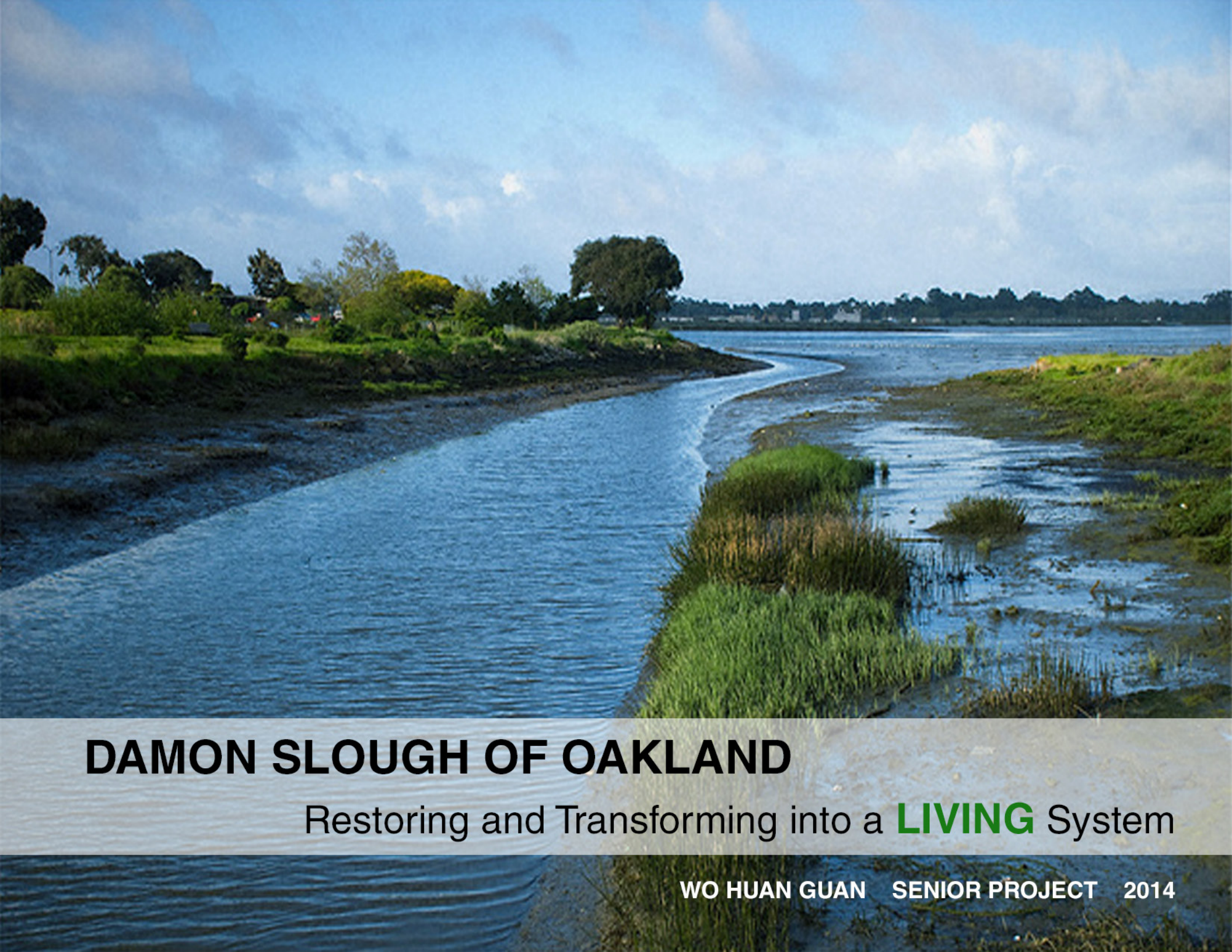

DAMON SLOUGH OF OAKLAND

Restoring and Transforming into a **LIVING** System

WO HUAN GUAN SENIOR PROJECT 2014

DAMON SLOUGH OF OAKLAND

Restoring and Transforming into a Living System

Presented to the faculty of the
Landscape Architecture Department of the
University of California, Davis,
in partial fulfillment of the requirements for
the Degree of Bachelors of Science in
Landscape Architecture.

ACCEPTED AND APPROVED BY:

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Donald Strong, Committee Member

Wo Guan
June 12 2014

ABSTRACT

Wetlands are considered the most ecologically valuable lands to the environment because they are biologically diverse—providing a wide range of habitats to both plants and animals. While wetlands provide various benefits to the environment, however, their acreages have been declining dramatically in the United States, especially in the San Francisco Bay Area of California. Consequently, this trend of wetland decline has brought tremendous negative impacts to the ecosystem. This has motivated me to design a restoration project to bring back wetlands in the Bay Area.

My project location is the Damon Slough of Oakland, California. Although this engineered channel currently has poor water quality due to trash discharge and polluted runoff from the local communities, it has the potential to be restored as a slough and provide wildlife habitats, improved waterway accessibility, and increased recreational activities within the area. The City of Oakland has been working on an on-going development plan called the Coliseum Area Specific Plan, and part of the Plan includes restoring the Damon Slough.

By taking the Coliseum Area Specific Plan as my design base, my project is to develop a restoration plan for the slough in further detail. The goal is not only to restore the Damon Slough, but transform it into a functional landscape, where both humans and wildlife could be served simultaneously through a series of wetland ponds.

ACKNOWLEDGEMENTS

TO MY COMITTEE MEMBERS: Thank you for being my committee for this senior project. Deeply appreciate from the bottom of my heart for your guidance and support throughout this long process. I've learned alot from you, Emily Schlickman, Joseph Ditomaso, and Donald Strong.

TO MY PROFESSORS: Thank you for teaching me all the different design concepts and materials in the last four years. This has helped me discovering my true interest and motivation of Landscape Architecture.

TO MY FAMILY: Thank you for providing me supports throughout the years and college life in Davis.

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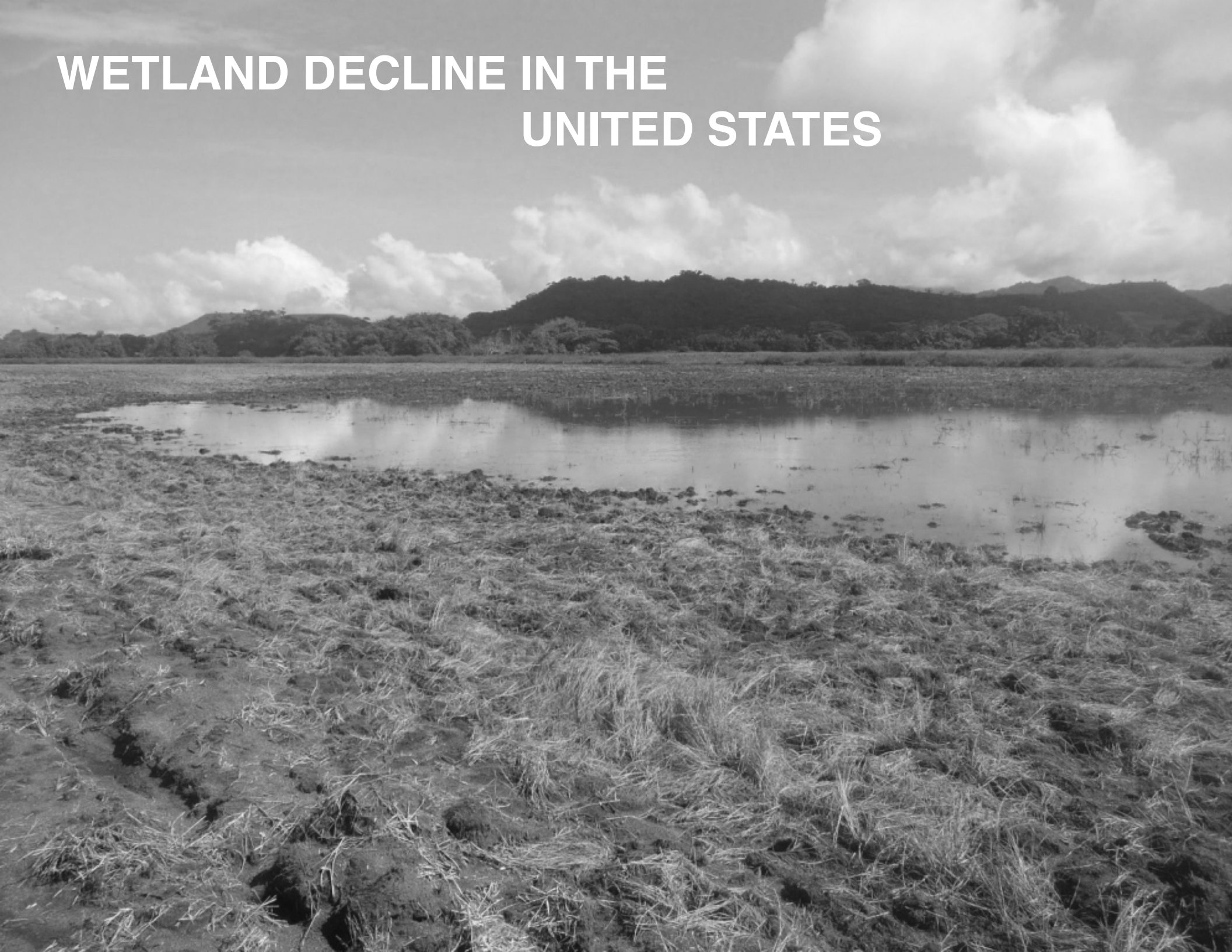
WETLAND DECLINE IN THE UNITED STATES



Within the past several centuries, wetlands have declined severely and dramatically in the United States. Since 1780, over twenty-two states have lost at least 50 percent of their original wetlands (Figure 1.2). In California, over ninety-one percent of historical wetlands have been either modified or degraded due to land conversion for urbanized development and agricultural usages. As a consequence of wetland decline, many wildlife species are heading toward endangerment and extinction. Thousands of species have lost their habitats and struggled for survival, resulting in an unbalanced ecosystem. In San Francisco Bay, water quality has been degraded because there are fewer functioning wetlands for runoff purification. Meanwhile, the amount of trash discharged into the Bay has increased as well. This impact has degraded the wetland aesthetics regionally and locally. It was only in recent decades that public awareness has increased about wetland decline. Many environmental organizations then have begun implementing restoration projects in the Bay.

