GHD

bayshorebikeway
RESILIENCY PROJECT

Final Feasibility Study

February 3, 2023

Prepared for:
Nexus Planning & Research

On behalf of:
The City of Imperial Beach

Executive Summary

This Feasibility Study (Study) assesses the feasibility of retrofitting a 1.2-mile segment of the Bayshore Bikeway into a multi-benefit community flood protection and ecosystem resilience corridor in the City of Imperial Beach. This segment of the City experiences coastal and stormwater flooding today, which episodically impacts the Bayside Community and Elementary School. Previous City-led coastal flooding vulnerability assessments identified that sea level rise threatens to dramatically increase the frequency and severity of flooding in this area. Increased water levels in the San Diego Bay will also threaten to drown marsh fringe habitat due to the steep slopes that exist along the shoreline in this area.

The Bayshore Bikeway Resiliency Project (Project) proposes to develop a living or ecotone levee system that will provide coastal flood protection to these areas while providing adequate space and slopes for wetland habitats to transgress (i.e., move upslope) as sea levels rise. The Project also opportunistically includes a number of ancillary improvements to the Bikeway and surrounding environment including: 1) public access, safety and usability improvements to the Bikeway; 2) improvements to stormwater infrastructure to reduce nuisance flooding in the Bayside community; 3) creation of a multi-purpose detention basin with a joint-use park (school / City Park, and 4) relieving the tidal muting in Pond 10A as a result of the Bikeway. The Project is designed to be resilient to 3.5 feet of sea level rise, with ability to adapt to higher rates in the future, consistent with the State of California Ocean Protection Councils target.

Three alternatives were developed to address the Projects goals and objectives, which included the following:

- Alternative 1 - “Elevate in Place”: Alternative 1 utilizes the existing developed Bikeway footprint across the entire Project area to construct the living levee. This alternative would result in the least amount of change to the Bikeway corridor and would not relieve the tidal muting in Pond 10A. This alternative was the least expensive option and was estimated to cost $11.2 million to construct.
- Alternative 2 – “Replace with Bridge”: Alternative 2 would partially realign the Bikeway in the east end to relieve a safety concern (blind corner) and would construct an elevated bridge across Ponds 10/10A to relieve the tidal muting in Pond 10A. The existing Bikeway and dike through Pond 10A area would be demolished and restored with native habitats and a new tidal channel would be constructed to restore the tidal hydraulics to Pond 10A. A living levee would be constructed along the Flamingo Trail alignment to provide flood protection to a low-lying portion of the Bayside Community, which becomes vulnerable to coastal flooding with the removal of tidal muting in Pond 10A. This alternative is the most expensive option due to inclusion of the raised bridge and was estimated to cost $33.7 million to construct.
- Alternative 3 – “Remove and Reroute”: Alternative 3 would reroute the Bikeway around the perimeter of Pond 10A along the existing Flamingo trail and then run parallel to State Route 75 – signifying the most significant change to the existing conditions. The existing Bikeway and dike would be demolished, habitats would be restored, and a new channel would be created to improve tidal hydraulics to Pond 10A. Pond 10A, in this option, would be reconnected to the Bay without bisection (via dike or bridge) as would occur in Alternatives 1 and 2. Because of the reconnection, this alternative provides the greatest ecological benefits; however, rerouting the Bikeway around Pond 10A would be increase the Bikeway length and limit public access to the Bay to the only edges in this area. Similar to Alternative 2, Alternative 3 would realign a portion of the Bikeway along the Bayside Elementary School to improve safety and potentially restore Bay habitat. This alternative is the second most expensive option and was estimated to cost $21.7 million to construct.

A multi-criteria analysis of the alternatives was conducted to analyse each alternative against a range of criteria that reflects the multiple goals and objectives of the Project. Alternatives were evaluated against the following criteria: Coastal Hazards, Public Access and Safety, Consistency with Public Vision, Habitat Enhancement, and Regulatory and Financial Considerations. Based on this analysis, the highest-ranking alternative was Alternative 3 “Remove and Reroute”. Alternative 2 “Replace with Bridge” was the second highest scoring alternative and could still be a viable alternative should financial considerations not be a substantial constraint.

Preliminary engineering design (30 percent design) of Alternative 3 was developed at the completion this Project phase. Next steps for the Project include progression to, and completion of, the final engineering design and environmental compliance (i.e., CEQA/NEPA and permits). The next phase of work should take approximately two years to complete.

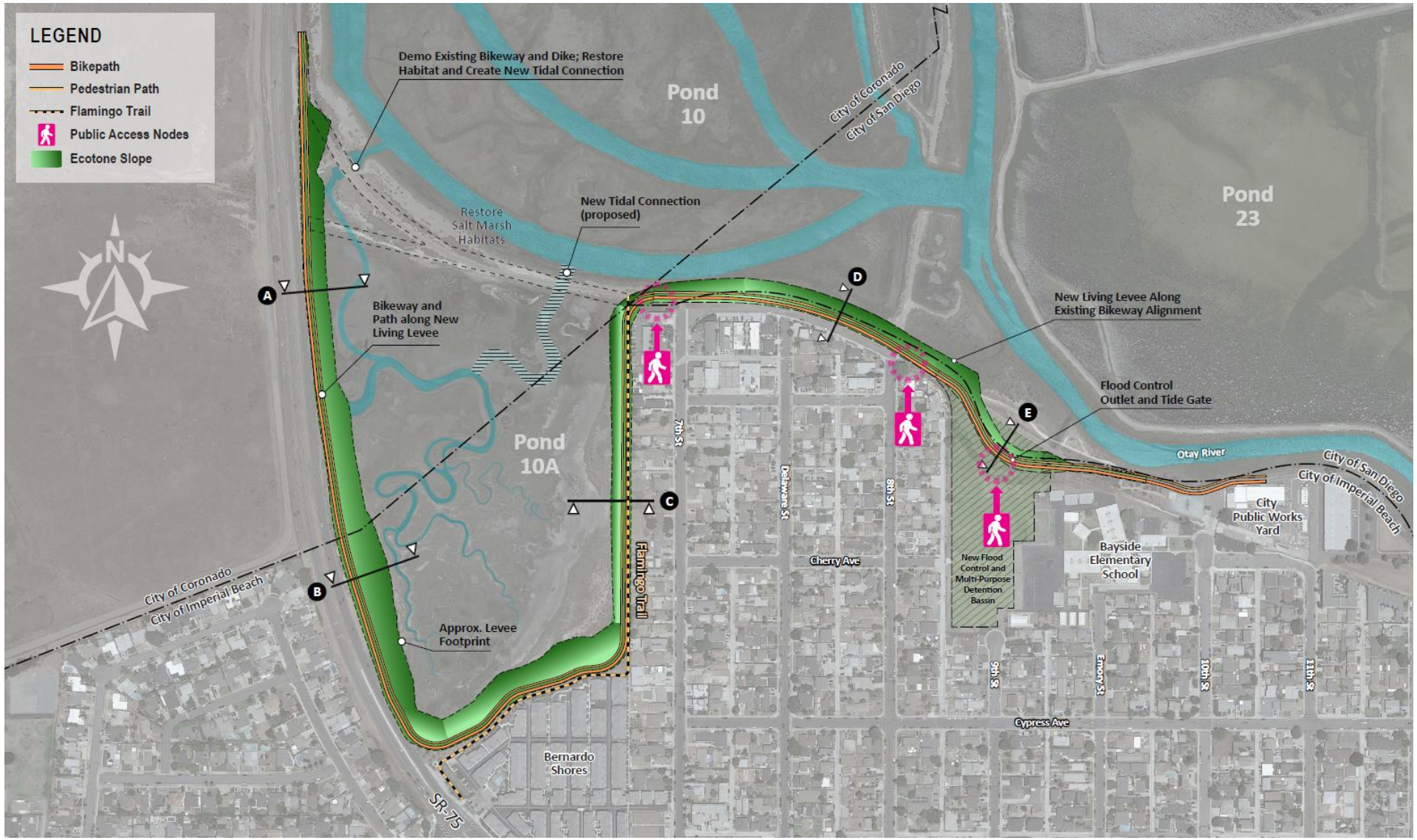

Figure ES-1. Preferred Alternative (Alternative 3 – Remove and Reroute) Plan View

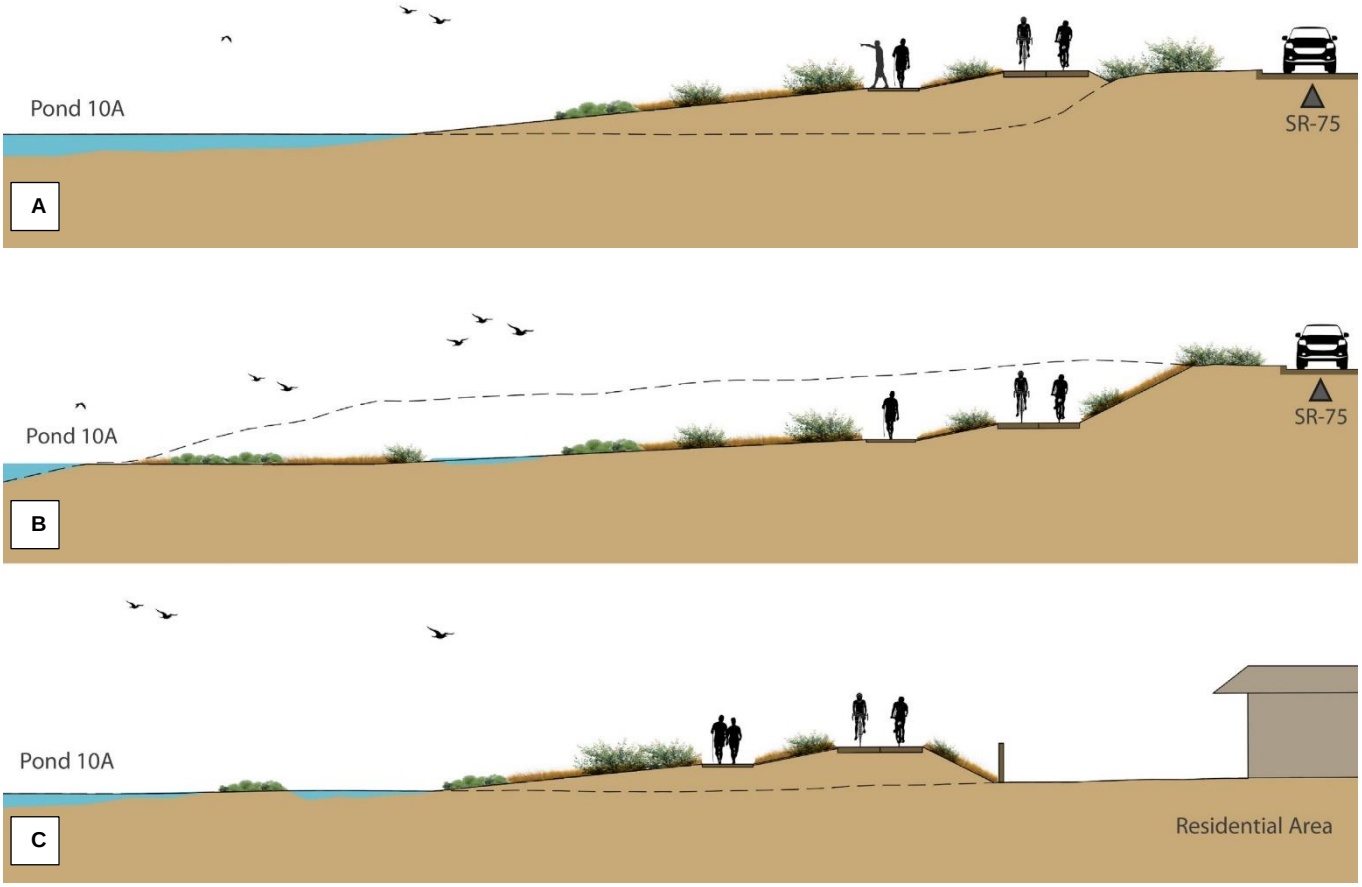

Figure ES-2. Preferred Alternative (Alternative 3 – Remove and Reroute) Typical Sections

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1. Introduction

The Bayshore Bikeway (Bikeway) is a 24-mile long, Class 1 bike path that runs along the perimeter of the South San Diego Bay. The Bikeway spans multiple jurisdictions and sits at the interface between the sensitive biological habitat of the Bay and the developed upland communities surrounding the Bay. Many of these communities have predicted vulnerabilities to coastal flooding as a result of sea level rise (SLR) and are seeking adaptation solutions.

This report evaluates the feasibility of retrofitting approximately one-mile segment of the Bayshore Bikeway (Bikeway) into a multi-benefit community flood protection and ecosystem resilience corridor in the City of Imperial Beach (City). The corridor is within the north-western portion of the City adjacent to the San Diego Bay (Bay) and the Bayside Community (Figure 1-1). This disadvantaged community is extremely vulnerable to coastal flooding and stormwater flooding, which would be exacerbated with sea level rise. The Bayshore Bikeway Resiliency Project (Project) would provide flood protection to the community while enhancing the resiliency of salt marsh habitats and providing opportunities for enhanced coastal access to and along the Bay shoreline. These coastal access improvements will also serve to activate the surrounding area, increasing the demand for coastal-focused recreational and commercial uses.

The City received an Ocean Protection Council (OPC) Proposition 68 grant in 2021 to conduct a feasibility study to evaluate three potential coastal resiliency alternatives along this corridor. Project alternatives were developed alongside community and stakeholder input, various technical analyses, and were ranked using a Project specific multi-criteria decision matrix. A preliminary engineering design was prepared for the preferred alternative with sufficient detail to progress the Project into the next phase (i.e., CEQA, permitting, final engineering and construction). The Project is primarily intended to benefit the Bayside neighborhood; however, it will also serve as a proof-of-concept to be applied along other segments of the 24-mile Bikeway corridor to protect communities with similar needs.

The Project fits broadly under the State of California's natural shoreline infrastructure (NSI) initiative, which is defined as "using natural ecological systems or processes to reduce vulnerability to climate change related hazards while increasing the long-term adaptive capacity of coastal areas by perpetuating or restoring ecosystem services" (Newkirk, 2018). The California Coastal Commission defines nature-based adaptation strategies (NBAS) as a resilient approach to climate adaptation that "incorporate ecological principles into shore protection strategies to support multiple benefits, including hazard adaptation and mitigation, natural resource resilience and enhancement, and recreation and scenic resource preservation (Vu, 2021). The Federal Highway Administration (2018) also encourages nature-based solutions to prevent coastal highway flood damage and/or disruption by implementing approaches that mimic characteristics of natural features and protect or improve the build environment while maximizing the habitat value associated with the natural system. Similar terms for these types of projects include green infrastructure and living shorelines.

