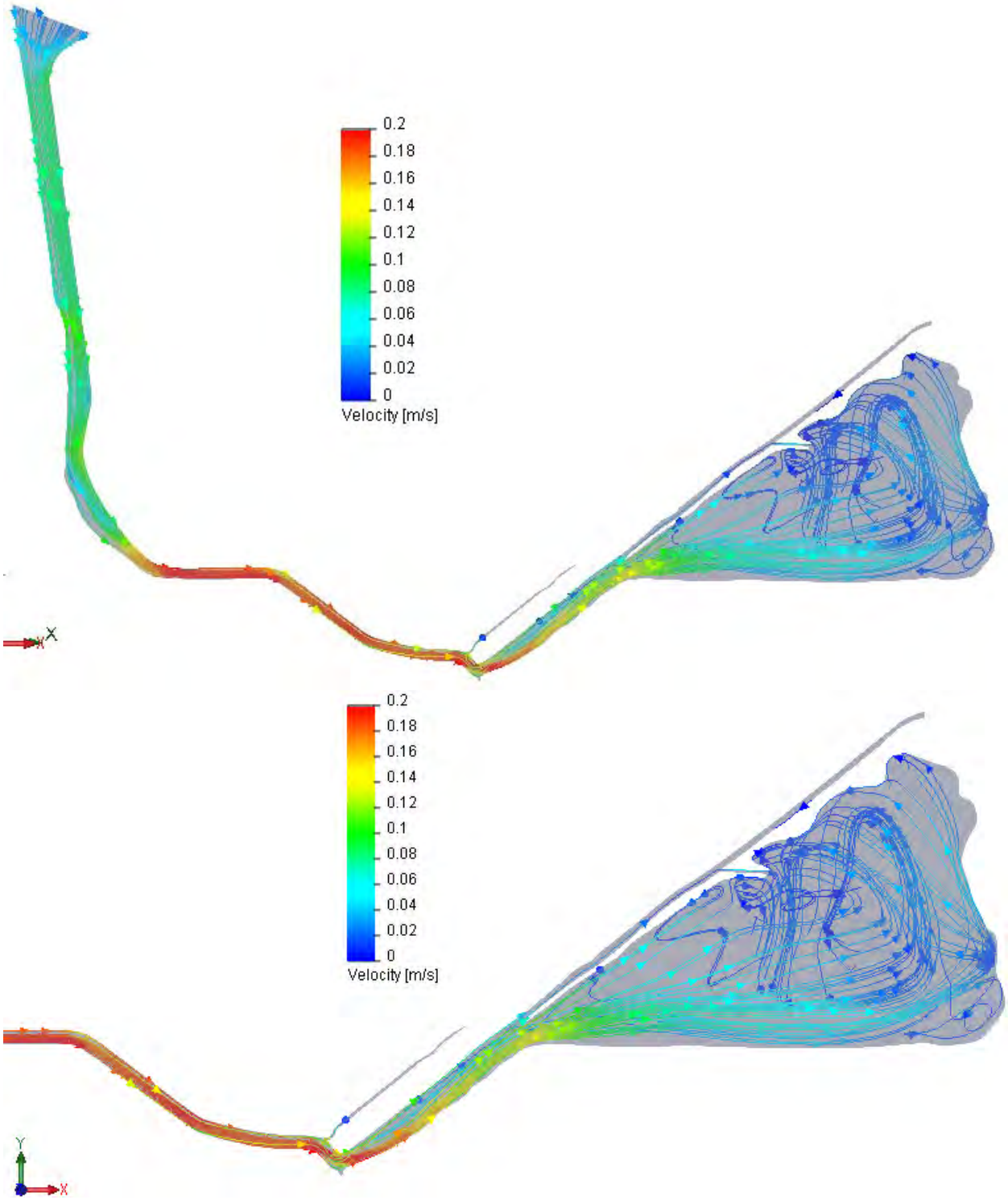

Figure 20: Hydrodynamic simulation of maximum flood flow during spring tides for Alternative-2 of the Otay Wetlands Restoration Project, based on San Diego Bay tides 18 September, 2009.

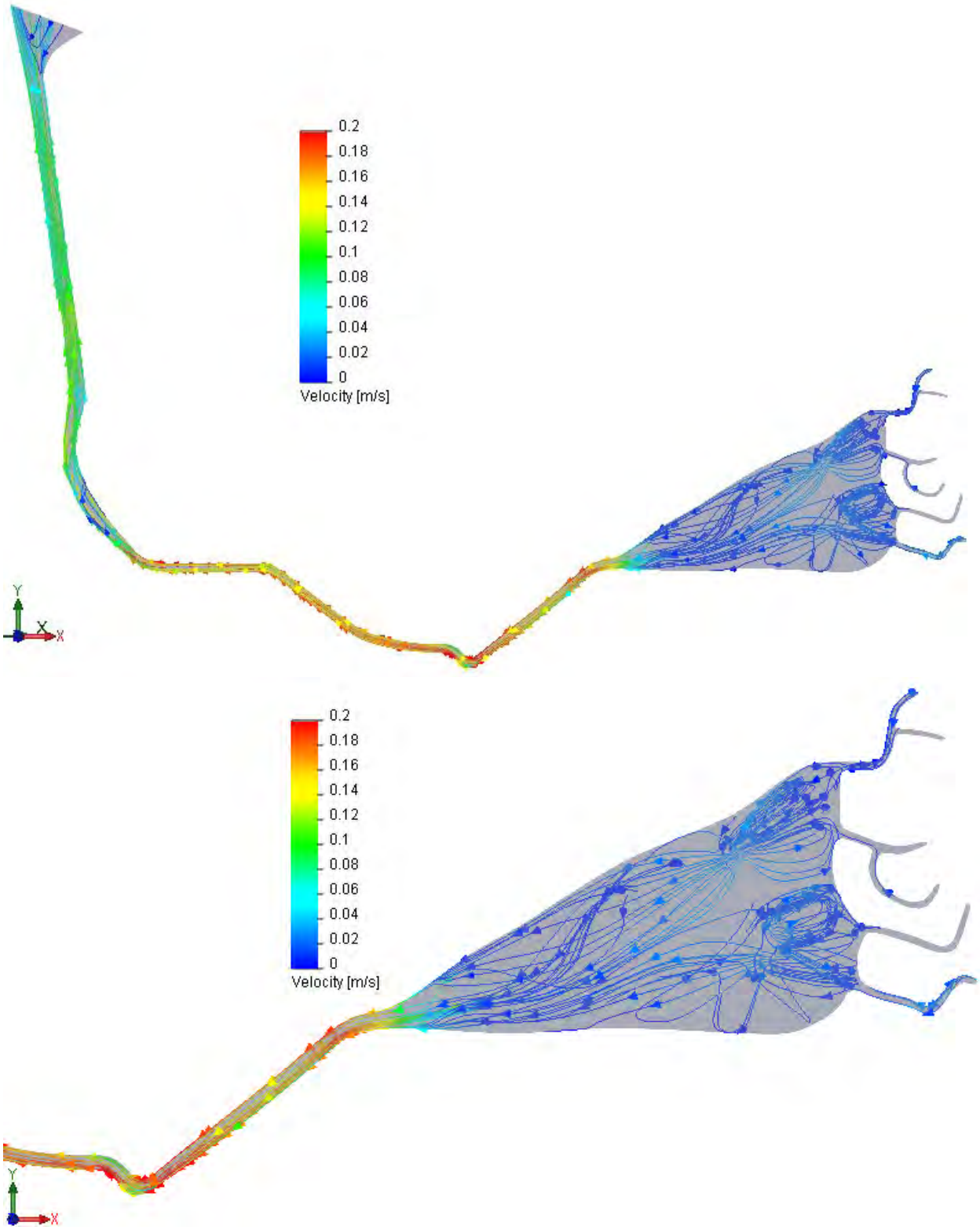

Figure 21: Hydrodynamic simulation of maximum ebb flow during spring tides for Alternative-2 of the Otay Wetlands Restoration Project, based on San Diego Bay tides 18 September, 2009.

north/south reach before discharging into San Diego Bay. In general, currents in Alternative-2 are everywhere greater than those found for Alternative-1 by a factor proportional to the relative size of the diurnal tidal prisms.

Similar flow patterns to Figures 20 & 21 are found in the Alternative-2 tidal basin during mean range tides and neap tides in Appendix A. The flow trajectories and depth averaged tidal currents during mean range flood and ebb tides are found in Figures A5 & A6, while the neap tide flows are shown in Figures A7 & A8.

4.3 Alternative-2 Hydroperiod Simulations: The hydroperiod function for Alternative-2 was calculated from forcing based on the 1980-2009 period of record of San Diego Bay water levels using the same procedures and exposure levels for habitat breaks detailed in Section 3.3 for Alternative-1. The blue line in Figures 22 shows the hydroperiod function calculated for the Alternative-2 tidal basin. Water levels in the Alternative-2 tidal basin reached an extreme high water level of +5.63 ft NGVD in response to San Diego Bay water levels on 13 November 1997, while extreme low water in the Alternative-2 tidal basin dropped to – 2.51 ft NGVD in response to 10 January 2009 water levels in the Bay, slightly lower than what was found for Alternative-1. Mapping the elevations of habitat breaks in Figure 22 onto the stage area function in Figure 18, we find: the perpetual sub-tidal area of the new Alternative-2 tidal basin increases by 14.35 acres, to 31.27 acres from 16.92 acres for the Alternative-1 tidal basin, while the mean subtidal area with the Alternative-2 tidal basin increases by 14.30 acres to 32.80 acres, from 18.50 acres for the Alternative-1 tidal basin; frequently flooded mud flat is decreased by 14.10 acres, from 27.73 acres for the Alternative-1 tidal basin to 13.63 acres for the Alternative-2 tidal basin; frequently exposed mud flat is decreased by 2.59 acres, from 8.90 acres for the Alternative-1 tidal basin to 6.31 acres for the Alternative-2 tidal basin; low salt marsh is increased slightly by 1.74 acres, from 7.55 acres for the Alternative-1 tidal basin to 9.29 acres for the Alternative-2 tidal basin; mid salt marsh is decreased by 2.25 acres, from 12.80 acres for the Alternative-1 tidal basin to 10.55 acres for the Alternative-2 tidal basin; high salt marsh is increased by 2.99 acres, from 7.51 acres for the Alternative-1 tidal basin to 10.50 acres for the Alternative-2 tidal basin; transitional habitat is increased very slightly by 0.02 acres from 1.22 acres for the Alternative-1 tidal basin to 1.24 acres for the Alternative-2 tidal basin. Maximum intertidal

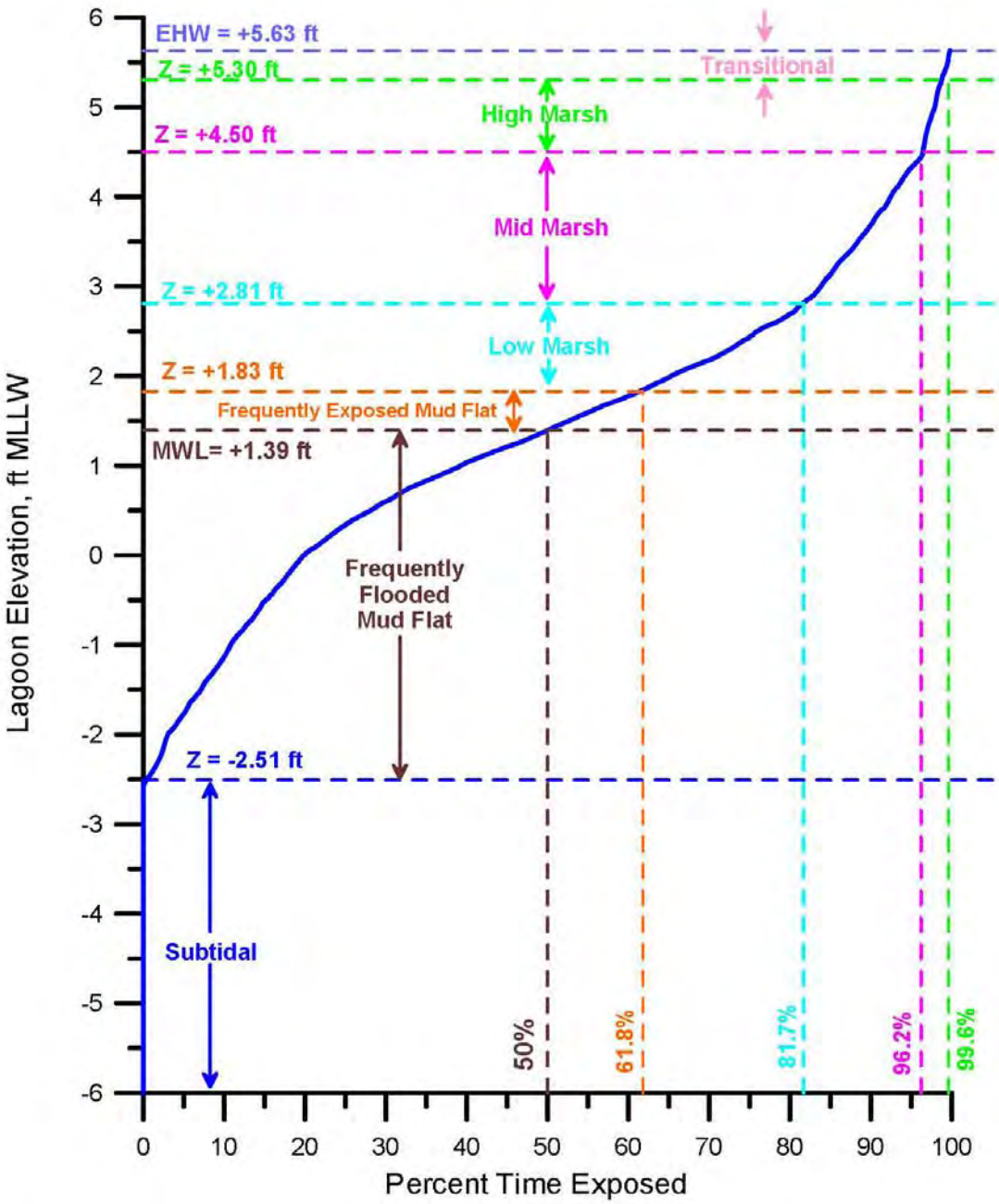

Figure 22. Hydroperiod function of the tidal basin for Alternative -2 Otay Wetland Restoration Project. Based on water level data from NOAA tide gage #941-0170, Navy Pier, San Diego Bay.

habitat is decreased significantly by 14.19 acres to 51.52 acres with the Alternative-2 tidal basin as compared to 65.71 acres for the Alternative-1 tidal basin; and the mean area experiencing tidal inundation up to MHHW is increased by 2.04 acres from 60.57 acres for the Alternative-1 tidal basin to 62.61 acres for the Alternative-2 tidal basin resulting in an average 29.81 acres of intertidal habit, a substantial decrease of 12.26 acres over the Alternative-1 tidal basin. Thus, Alternative-2 has about 77% more subtidal habitat than Alternative-1, but about 29% less intertidal habitat.