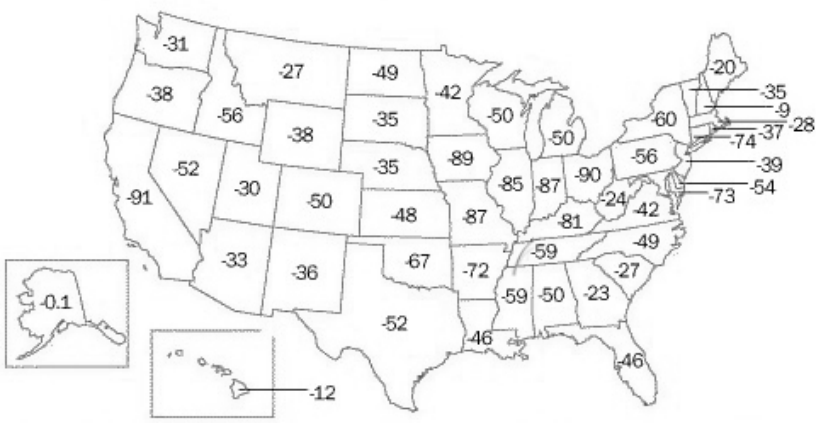


Figure 1.2

Percentage of Wetlands Acreage Lost, 1780's - 1980's
Source: Mitsch and Gosselink. Wetlands. 2nd Edition, Van Nostrand Reinhold, 1993.

WHAT IS A WETLAND?

2. Wetland

2.1 Definition

According to the US Army Corps of Engineers and the US Environmental Protection Agency, wetlands are defined as “areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions” (Recognizing Wetlands).

In the United States, wetlands generally fall into four categories—swamps, marshes, bogs, and fens. Subtypes include mangrove, carr, pocosin, and varzea. While there are different categories of wetlands, three characteristics are commonly evaluated to determine a land as a wetland. The three characteristics are vegetation, soil, and hydrology. Vegetation that occurs in wetlands is known as hydrophytic vegetation. It includes, for example, cattails, bulrushes, cordgrass, bald cypress, willows, sedges, and etc. This type of vegetation is unique in wetlands because it survives in hydric soils, which “were developed in conditions where the soil oxygen is limited by the presence of saturated soil for long periods during the growing season” (Recognizing Wetlands). In addition, hydrology plays an important role in wetlands because the presence of water at or above the soil surface for a sufficient period of the year is significant in influencing the plant types and soils in wetlands. Water in wetlands could be saltwater, freshwater, and brackish depending on the location.

2.2 Benefits

Wetlands provide many beneficial services for the environment and for people. They purify and store water, reduce flood risks, and provide habitats for fish and wildlife. Additionally, they provide recreational opportunities, aesthetic benefits, and educational research for human uses.

Wetlands function like natural sponges. They absorb and retain water in the soil, and slowly release it back into nature. This natural process not only slows down water runoff and erosive potential, but also reduces flood heights. Thus, wetland restoration could reduce the economic costs of property damage and loss of life that result from flooding. According to studies, wetlands produce $4,650 per acre in flood control and dredging cost savings compared to engineered dams, reservoirs and channels (Save The Bay). In addition, when polluted water flows through wetlands, the pollutants can be purified naturally by the plants. This process of filtration makes wetlands uniquely functional. Most importantly, “wetlands are some of the most biologically productive natural ecosystems in the world” (EPA, 2001). The plant diversity and water in wetlands could provide many suitable habitats for different fish and wildlife. As a result, all these benefits from wetlands impart unique values in the landscape.

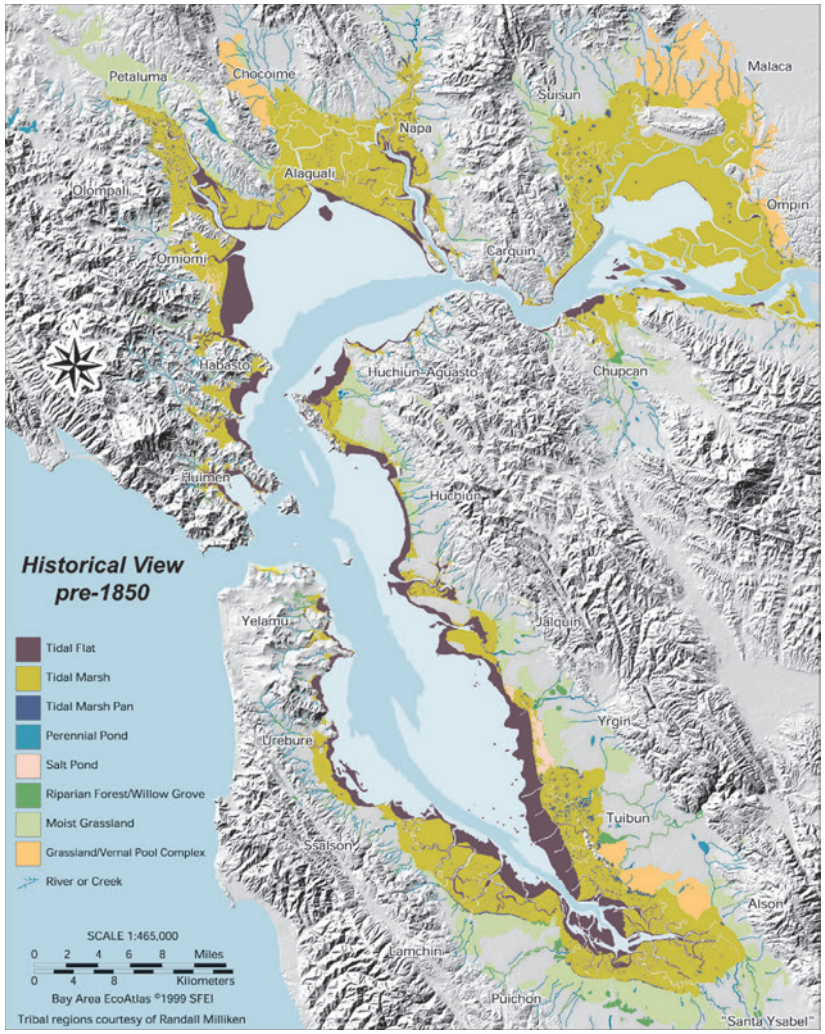


Figure 2.2

Distribution of Bayland Habitat Pre-1850

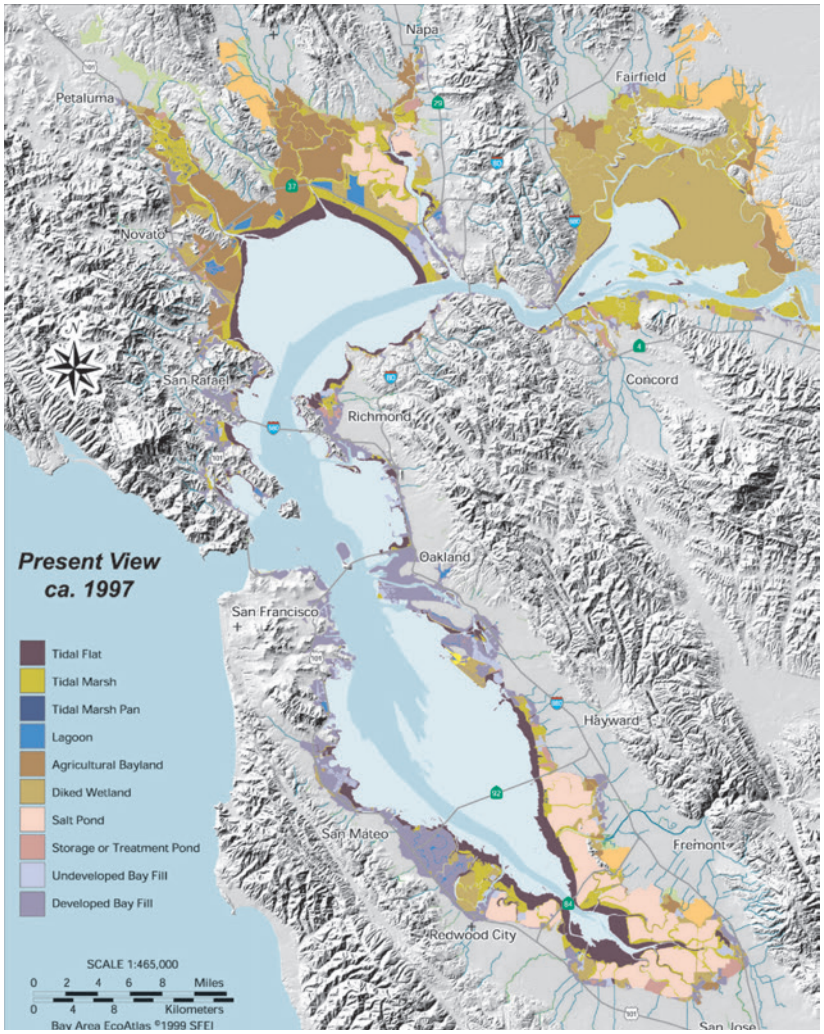


Figure 2.3

Distribution of Bayland Habitat in 1997

Source: Habitat Goals Project (1999)

2.3 History

Although wetlands are considered valuable in the United States today because they provide numerous benefits, they were valued differently in the past. During the 1700s, wetlands were regarded as swampy lands that bred diseases, restricted overland travel, impeded the production of food and fiber, and generally were not useful for frontier survival (Dahl and Allord). The environmental value of wetlands has been one of the triggers for tremendous wetland conversion in the U.S. Meanwhile, as population growth has been increasing, the demands for urbanized development and agriculture have increased. With all these factors, land developers have converted many wetlands to other uses, disregarding the environmental consequences.

Since 1860, California has become one of the states with notable wetland loss (Dahl and Allord). Between the 1780s to mid-1980s, more than 85 percent of wetlands have been lost in CA. One of the most notable projects that affected California's wetlands was the Central Valley Project (See Figure 2.4). By the 1920s, about 70 percent of the original wetland acreage had been modified by levees, drainage, and water-diversion projects (Frayer and others, 1989). Also, large-scale flood control projects, diversion dams, and water-control structures resulted in wetland modification as well.