Although highly compelling conceptually and encouraged by public agencies, NSI projects are still considered innovative and relatively few projects have been implemented in California. The NSI approach face challenges, limitations, and tradeoffs which must be addressed to identify feasible projects. Feasibility encompasses multiple dimensions including technical feasibility (effectiveness at achieving goals and objectives), economic feasibility (capable of being financed or funded), legal and regulatory feasibility (capable of receiving permits and approvals), and social feasibility (consistent with core community values). Each NSI project will have a unique design based on the geomorphic conditions, physical processes, and habitat types at a given site. One of the primary technical challenges is to understand the dynamics of natural systems at a specific location and how they have been disturbed by human intervention over time. Other challenges include demonstrating an overall net ecological benefit to the intertidal habitats affected; developing site-specific designs with interdisciplinary teams; and aligning innovative approaches with existing permitting paradigms. This feasibility study was developed specifically to address these challenges.

The overall goal of the Project is to provide multiple benefits to a disadvantaged community of Imperial Beach through the retrofit of the Bikeway corridor – benefits include flood protection, sea level rise resilience, enhanced coastal access, and ecosystem resilience. The Project objectives are as follows:

1. Objective 1: Repurpose the existing Bikeway into a multi-use coastal resilience corridor that protects the Bayside neighborhood, State Route 75, and the Bayshore Bikeway itself from current and future coastal flooding.
2. Objective 2: Add transitional habitat ecotone (low, middle, and high marsh to the upland transition zone) along the Bay's edge to increase salt marsh area and allow for habitat transgression with sea level rise.
3. Objective 3: Enhance vertical and lateral coastal access through community-driven design.

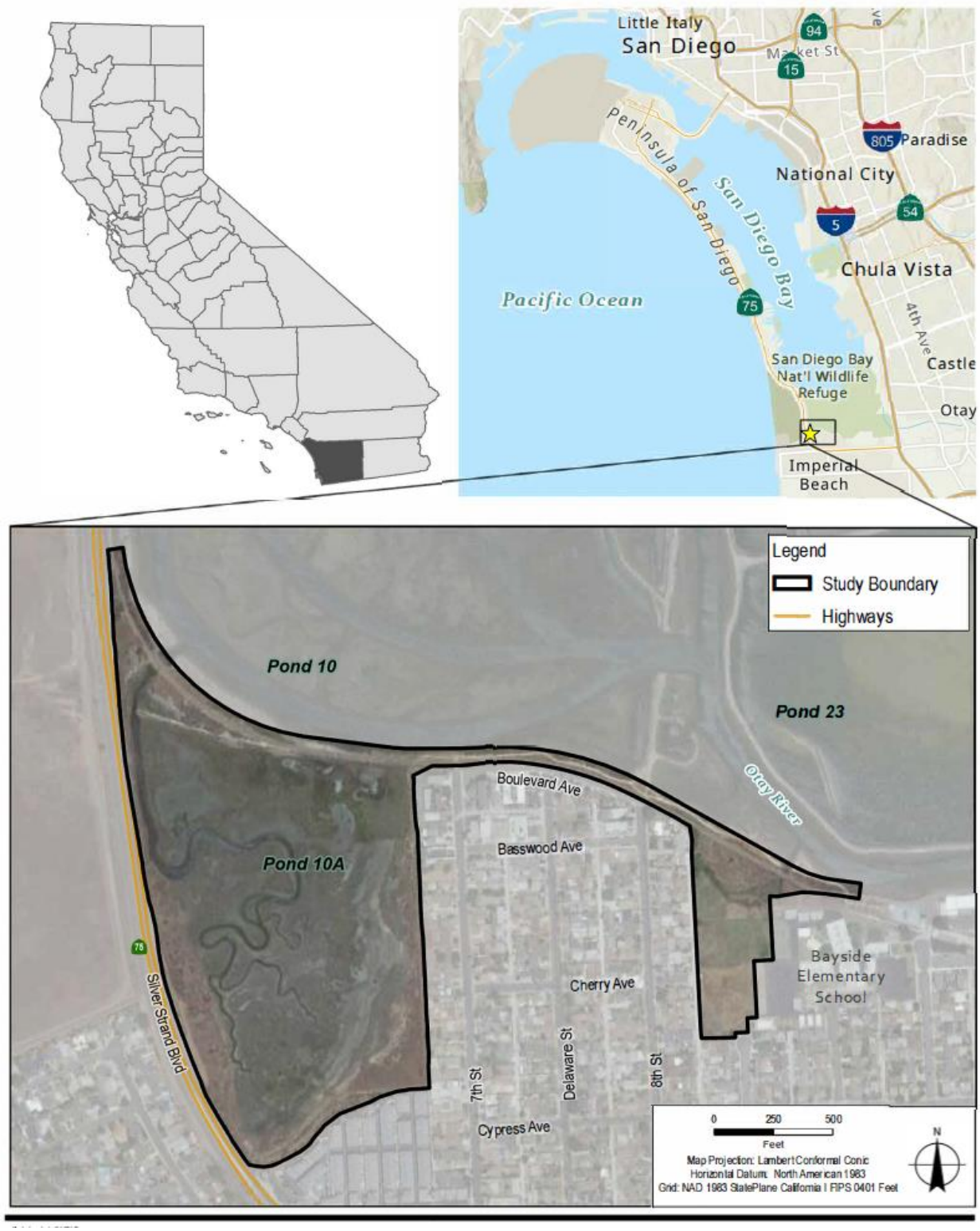

Figure 1-1. Project Location & Vicinity Map

2. Site Description

2.1 Existing Physical Conditions

The Project area consists of approximately one mile of shoreline along the San Diego Bay, along which the Bikeway is the primary feature. The Bikeway is a Class 1 bike path, as defined by the California Highway Design Manual. It is a multi-use, paved path for exclusive use by bicyclists, pedestrians and those using non-motorized modes of travel. The Bikeway is 10 feet in width throughout the Project area with unimproved shoulders. The existing elevation of the Bikeway within the Project area varies between approximately 8 feet and 15 feet (NAVD88). The low-lying areas of the Bikeway include the stretch between Ponds 10 and 10A, and the Bayside School stormwater outfall (Figure 2-1). The maximum elevation within the Project area exists between Delaware Street and 8th Street, which the grade from either side steadily increases to 15 feet.

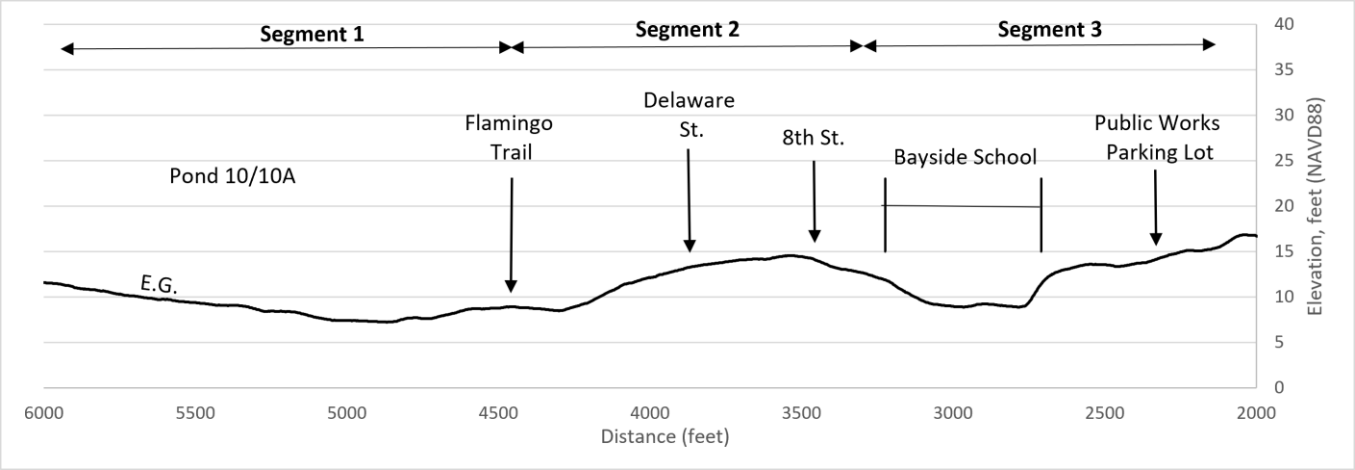

Figure 2-1. Existing Bikeway Elevations within the Project Area

The Project area is primarily within the City's jurisdiction; however, the western-most portion is within the City of Coronado. Along the Project area the Bikeway is adjacent to a number of former salt ponds (specifically Ponds 10 and 10a), the Otay River, Bayside Elementary School, a number of City communities (including the Bayside Community and Bernardo Shores) and the Bayside Elementary School.

The Project area was divided into three segments that have distinct physical and hydrologic conditions, as shown in Figure 2-2. These segments are defined as follows:

- Segment 1 (Pond 10A Reach),
- Segment 2 (Bayside Community Reach), and
- Segment 3 (Bayside Elementary School Reach).

These segments are further described in this section.

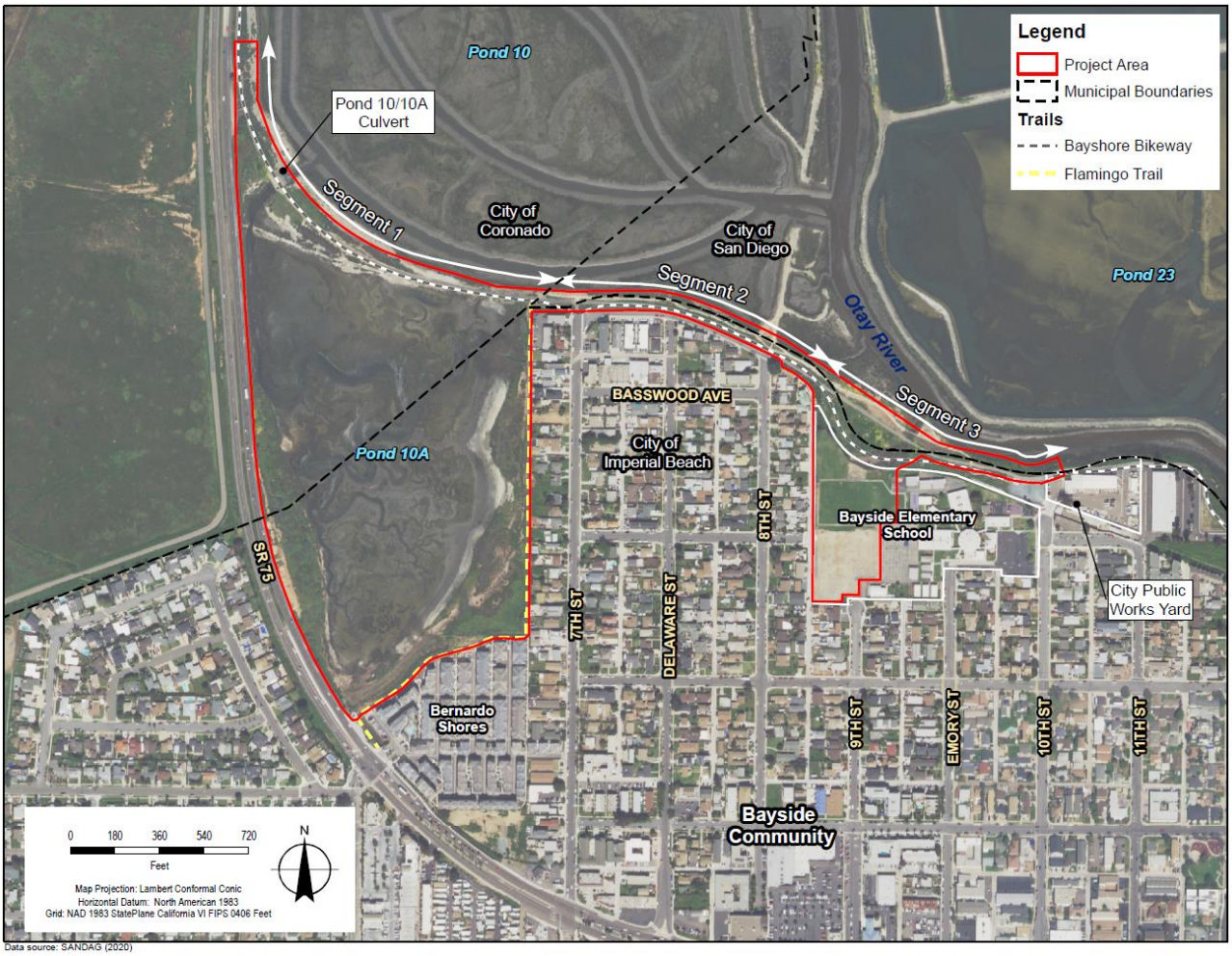

Figure 2-2. Project Segments

2.1.1 Segment 1: Pond 10A Reach

Segment 1 encompasses the western portion Project area, which includes a portion of State Route (SR) 75, Pond 10, Pond 10A and the Flamingo Trail. The Bikeway throughout Segment 1 divides Pond 10 and Pond 10A, with a small tidal connection (culvert under the bikeway) near SR-75. The tidal hydraulics within Pond 10A are currently tidally muted by the box culvert / headwall at this location (Coastal Environments, 2015; Nordby Biological & TRNERR, 2017). Previous studies found that the low tides do not drain below the elevation of the culvert, which is 3.8 feet (NAVD88), and high tides are about 67 percent of the water levels in the San Diego Bay. Given this difference in tidal range, Pond 10A and Pond 10 are both defined by slightly different habitat quality and compositions.

The Bikeway elevation through this segment ranges from approximately 7.5 to 10.5 feet (NAVD88) with the lowest lying portion just west of 7th Street. The Flamingo Trail is a 10-foot wide, north-south oriented paved trail that serves as a connection from SR-75 and the Bernardo Shores neighborhood to the Bayshore Bikeway. The Flamingo Trail elevation is similar to that of the Bikeway through Segment 1; however, the trail has portions that are lower in elevation (southeast corner) prior to gaining elevation adjacent to the Bernardo Shores neighborhood. Representative site photos of Segment 1 are shown below in Figure 2-3.