4.4 Alternative-2 Tidal Scour and Erosion: The tidal currents calculated in the lower Otay River and feeder channel during spring tides (cf. Figures 20 & 21; A5-A8) are compared against grain size and threshold of motion data in Figure 16 to estimate the potential for scour and erosion. In general the channel velocities calculated during spring tides in Figures 20 & 21 show that for the most part current speeds with Alternative-2 remain less than 0.6 ft/sec (0.18 m/s) and greater than 0.27 ft/ sec (0.08 m/sec) and consequently, an equilibrium channel is achieved with the native sediments. There is sediment transport down channel but not deposition, and hence a maximum likelihood of self-maintaining channel. But there is one exception to this condition, and that occurs during flooding spring tides along the narrower east/west reach where the channel currents accelerate 0.2 m/sec (0.66 ft/sec) before entering the Alternative-2 tidal basin. This exceeds the 0.6 ft/sec (0.18 m/s) threshold of motion for the 0.3 mm sized native sediments, and erosion will occur and persist until the channel cross sectional area is enlarged sufficiently to lower local channel currents to less than 0.6 ft/sec. If Alternative-2 is selected for final design, it would be appropriate to provide additional grading to this reach of channel to enlarge its cross section.

5) Tidal Hydraulics Analysis of Restoration Alternative-3

Figure 23 details the elevation contours of the Alternative-3 tidal basin merged with the Otay River bathymetry. The Alternative-3 tidal basin was designed by Nordby Biological and KTU+A to satisfy mitigation requirements placed upon Poseidon Resources Corporation by the

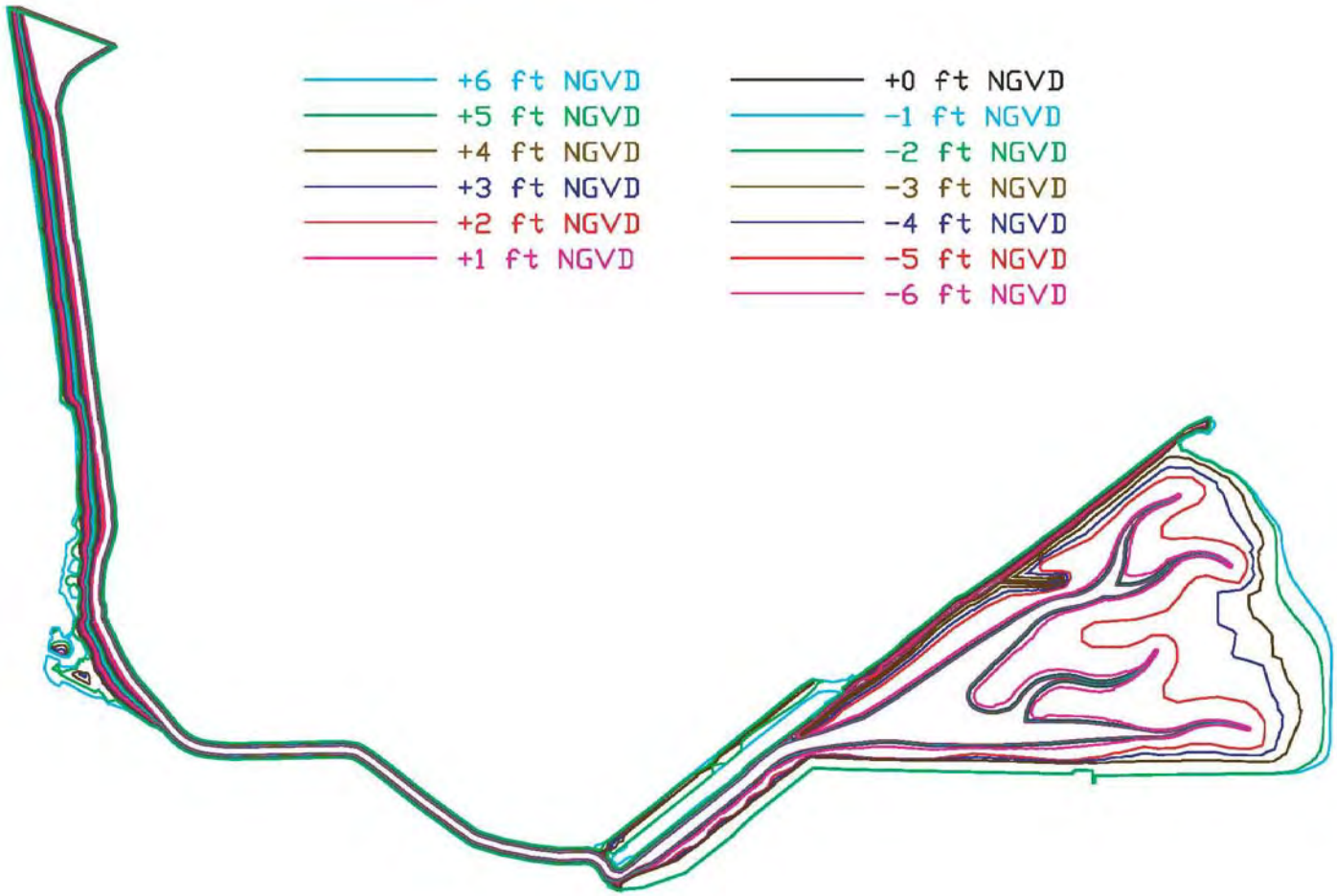

Figure 23. Contours for proposed Otay River tidal basin, Alternative-3, ft. NGVD.

CCC and RWQCB. The design concept for Alternative-3 is based on achieving maximum intertidal acreage while maintaining adequate subtidal acreage to meet the fish productivity requirements of the RWQCB mitigation requirements. It is therefore referred to as the *maximum intertidal- plan*. The estimated minimum subtidal acreage to meet fish productivity requirements of the RWQCB mitigation requirement is 11 acres; while the minimum required acreage of restored tidal wetland is 66 acres.

5.1 Bathymetric Input for Alternative-3: Gridding Alternative-3 for the TIDE_FEM model followed the same 3-node element descretization of the grading contours that was detailed in Section 3.1 for Alternative-1. Figure 24 gives the stage area function of the Alternative-3 tidal basin in isolation. For tidal inundation up to the historic extreme high water level of San Diego Bay (EHW = +5.63 ft NGVD, upper red dashed line in Figure 24), Alternative-3 could provide as much as 82.8 acres of tidally influenced wetland and high salt marsh. We will find that Alternative-3 provides on average 14.8 acres of subtidal habitat (lower dashed blue line in Figure 24); while the amount of subtidal habitat is never less than 14.3 acres (lower dashed red line in Figure 9a). Subtracting these subtidal acreages from the total inundated areas in Figure 24 (upper blue and red dashed lines), it appears Alternative-3 can provide an average of 45.2 intertidal acres and a maximum of 68.5 intertidal acres. Comparing these intertidal acreage numbers against those in Figure 9a for Alternative-1, it is apparent that Alternative-3 (the maximum intertidal plan) provides on average about 3.1 more acres of intertidal habitat than Alternative-1 yet still exceeds the critical threshold for adequate fish productivity (11 acres of subtidal habitat) with a safety margin on average of about 3.3 acres.

The storage rating function for Alternative-3 in Figure 25 shows that the maximum volume of San Diego Bay water that is exchanged with the Alternative-3 tidal basin is 488 acre-ft during an extreme high water event (dashed red line limits in Figure 25). The average diurnal tidal prism of Alternative-3 is 223 acre-ft (dashed blue line limits in Figure 25). Thus Alternative-2 has about 5% less tidal prism than Alternative-1, thereby providing less transport energy than either Alternatives 1 & 2.

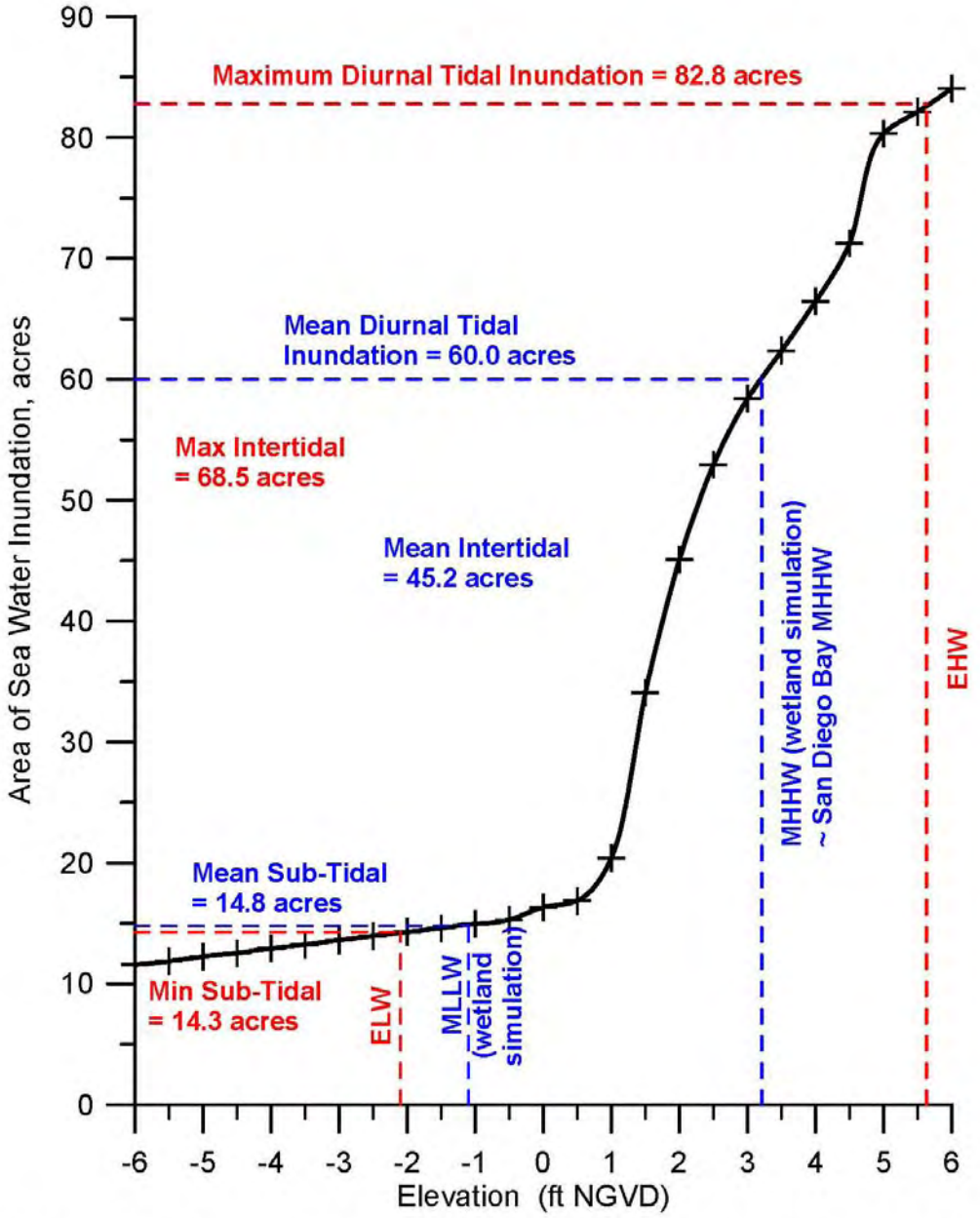

Figure 24. Stage area function of the tidal basin for Alternative - 3 Otay Wetland Restoration Project. Water level data from NOAA tide gage #941-0170, Navy Pier, San Diego Bay.