Wetland loss has been apparent in the San Francisco Bay since the late 1800s. Before the mid-1800s, the Bay was ringed by roughly 190,000 acres of tidal marshes, 50,000 acres of tidal flats, 85,000 acres of seasonal wetlands and associated uplands (including vernal pools), and over 69,000 acres of riparian habitat (Restoring the Estuary). However, only 40,000 acres of tidal marsh remains today. The rest was filled for urban development or federal and state projects, or diked for salt production or

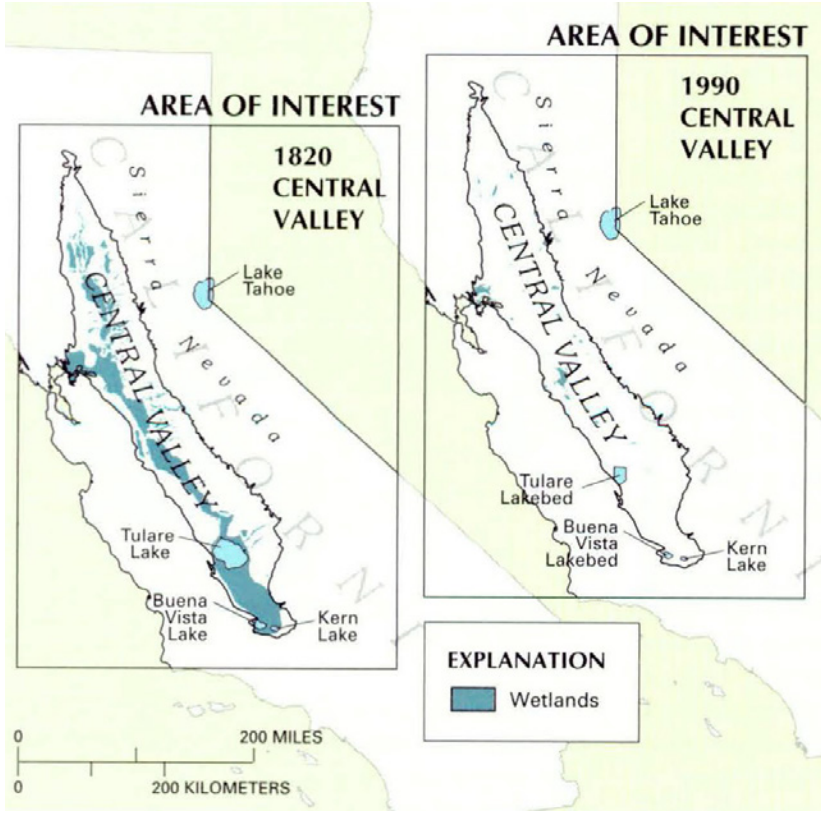


Figure 2.4

Wetlands of the Central Valley of California, circa 1820 (left) and 1990 (right). Source: U.S. Fish and Wildlife Service, Status and Trends,unpub. data, 1994.

agriculture.

Although wetlands have been destroyed and degraded historically, public awareness of wetlands has increased as educational studies have shown their value and function to our environment. Many new policies and laws have been implemented to eliminate the destruction of wetlands. While construction projects on wetlands have been abandoned tremendously, many restoration projects have increased. Different environmental groups have successfully completed restoration projects.

OAKLAND COLISEUM AREA SPECIFIC PLAN

3. Oakland Coliseum Area Specific Plan

3.1 Project Description

The city of Oakland is currently working on an on-going development plan called the Coliseum Area Specific Plan. The purpose of the Plan is intended “to provide both a short-term development plan for the accommodation of up to three new venues for the City’s professional sports teams, and a longer term, 25-year planning document providing a roadmap for land use policy, regulatory requirements and public and private investment that coordinates future development in the Coliseum Area to create significant long-term value for Oakland and Alameda County” (Coliseum Area Specific Plan NOP, 2013). Transforming the underdeveloped land around the Oakland-Alameda County Coliseum site and its surrounding areas into a long-term development district, will boast a dynamic and active urban setting with retail, entertainment, arts, culture, live and work uses. In addition, it will bring in a new job base, increase critical new tax revenue, and establish significant new community value for the residents of the city (Coliseum Area Specific Plan NOP, 2013).

3.2 Key Objectives of the OCASP

• Retain the existing sports teams, and maximize the economic value for Oakland and Alameda County from these sports facilities.

• Create a regionally significant Science and Technology District that can act as a catalyst to expand Oakland's ability to attract new businesses and to participate in the Bay Area's dynamic 'innovation economy'.

• Create a vibrant urban mixed-use district in the Coliseum Area which will attract a significant community of new residential and commercial uses. This district will generate activated streets, public spaces that provide an enhanced pedestrian experience, site security and high quality development.

• Create new open space, Bay access, and natural habitat enhancement, providing public educational and Bay accessibility opportunities for Oakland and Bay Area residents.

• Leverage and enhance the existing transit and transportation infrastructure in the Coliseum Area, and create a model transit-oriented development (TOD) which is consistent with regional growth policies and state law as provided for under SB 375 and AB 32. Such transit-oriented development will increase Oakland's ability to leverage its central position in the Bay Area to capture a bigger share of regional housing growth, job growth and economic investment.

(Source: Coliseum Area Specific Plan NOP, 2013)

3.3 Project Location

Figure 3.2

Project Location Map

The Specific Plan is located in East Oakland, the center of the Bay Area. It is bounded by 66th Avenue to the north, San Leandro Street on the east, Hegenberger Road on the south, and San Leandro Bay and the Oakland International Airport to the west. It covers an area of approximately 800 acres, including the Oakland Alameda County Coliseum and Arena and the Oakland Airport Edgewater Business Park. In addition, the area covers some of the Bay Area's most valuable core development assets. More importantly, the area is served by various transit systems, including the Coliseum BART station, Amtrak station, Oakland International Airport, and two I-880 freeway interchanges. With such regional transit infrastructure, it is envisioned as a regional hub for the Bay Area.

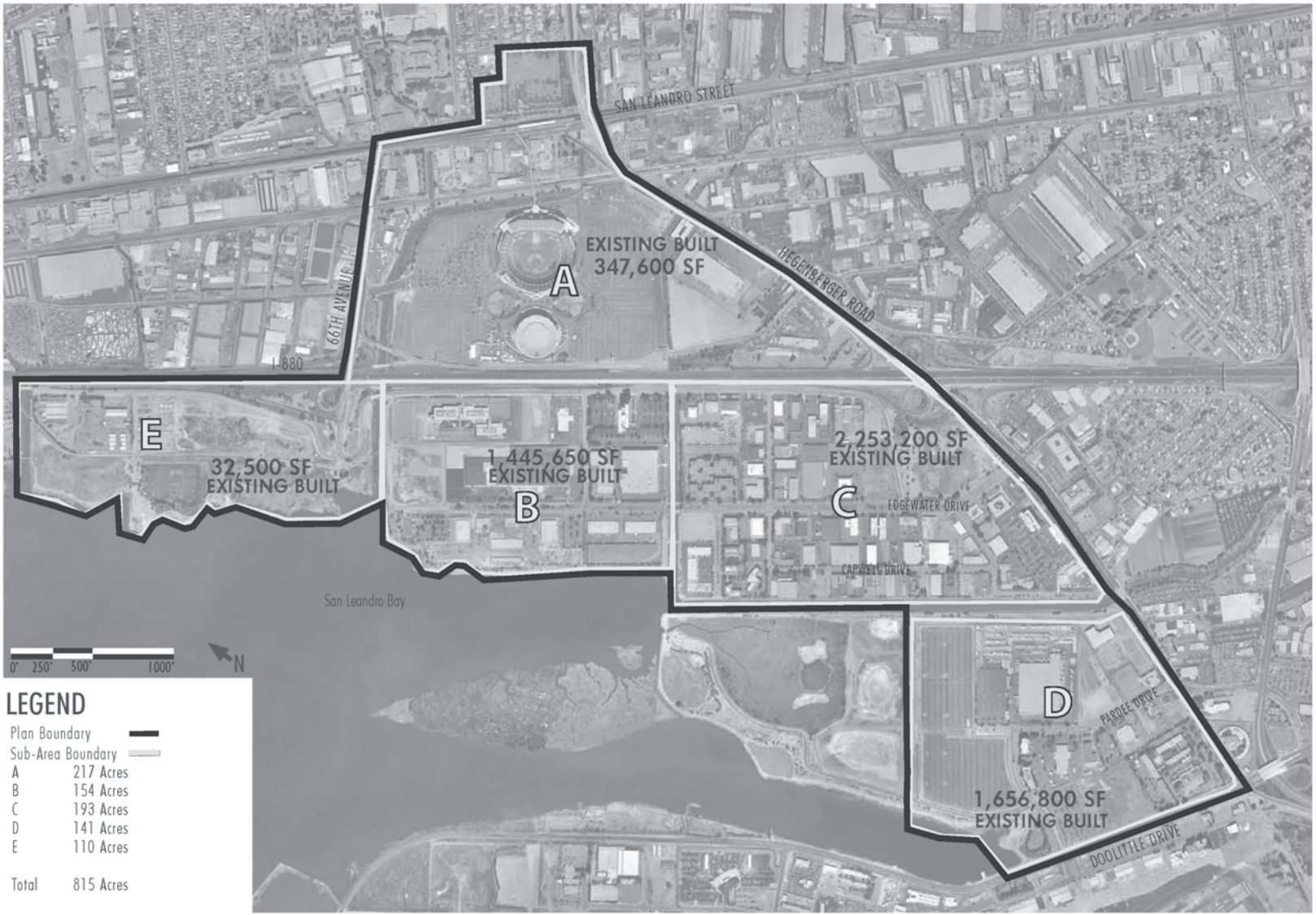


Figure 3.3
Sub-Area Map
Source: Department of Planning and Building, City of Oakland

3.4 Existing Conditions

In order to prepare development concepts for the Specific Plan, the area has been divided into five distinct Sub-Areas, A, B, C, D, and E (See Figure 3.3). Sub-Area A, approximately 230 acres, primarily consists of the Coliseum site, City-owned land, and private properties. In addition, it includes approximately 348,000 square feet of primarily light industrial, office and government/utility building space. Sub-Area B, approximately 120 acres, covers the northerly portion of the Oakland Airport Edgewater Business Park, south of Damon Slough and Elmhurst Slough. It also contains approximately 1.45 million square feet of light industrial and office space. Sub-Area C, approximately 190 acres, includes the southerly portion of the Oakland Airport Edgewater Business Park, southerly of Elmhurst Slough and north of Hegenberger Road. Building space is mainly used for offices, light industrial, and auto-oriented buildings. Sub-Area D, approximately 140 acres, covers the most westerly portion of the Oakland Airport Edgewater Business Park. It is mainly used for businesses, light industrial, hotel, and retail/restaurants. Sub-Area E, approximately 120 acres, consists of largely undeveloped open space. About half of the area is owned and used by the East Bay Municipal Utility District and the remaining parcels are owned by the City of Oakland.

(Source: Coliseum Area Specific Plan NOP, 2013)

3.5 Master Plan by JRDV Urban International

In March of 2012, the Oakland City Council entered into an Exclusive Negotiating Agreement (ENA) with a team of urban designers, architects and developers led by the Oakland-based firm of JRDV Urban International (Coliseum Area Specific Plan NOP, 2013). Within the last two years planning has progressed, including technical work, consultation with the City and numerous other public agencies, and detailed design development. Today, a proposed land use map and a master plan have been prepared by JRDV (See Figure 3.4 & 3.5). While it only represents one potential future scenario, it is the City's preferred development vision for the area. Additional investigation is required for the feasibility of both public and private financing options because the Master Plan does not yet represent any commitments of either private or public finances.