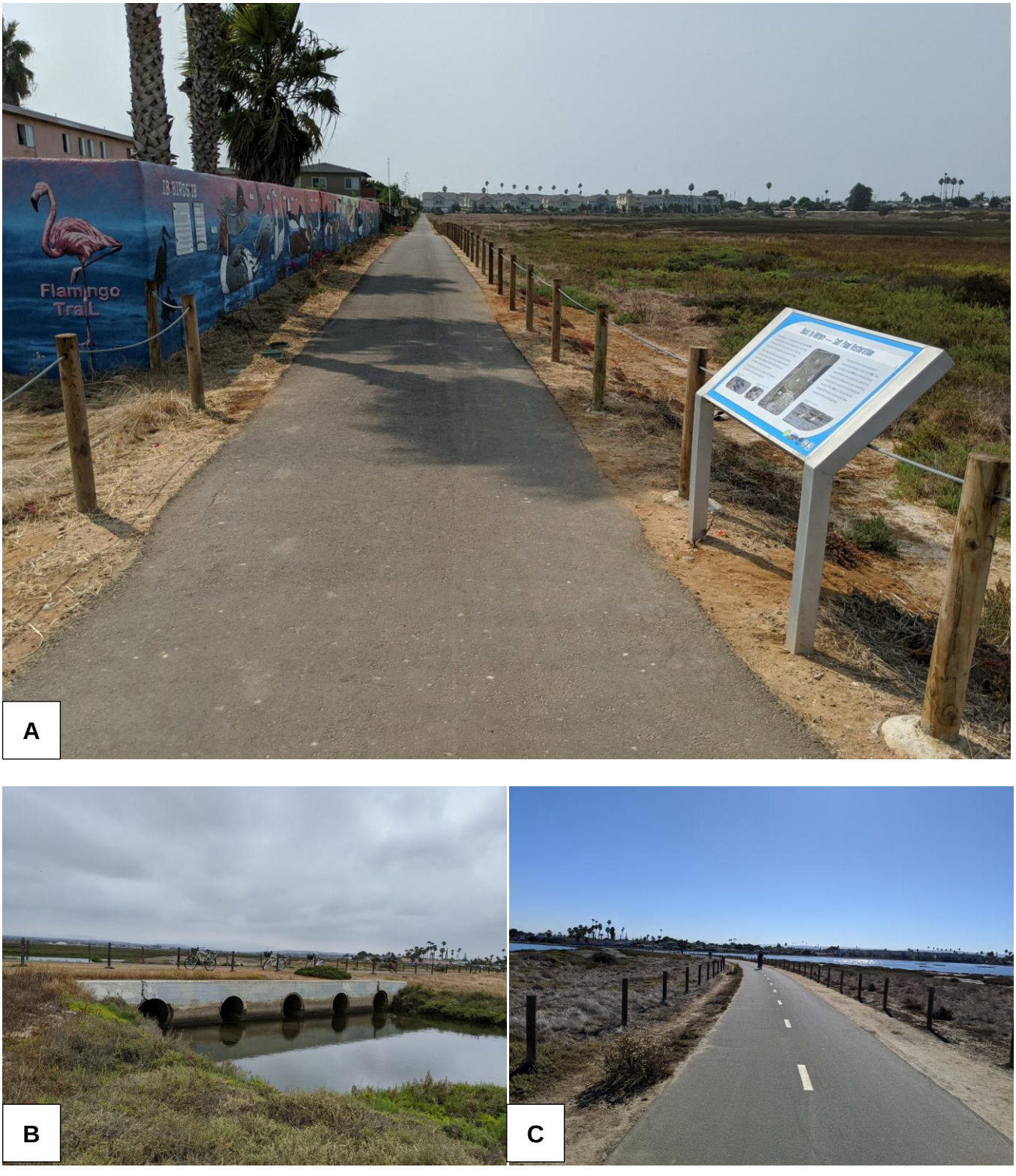

Figure 2-3. Segment 1 photos. (A) Flamingo Trail facing south; (B) Pond 10/10A culvert; (C) Bikeway between Pond 10/10A facing south-east

2.1.2 Segment 2: Bayside Community Reach

Segment 2 comprises a segment of the Bikeway between 7th Street and the western boundary of Bayshore Elementary. The main feature, aside from the existing Bikeway, in this segment is the Birding and Walking Trail that runs parallel to the Bikeway. The Birding and Walking Trail was constructed in 2015, as led by the United States Fish and Wildlife Service (USFWS) and grant funded by the State Coastal Conservancy. The non-contiguous, decomposed granite, trail is 2,060 feet in total length, of which approximately 1,100 feet is located within Segment 2. It is a 6-foot-wide trail and ranges from 8 to 12 feet in elevation. The Birding and Walking trail was constructed to relieve congestion among pedestrians and bikers along the Bikeway (Figure 2-4). The construction of this trail also involved mitigation of 0.2 acres of salt marsh habitat adjacent to the new trail. Community access to Segment 2 of the Bikeway is available at 7th Street and 8th Street.

Figure 2-4. Birding & Walking Trail within Segment 2

2.1.3 Segment 3: Bayside Elementary School Reach

Segment 3 spans the area between the western boundary of the Bayshore Elementary and 10th Street, to the west. The main elements within Segment 3 include the Bayshore Elementary School (facilities and its associated recreational fields), the Birding and Walking Trail, and the City's Public Works yard (Figure 2-5).

The Bikeway elevation in Segment 3 ranges from 9 ft at a low point near the Bayshore Elementary School to a high point of 15 feet near the City's Public Works Yard. The Bayside Elementary School recreational field ranges in elevation from approximately 6.7 feet to 9 feet, with the low point at the southwest corner of the field (Figure 2-5c).

Within this segment, a 48-inch diameter reinforced concrete pipe (RCP) storm drain bisects the Bayside Elementary School recreational fields underground and discharges to the San Diego Bay. The RCP is an unprotected outlet at the downstream end of the City's second largest stormwater basin. This stormwater system is undersized leading to localized flooding in the Bayside community during rain events. Tidal waters are also known to back up into the stormwater system in this area during extreme high tides, which limits the storm drain capacity and can lead to nuisance flooding at stormwater inlets in the City.

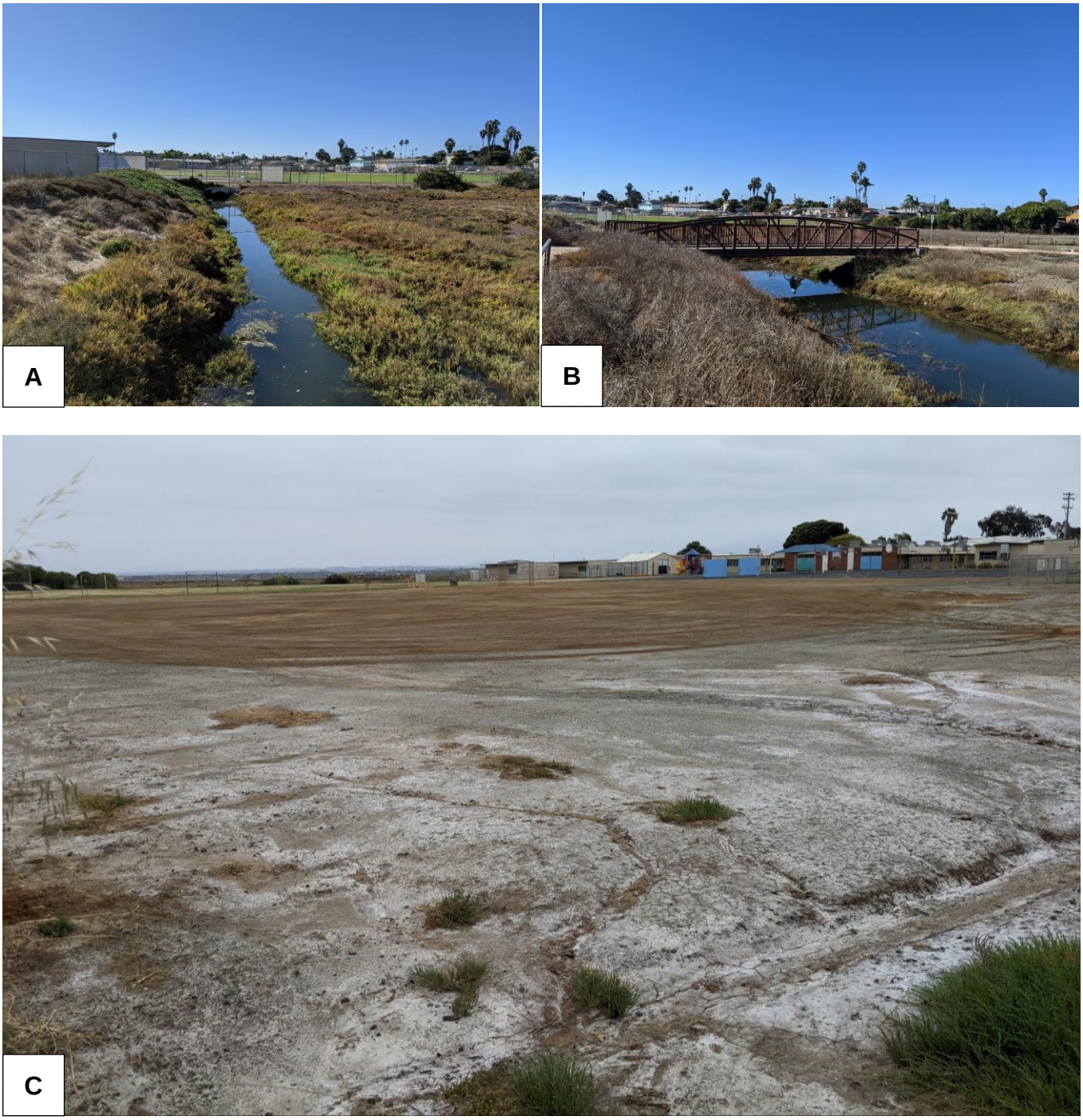

Figure 2-5. Segment 3 photos. (A) culvert and channel at the Bayside Elementary School; (B) Birding and Walking Trail bridge; (C) Bayside Elementary School ballfield

2.2 Existing Biological Conditions

The Project Area is located adjacent to the south San Diego Bay, an area classified as the San Diego Bay National Wildlife Refuge (NWR) and managed by the USFWS. This area is designated as a Western Hemisphere Shorebird Reserve Network Site and a globally important Bird Area (USFWS, 2009). The NWR contains a range of wetland habitat that supports a wide variety of avian and other biological species. This area is predominately shallow subtidal, intertidal, wetland/upland transitional, and upland scrub habitat (USFWS, 2009). Some of the avian species supported include the western snowy plover, belding's savannah sparrow, and the light-footed clapper rail.

The habitat within the Project area is comprised of coastal scrub, tidal slough, salt marsh, and mudflats (i.e., within the San Diego Bay National Wildlife Refuge (NWR) and the Otay River). Previous studies that have overlapped or been conducted immediately adjacent to portions of the Project area noted that general habitat conditions in the Project vicinity (outside of the NWR) are largely disturbed, degraded, and dominated by invasive vegetation. There are recent records of several special status plant and wildlife species, as well as sensitive natural communities (SNCs) and environmental sensitive habitat areas (ESHA) and aquatic resources immediately adjacent to the Project footprint. In addition, the adjacent NWR is considered both a nationally and internationally important bird area. A detailed biological survey of the Project area will be conducted within the next phase of work to further characterize these areas and avoid or minimize impacts.

2.3 Historical Perspective / Development History

The San Diego Bay and Project area were historically coastal salt marsh, intertidal mudflats, and shallow subtidal habitats (Dudek, 2018). In the early 1900's, this area of the Bay was then converted, by way of earthen dikes, into a series of salt evaporation ponds for industrial use. Since this time, the Project area has been further developed, although there has been little alteration to the physical landscape.

The Bikeway began construction in 1976 in National City with the plan of creating a continuous bike path around the San Diego Bay. Since initial construction, about 18 miles of the Bikeway have been built and the remainder of the Bikeway consists of on street segments or bike routes (SANDAG, 2019). There are several planed segments of the Bikeway to replace the on-street portions, some of which are located in the City of San Diego, National City, and Chula Vista. The Bikeway ownership and management falls under the jurisdiction which it is located; however, a SANDAG working group exists to bring together the multiple Bikeway stakeholders to assist in the maintenance, management, and future planning of the Bikeway corridor.

Adjacent to the Project area is a community referred to as the Bayside neighborhood within the City of Imperial Beach. The Bayside neighborhood was part of the first subdivision in the City of Imperial Beach. Originally, called "South San Diego" the neighborhood encompassed most of the area between 5th Street to 13th Street, north of Palm Avenue. Residential development in the Bayside neighborhood consists of approximately 1,600 single- and multi-family housing units. Development in the neighborhood occurred primarily between 1960 and 1990, with almost 70 percent of homes built within those three decades.

Since the early 1900's, the South San Diego Bay consisted of several diked solar salt ponds which were shut off from tidal influence. Some of these salt ponds in the South Bay are still actively used for industrial salt mining while others are being restored back to salt marsh habitat areas. In 2011, a project was undertaken to begin restoration of these diked salt ponds. This project was termed the *South Bay Salt Pond Restoration Project* and restored 220 acres of former solar salt ponds (Ponds 10A 10, and 11) to salt marsh. The Project monitoring has since revealed that the project was successful in providing high-quality nursey habitat for fish and invertebrates, and natural recruitment of native vegetation.

Shortly after the restoration of the western salt ponds, a naturalized (decomposed granite) pedestrian trail was constructed parallel to the Bikeway to alleviate multi-use congestion of the Bikeway (cyclists vs pedestrians) and to provide (passive) recreational opportunities. This pedestrian trail is referred to as the Birding and Walking Trail and was partially completed in 2015. This project involved the construction of a six-foot wide, 2,060-foot-long non-contiguous, pedestrian path that is roughly parallel to the Bikeway. A 50-foot-long bridge and a 750-sq.ft. overlook area were also constructed north of the trail at 10th street. The construction of this trail was intended to alleviate unwanted off-trail activity and unintentional trampling of sensitive wetland habitat. However, unwanted trail activity is still an issue, as unofficial trails have been created by mountain bikers and other user groups adjacent to the Bikeway.

Following the construction of the birding and walking trail, a project was completed in 2018 to convert the Bernardo Shores RV Park to a multi-family residential community. The Bernardo Shores community is located at the southwestern corner of the Project site, at the border of Pond 10A. The project included the demolition of the existing Bernardo Shores RV Park and the construction of permanent homes. The new community now contains 193 dwelling units, including town homes and single-family houses. Among other features, the project included a greenbelt area, which was a 100-ft setback area from pond 10A. It was comprised of two Phases, with phase 1

including the residential development portion and phase 2 including a new bike path connection to the Bayshore Bikeway, unofficially referred to as the Flamingo Trail.

3. Coastal Hazards

Numerous studies have identified the Project area as being vulnerable to flooding as a result of projected sea level rise. The most recent study is the City's Sea Level Rise Assessment (Revell 2016). This study built upon previous sea level rise modelling and mapping work conducted by the United States Geological Survey (USGS) and U.S. Navy to increase the understanding of coastal flood risks within the project area. This Study leverages this work and performs more site-specific analyses to aide in the design of this coastal resiliency Project.

The primary coastal hazards within the Project area consist of coastal and stormwater flooding. These hazards are currently being observed in the City during extreme conditions (i.e., precipitation events or high tides). Sea level rise will increase the frequency and severity of these hazards, as further described in this section.

3.1 Water Levels

The tide cycle in Southern California is mixed semi-diurnal, meaning that there are two uneven highs and lows for each lunar day, which is approximately a 25-hour period. The San Diego Bay tidal gauge was chosen to represent water levels for the Project site, given its location within the Bay. The water level datums for the NOAA San Diego Bay tide station (Station 9410170) are shown in Table 3-1.