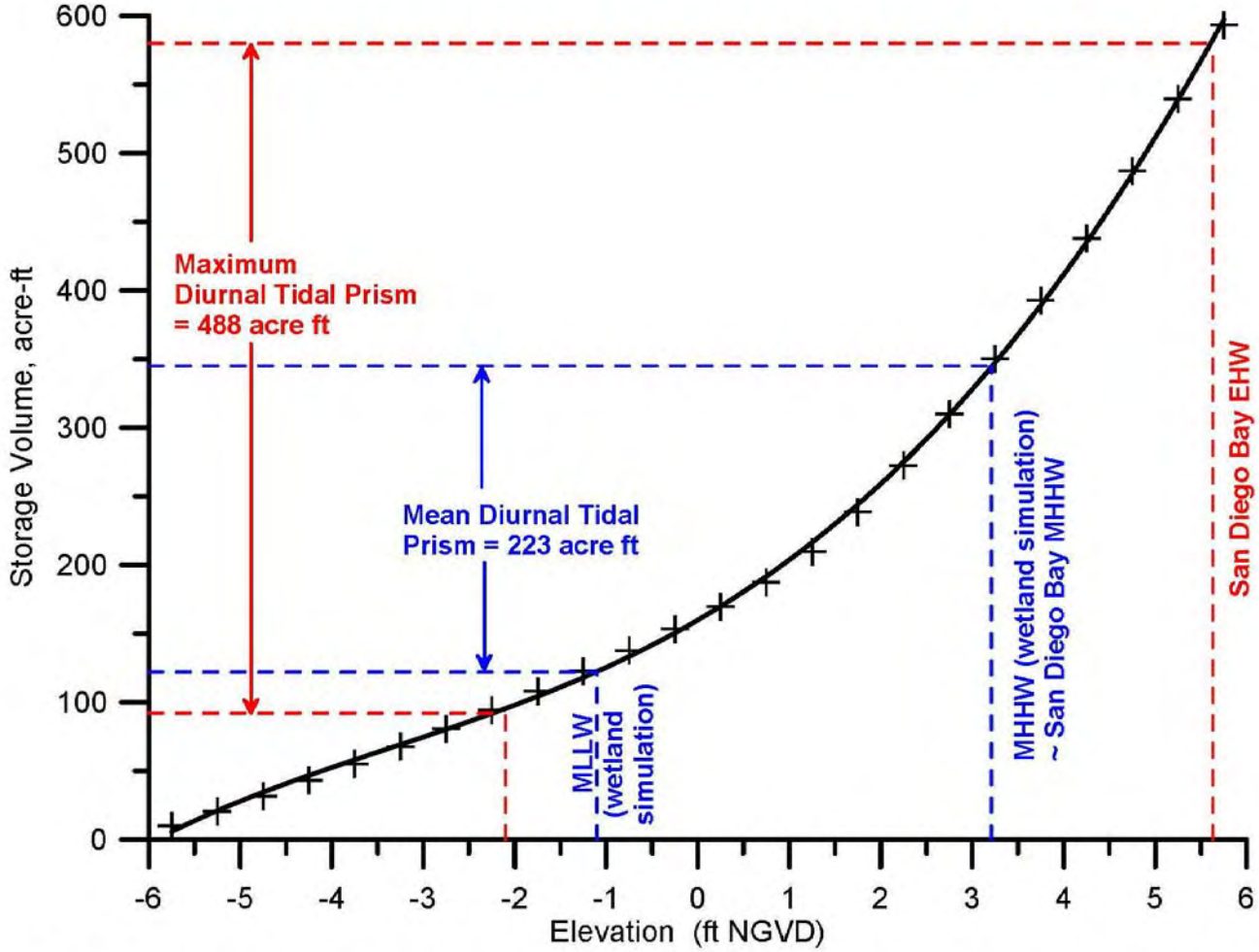

Figure 25. Storage rating function of the tidal basin and Otay River feeder channel for Alternative - 3 of the Otay Wetland Restoration Project. Water level data from NOAA tide gage 941-0170, Navy Pier, San Diego Bay.

5.2 Alternative-3 Tidal Flow Simulations: Figure 26 gives the flow trajectories and depth averaged tidal currents in Alternative-3 as computed by the calibrated TIDE_FEM model during spring flooding tides on 18 September 2009. Maximum flooding spring tidal currents in the deeper sections of the inlet channel (north/south reach of the Otay River near its mouth) are about 0.095 m/sec (0.31 ft/sec), and then accelerate in the narrower east/west reach to 0.17 m/sec (0.56 ft/sec) before entering the Alternative-3 tidal basin. Flood tide currents entering the tidal basin initially form a boundary current along the south bank with speeds of about 0.06 m/s (0.20 ft/sec). This boundary current quickly diverges into a pair counter-rotating eddies in the center and in the eastern quadrant of the tidal basin. The flood tide basin current system in Figure-26 is weaker but a bit more ordered than was found for Alternative-1 in Figure 11. Eddy speeds in the tidal basin are on the order of 0.02 m/sec (0.07 ft/sec), insufficient to transport fine sand but an important stirring mechanism for mixing the tidal basin water mass to maintain high oxygen levels and to sustain fine silt and clay sized sediment particles in suspension.

Figure 27 gives the flow trajectories and depth averaged tidal currents in the Alternative-3 tidal basin computed by the TIDE_FEM model during spring ebbing tides on 18 September 2009. The wetted area of the tidal basin in Figure 27 is significantly reduced relative to the flood tide area in Figure 26, due to the lower water levels acting on the stage area curve in Figure 24. In Figure 27, drainage from the complex of dendritic channels on the east side of the basin merges in the center of the sub-tidal basin of Alternatie-3, forming a single feeder current in the western end that evacuates the basin. The feeder current converges at the western end of the basin and accelerates to about -0.05 m/sec (-0.16 ft/sec). As it passes through the pinch point under the railroad bridge it further accelerates in the narrow east/west reach of channel to about -0.10 m/sec (-0.33 ft/sec). Ebb flow in the channel then decelerates to -0.095 m/sec (-0.31 ft/sec) in the deeper north/south reach before discharging into San Diego Bay. In general, currents in Alternative-3 are everywhere about 5% less than those found for Alternative-1, roughly proportional to the relative size of the diurnal tidal prisms.

Similar flow patterns to Figures 26 & 27 are found in the Alternative-3 tidal basin during mean range tides and neap tides in Appendix A. The flow trajectories and depth averaged tidal

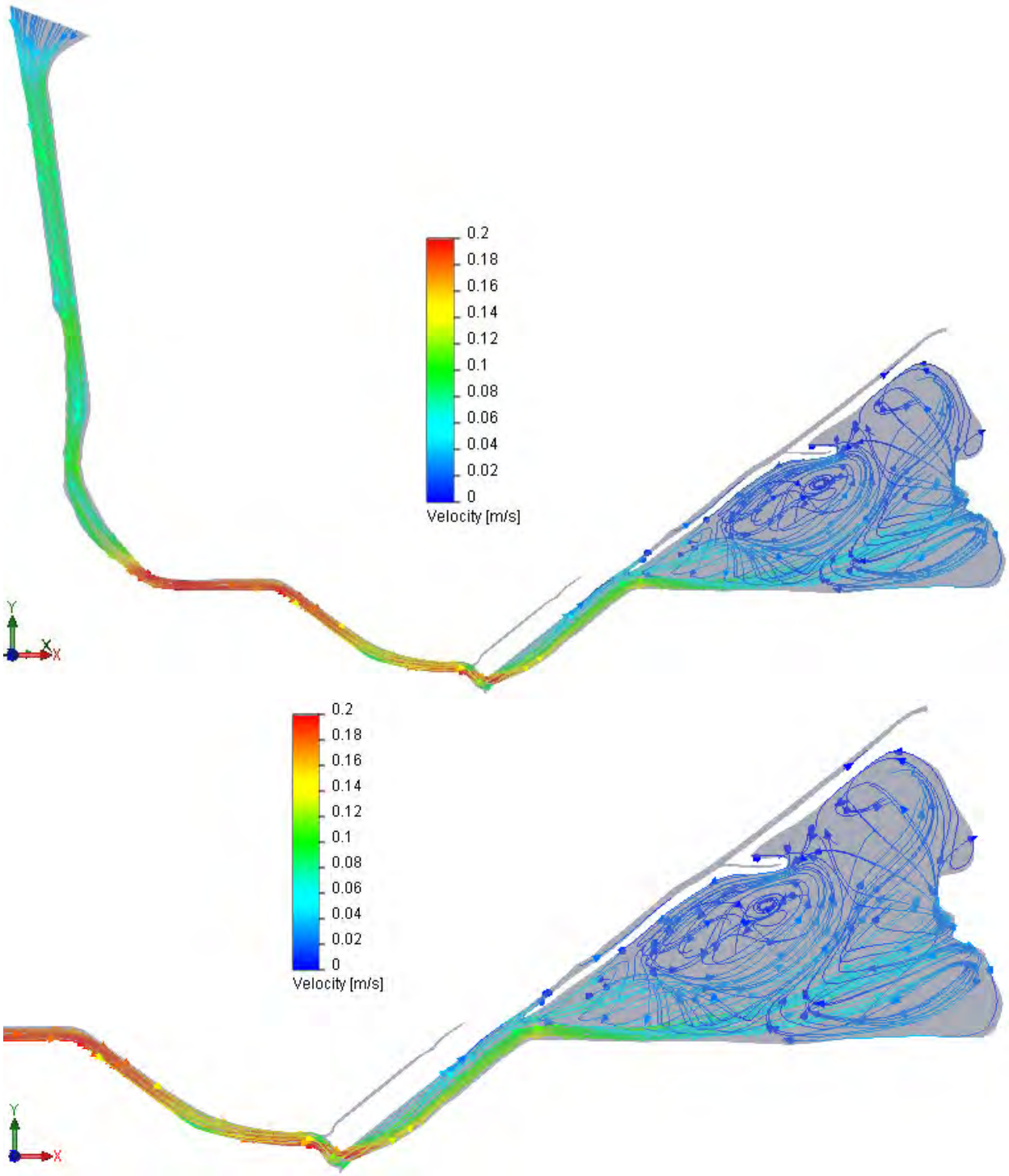

Figure 26: Hydrodynamic simulation of maximum flood flow during spring tides for Alternative-3 of the Otay Wetlands Restoration Project, based on San Diego Bay tides 18 September, 2009.

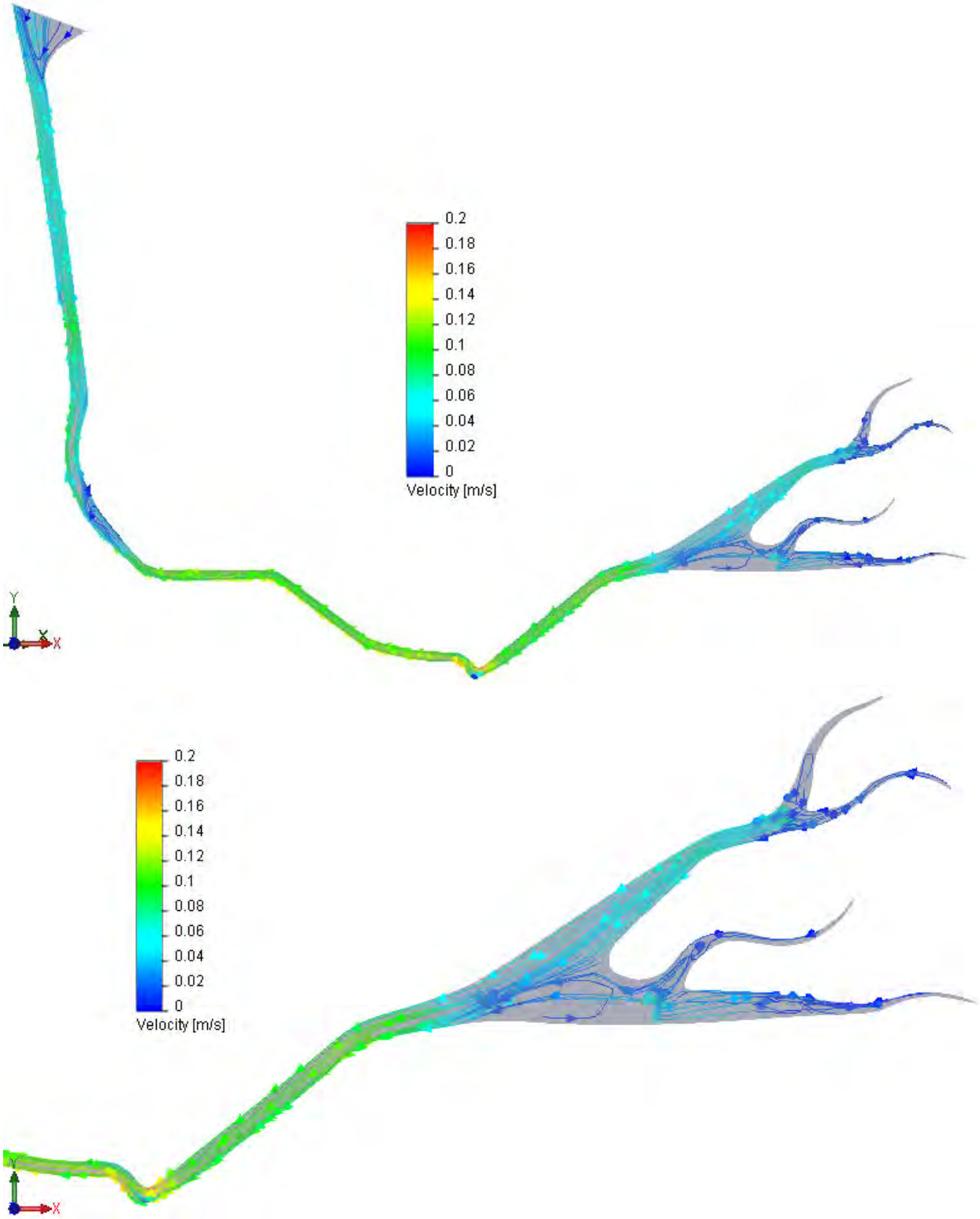

Figure 27: Hydrodynamic simulation of maximum ebb flow during spring tides for Alternative-3 of the Otay Wetlands Restoration Project, based on San Diego Bay tides 18 September, 2009.

currents during mean range flood and ebb tides are found in Figures A9 & A10, while the neap tide flows are shown in Figures A11 & A12.