(Source: Coliseum Area Specific Plan NOP, 2013)

Figure 3.4
Proposed Land Use Map
Source: Department of Planning and Building,
City of Oakland

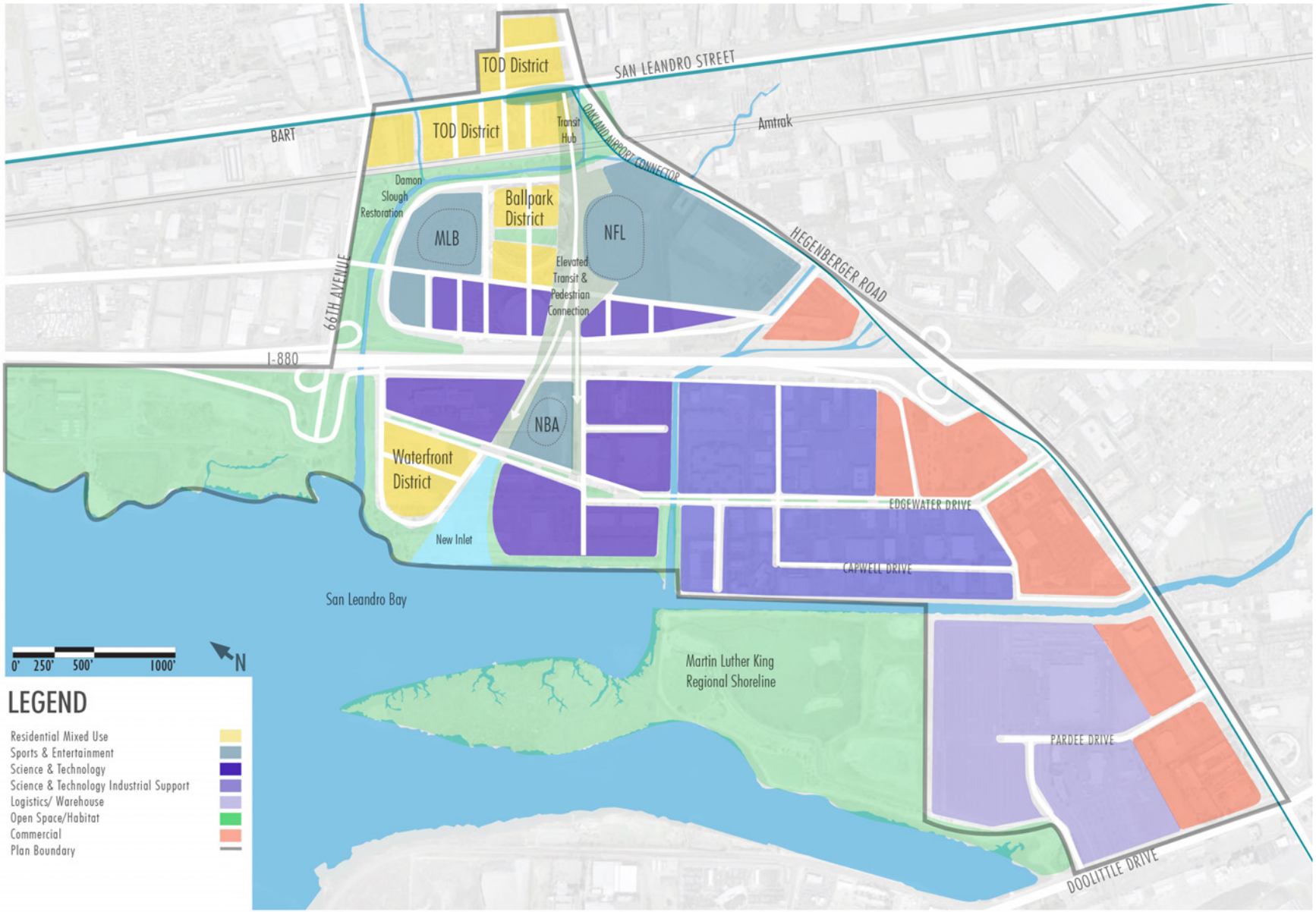


Figure 3.5
Master Plan
Source: JRDV Urban International

Figure 3.6
Birdseye Perspective at Waterfront
Source: JRDV Urban International

Figure 3.7
Birdseye Perspective at TOD District
Source: JRDV Urban International

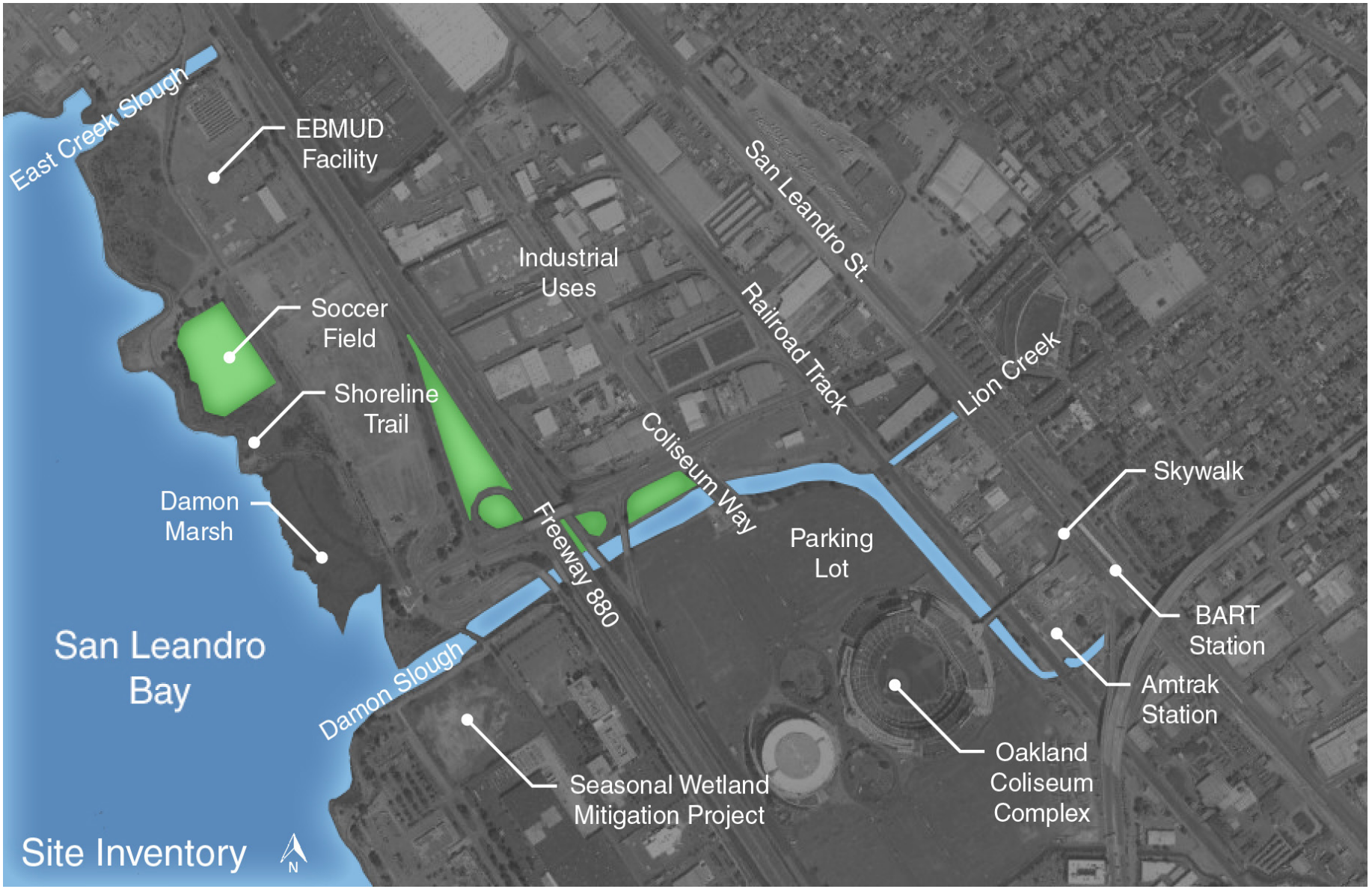


Figure 4.1
Site Inventory

4. Damon Slough of Oakland

4.1 Selection of Design Location

One of the reasons I selected Damon Slough in Oakland as the location of my senior project is because the City of Oakland has already been working on the Coliseum Area Specific Plan. In Sub-Area A, the Master Plan proposes to restore and rehabilitate the Damon Slough—transforming it into a functional tidal habitat that helps revive the natural health of the Bay. It is envisioned that this restored open space and habitat area has the potential to become a unique educational resource focused on natural Bay ecology, accessible to the approximately 10 million visitors expected to come to this regional destination every year (Coliseum Area Specific Plan NOP, 2013). However, while the Master Plan has done lots of detailed planning on the Coliseum entertainment district, high-density communities, and mixed-used transit district, it has neglected the restoration of the Damon Slough. Thus, it is a great opportunity to take the Master Plan as guidance and design the Damon Slough Restoration in further detail.

Another reason I chose the slough is because its water quality has been degraded with various metallic contaminants and trash. Currently, the slough has been named as one of the Bay Area's top five most littered waterways by Save The Bay—the largest regional organization working to protect, restore and celebrate San Francisco Bay (Hart, 2012). Because the water of the slough is flowing downstream from the local communities to the east, it accumulates an excessive quantity of trash year-round. This issue has caught local environmentalists' attention and spurred occasional voluntary cleanups.

4.2 Slough Description

Damon Slough is an approximately one-mile long engineered channel located in between the northern edge of Oakland Coliseum's parking lot and 66th Avenue (See Figure 4.1). It connects with Arroyo Viejo Creek and Lion Creek on the East and meets with San Leandro Bay on the West. While the slough is now part of the Martin Luther King Jr. Regional Shoreline, it intersects with multiple engineered infrastructures, including Coliseum Way, freeway I-880, and a pedestrian bridge. Areas along the slough are primarily covered with concrete pavement and used for light industrial, making the slough less environmentally friendly.

4.3 Site Analysis

Damon Slough Watershed

Saltwater from the Pacific Ocean mixes with freshwater from the Arroyo Viejo and Lion Creeks, creating a mini-estuary within the slough. Brackish water of the slough provides a very important habitat to many specialized birds, fish, and plants. In addition, Damon Slough is the draining destination of several residential communities to the east, including the 73rd Avenue Branch, Hillsmont Branch, Rifle Range Branch, Melrose Highlands Branch, and County Club Branch. All runoff within the watershed is affecting the water quality of the slough and San Leandro Bay.