Table 3-1. Tidal Datums for the San Diego Bay (NOAA Station 9410170)

Datum	NAVD88 (ft)
Highest Observed (11/25/2015)	7.81
Highest Astronomical Tide (HAT)	7.29
Mean Higher High Water (MHHW)	5.29
Mean High Water (MHW)	4.56
Mean Tide Level (MTL)	2.53
Mean Sea Level (MSL)	2.51
NAVD88	0.00
Mean Low Water (MLW)	0.51
Mean Lower Low Water (MLLW)	-0.43
Lowest Astronomical Tide (LAT)	-2.54
Lowest Observed (12/17/1937)	-3.52

Typical daily tides range from mean lower low water (MLLW) to mean higher high water (MHHW), a range of about 5.7 feet. During spring tides, which occur twice per lunar month, the tide range increases due to the additive gravitational forces caused by alignment of the sun and moon. During neap tides, which also occur twice per lunar month, the forces of the sun and moon partially cancel out, resulting in a smaller tide range and lower high tides. The largest spring tides of the year, which occur in the winter and summer, are sometimes referred to as "King" tides result in water levels of 7 feet or greater.

Ocean water levels typically vary within predictable astronomical tide ranges; however, sea level anomalies caused by El Niño Southern Oscillation or storm surge events can increase the water levels above the predicted astronomical tide. These events in combination with high astronomical tides can result in extreme water levels (EWL) and increased potential for flooding of low-lying coastal areas. The extreme water levels corresponding to various annual exceedance probabilities are shown in Table 3-2. An annual exceedance probability of 1 percent

refers to a return period of 100-years, while an annual exceedance probability of 99 percent refers to a return period of 1-year.

Table 3-2. Extreme Water Levels for the San Diego Bay (Sta. 9410170)

Annual Exceedance Probability (Return Period)	Feet Above NAVD88
1% (100-year)	7.69
10% (10-year)	7.46
50% (2-year)	7.17
99% (1-year)	6.78

SLR projections are provided for 12 active tidal gauges across California in the OPC State of California Sea Level Rise Guidance 2018 Update. San Diego is the nearest tide gauge to the Project site for which SLR projections are provided in the OPC SLR guidance document. These projections are listed in Table 3-3 and shown for a range of probabilistic scenarios and time horizons.

Table 3-3. Sea Level Rise Projections for San Diego Bay (OPC, 2018)

Time Horizon	Low Risk Aversion		Medium Risk Aversion	Medium-High Risk Aversion
	66% Probability SLR is between		5% Probability SLR meets or exceeds…	0.5% Probability SLR meets or exceeds…
2030	0.4	0.6	0.7	0.9
2050	0.7	1.2	1.4	2.0
2070	1.1	2.0	2.5	3.6
2100	1.8	3.6	4.5	7.0

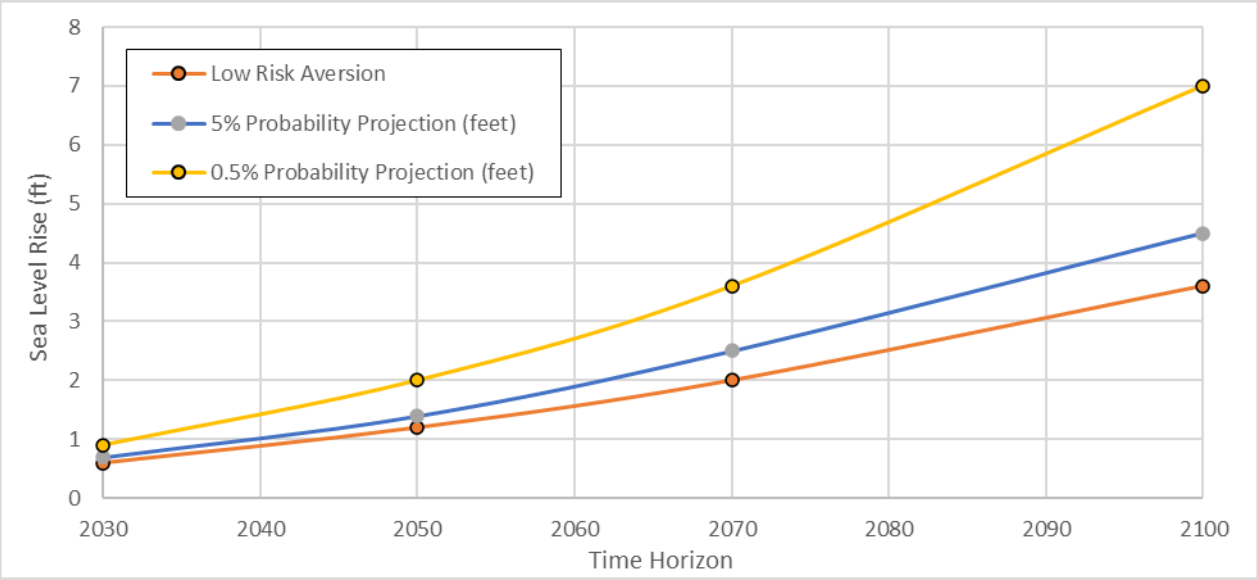

Figure 3-1. Sea Level Rise Projections for San Diego Bay (OPC, 2018)

When using these SLR projections it is important to consider risk tolerance, risk aversion and the Project's design life when evaluating the effects of SLR on various coastal development projects. The OPC defines risk tolerance as "the level of comfort associated with the consequences of SLR and associated hazards in project planning and design". Whereas risk aversion is defined as the strong inclination to avoid taking risks in the face of uncertainty (OPC, 2018).

The OPC guidance also provides planning and adaptation goals, one of which states that California should include pathways to resiliency to 3.5 feet of SLR by year 2050, and 6 feet by 2100. The Project's goal is to be resilient to

3.5 feet of SLR with ability to adapt to higher rates, consistent with the State's guidance. This SLR projection approximately corresponds to the likely (66%) range of projections for 2100, and within the medium-high risk aversion (1-in-200 chance) projections for 2070.

3.2 Coastal Flooding

Coastal flooding in the Project area refers to periods of time when elevated water levels in the Bay overtop existing landside features to flood coastal areas. An example of this occurred on November 25th, 2015, when extreme Bay water levels overtopped the Bikeway between Ponds 10 and 10A (Figure 3-2). Coastal flooding limits were approximated using publicly available tools and verified against an extreme water level analysis and anecdotal observations.

The Coastal Storm Modeling System (CoSMoS) is a publicly available tool created by the U.S. Geological Survey (USGS) to estimate coastal flood hazards under a variety of static and dynamic water levels with SLR. The CoSMoS flood hazards zones for a 100-year storm with 3.3 feet and 6.6 feet of SLR are shown in Figure 3-3. The model depicts two primary vulnerabilities or coastal flood pathways - one at the Bayshore Elementary School and another at the eastern boundary of Pond 10A at 7th Street.

Within the 3.3 feet SLR scenario, the majority of the Bikeway within the Project area would be overtopped and water would spill into the Bayside Neighborhood and Bayshore Elementary School. The 6.6 feet SLR scenario results in the flood hazard zone increasing in extent within the Neighborhood and School areas and encroaching into the State Route (SR) 75 along the western boundary of Pond 10A.

Figure 3-2. Overtopping of the Bikeway on 11/25/2015

(Source: Phil Gibbons, Port of San Diego)

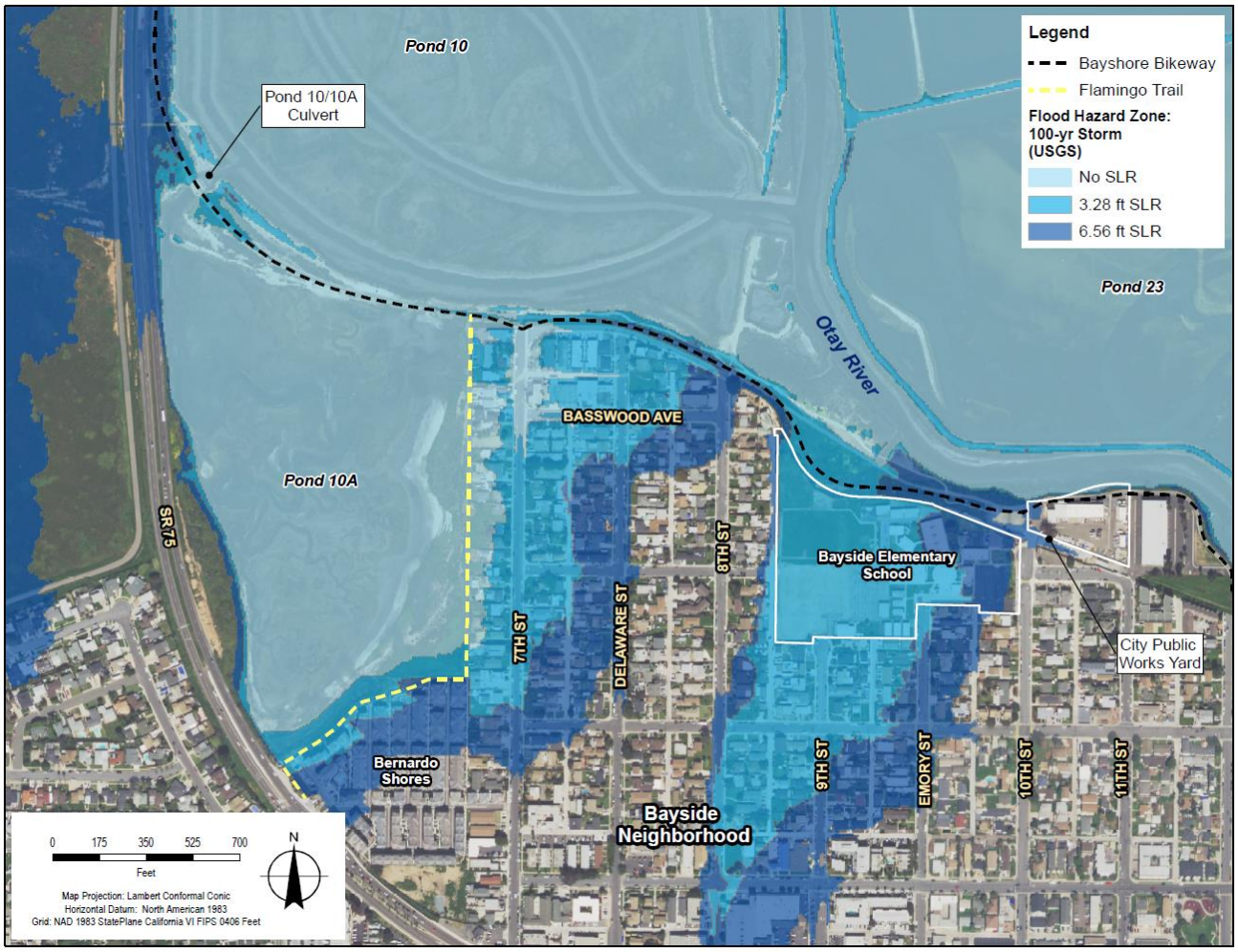

Figure 3-3. CoSMoS Coastal Flood Hazards with Sea Level Rise

3.3 Stormwater Flooding

Stormwater flooding refers to the overwhelming of a coastal stormwater management system that causes water to inundate roads and property. Low-lying coastal communities, like the City of Imperial Beach, have unique stormwater management challenges that are exacerbated by coastal flooding. As is common with most municipal stormwater systems, the City's system relies on gravity to help water move through the pipes. However, the low-lying nature and flat topography of the City make this a difficult approach to manage rainwater as the slope within the stormdrains or fall is limited. This is further compromised by coastal flooding that causes the unprotected stormwater outfalls to be partially or completely submerged by tidal waters. These factors have the ability to prolong and exacerbate a precipitation-induced flooding event in the City.

The submergence of City's stormdrains unprotected outfalls also allow for tidal waters to backflow into the system. This results in 1) upland flooding through the street drains sometimes referred to as "nuisance" or "sunny day" flooding, 2) damage to the stormwater infrastructure from saltwater exposure and 3) a reduction in the system's capacity to convey water during a precipitation event. Stormwater flooding is described schematically in Figure 3-4.

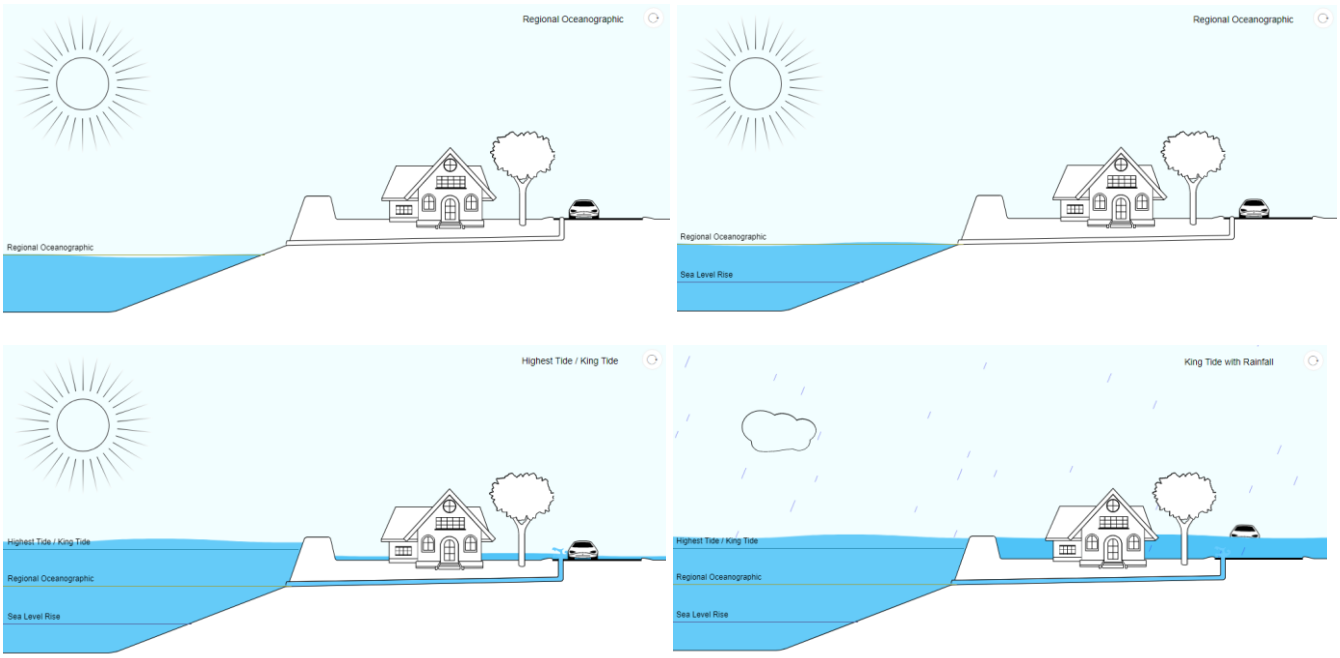

Figure 3-4. Stormwater Flooding Mechanisms & Pathways Schematic (NOAA 2022)

Tidal water from the Bay currently backflows into the stormwater system and has been observed flooding stormdrain inlets in Bayside Elementary and within the streets of the Bayside Community, as shown in Figure 3-5. An example of stormwater flooding at the Bayside Elementary School during a king tide is shown in Figure 3-6. Sea level rise threatens to make these stormwater flooding issues more pronounced in the City as the stormdrain capacity lessens.