5.3 Alternative-3 Hydroperiod Simulations: The hydroperiod function for Alternative-3 was calculated from forcing based on the 1980-2009 period of record of San Diego Bay water levels using the same procedures and exposure levels for habitat breaks detailed in Section 3.3 for Alternative-1. The red line in Figures 28 shows the hydroperiod function calculated for the Alternative-3 tidal basin. Water levels in the Alternative-3 tidal basin reached an extreme high water level of +5.63 ft NGVD in response to San Diego Bay water levels on 13 November 1997, while extreme low water in the Alternative-2 tidal basin dropped to – 2.10 ft NGVD in response to 10 January 2009 water levels in the Bay, slightly lower than what was found for Alternative-1.Thus, with less flow energy, Alternative-3 drains less completely than either Alternatives 1 or 2.

Mapping the elevations of habitat breaks in Figure 28 onto the stage area function in Figure 14, we find: the perpetual sub-tidal area of the Alternative-3 tidal basin decreases by 2.65 acres, to 14.27 acres from 16.92 acres for the Alternative-1 tidal basin, while the mean subtidal area with the Alternative-3 tidal basin decreases by 3.69 acres to 14.81 acres, from 18.50 acres for the Alternative-1 tidal basin; frequently flooded mud flat is decreased by 2.49 acres, from 27.73 acres for the Alternative-1 tidal basin to 25.24 acres for the Alternative-3 tidal basin; frequently exposed mud flat is increased by 2.27 acres, from 8.90 acres for the Alternative-1 tidal basin to 11.17 acres for the Alternative-3 tidal basin; low salt marsh is increased by 4.26 acres, from 7.55 acres for the Alternative-1 tidal basin to 11.81 acres for the Alternative-3 tidal basin; mid salt marsh is increased slightly by 0.55 acres, from 12.80 acres for the Alternative-1 tidal basin to 13.35 acres for the Alternative-3 tidal basin; high salt marsh is decreased by 1.80 acres, from 7.51 acres for the Alternative-1 tidal basin to 5.71 acres for the Alternative-3 tidal basin; transitional habitat is increased very slightly by 0.02 acres from 1.22 acres for the Alternative-1 tidal basin to 1.24 acres for the Alternative-3 tidal basin. Maximum intertidal habitat is increased by 2.81 acres to 68.52 acres with the Alternative-3 tidal basin as compared to 65.71 acres

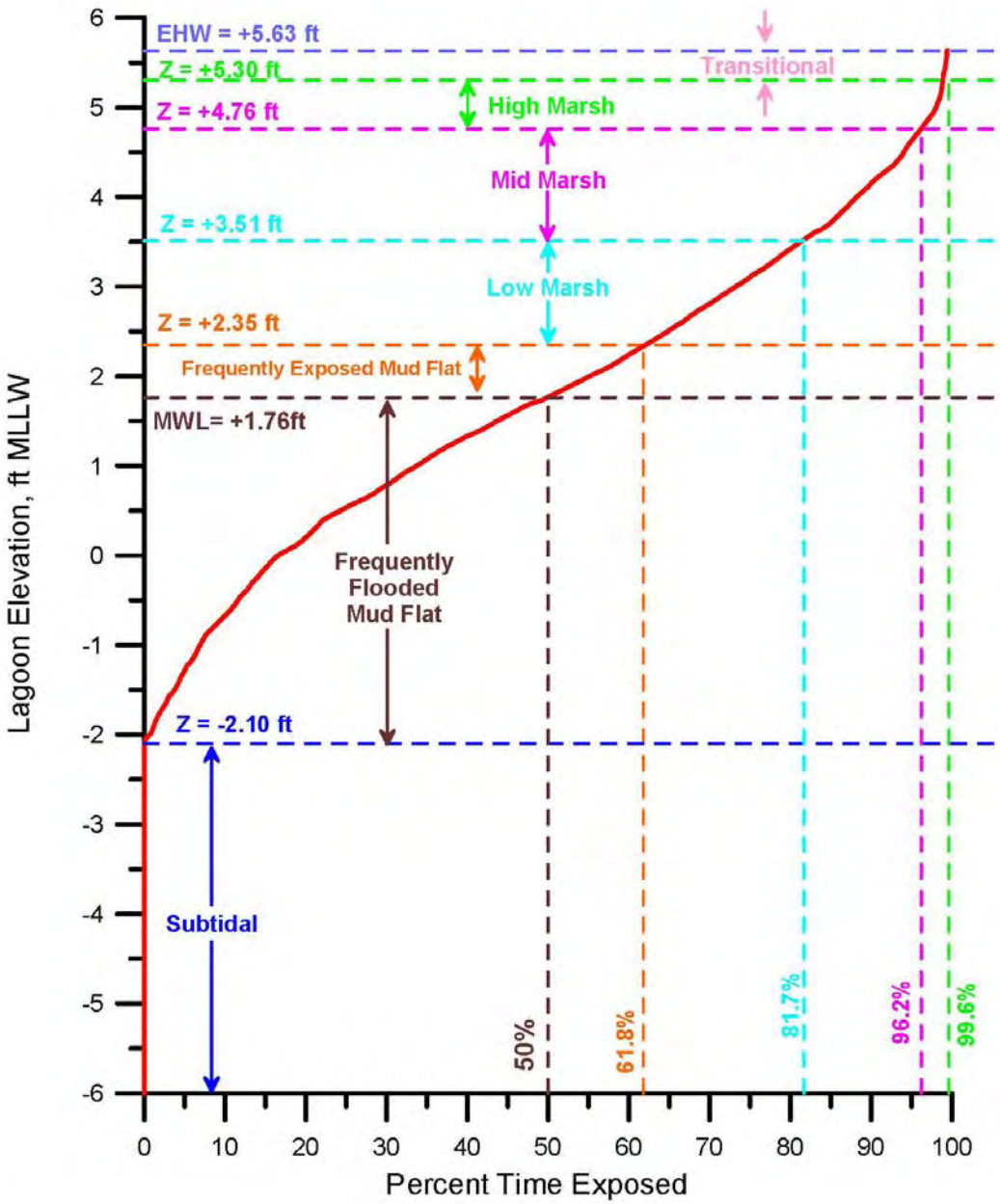

Figure 28. Hydroperiod function of the tidal basin for Alternative -3 Otay Wetland Restoration Project. Based on water level data from NOAA tide gage #941-0170, Navy Pier, San Diego Bay.

for the Alternative-1 tidal basin; and the mean area experiencing tidal inundation up to MHHW is decreased slightly by 0.54 acres from 60.57 acres for the Alternative-1 tidal basin to 60.03 acres for the Alternative-3 tidal basin resulting in an average 45.22 acres of intertidal habit, an increase of 3.15 acres over the Alternative-1 tidal basin. Thus, Alternative-3 has on average about 20% less subtidal habitat than Alternative-1, but only about 7.5% more intertidal habitat.

5.4 Alternative-3 Tidal Scour and Erosion: The tidal currents calculated in the lower Otay River and feeder channel during spring tides (cf. Figures 26 & 27; A9-A11) are compared against grain size and threshold of motion data in Figure 16 to estimate the potential for scour and erosion. In general the channel velocities calculated during spring tides in Figures 26 & 27 show that current speeds with Alternative-3 are everywhere less than 0.6 ft/sec (0.18 m/s) and greater than 0.27 ft/ sec (0.08 m/sec) and consequently, an equilibrium channel is achieved with the native 0.3 mm size sediments. Consequently, there is sediment transport down channel but not deposition, and hence a maximum likelihood of self-maintaining channel.

6) Residence Time

Residence time refers to the average amount of time source water spends in a particular tidal system. Residence time begins from the moment a *material element of water* (a parcel that contains the same collection of water molecules) enters a tidal system on flooding tide and ends when that same element leaves the system on ebbing tide. At lowest order, the residence time in a particular tidal system can be approximated by *removal time*, which is a ratio of the storage capacity of that system at mean higher high water to the rate of tidal exchange during a mean diurnal tidal period (Horikawa, 1988), or :

$$\bar{\tau} = \frac{V_s}{V_p} T$$

Where $\bar{\tau}$ is the removal time; V_s is the storage capacity of a particular restoration alternative at mean higher high water (including both the inlet channel and tidal basin); V_p is the mean diurnal tidal prism of a particular restoration alternative, and T is a diurnal tidal period equal to 1.0347 days (24 hours and 50 minutes). From this simple relation the removal time varies

between each restoration alternative according to the volume ratio of storage capacity to diurnal tidal prism, V_s/V_p . For Alternative 1, we find from Figure 9b that V_s/V_p = 1.59 and hence $\bar{\tau}_1$=1.65 days. From Figure 19 we find that V_s/V_p = 1.78 for Alternative 2 and thus $\bar{\tau}_2$ = 1.84 days; and for Alternative 3, Figure 25 indicates V_s/V_p = 1.55 and $\bar{\tau}_3$= 1.60 days. Therefore, removal time is roughly comparable between each the three restoration alternatives, with Alternative 2 having the longest removal time since it has a larger subtidal volume.

However, removal time is only a simple algebraic proxy for residence time in these cases because the mean diurnal tidal prism for each of the restoration alternatives is less than the storage capacity of those alternatives at MHHW, and it takes a number of tide cycles to completely replace all of the *old water* in each of those systems. Old water is defined as the water that remains in the tidal system (including both the inlet channel and tidal basin) after water outflow during ebb tide. As new water comes into the inlet channel and tidal basin, the old water becomes more diluted with each tidal cycle until all the old water is eventually replaced by new water. We utilize the mass conservation and transport algorithms of the TIDE_FEM model to solve for this progressive dilution of old water in each of the restoration alternatives. To facilitate comparisons of residence time calculations performed at other coastal lagoons, we adopt the convention of assigning residence time as the time required for old water to dilute to less than 2% of the storage capacity of the system (Elwany, et. al., 2005; Coastal Environments, 2009).

Figure 29 gives the TIDE_FEM hydrodynamic tidal simulations of the time dilution of old water in each of the tidal systems (inlet channel + tidal basin) of the three restoration alternatives. Time to dilute to 2% for old water in Alternative-1 gives a residence time estimate of τ_1 = 3.75 days. For Alternative 2, the residence time estimated from decay rates of old water is τ_2 = 3.29 days; and for Alternative 3, Figure 29 gives a residence time estimate of τ_3 = 3.93 days. As with the removal time calculations, residence times are comparable for all three restoration alternatives, and are in the same range (3 days-4 days) as residence times measured in healthy tidal lagoon systems such as the W-1 tidal basin in the newly restored San Dieguito Lagoon

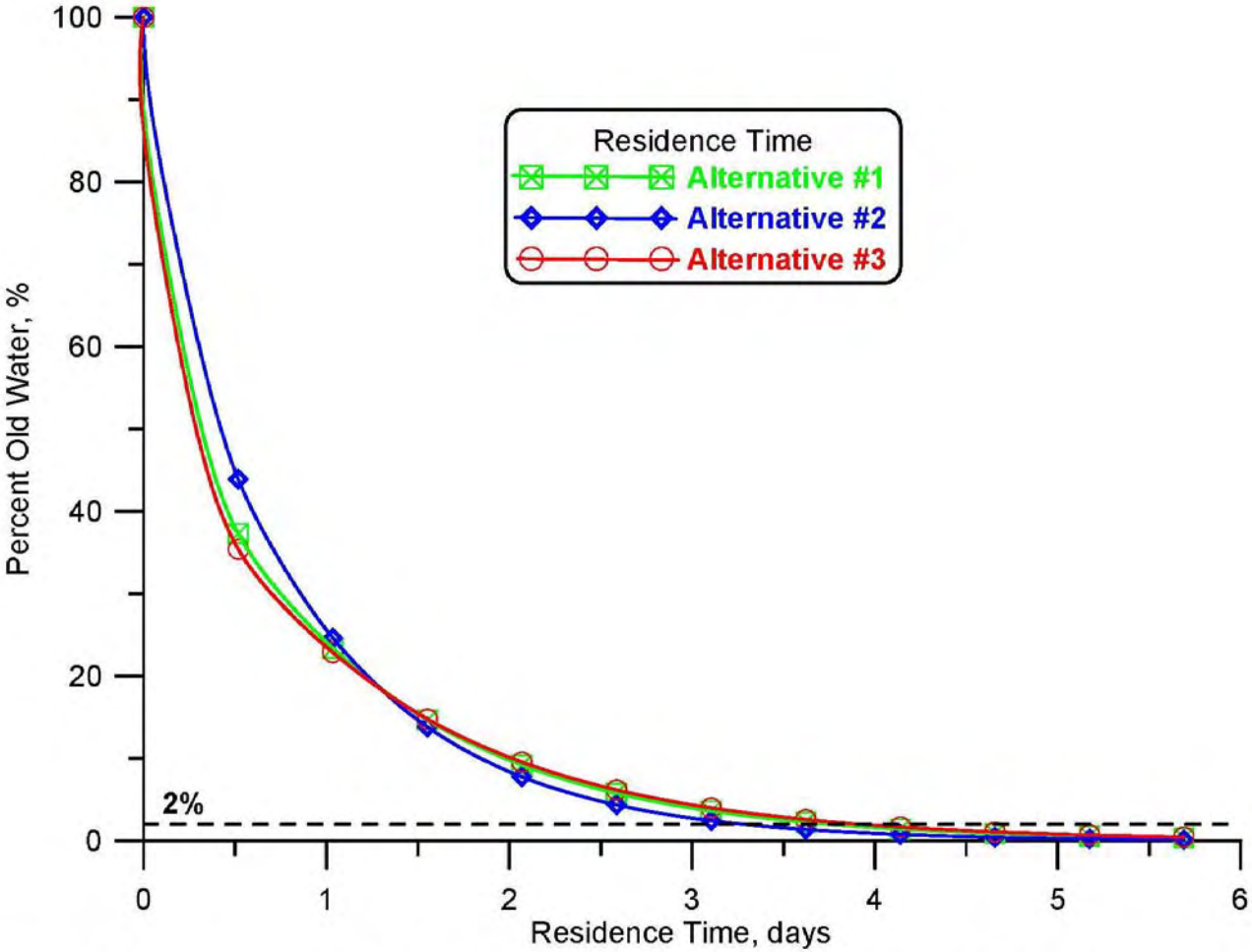

Figure 29 . Residence time for water in tidal basin of Otay River Floodplain Restoration Alternatives 1-3.