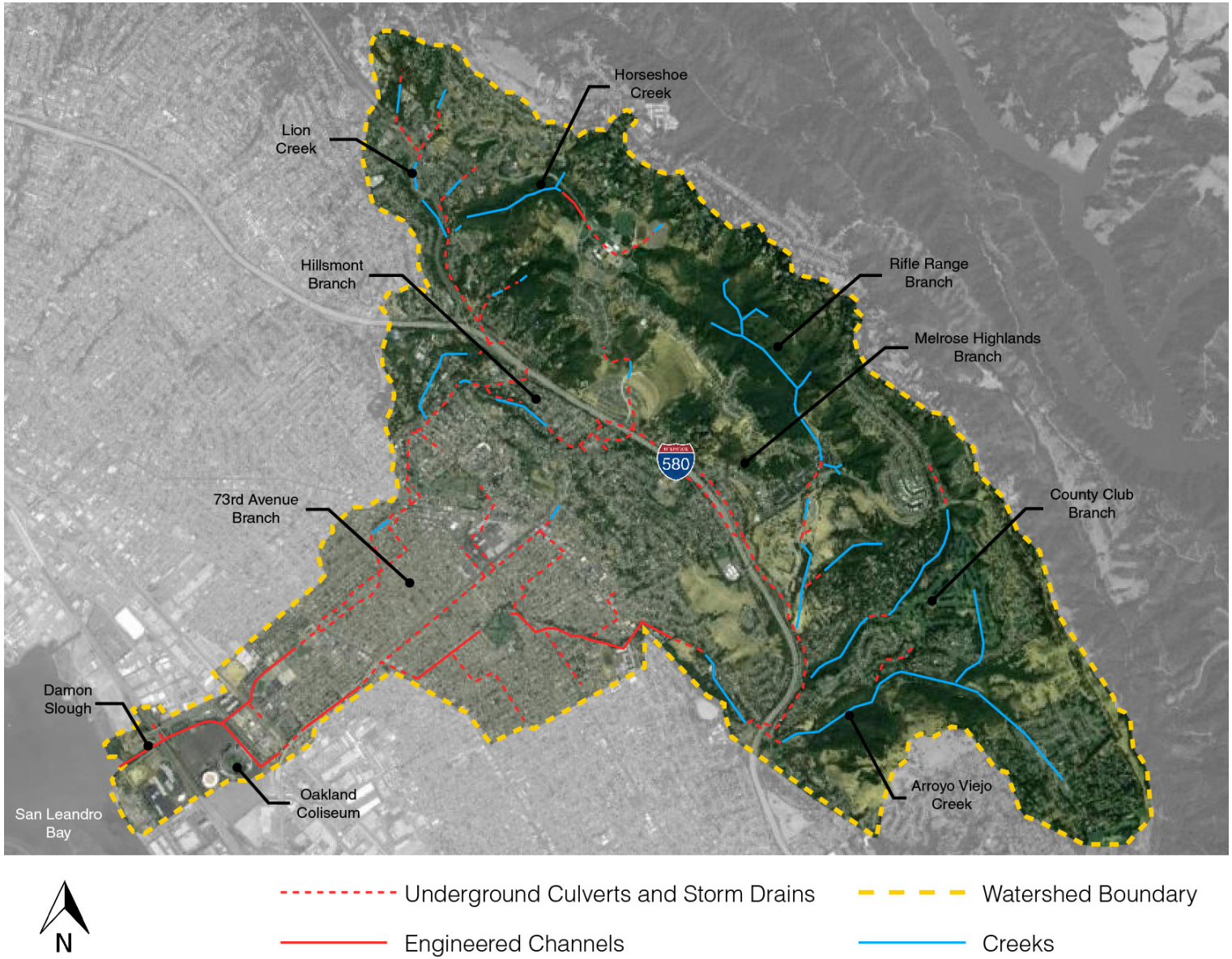


Figure 4.2
Damon Slough Watershed
Source: Oakland Museum of California

100 Year Floodplain

In a 100 year flood event, areas along the slough will not be affected. However, Damon Marsh at the shoreline is within the 100 year floodplain.

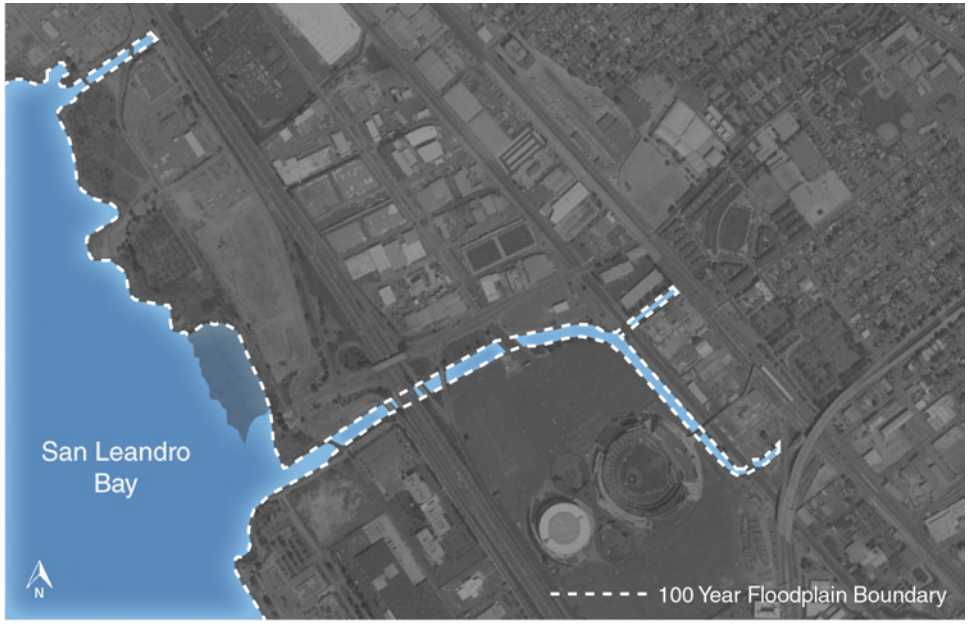


Figure 4.3
100 Year Floodplain Map
Source: Federal Emergency Management Agency

Current Circulation

Along the shoreline, there are trails for public access to the mouth of the slough. However, there is no public accessibility to the eastern part of the slough. There are no walkable paths. It is isolated by fences. Additionally, the railroad track separates the slough from the local residents who live further east.

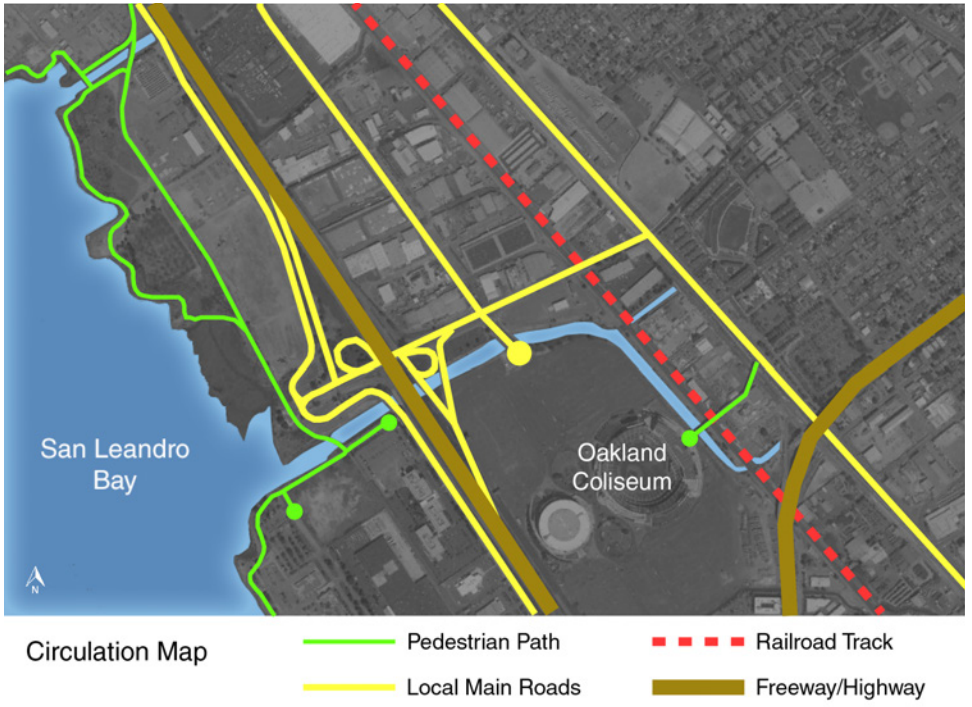


Figure 4.4
Circulation Map

Water Contamination

San Leandro Bay (SLB) is a shallow embayment in the central part of San Francisco Bay. SLB is formed by the confluence of four creek channels, and Damon Slough is one of them. With this hydrologic condition, water qualities of SLB and the slough have a close relationship. In August 1998, San Francisco Estuary Institute (SFEI) studied the sediment contamination in San Leandro Bay and its creek channels. Sixty sites were sampled for sediment, including Damon Slough. The study used the Effects Range Low (ERL) and Effects Range Median (ERM) guidelines developed by Long et al. (1995) as predictive tools to evaluate the toxic potential of sediment. The results showed that the collected samples of sediment had elevated concentrations of trace metals and organic compounds compared to background and sediment guideline levels (Daum and others, 2000). Along Damon Slough, the toxic metals found were mainly Nickel, Mercury, Copper, Lead, Arsenic, and Zinc. They were either higher than ERL or ERM.