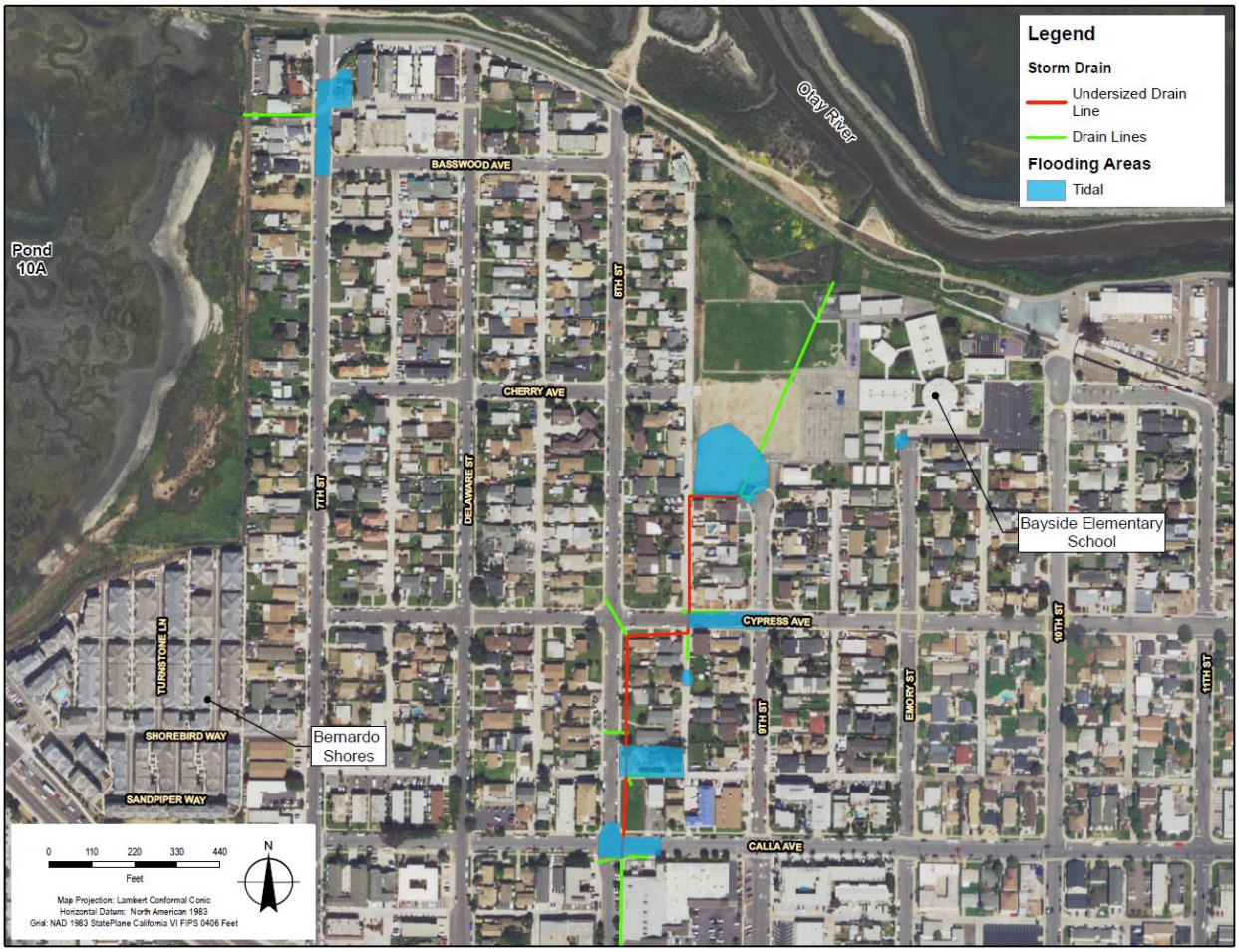

Figure 3-5. Observed Stormwater Flooding Areas in the Project Area

Figure 3-6. Stormwater Flooding at the Bayside Elementary School during a King Tide on 11/27/2019

4. Constraints and Opportunities

Based on a review of the existing conditions of the Project site, a constraints and opportunities analysis was conducted. Several constraints and opportunities were identified, as follows:

Constraints:

- Various land ownerships and management authorities within the Project area require detailed coordination during the Project development phase and may lead to a more complex implementation pathway (Figure 4-1). These entities have differing missions, some which may require reconciliation within the new phase. Specific land ownerships and management authorities within the Project area are as follows:
    - **City of Imperial Beach:** The City of Imperial Beach maintains authority for the Bayshore Bikeway from 7th Street and terminating at 13th Street.
    - **San Diego-Arizona Eastern Railway Company:** This right-of-way located at the northern boundary of the City was originally dedicated in 1876 as an 80 to 120 foot wide, by 0.9-mile long strip of land. In 1912, the San Diego-Eastern Arizona Railroad obtained part of the right-of-way for a line to transport people from San Diego to the Hotel Del Coronado and back. Currently, the City of Imperial Beach maintains a license for Right-of-Way Improvement from the San Diego-Arizona Eastern Railway Company. The original agreement, adopted on October 16, 1996, and updated on August 18, 1999, granted license to the City of Imperial Beach for the operation and maintenance of the bike path with specific conditions. The license was further expanded on March 16, 2006, to enlarge the present entrance to the Public Works Facility, increase parking spaces, and construct a new entrance to the Bayshore Bikeway. More recently, the City is allowed to use portions of the right-of-way for the Bayshore and Bernardo Shores bikeways, as well as community park purposes.
    - **San Diego Unified Port District (Port of San Diego):** The estuaries and ponds in San Diego Bay are under land use management authority of the San Diego Unified Port District and leased to the United States Fish and Wildlife Service. These areas still reside within either the City of Imperial Beach, City of Coronado, or City of San Diego jurisdictions. Segments of the Bayshore Bikeway also fall within the Port of San Diego's managed lands.
    - **United States Fish and Wildlife Service:** The United States Fish and Wildlife Service leases the National Wildlife Refuge areas from the Port of San Diego. The lease occupies all submerged lands within the Project area.
    - **City of Coronado:** The City of Coronado maintains authority over a portion of the Bikeway on the dike between Ponds 10 and 10A in Segment 1.
    - **City of San Diego:** The City of San Diego maintains authority over a small parcel south of the Bayshore Bikeway and east of 7th Street. The Bayshore Bikeway within Segment 3 is within the City of San Diego.
    - **California Department of Transportation (Caltrans):** The California Department of Transportation maintains management authority of State Route 75 west of Segment 1. While SR 75 is not within the development footprint, it is adjacent and potentially affected by proposed Project features adjacent to SR 75 along the western edge of Pond 10A.
    - **South Bay Union School District:** Bayside Elementary, a school within the South Bay Union School District, is directly adjacent to the Bayshore Bikeway in Segment 3. The recreational park adjoining the school is the location of the proposed multi-purpose detention basin and tidal gate.
    - **Private Property:** Private property, including residential development and commercial development, is adjacent to the proposed Project area.

- **San Diego Association of Governments (SANDAG):** SANDAG manages and updates the Bayshore Bikeway Plan that identifies alignments that use railroad, utility, and other public rights-of-way. Construction of the Bikeway is paid for by federal, state, and local funds, including the regional TransNet half-cent sales tax for transportation, administered by SANDAG. SANDAG does not own or manage the underlying property; however, they do have a vested interested in the maintenance of the Bikeway.
- **California Coastal Trail:** The existing Bayshore Bikeway segments, including the Flamingo trail north/south access from Bernard Shores, within the proposed development area is part of the California Coastal Trail (CCT). The CCT an interconnected public trail system being developed along the California coastline that will span over 1,230 miles from Oregon to Mexico. While neither Coastal Conservancy nor Coastal Commission own or manage the underlying property that supports the CCT, they do have a vested interested in the maintenance of the CCT.

- The low-lying nature of the City leads to complexities in developing stormwater management solutions. The existing system in the Project area is undersized and the outfalls are intermittently submerged by tides – both of which have resulted in periods of prolonged or nuisance flooding.
- The Bikeway corridor is located on a narrow strip of land between highly sensitive habitats within the San Diego Bay and coastal development. Thus, space to build a living levee and other supporting public amenities is limited without impacting sensitive habitat areas or encroaching on coastal development.

Opportunities:

- Existing safety hazards along the Bikeway in the Project area (within Segment 3). A blind curve has led to collisions between pedestrians and cyclists.
- Existing Bikeway user group conflicts between pedestrians and cyclists and cyclists operating at differing speeds and abilities. The existing width of the Bikeway does not allow for these various user groups to concurrently enjoy the Bikeway safely.
- Birding and Walking Trail Project included a Deck and Overlook at the southern terminus of 8th Street in the Project area that was never constructed. The entitlements and designs for this feature exists and could be carried forward by this Project, if desired.
- Public access to the Bikeway is limited to a few street ends within the Project area. More access points and congregation nodes would benefit the community.
- Pond 10A is a muted tidal system as a result of the culvert under the Bikeway in Segment 1. Removal of the tidal muting would provide a significant ecological lift to the Pond and had been considered in prior studies by USFWS. Relieving the muting was not carried forward in the past due to potentially resulting in flooding within the Bayside Community.
- Existing grades of the high marsh habitat along the boundaries of the Bay are steep and will not allow for upslope habitat migration with SLR. Creating an ecotone slope will allow for wetland habitat to transgress with SLR

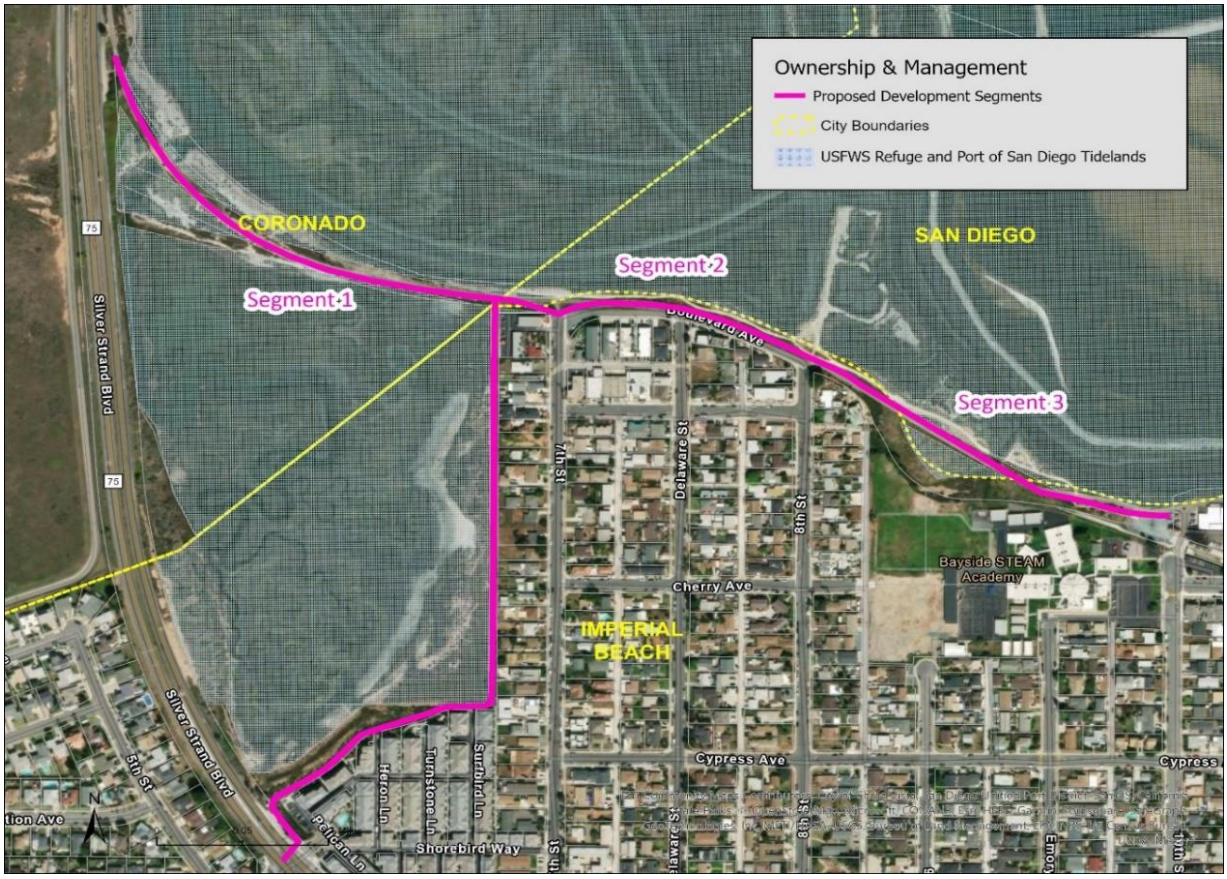

Figure 4-1. Various Land Ownership in the Project Area

5. Development of Project Alternatives

Based on the findings of the constraints and opportunities analysis, several project features were developed for use in the creation of the three Project alternatives. Central to the development of concepts was the use of multi-benefit, natural shoreline infrastructure solutions - consistent with Project goals and objectives. The primary features developed to address the identified constraints and opportunities are described in this section.

5.1 Living Levee

The primary Project design feature entailed use of the existing Bikeway corridor to create a living levee. A living levee or ecotone levee, refers to the modification of a traditional flood risk management levee to provide shallow side slopes (Figure 5-1). These features connect the levee to the marsh surface and can provide high quality transition zone habitat when vegetated with appropriate native plants. Ecotone levees provide multiple benefits, including high tide refuge, nesting, and foraging habitat for wildlife, space for marshes to migrate as sea level rises, and wave damping that reduces erosion and required height for flood risk management levees (SFEI, 2018). A schematic showing the concept of marsh transgression up an ecotone slope is shown in Figure 5-2.

The living levee would be designed to add sufficient elevation to the corridor to provide flood protection to the Bayside Community from extreme water levels and projected sea level rise. The alignment and the slope of the living levee varied between alternatives to maximize SLR resiliency, habitat transgression opportunities, usability, public access, and aesthetics and visual resources.