(Coastal Environments, 2009) and in the East Basin at Agua Hedionda Lagoon (Elwany, et. al., 2005). Although Alternative 2 had a longer removal time owing to a larger storage to tidal prism volume ratio; it none the less produced a slightly smaller residence time in the hydrodynamic simulations due to more rapid mixing of old water with new water as a result of stronger tidal basin currents and more vigorous eddy systems, (cf: Figures 20, A5, & A7)

7) Summary and Conclusions:

This is a hydrodynamic feasibility study of conceptual site plans for a proposed wetland restoration site. This study employs a well-tested and peer-reviewed hydrodynamic model to evaluate the tidal hydraulics of three alternative tidal basin and channel concepts for Poseidon's Marine Life Mitigation Plan in the Otay River floodplain. The proposed new tidal basin would occupy a land parcel known as *Otay River Floodplain* and would have a triangular foot print and receive its marine source water from south San Diego Bay through a connection with the Otay River. There are three grading concepts being considered for this triangular basin: *Alternative-1* is graded for an approximately prototypic balance between subtidal and intertidal habitat and is referred to as a *mixed-habitat plan*; *Alternative-2* is graded for an emphasis on subtidal habitat and is referred to as a *maximum subtidal plan*; while the grading of Alternative-3 emphasizes intertidal habitat and is referred to as a *maximum intertidal plan*. The estimated minimum subtidal acreage needed to meet fish productivity requirements of Poseidon's Marine Life Mitigation Plan is 11 acres; while the minimum required acreage of restored tidal wetland is 66 acres.

The model, analysis methods, and supporting data bases used herein are the same as those utilized in the Environmental Impact Report/Environmental Impact Statement (EIR/EIS) for the San Dieguito Wetland Restoration Project, (EIR/EIS, 2000), and for the preparation of the San Dieguito Wetlands Restoration Project, Final Restoration Plan, (SCE, 2005). Monitoring data for the newly-completed San Dieguito Lagoon Restoration Project was also used to calibrate the tidal hydraulics model. San Dieguito Lagoon was selected as a proxy for the restoration alternatives because of morphologic similarities: in particular, both restoration sites

have a long “goose-neck” feeder channel connecting source water to interior tidal basins of comparable acreage and distance from the source water. Habitat surveys conducted during the San Dieguito Lagoon Restoration Project by Josselyn & Whelchel (1999) were also used to develop functional relationships between habitat breaks and amounts of time for wetting and drying (hydroperiod functions). These relationships were used to transpose tidal hydraulics model output into calculations of acreage of various wetland habitat types created by the three restoration alternatives. Calculations of habitat creation were based on long-term tidal hydraulics simulations using tidal forcing at the mouth of the Otay River based on the 1980-2009 period of record for San Diego Bay tides measured by the NOAA tide gage #941-0170 located at the Navy Pier.

Table 2 summarizes habitat creation computed from the long term tidal hydraulics simulations of the three restoration alternatives. Inspection of Table 2 reveals that all of the alternatives create significantly more than the required minimum of 66 acres of tidally influenced wetland, achieving maximum areas of salt water inundation of between 82.6 acres and 82.8 acres. In this regard, the restoration designs provide a safety margin in habitat creation of about 17.6 acres – 17.8 acres or about 27%. Furthermore, all of the restoration alternatives provide significantly more than the minimum 11 acres of subtidal habitat required for fish production. Alternative-1 provides on average 18.5 acres of subtidal habitat, and is never less than 16.9 acres. Thus the critical threshold for adequate fish productivity (11 acres of subtidal habitat) is satisfied with a safety margin of at least 5.9 acres. Alternative-2 provides on average 32.8 acres of subtidal habitat while it is never less than 31.3 acres. Hence Alternative-2 (the maximum sub-tidal plan) provides substantially more subtidal habitat than Alternative-1 by a factor of 1.9, and easily exceeds the critical threshold for adequate fish productivity (11 acres of subtidal habitat) with a safety margin of at least 20.3 acres. Alternative-3 provides on average 14.8 acres of subtidal habitat and is never less than 14.3 acres, a safety margin of at least 3.3 acres.

Hydrodynamic simulations of tidal exchange and dilution rates give residence time estimates of τ_1 = 3.75 days for Alternative-1; τ_2 = 3.29 days for Alternative-2; and for Alternative-3, a residence time estimate of τ_3 = 3.93 days. Residence times for all three

***Table 2: Habitat Creation for Restoration Alternatives in the Otay River Floodplain**

Habitat Areas	Alternative -1 (Mixed Habitat)	Alternative -2 (Max Subtidal)	Alternative -3 (Max Intertidal)
Perpetual Sub-Tidal (acres)	16.92	31.27	14.27
Mean Sub-Tidal (acres)	18.50	32.80	14.81
Frequently Flooded Mud Flat (acres)	27.73	13.63	25.24
Frequently Exposed Mud Flat (acres)	8.90	6.31	11.17
Low Salt Marsh (acres)	7.55	9.29	11.81
Mid Salt Marsh (acres)	12.80	10.55	13.35
High Salt Marsh (acres)	7.51	10.50	5.71
Transitional Habitat (acres)	1.22	1.24	1.24
Maximum Intertidal Area (acres)	65.71	51.52	68.52
Maximum Area of Salt Water Inundation (acres)	82.63	82.79	82.79
Mean Intertidal Area (acres)	42.07	29.81	45.22
Mean Area of Salt Water Inundation (acres)	60.57	62.61	60.03

*These acreages based on the following exposure times for each habitat type:

Subtidal Exposure < 0%;

0% < **Frequently Flooded Mud Flat Exposure** < 50%;

50% < **Frequently Exposed Mud Flat Exposure** < 61.8%

61.8% < **Low Salt Marsh Exposure** < 81.7%

81.7% < **Mid Salt Marsh Exposure** < 96.2%

96.2% < **High Salt Marsh Exposure** < 99.8%

99.8% < **Transitional Exposure** < 100%

restoration alternatives are comparable to those measured or calculated for healthy tidal lagoon systems such as the W-1 tidal basin in the newly restored San Dieguito Lagoon (Coastal Environments, 2009) and in the East Basin at Agua Hedionda Lagoon (Elwany, et. al., 2005).

Tidal exchange simulated during spring tides show for all three restoration alternatives that Otay River channel velocities generally remain less than the threshold of sediment motion (0.6 ft/sec or 0.18 m/s) and greater than the deposition threshold (0.27 ft/ sec or 0.08 m/sec) and consequently, an equilibrium channel is achieved with the native sediments. There is sediment transport down channel but not deposition, and hence a maximum likelihood of self-maintaining channel. Furthermore, the inlet channel and the mouth of the Otay River are not subject to littoral transport by shoaling ocean waves, as south San Diego Bay provides complete sheltering from high energy shoaling swells. Consequently, the inlet channel is not likely to infill or close from sand influx in the source water, making the site significantly easier to maintain. But, there is one isolated erosion concern, and that occurs during flooding spring tides in Alternative-2 along the narrower east/west reach. Because of the larger tidal prism of this alternative, the channel currents accelerate to 0.2 m/sec (0.66 ft/sec) before entering the Alternative-2 tidal basin. This exceeds the 0.6 ft/sec (0.18 m/s) threshold of motion for the 0.3 mm sized native sediments, and erosion will occur and persist until the channel cross sectional area is enlarged sufficiently to lower local channel currents to less than 0.6 ft/sec. If Alternative-2 is selected for final design, it would be appropriate to provide additional grading to this reach of channel to enlarge its cross section.

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APPENDIX -A : Additional Flow Simulations for Mean and Neap Tidal Ranges

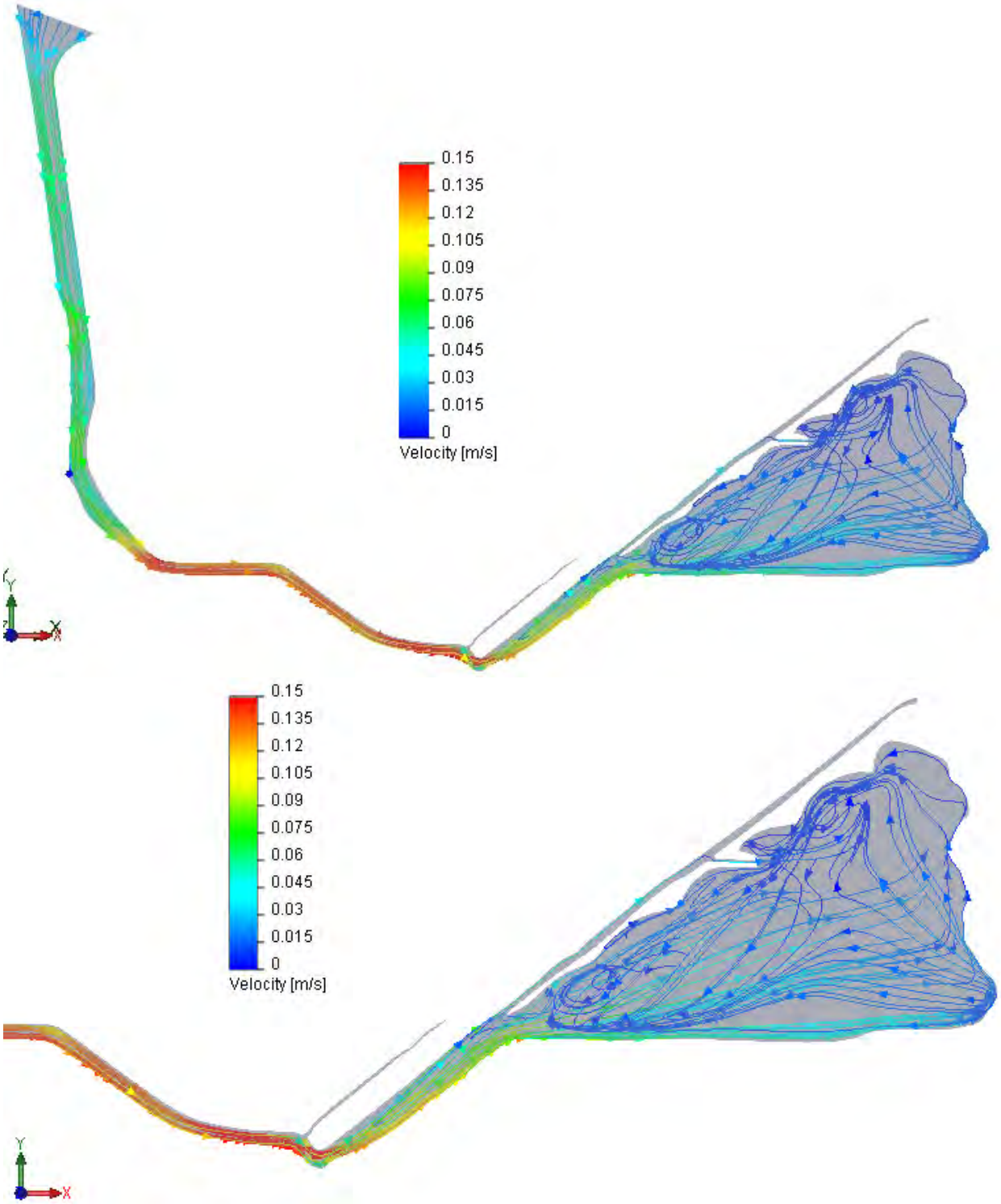

Figure A1: Hydrodynamic simulation of maximum flood flow during mean tides for Alternative-1 of the Otay Wetlands Restoration Project.