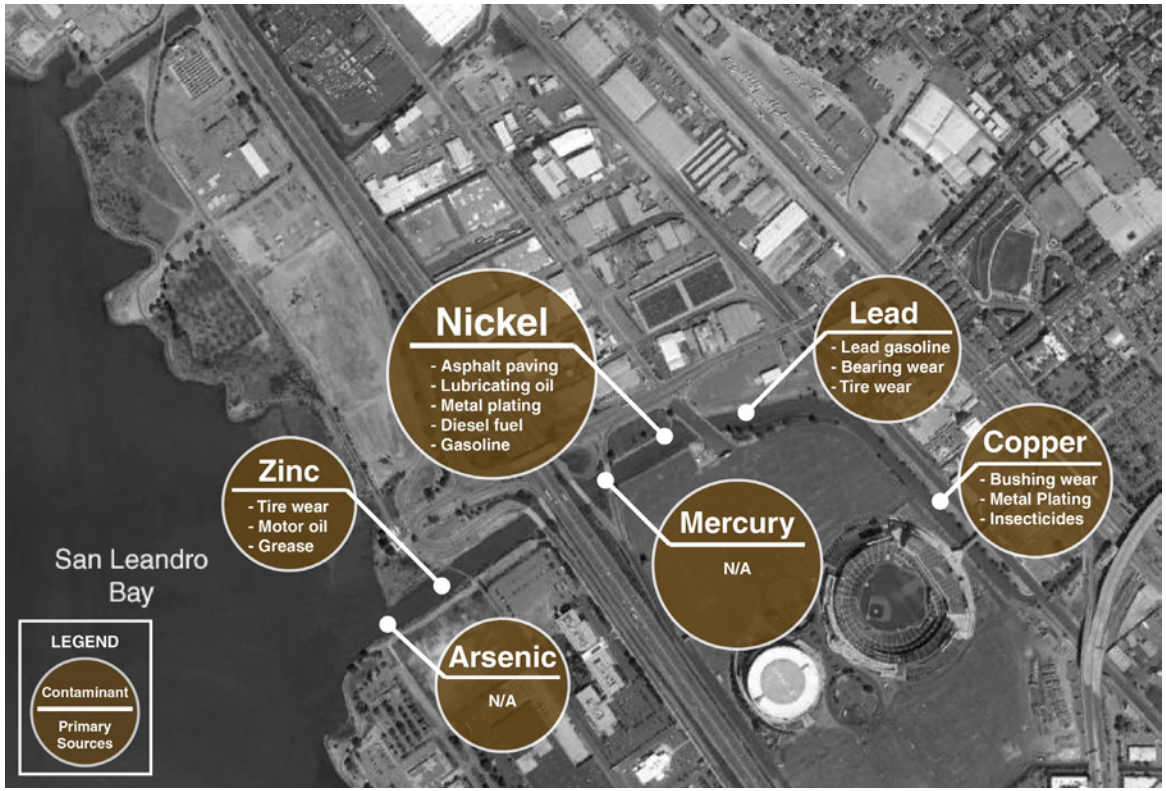


Figure 4.5
Water Contamination Map
Source: San Francisco Estuary Institute

Figure 4.6
Slough Condition near the mouth of Damon Slough

Figure 4.7
Pedestrian Bridge near the mouth of Damon Slough

Figure 4.8
Skywalk over the slough

Figure 4.9
Lion Creek

Figure 4.10
The slough is fenced-off on the Coliseum side

Figure 4.11
Railroad over the Lion Creek

Figure 4.12
Walking condition along the slough and railroad

Figure 4.13
Upper Stream of Damon Slough

RESTORATION DESIGN

5. Design

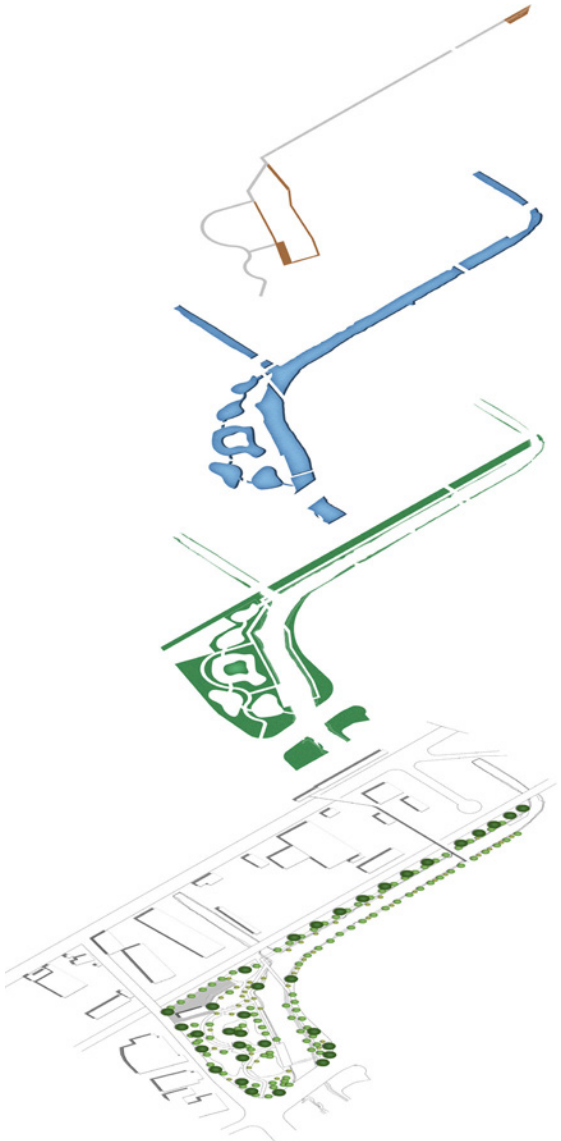


Figure 5.2
Axonometrics

5.1 Design Goals

- Restore and create habitats for wildlife species and educational resources
- Improve slough accessibility and water quality for the public
- Create a recreational activity destination to attract tourists

5.2 Design Strategies

- Use California native wetland plants
- Create a series of wetland ponds for water purification by excavating
- Construct an artificial islet by reusing the excavated materials from the wetland ponds
- Create pedestrian and bike paths along the slough

5.3 Design Boundary

While the design boundary does not encompass the whole slough, it covers the upper stream of Damon Slough. It extends from the start of the slough to Coliseum Way, including the light industrial land on the north edge.