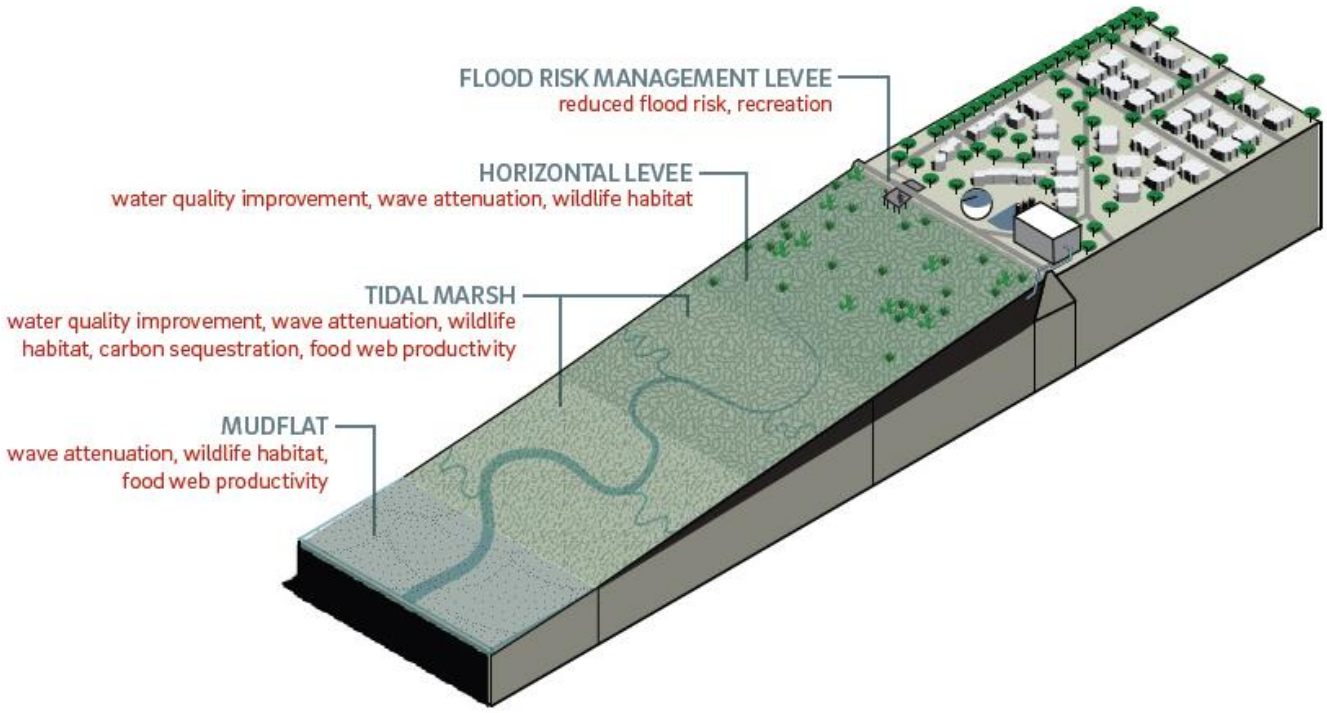

Figure 5-1. Schematic showing Major Components of Living / Ecotone Levee (SFEI 2021)

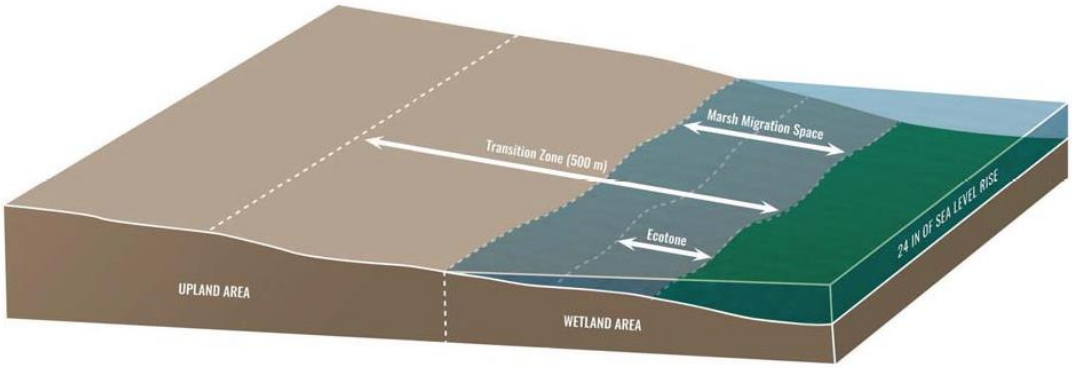

Figure 5-2. Schematic Depicting Wetland Habitat Migration Concept (SFEI 2018)

5.2 Ecosystem Resiliency

The steep grades of the existing high marsh habitat within the Project area are predicted to limit upslope habitat migration with SLR. Thus, the creation of an ecotone slope along the bayside levee was conceived to allow for these habitats persist through transgression upslope with SLR. An analysis was conducted to understand the vulnerabilities of the existing habitat and the effectiveness of the proposed ecotone in preserving these vegetation communities with SLR. Sea Level Affecting Marshes Model (SLAMM) version 6.7, a component NOAA's U.S. Climate Resilience Toolkit, was used for this wetland migration analysis. SLAMM modelling of the existing conditions (No Project) was conducted to help understand the vulnerabilities to existing habitats is described in this section.

5.2.1 Habitat Types in the Project Area

Since wetland vegetation types have a strong dependency on tidal water levels, land elevations along and within tidal marshes provide a good indication of the types of habitats that may exist in these areas (e.g., low, mid and high marsh). Because of this, it is common practice to use these elevations to approximate wetland habitat types. Regional and site-specific knowledge of water levels and vegetation types are useful in defining these habitat bands. For this Project, habitat elevation breaks for Pond 10 and 10A were defined based on prior restoration and ongoing monitoring work that was performed by the USFWS and others for the Western Salt Ponds Restoration Project in 2011. The habitat adjacent to the Bikeway was assumed to have the same elevation breaks as Pond 10, given that the tidal hydraulics for each area is almost identical.

The limited/muted tidal range in Pond 10A results in an increased upper limit of the subtidal zone, when compared to unmuted nearby areas. In addition, this limits the overall extent of the low marsh and mid marsh areas, which are constrained between the subtidal and high marsh areas. This is shown below in Figure 5-3, in which Pond 10 represents the unmuted conditions with more evenly distributed habitat bands. The elevation breaks are shown in tabular format below in Table 5-1.

Table 5-1. Habitat Bands for Pond 10A and 10

Habitat Category	Pond 10A*		Pond 10*	
	Lower Elev.	Upper Elev.	Lower Elev.	Upper Elev.
Upland	7.6	-	7.6	-
High Marsh	5.3	7.6	5.8	7.6
Mid Marsh	5	5.3	4.6	5.8
Low Marsh/Mudflat	4.6	5	2.2	4.6
Subtidal	-	4.6	-	2.2

*Elevations in feet relative to NAVD88

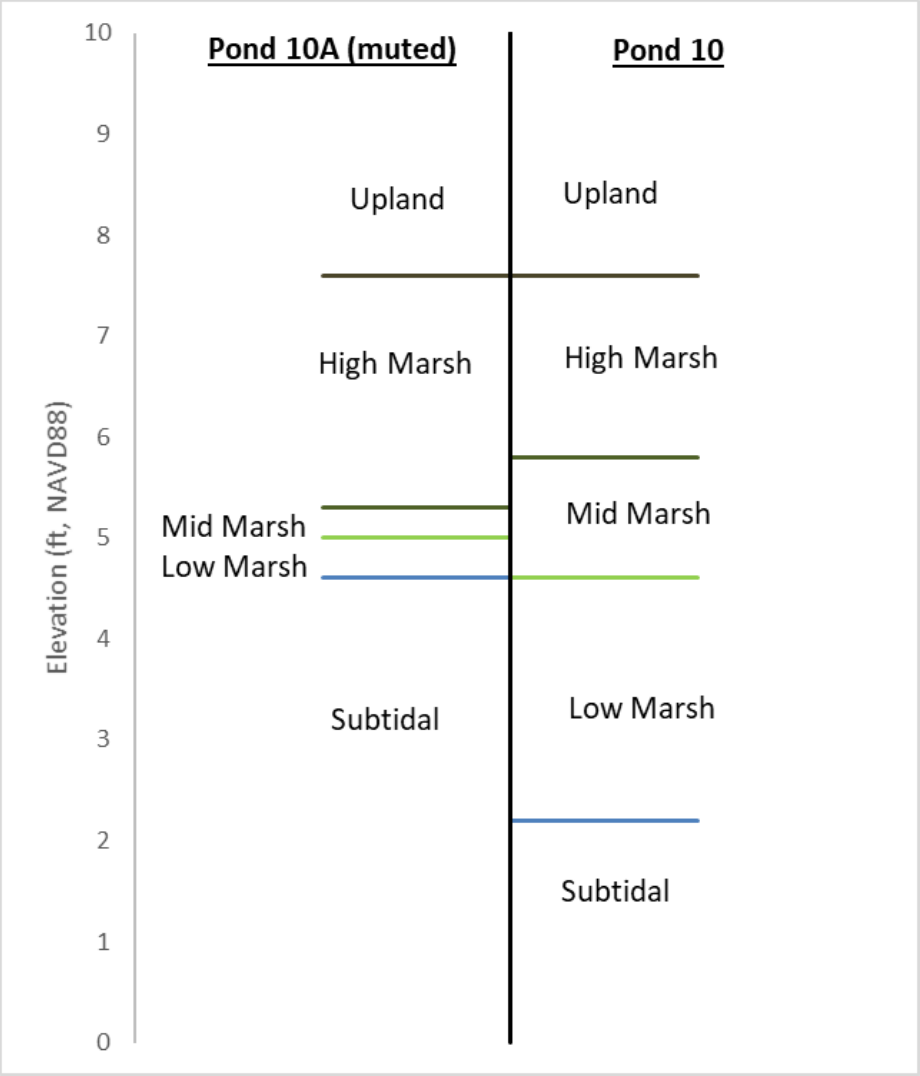

Figure 5-3. Habitat Bands for Pond 10A (tidally muted system) and Pond 10 (unmuted system)

Each habitat classification within the wetland profile provides unique ecological value and supports specific species. Low marsh and mudflats can provide foraging, roosting, and resting area for a variety of shorebirds and were even noted by the South Pacific Shorebird Conservation Plan to be the most important shorebird habitat within the coastal embayment's of California (USFWS, 2006; Hickey et al., 2003). Low marshes in the San Diego Bay typically include cordgrass, pickleweed and saltwort (USFWS, 2006). The next elevation break is mid marsh and it is known to support saltwort, pickleweed, estuary seablite and arrow grass (USFWS, 2006). High marsh occurs along the upland edge of the marsh and supports glasswort and the federally listed salt marsh birds beak (USFWS, 2006). The upland transition acts as a buffer between high marsh and native scrub communities; however, much of upland transition in the San Diego Bay is disturbed (USFWS, 2006). Each zonation plays a vital role in the salt marsh community.

5.2.2 Existing Habitat Vulnerabilities with Sea Level Rise

The SLAMM model was used to simulate marsh habitat changes within the Project area with sea level rise. In general, the Project area currently consists of low marsh and mudflats within Pond 10A and marsh fringe backed by upland habitat in other areas along the Bikeway. The existing conditions in the SLAMM model assumed the documented amount of tidal muting within Pond 10A. The habitat projection results with 1 foot, 2 feet, and 3.5 feet of sea level rise are shown below in Figure 5-4 and Figure 5-5.

Key findings of the projected habitat changes with sea level rise for the existing conditions are as follows:

- The steep topography of the existing marsh fringes provides limited habitat transgression potential and significantly constrain habitat bands with SLR greater than 1 foot. The limited transgression potential could decrease vegetation diversity and persistence.
- Under current conditions, Pond 10A does not drain fully during low tides and therefore an increase in water depths with future SLR will result in low marsh becoming more regularly inundated and converting to subtidal. With 1 foot of SLR, approximately 75 percent of the low marsh will convert to subtidal.