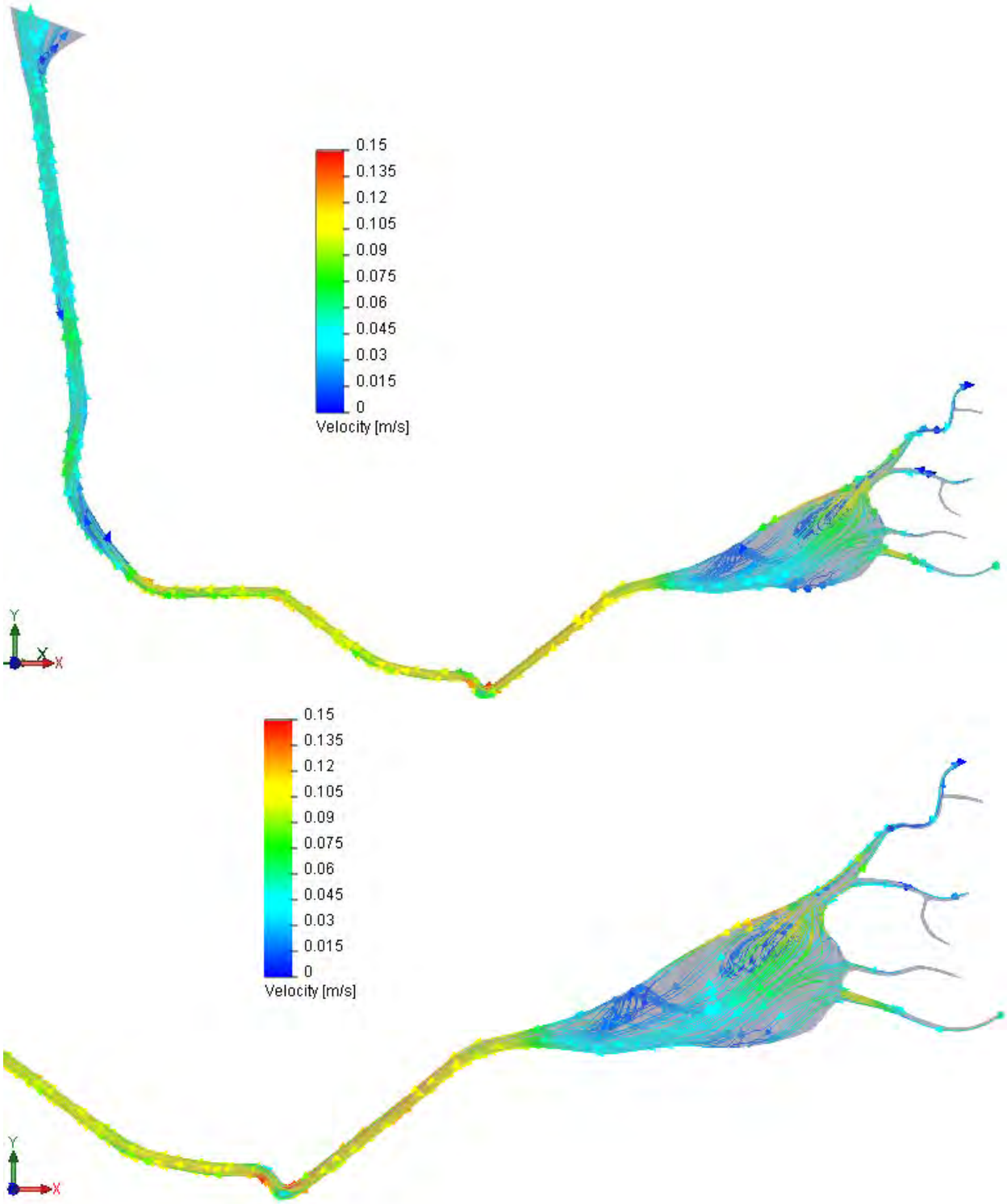

Figure A2: Hydrodynamic simulation of maximum ebb flow during mean tides for Alternative-1 of the Otay Wetlands Restoration Project.

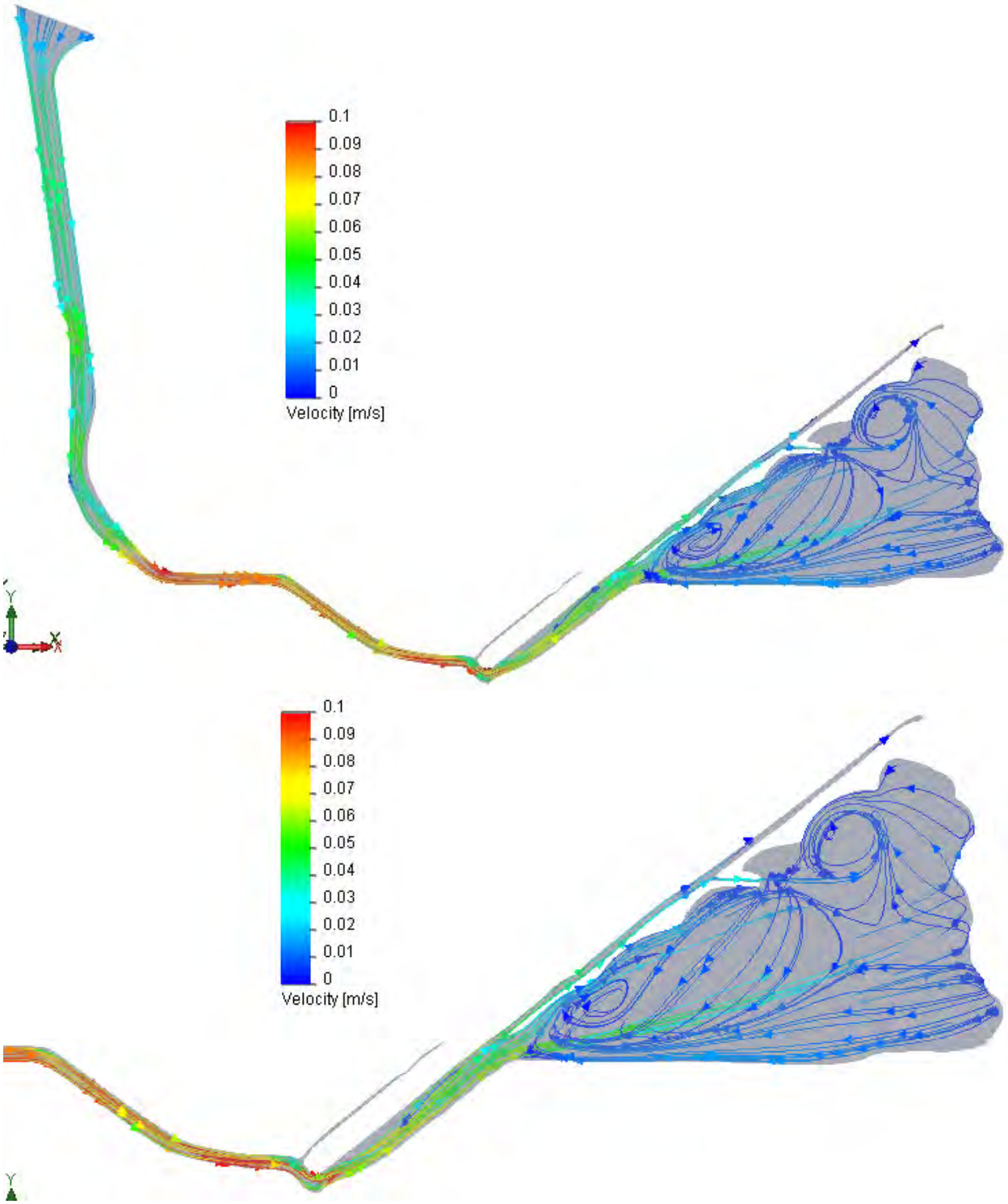

Figure A3: Hydrodynamic simulation of maximum flood flow during neap tides for Alternative-1 of the Otay Wetlands Restoration Project.

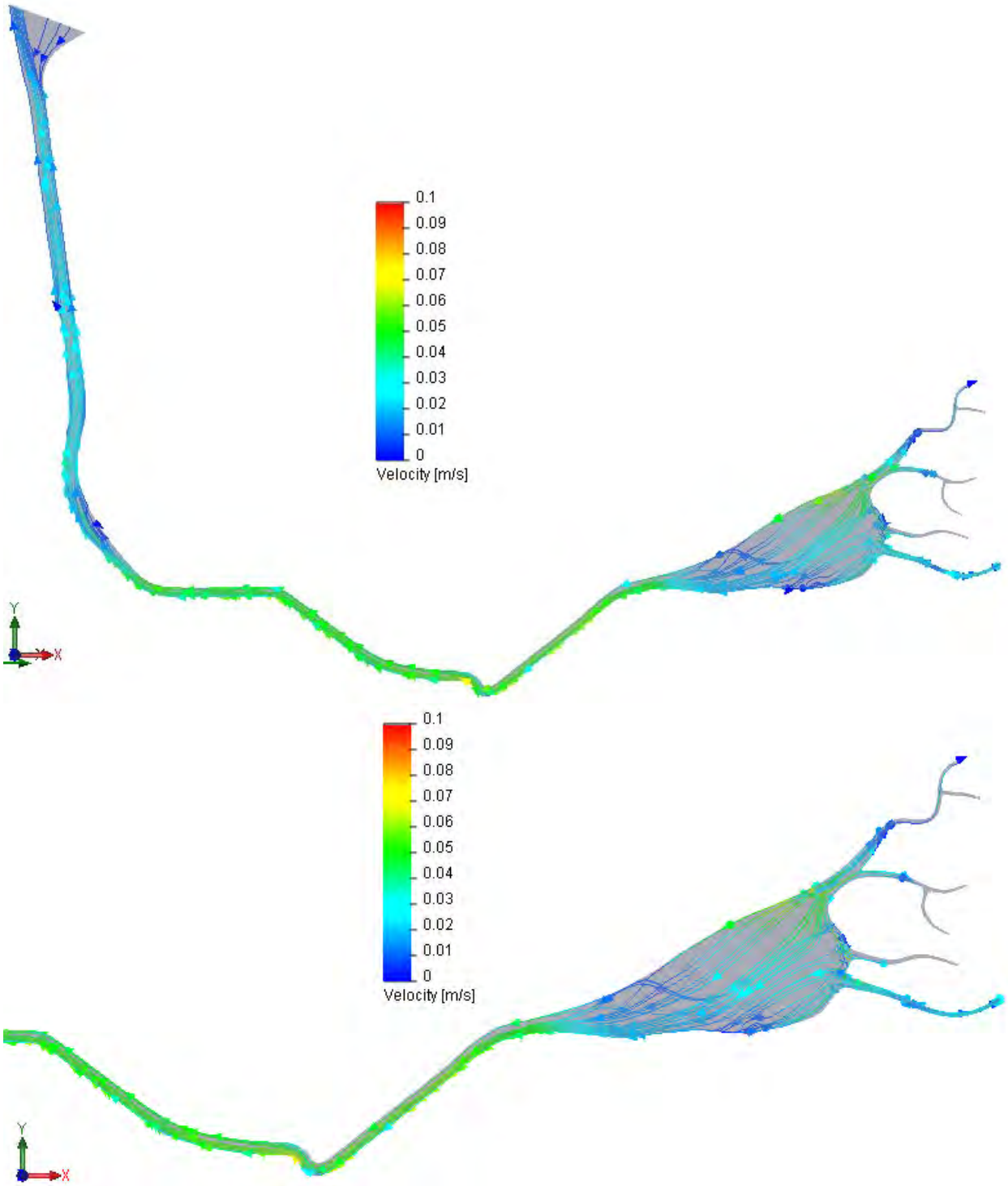

Figure A4: Hydrodynamic simulation of maximum ebb flow during neap tides for Alternative-1 of the Otay Wetlands Restoration Project.

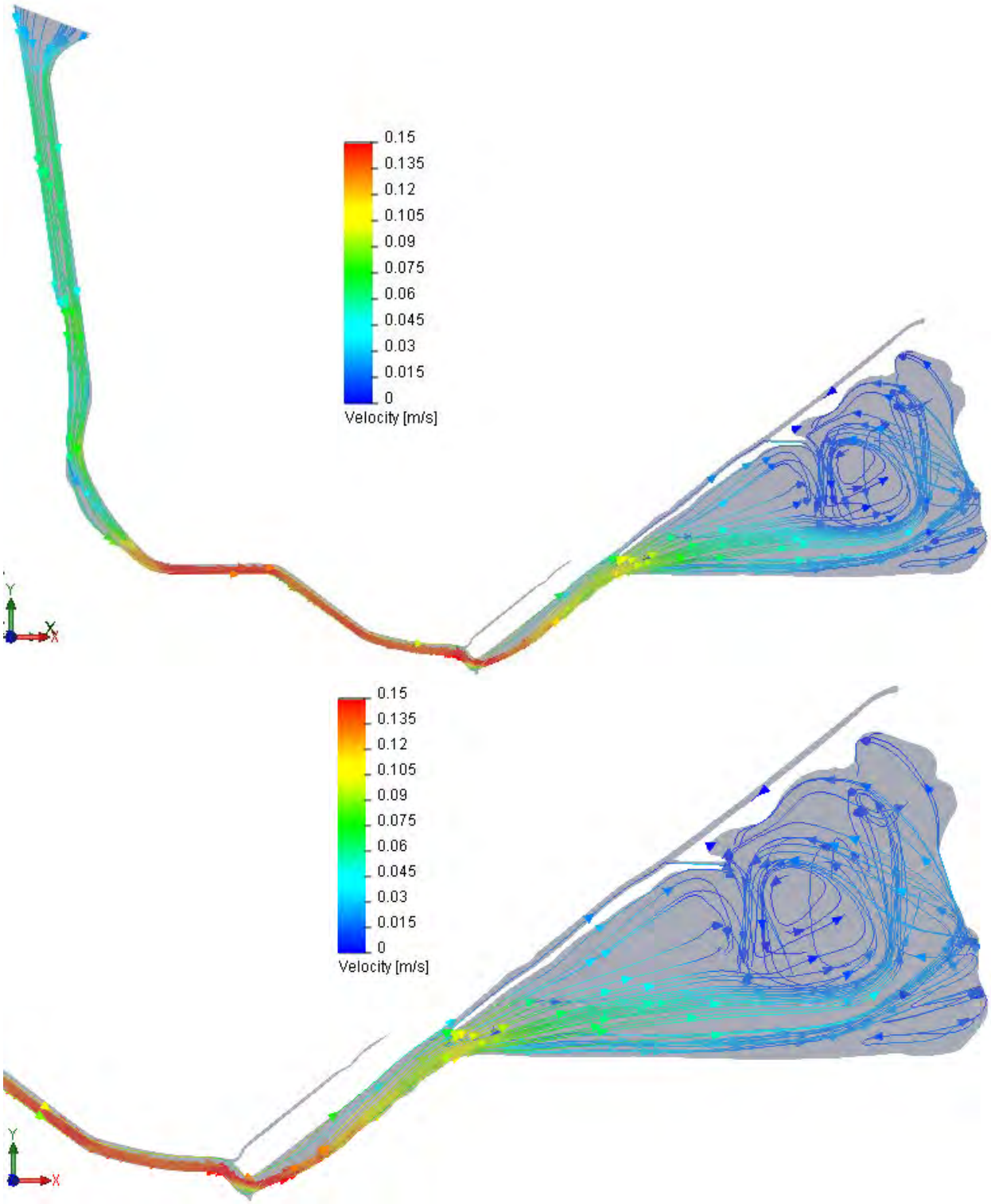

Figure A5: Hydrodynamic simulation of maximum flood flow during mean tides for Alternative-2 of the Otay Wetlands Restoration Project.