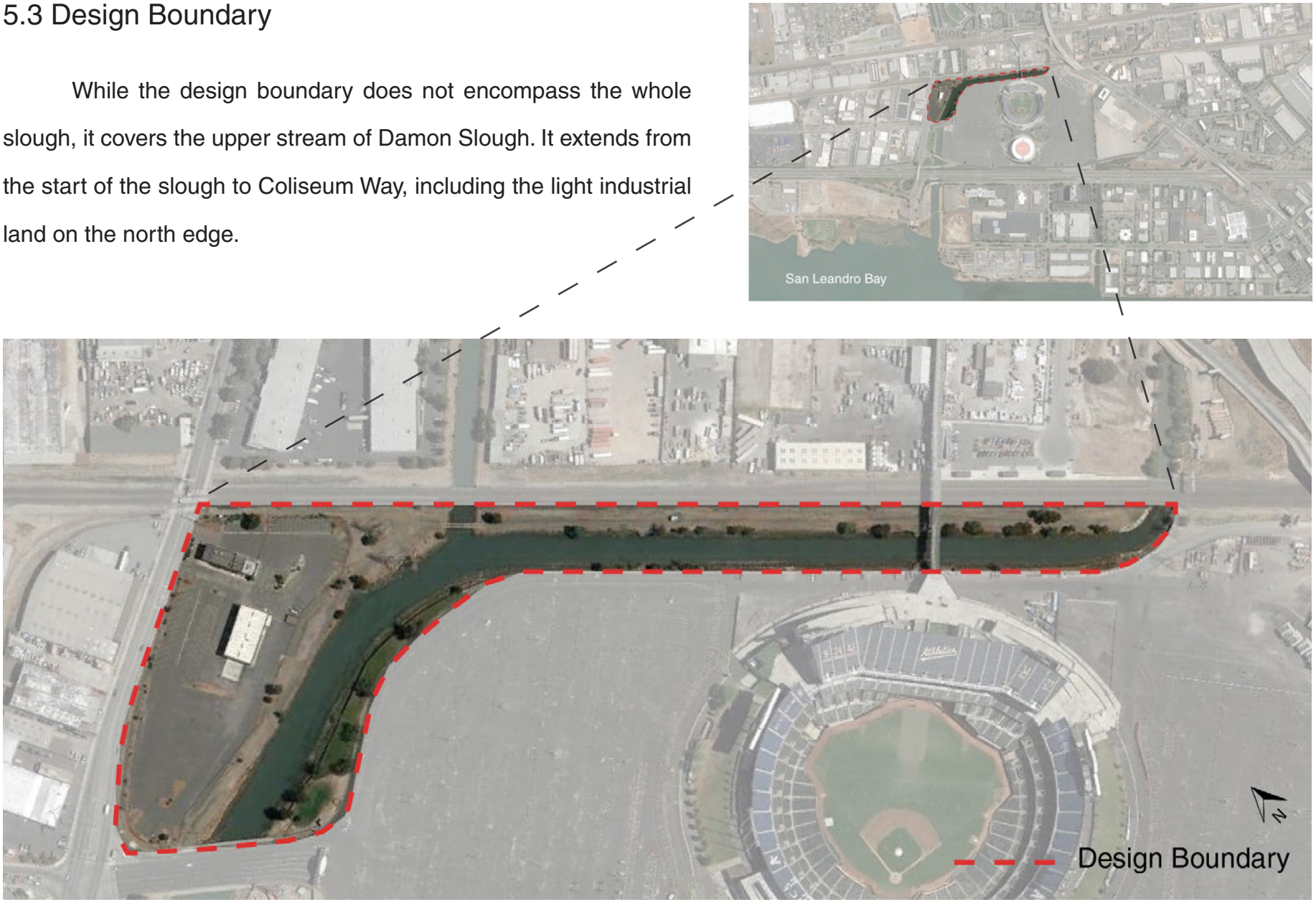


Figure 5.3
Design Boundary Map

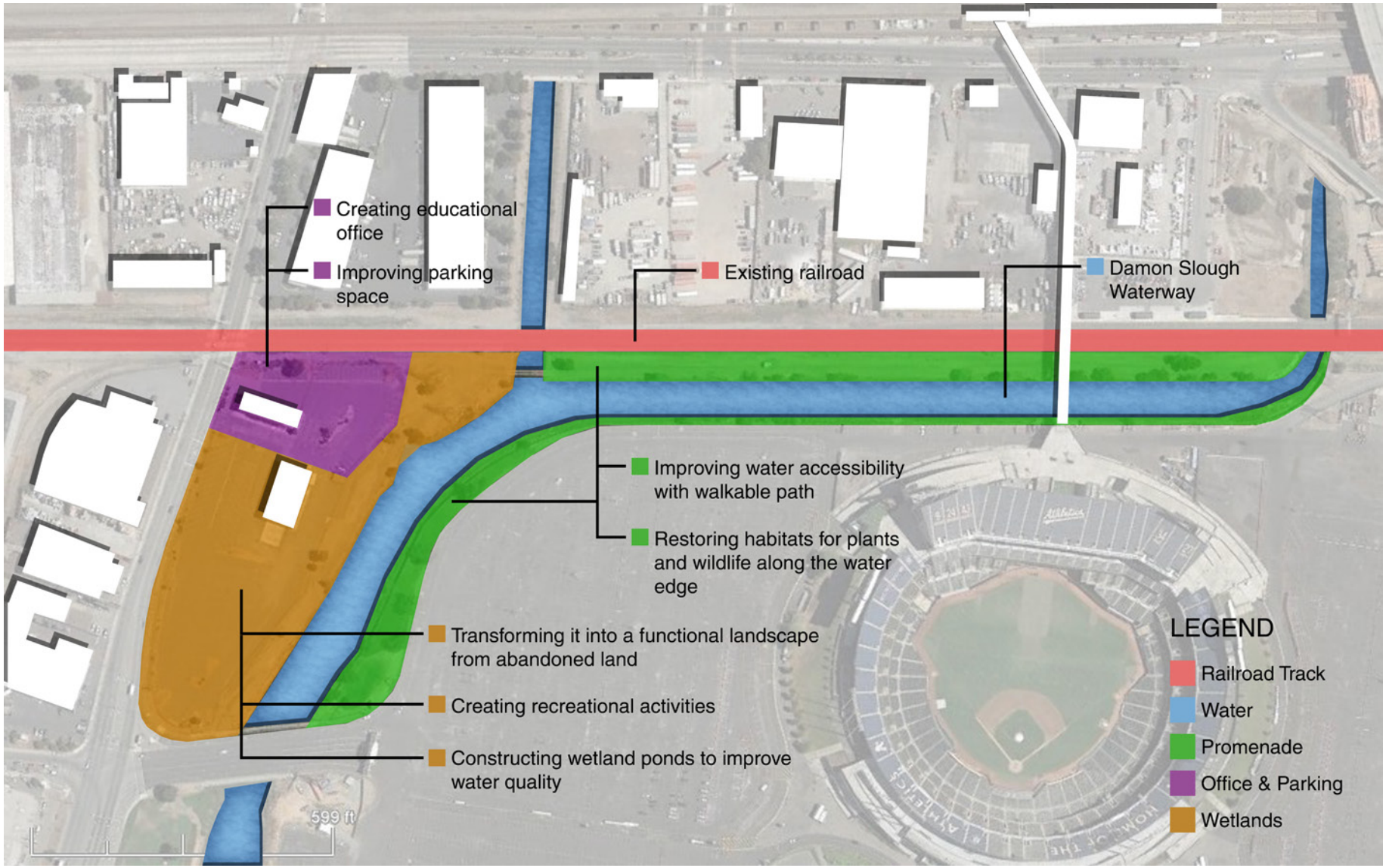


Figure 5.4
Proposed Land Use Division

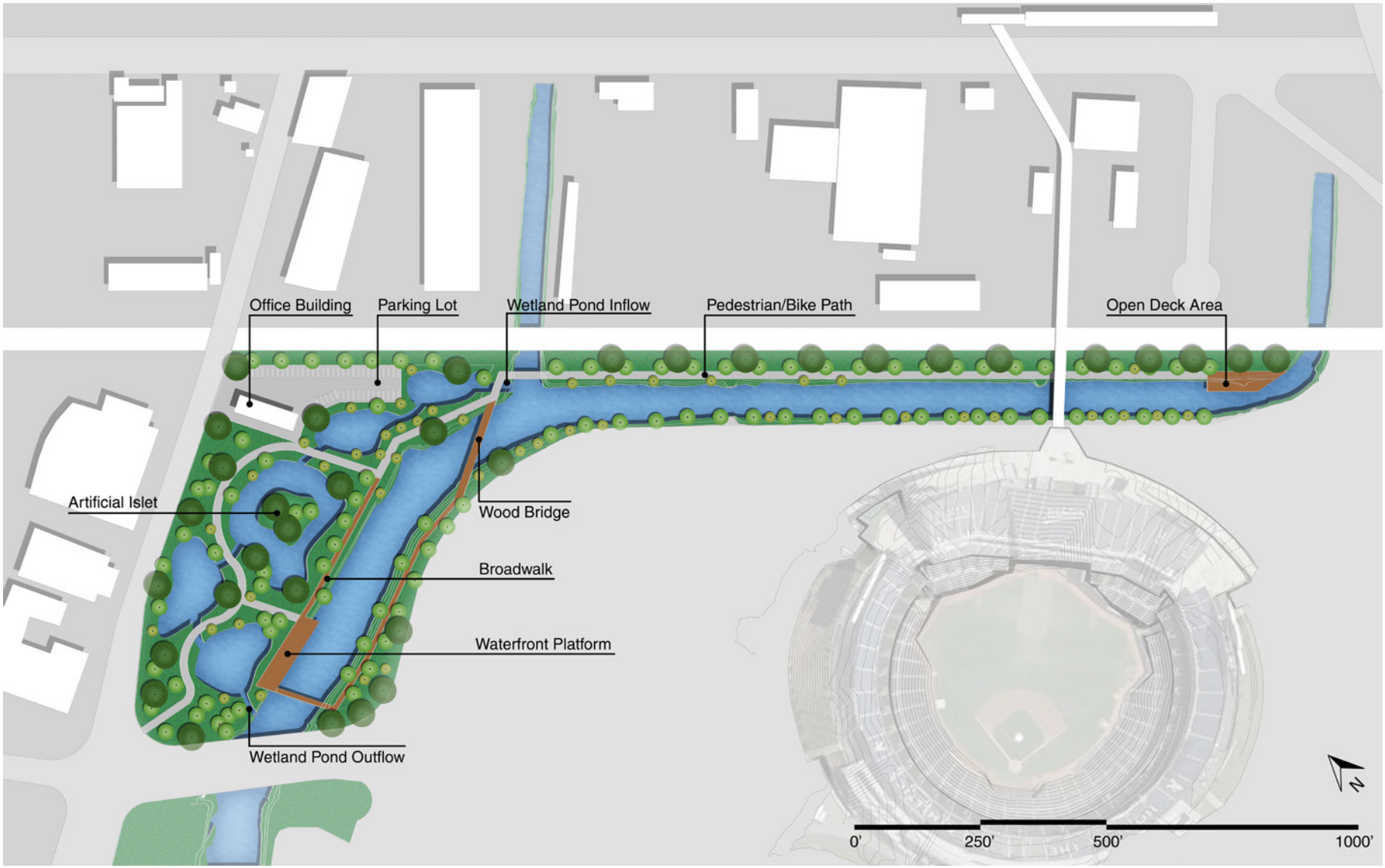


Figure 5.5
Site Design Plan

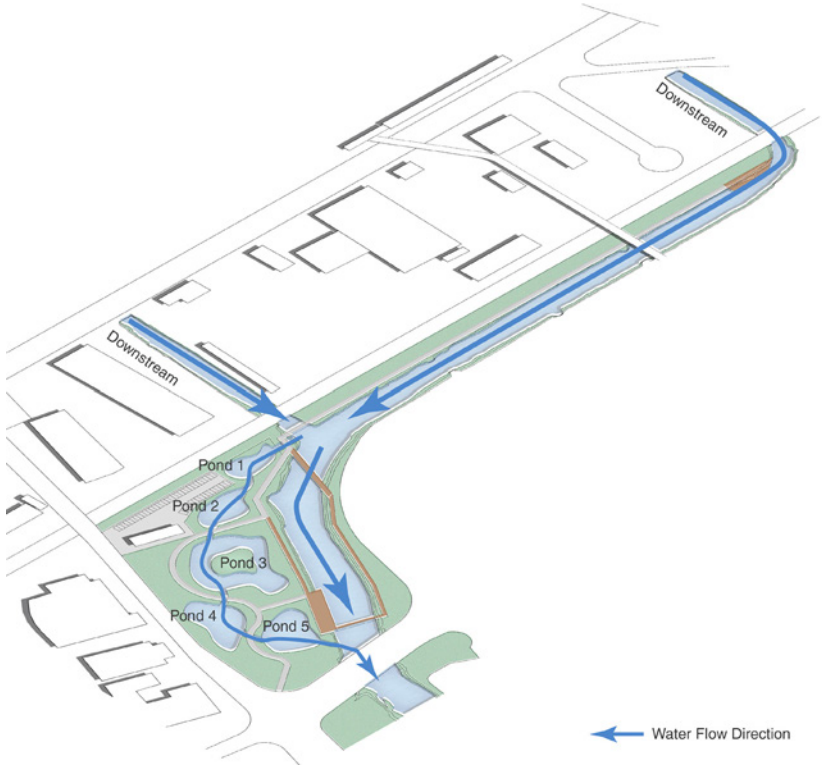


Figure 5.6
Water Flow Diagram

Figure 5.7
Programmatic Diagram

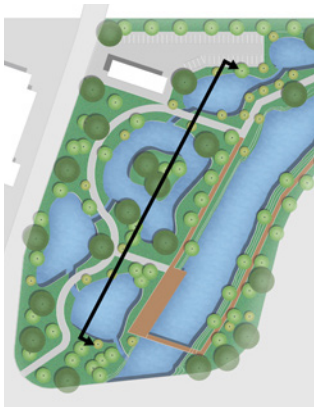
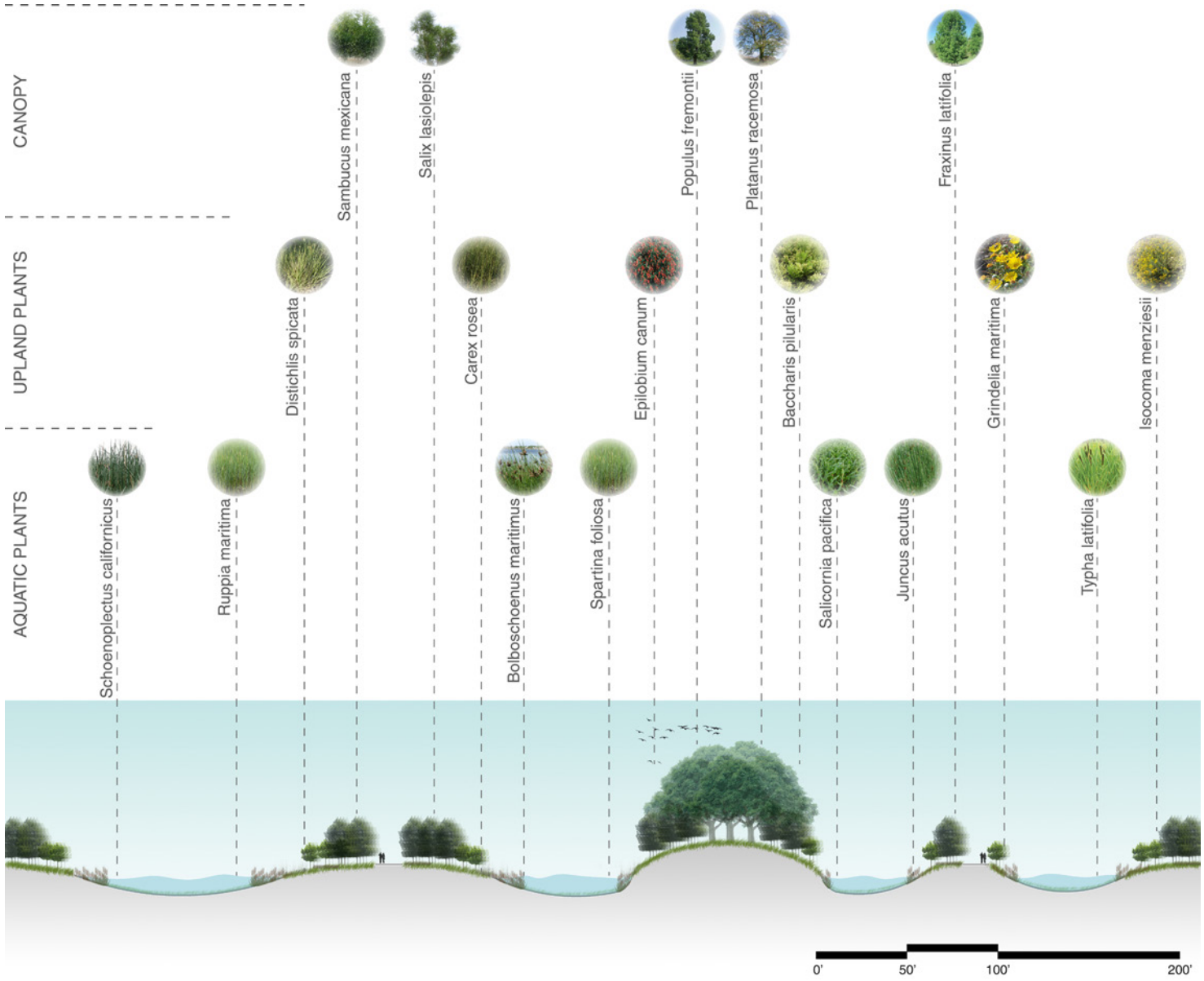
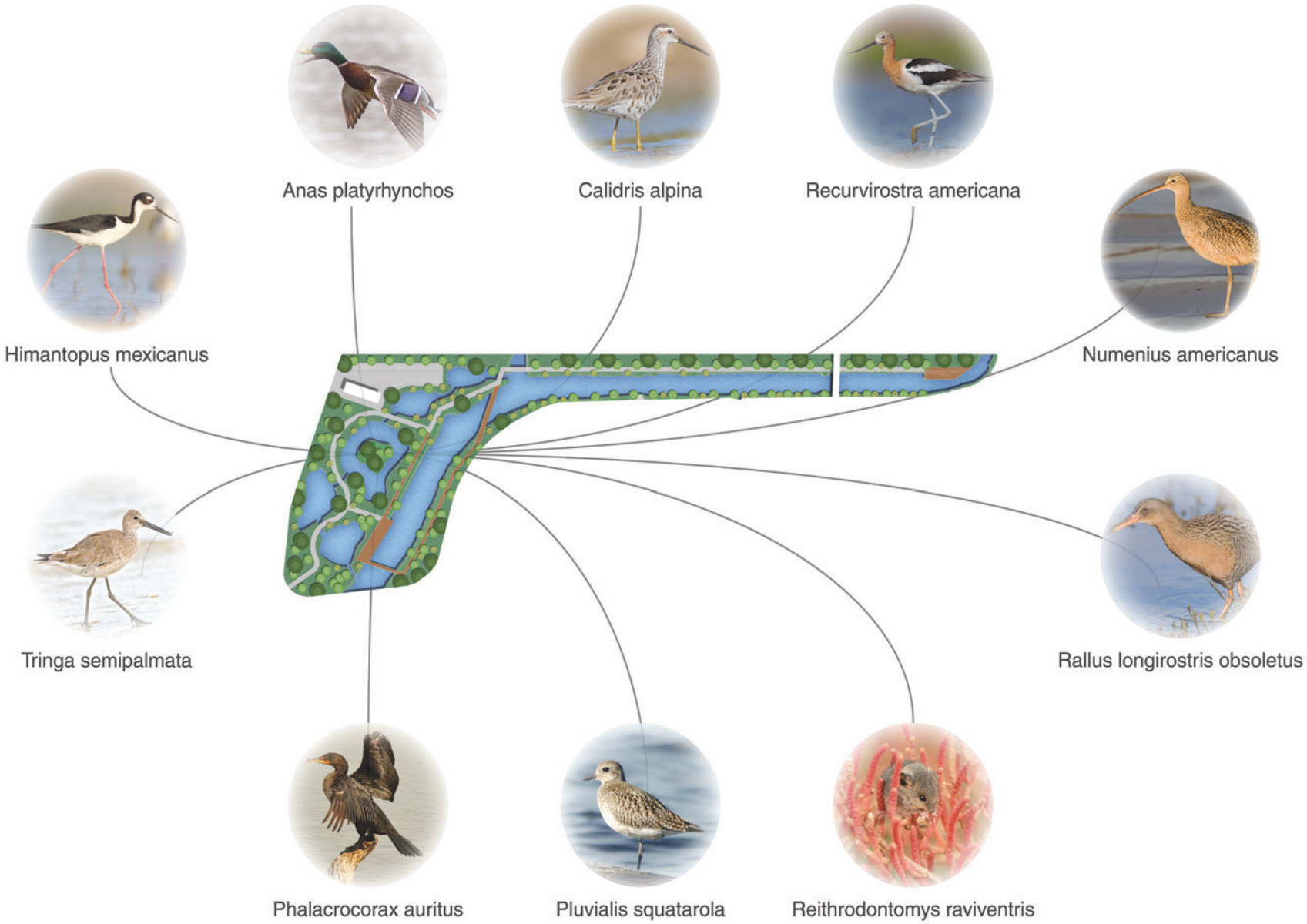


Figure 5.8
Section Cut Location



Recommended plant palette was developed based on vegetation's adaptation to brackish water in the slough.

Figure 5.9
Section with Plant Palette



Restored landscape will attract tremendous amount of various wildlife species to the design area.

Figure 5.10
Fauna Diagram