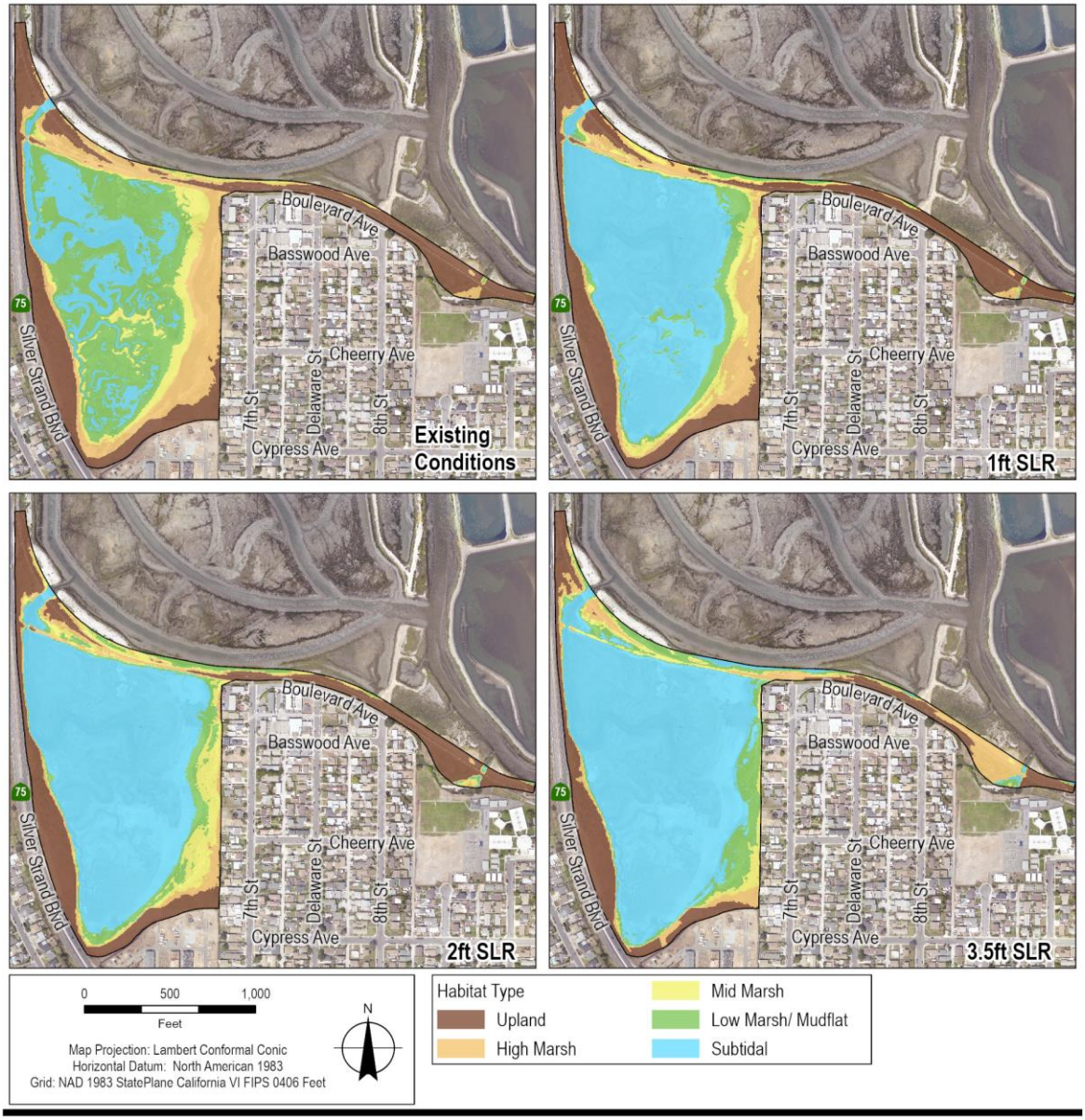

Figure 5-4. Existing Habitat Migration Projections with Sea Level Rise

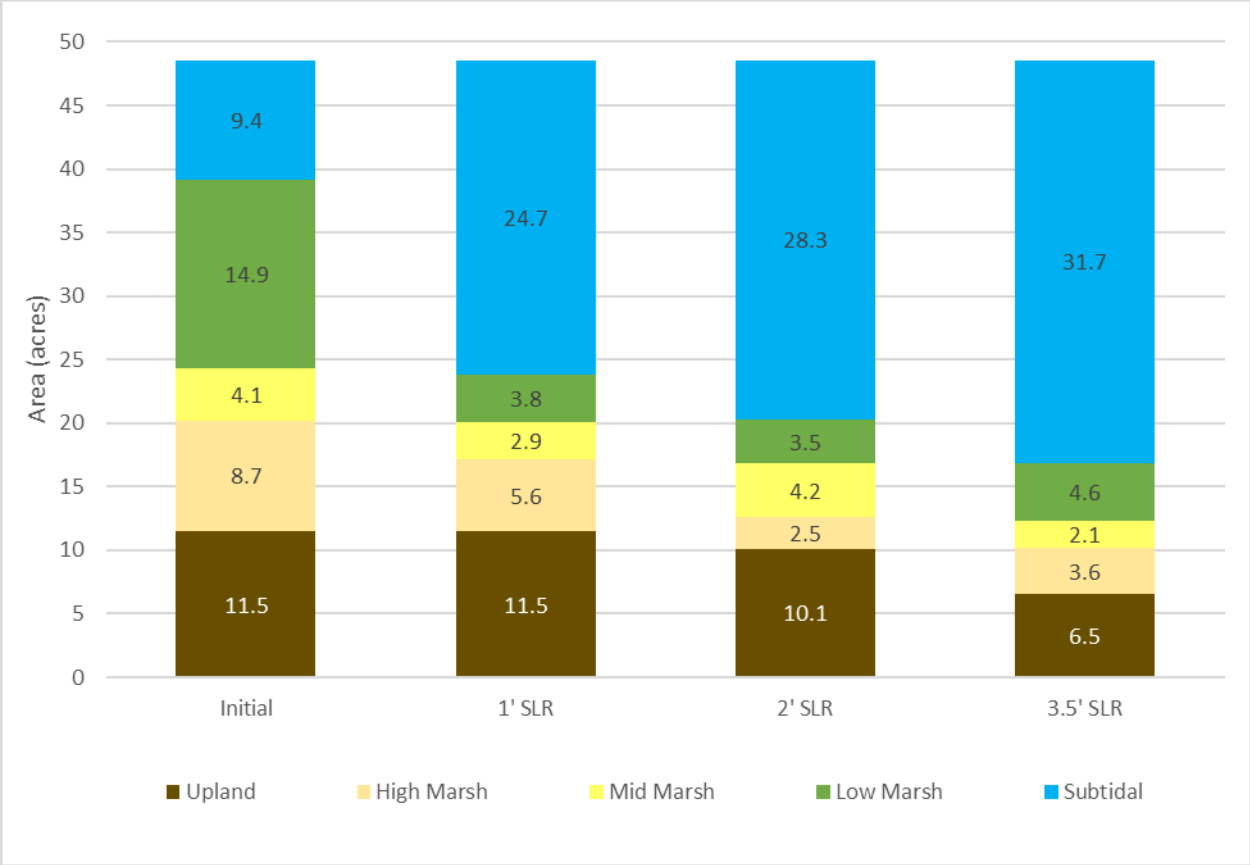

Figure 5-5. Existing Habitat Distribution Projections within the Project Area with Sea Level Rise

The percent change of each habitat category with SLR in the existing condition are presented in Table 5-2. The total marsh area (low, mid, and high marsh) is projected to decrease by approximately 56 percent with 1 foot of SLR and 63 percent with 3.5 feet of SLR, a total loss of 17.4 acres. These marsh reductions are the result of inundation of these areas, as demonstrated by the 237 percent increase in subtidal areas with 3.5' of SLR. This analysis demonstrates the vulnerability of existing marsh habitats with SLR in the Project area.

Table 5-2. Percent Habitat Change with Sea Level Rise Relative to the Existing Conditions

Habitat Type	Area (acres)				% Change		
	Existing Conditions	1' SLR	2' SLR	3.5' SLR	1' SLR	2' SLR	3.5' SLR
Upland	11.5	11.5	10.1	6.5	-0.4%	-12.2%	-43.4%
High Marsh	8.7	5.6	2.5	3.6	-34.9%	-71.0%	-58.0%
Mid Marsh	4.1	2.9	4.2	2.1	-28.9%	1.3%	-48.7%
Low Marsh	14.9	3.8	3.5	4.6	-74.4%	-76.6%	-68.9%
Subtidal	9.4	24.7	28.3	31.7	163.2%	201.1%	237.3%

5.3 Restoring Tidal Hydraulics to Pond 10A

Restoring the tidal connection to Pond 10A was identified as being a significant ecosystem restoration opportunity that could be coupled with the Project. Relieving muting of this system had been considered in various studies in the past and not carried forward due to the potential to cause flooding within the Bayside Community. Options to relieve the muting of the system included: 1) removing the Bikeway and dike between Ponds 10 and 10A entirely and restoring this area with tidal channels and salt marsh habitat or 2) constructing an elevated bridge along the existing Bikeway alignment to convey cyclists and pedestrians across the ponds while still providing additional tidal channels and connections.

Any option that restores the tidal hydraulics to Pond 10A requires construction of additional flood protection to low-lying portions of the Bayside Community (i.e., along the Flamingo Trail). This was accomplished through continuation of the living levee concept along the majority of the existing Flamingo Trail.

Figure 5-6. Example of Dike Breaching to Restore Tidal Connection to San Francisco South Bay Salt Ponds

(source: https://www.southbayrestoration.org/page/our-progress)

Figure 5-7. Example of a Raised Pedestrian Bridge Concept (Assateague Island, Maryland)

(Source: https://www.nps.gov/asis/planyourvisit/hiking.htm)

5.4 Stormwater Improvements

The City's gravity stormwater system conveys runoff from upland, developed areas to the bay, through low-elevation terrain. Stormwater conveyance capabilities are reduced by pipe diameter and relatively flat slopes for stormdrain pipes that are restricted by the outfall elevations at the slough channels along the bay. The stormdrain outfalls at the bay are free outfalls, which allow tidal waters to enter the stormdrain system. Due to the low elevation of the Bayside Community (and Imperial Beach) and proximity to the bay, the stormdrain inlets are relatively low and stormdrain pipes are relatively shallow.

During combined rainfall events and high tides, the 9th Street outfall (and others) are fully or partially submerged by tidal waters with much of the storage within the system filled by tidal waters. The addition of rainfall runoff often exceeds the system capacity and can lead to extended durations of flooding in the neighborhood.

Through the evaluation of existing hydraulic models of the stormwater drainage system, the Project team discovered previous stormwater models underestimated potential flooding risks from precipitation events by not accounting for the downstream tidal boundary (i.e., San Diego Bay) and sea level rise.

The Project team undertook a new stormwater modeling effort to evaluate the drainage system modifications within the Bayside Elementary School property to mitigate flooding in the vicinity of Calla Avenue, Cypress Avenue, 8th Street and 9th Street in Drainage Basin H. Additionally, variations in tidal boundary conditions were modeled to evaluate a variety of conditions representing typical, low recurrence, and future conditions with sea level rise.

Design alternatives were developed to assess the sequential implementation of a tide gate and replacement of existing 4-foot diameter pipe with a daylighted open channel, and creation of a multi-purpose detention basin within the school property. This sequence was assessed with and without a previously recommended parallel stormdrain system project within Drainage Basin H that increased the conveyance capacity for stormwater runoff. It was determined that the sequence of Project component implementation and tidal conditions affect the flood location, volume, and duration throughout the portion of the storm drain system analyzed.

It was concluded that the storm drain system is sensitive to the tidal boundary condition and new, additional stormdrain alignments may result in new locations of flooding without the implementation of a tide gate to prevent tidal waters from reducing storage capacity within the storm drain system. To address this, the following design elements were included into the design alternatives:

- Tide gate: A tide gate within the living levee alignment in Segment 3 would eliminate tidal water backflow into the stormdrain system: A tide gate and open channel to provide flood reduction benefits to the lower elevation areas of the drainage system (Cypress Avenue and north end of 9th Street). Implementation of the tide gate and open channel, in combination with the proposed parallel stormdrain system, reduces flooding along the new alignment during higher tidal water levels. An example tide gate is shown below in Figure 5-8.
- Upstream stormdrain improvements: Improvements were identified as being needed to increase the conveyance capacity of the stormwater system within Segment 3 (several pipe segments are undersized). A parallel system (as proposed under a separate City project) or increasing pipe sizes along the existing alignment could improve the conveyance of the system.
- Daylight Existing Stormdrain and Construct a Multi-purpose Detention Basin at the Bayside Elementary School Site: Daylighting the existing stormdrain and constructing a multi-purpose detention basin within the school yard of the Bayside Elementary School would significantly reduce flooding when combined with stormdrain improvements and a tide gate. A conceptual multi-purpose detention basin is shown below in Figure 5-9 and an example detention basin is shown in Figure 5-10.

Figure 5-8. Example Tide Gate

(source: http://www.nehalemmarine.com/muted-tidal-regulator)

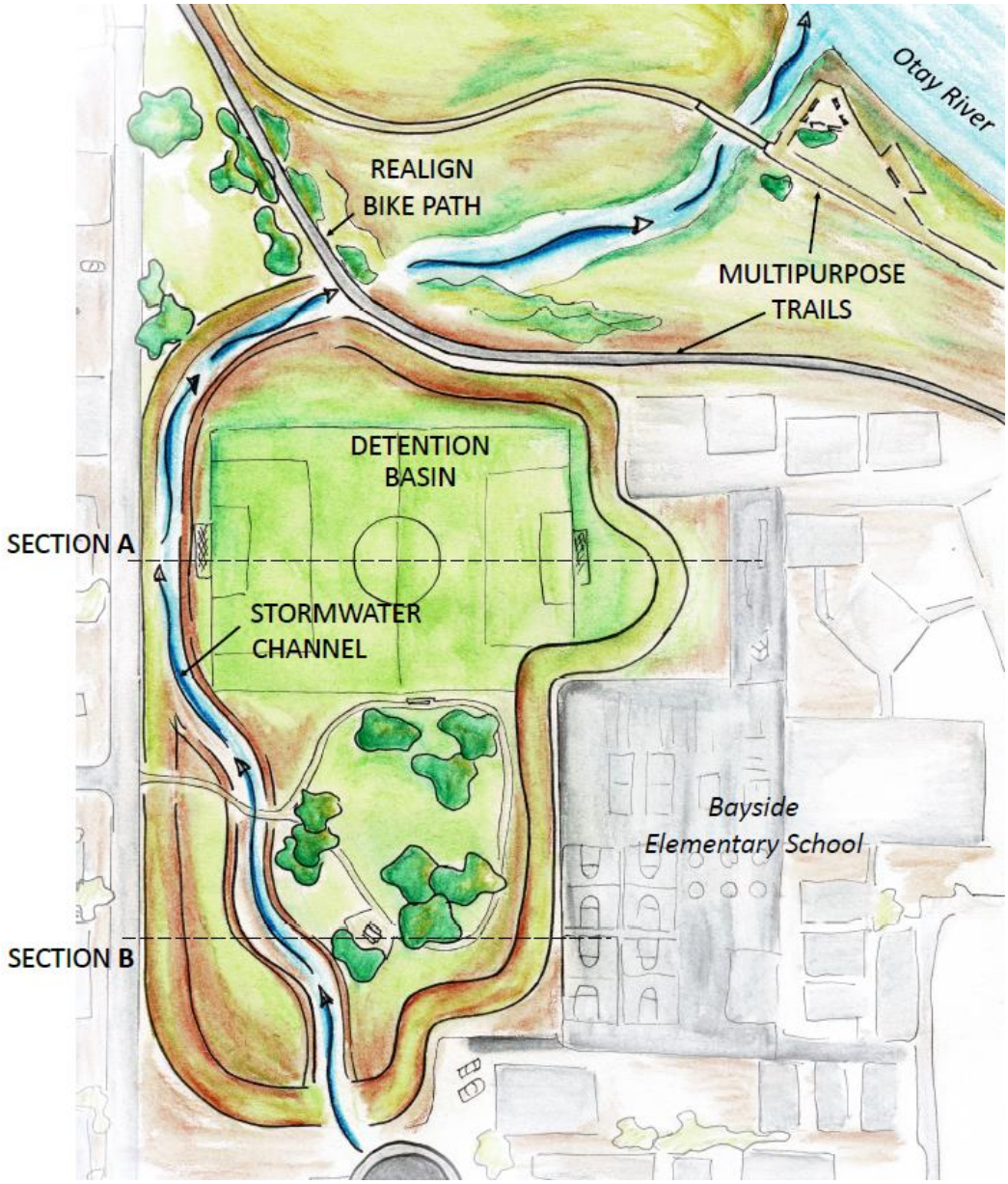

Figure 5-9. Daylighted Channel and Multi-purpose Detention Basin at the Bayside Elementary School Concept

Figure 5-10. Example Multi-purpose Detention Basin

(Source: https://tdhengineering.com/project/upgf-multiuse-athletic-field-intermittent-storm-water-detention-pond/)

6. Basis of Conceptual Designs

6.1 Living Levee Design

The design crest elevation of the living levee is 12.5 feet. This elevation includes the highest observed tide, 3.5 feet of SLR, and 1.2 feet of freeboard. This calculation is as follows:

Max tide + SLR + Freeboard

7.8 feet + 3.5 feet + 1.2 foot = 12.5 feet

The design elevation constraints for the Bikeway crest are largely related to the required slope / overall footprint and aesthetics / viewshed. There are potentially areas in which the Bikeway could be raised above 12.5 feet to provide additional freeboard and SLR resilience. The highest sections of the existing Bikeway within the Project area are around 15-feet and include the City Public Works parking lot and the stretch between Delaware Street and 8th Street. These elevated areas of 15 feet could be considered a maximum elevation for the proposed Bikeway. A crest elevation of 15 feet allows for a total SLR resiliency of 6.0 feet. The proposed living levee crest elevation relative to the existing grades is shown in Figure 6-1.