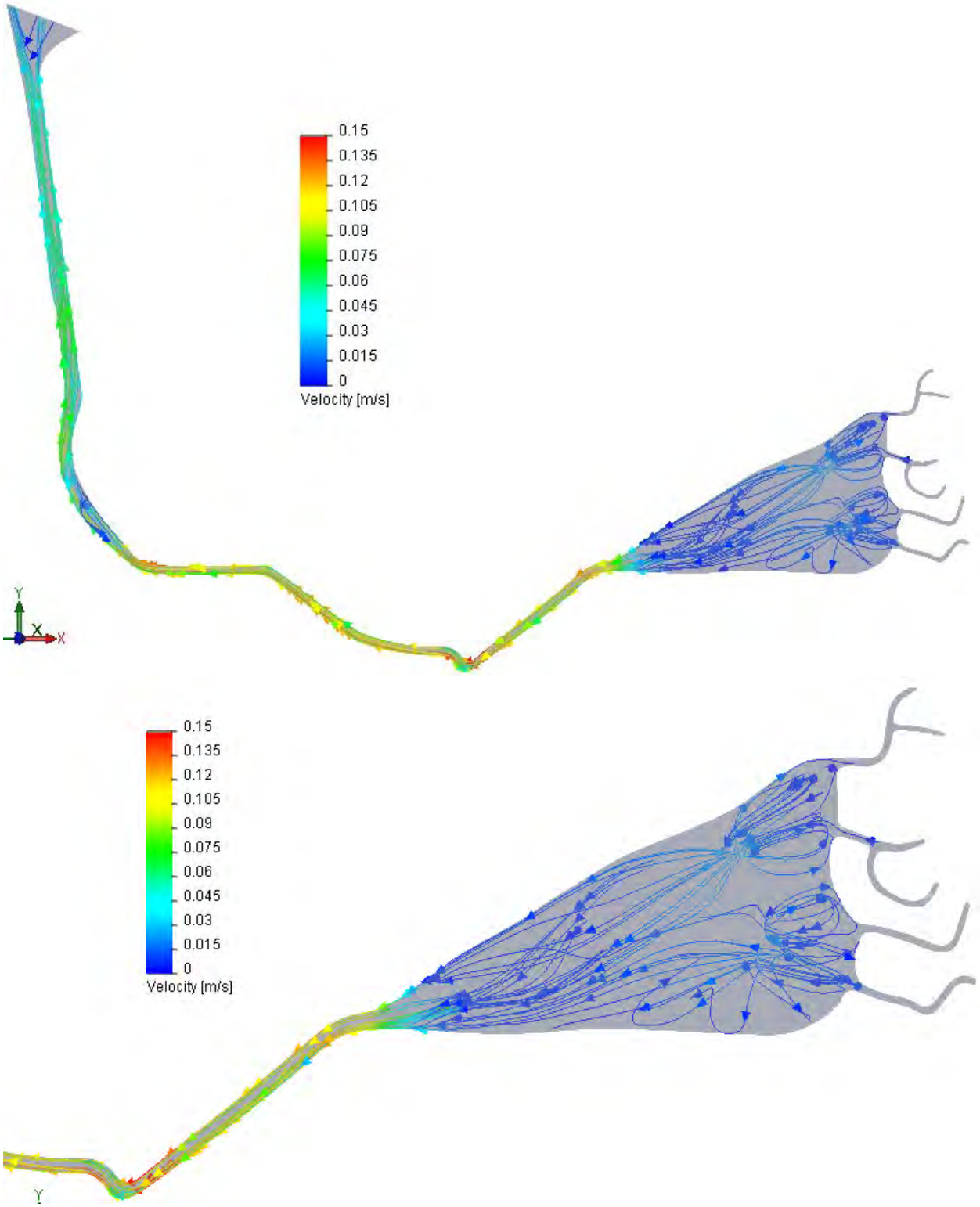

Figure A6: Hydrodynamic simulation of maximum ebb flow during mean tides for Alternative-2 of the Otay Wetlands Restoration Project.

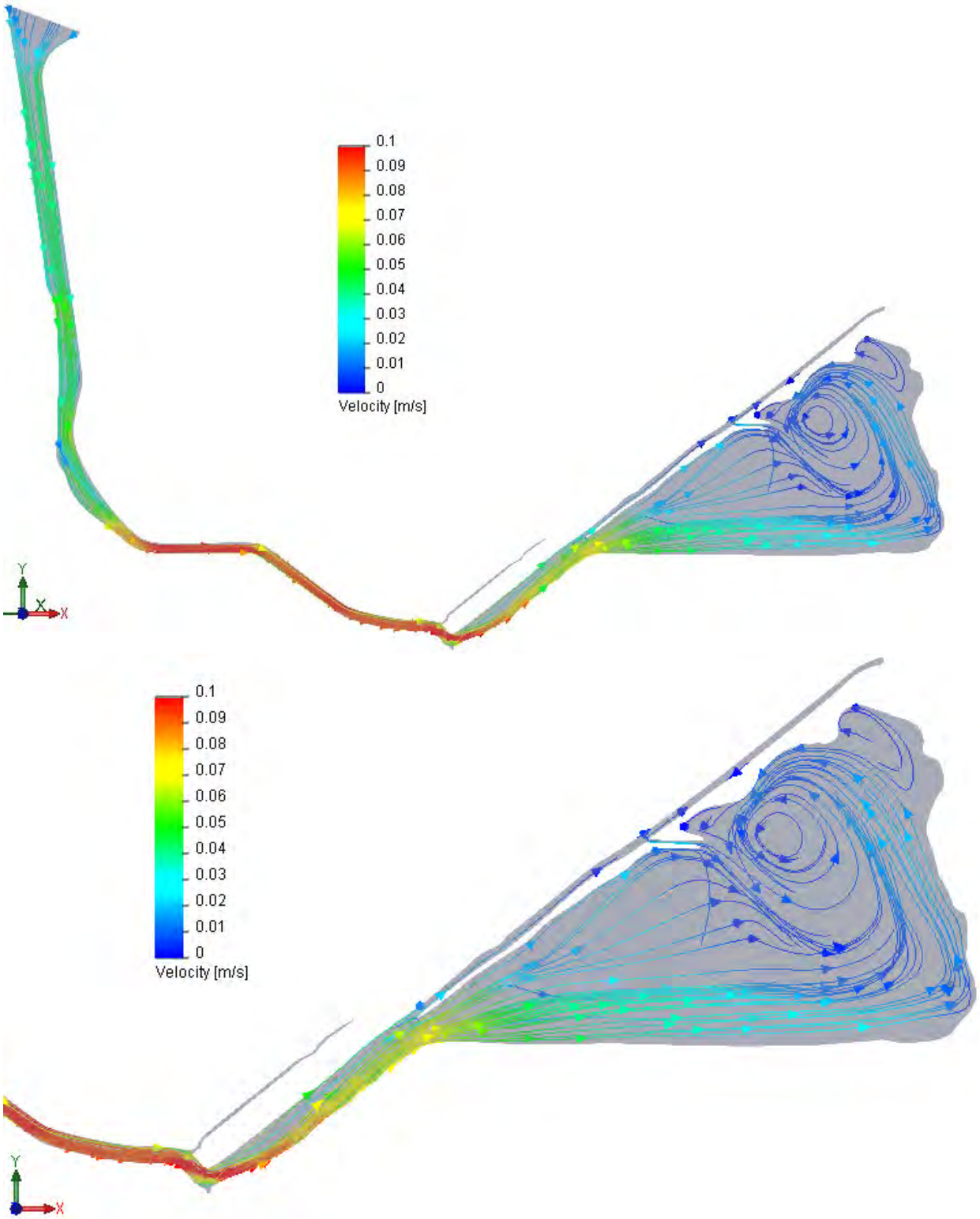

Figure A7: Hydrodynamic simulation of maximum flood flow during neap tides for Alternative-2 of the Otay Wetlands Restoration Project.

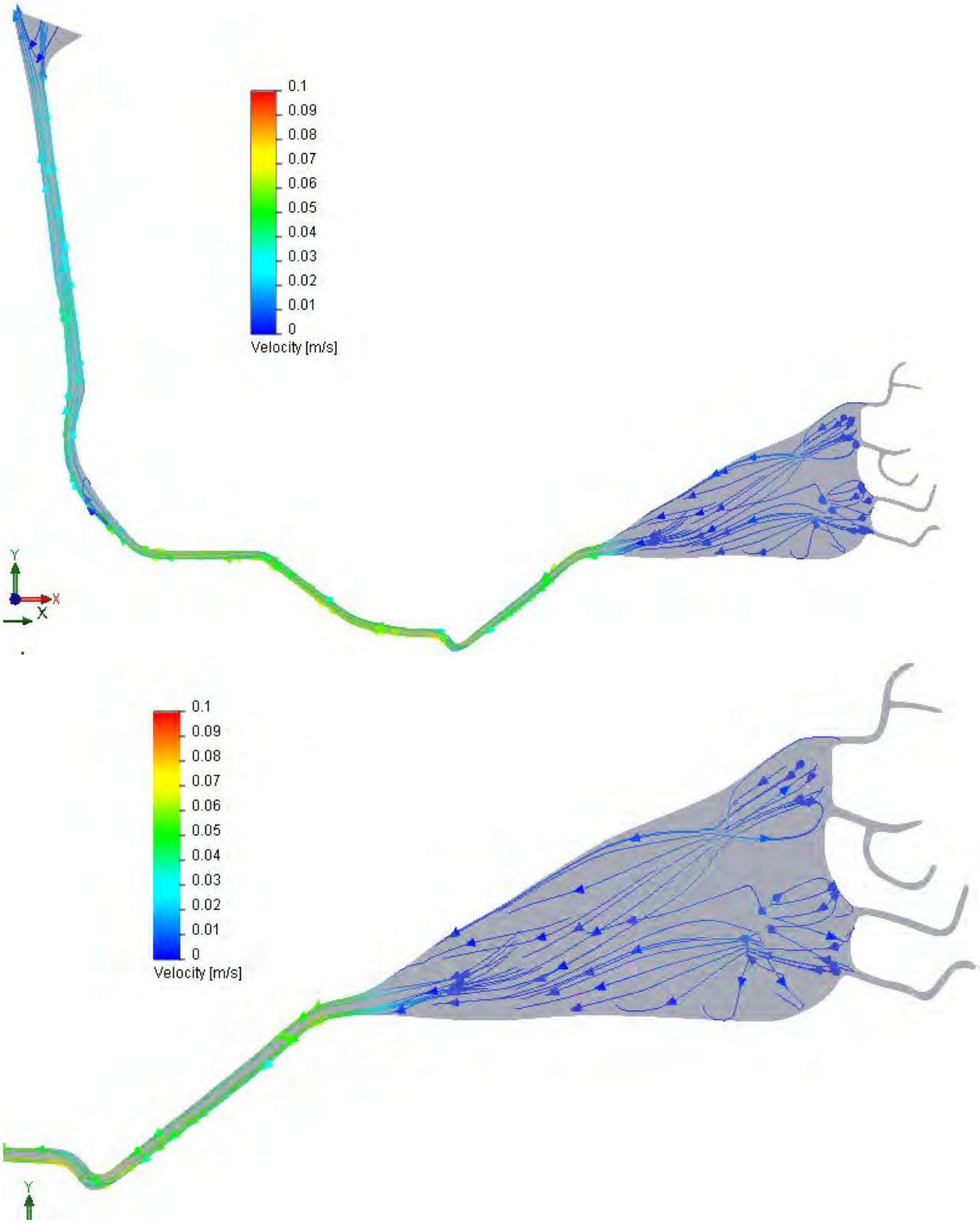

Figure A8: Hydrodynamic simulation of maximum ebb flow during neap tides for Alternative-2 of the Otay Wetlands Restoration Project.

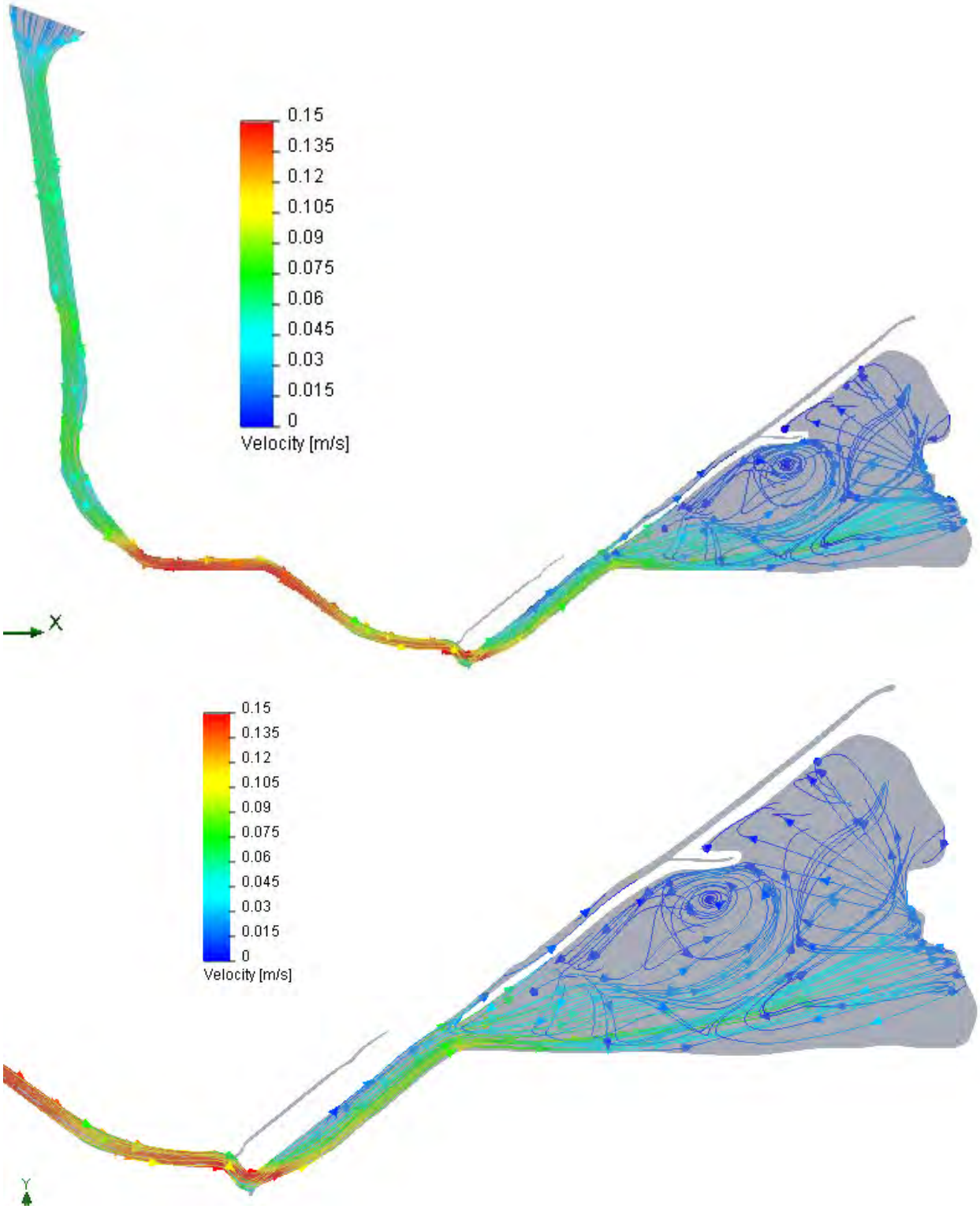

Figure A9: Hydrodynamic simulation of maximum flood flow during mean tides for Alternative-3 of the Otay Wetlands Restoration Project.