While the site design could attract various wildlife species by providing wetland habitats, it is important to create connectivity for people from the TOD District to the site and the San Leandro Bay Shoreline for recreational activities. The proposed bike paths not only could provide routes to the wetland ponds, but also to the shoreline through an elevated transit, which was proposed in the JRDV Master Plan.

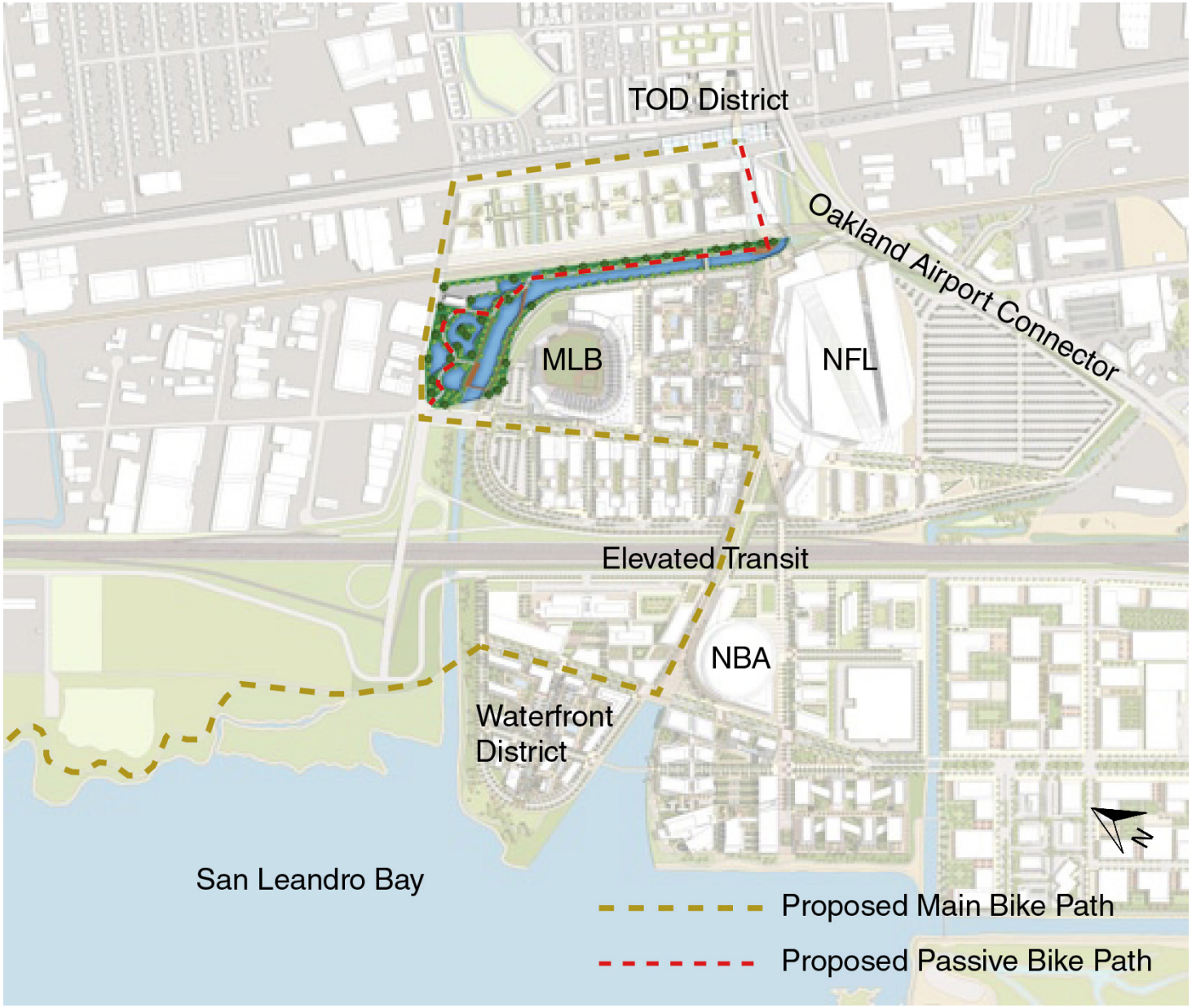


Figure 5.11
Connectivity to San Leandro Bay Shoreline

Figure 5.12
Birdseye Perspective

Figure 5.13
Perspective in between of the slough and railroad

Figure 5.14
Perspective at the Wooden Platform

Figure 5.15
Birdseye Perspective at the Artificial Islet

Figure 5.16
Perspective along the Wetland Ponds

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