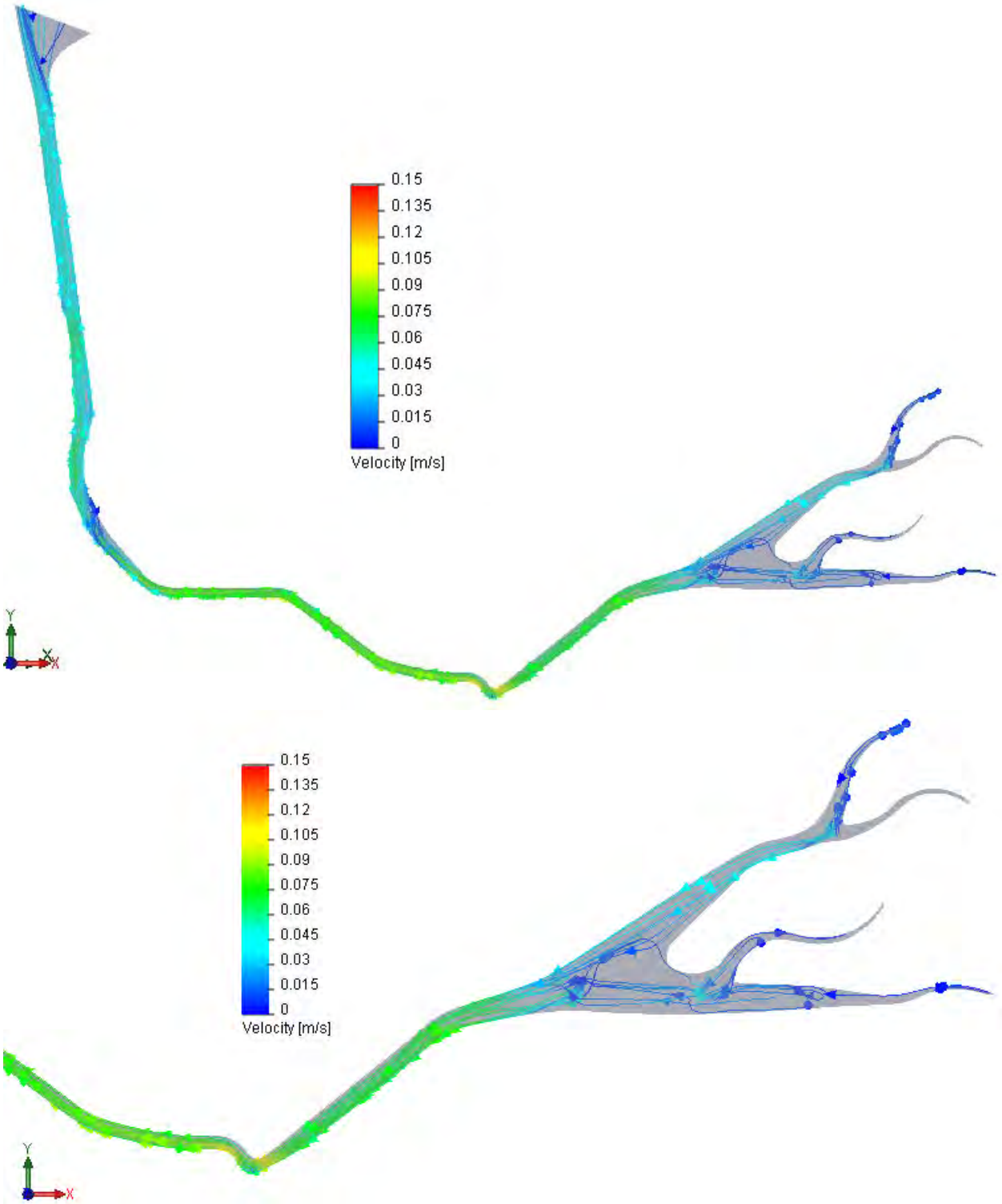

Figure A10: Hydrodynamic simulation of maximum ebb flow during mean tides for Alternative-3 of the Otay Wetlands Restoration Project.

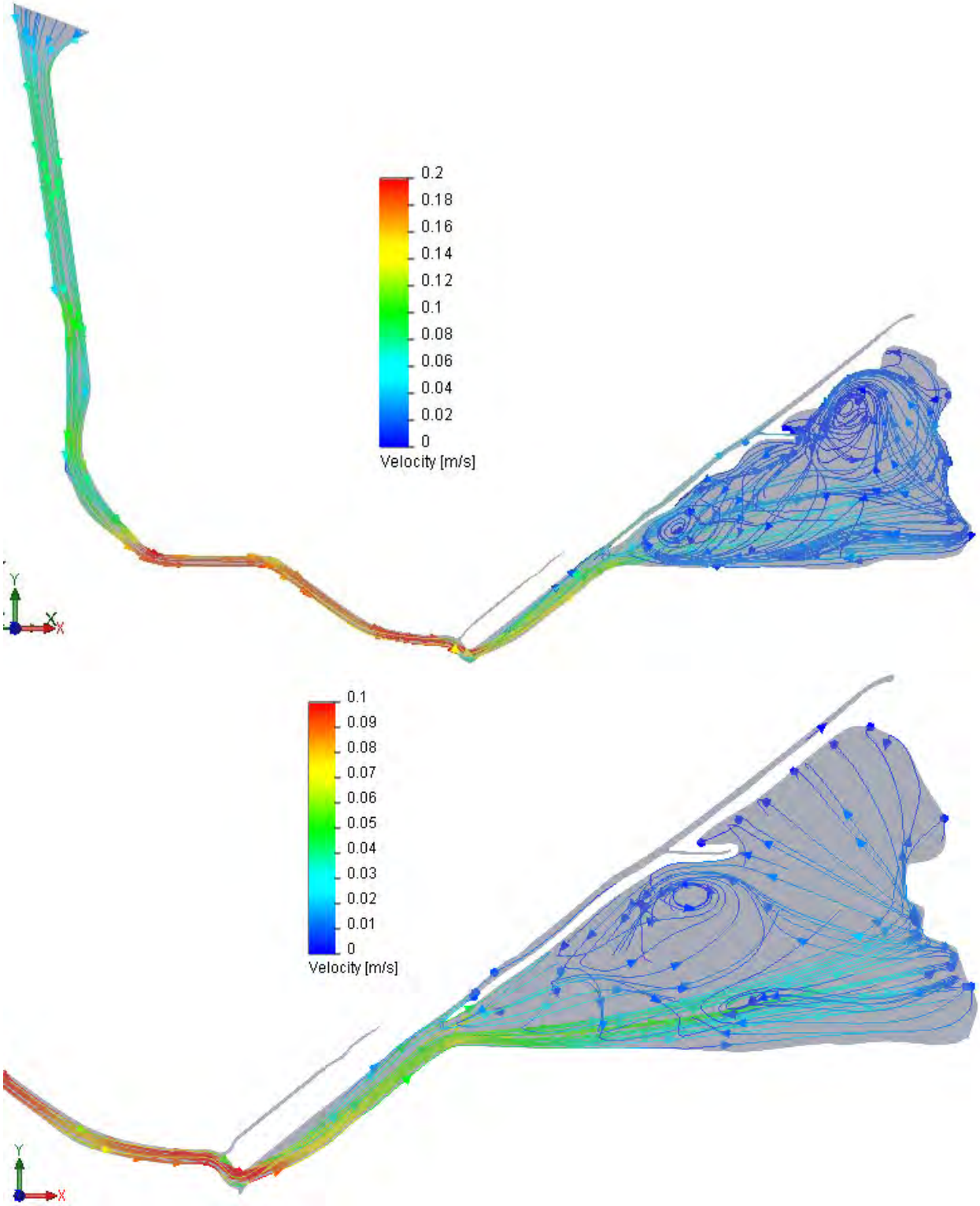

Figure A11: Hydrodynamic simulation of maximum flood flow during neap tides for Alternative-3 of the Otay Wetlands Restoration Project.

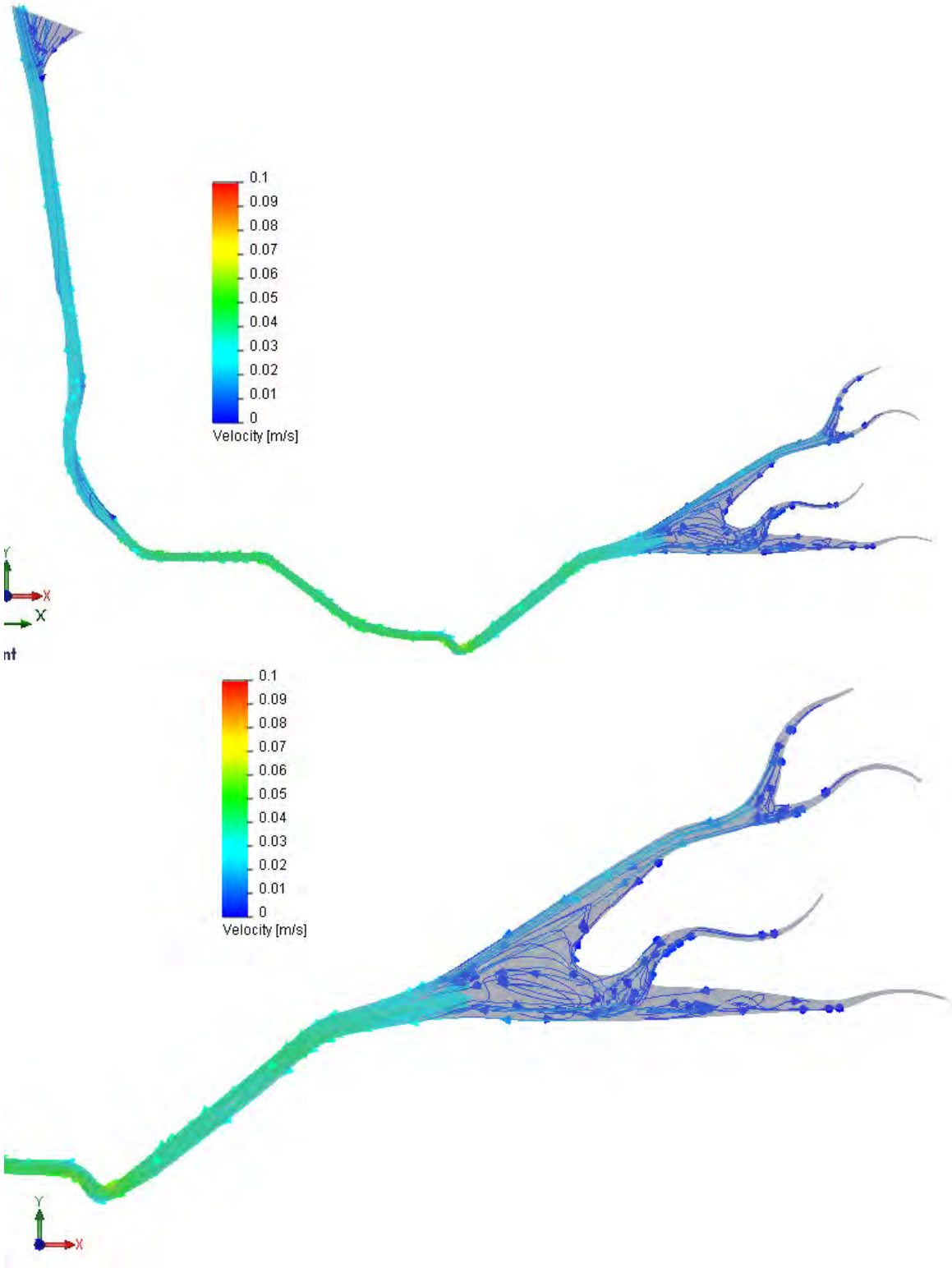

Figure A12: Hydrodynamic simulation of maximum ebb flow during neap tides for Alternative-3 of the Otay Wetlands Restoration Project.