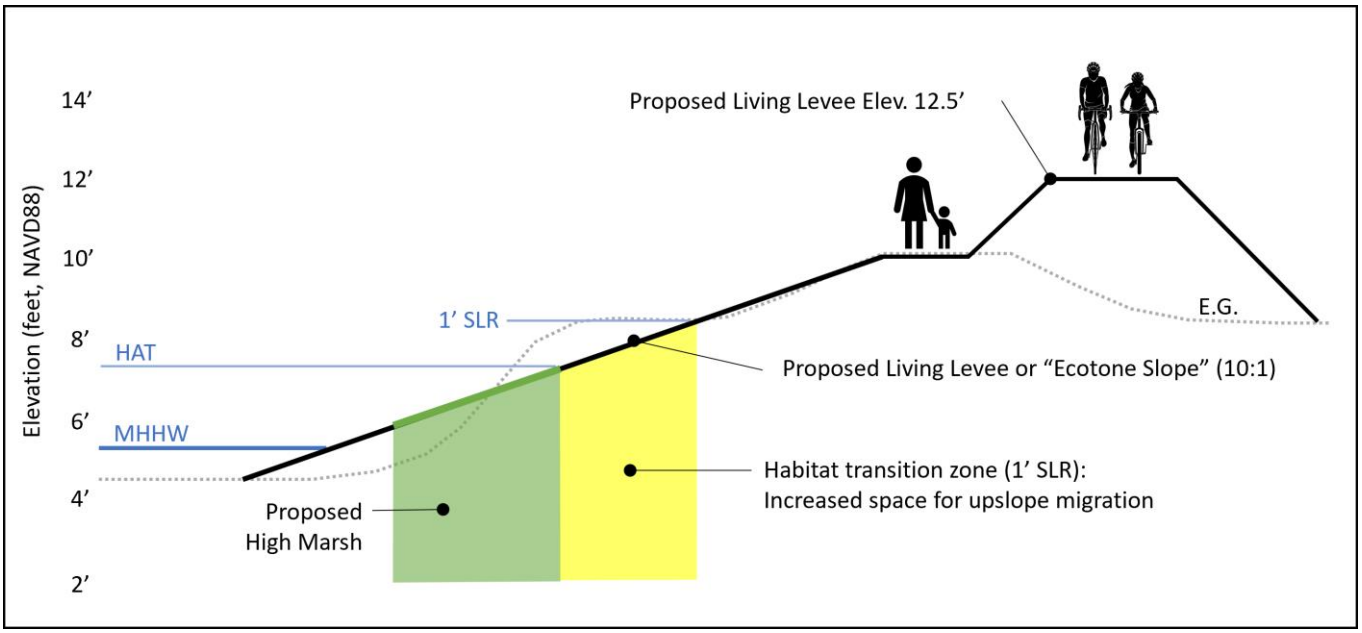

Figure 6-1. Representative Section of the Proposed Living Levee

The Project seeks to gain FEMA accreditation of the proposed levee such that the flood reduction is reflected in the Flood Insurance Rate Maps (FIRM). FEMA accredited levees are those that meet a set of design, data, and documentation requirements. The levee design will be further refined in the next design phase to meet these requirements.

6.2 Stormwater Improvements

Detailed engineering design of stormwater management solutions were not conducted during this phase of work. The next Project phase will consist of engineering design of the proposed tide gate, stormwater improvements (upstream), and the multi-purpose detention basin. Consistency with City of Imperial Beach, County of San Diego and Caltrans design standards will occur during this phase.

6.3 Ecosystem Resiliency

The ecotone slope of the living levee was optimized during the course of this study to provide the intended habitat migration opportunities while minimizing impacts to sensitive habitats and private properties. A minimum (no steeper than) slope of 7:1 (H:V) was determined.

The sizing of proposed tidal channels to restore tidal hydraulics to Pond 10A were not determined during this phase of work. Hydraulic modelling will be conducted in the next phase of work to determine the sizing and ideal location of tidal channels.

6.4 Pedestrian and Bicycle Path

The following provides minimum widths, preferred widths, location, and relevant design information for the Bikeway and Pedestrian Path. The Bikeway design was based on Caltrans Highway Design Manual (Chapter 100 – Bicycle Transportation Design). The separated Pedestrian Path was designed based on the County of San County Trails Program and the Community Trails Master Plan- Type B Rural Trail. Access to the Bikeway and Pedestrian Path will need to consider ADA design requirements. The design standards of the Bikeway and pedestrian pathway are as follows:

Bikeway Design Basis (Figure 6-2):

- Type: Two-way, Class 1 Bikeway. Paved surface with striping.
- Bikeway width: 10 ft minimum with 2 ft minimum shoulders (14 ft total width).
- Bikeway shoulder: Flat surface composed of all-weather surface material that is free of vegetation.

Pedestrian path Design Basis (Figure 6-3):

- Type: Type B Rural Trail Naturalized path / decomposed granite with headers. Natural tread surface material (decomposed granite) with optional binder material.
- Travel way: 6ft to 8ft tread width.
- Location: Pedestrian path should be north of the Bikeway (on the bayside).
- Minimum separation between pedestrian path and Bikeway: 4ft along earthen segments, 2ft minimum if on bridge.

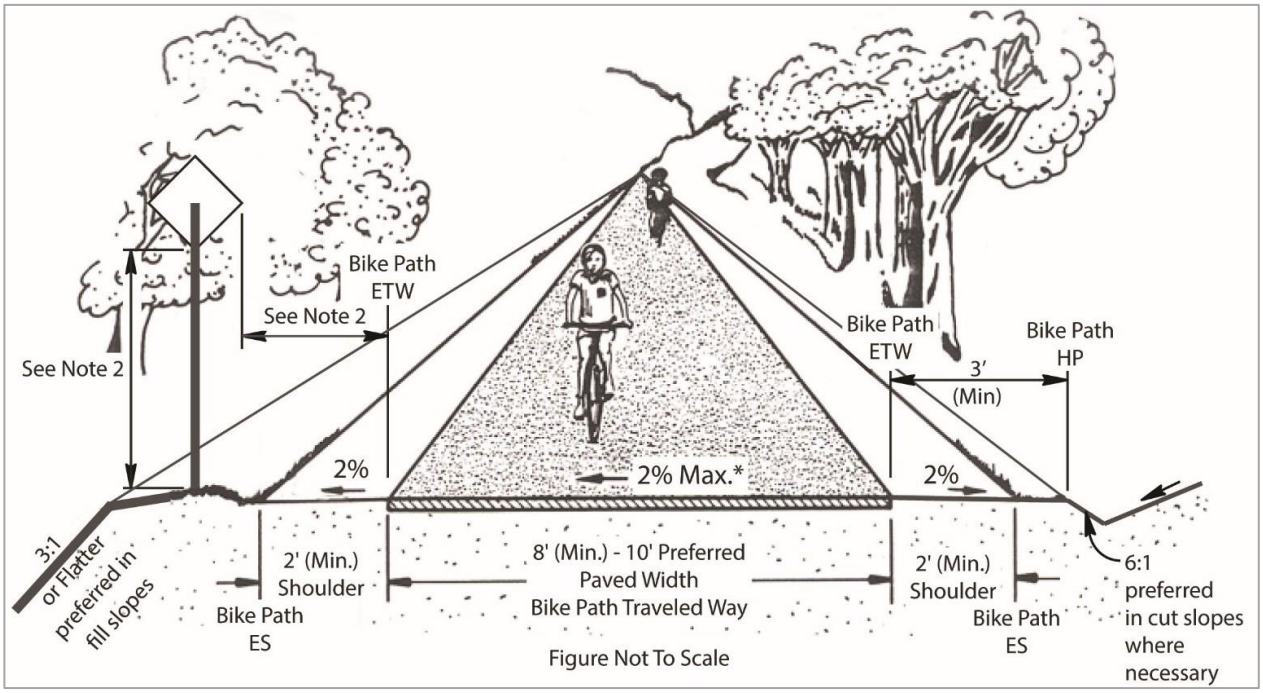

Figure 6-2. Two-Way Class 1 Bikeway Standard (Source: Caltrans, 2015)

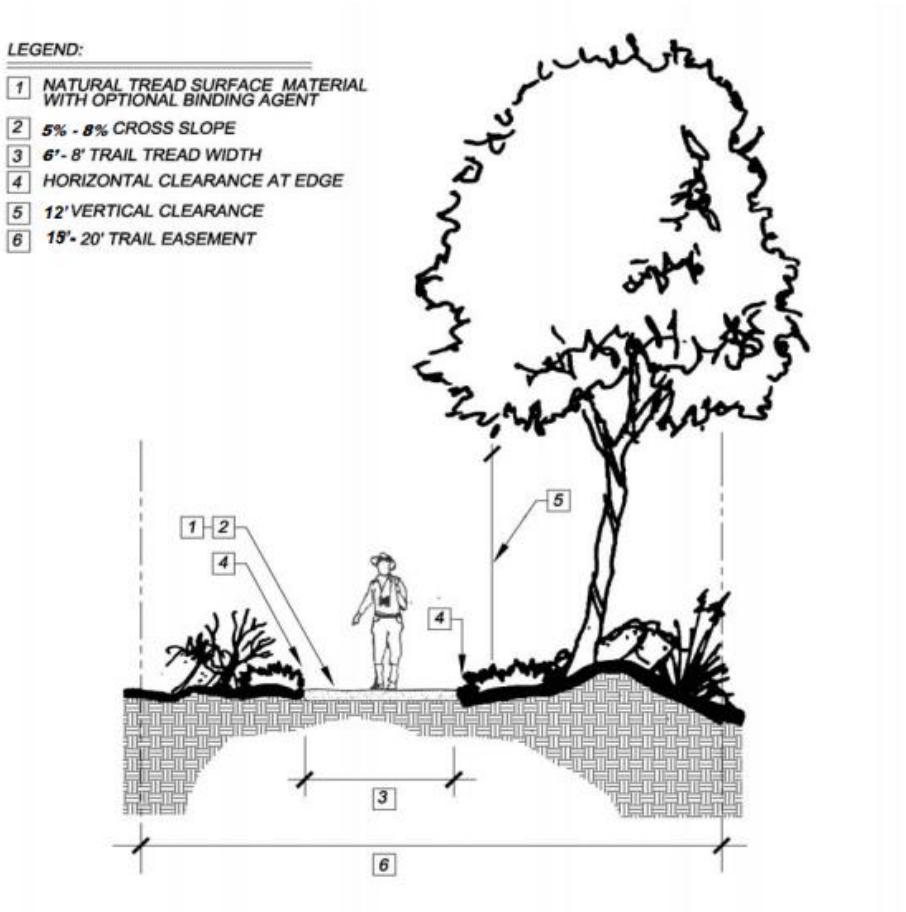

Figure 6-3. Pedestrian Path Design Basis (County of San Diego, 2005)

7. Project Alternatives

Three alternatives were developed from the constraints and opportunities analysis, conceptual design phase and several stakeholder and public outreach events. The alternatives and their short names are as follows:

- **Alternative 1** - “Elevate in Place”
- **Alternative 2** – “Replace with Bridge”
- **Alternative 3** – “Remove and Reroute”

Each of the three alternatives propose to:

- Construct a living levee with the following specifications:
    - 12.5 ft crest (minimum)
    - Ecotone slope with a minimum (no steeper than) of 7:1 (H:V) slope
- Separate user groups (pedestrians & cyclists) along the Bikeway by creating a bike path and pedestrian pathway with the following specifications:
    - 10ft wide Class 1 Bikeway with 2ft shoulders (14-foot width total)
    - 8 ft wide pedestrian trail
- Construct a tide gate and multi-purpose detention basin at the Bayside Elementary School

Each of these alternatives are described in detail in this section and the 30 percent design drawings are included in Appendix B.

7.1 Alternative 1 – “Elevate in Place”

Alternative 1 utilizes the existing developed Bikeway footprint across the entire Project area; therefore, is the least intrusive alternative. The existing Bikeway would be demolished, and a living levee would be constructed that contains both a Class 1 Bikeway and pedestrian trail. The Pond 10A culvert would be remain in place; however, would be improved with a tide gate or similar flood control structure to control water levels in Pond 10A with projected SLR. Pond 10A water levels would remain muted within this alternative. Alternative 1 provides adequate flood protection from coastal flooding and the multi-purpose detention basin would mitigate stormwater flooding. Alternative 1 is shown in plan and section in Figure 7-1 and Figure 7-2; respectively.

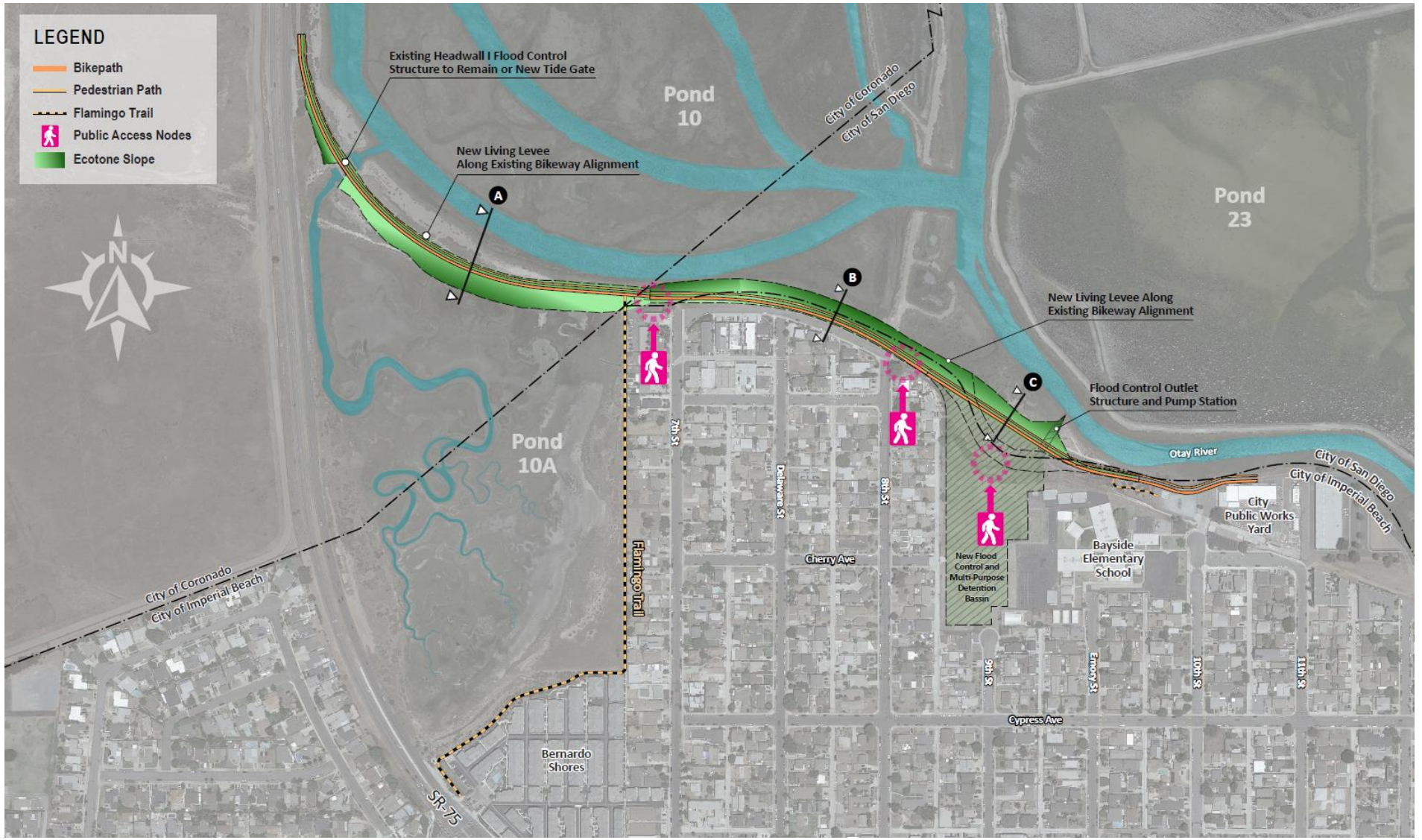

Figure 7-1. Alternative 1 – "Elevate in Place" Plan View

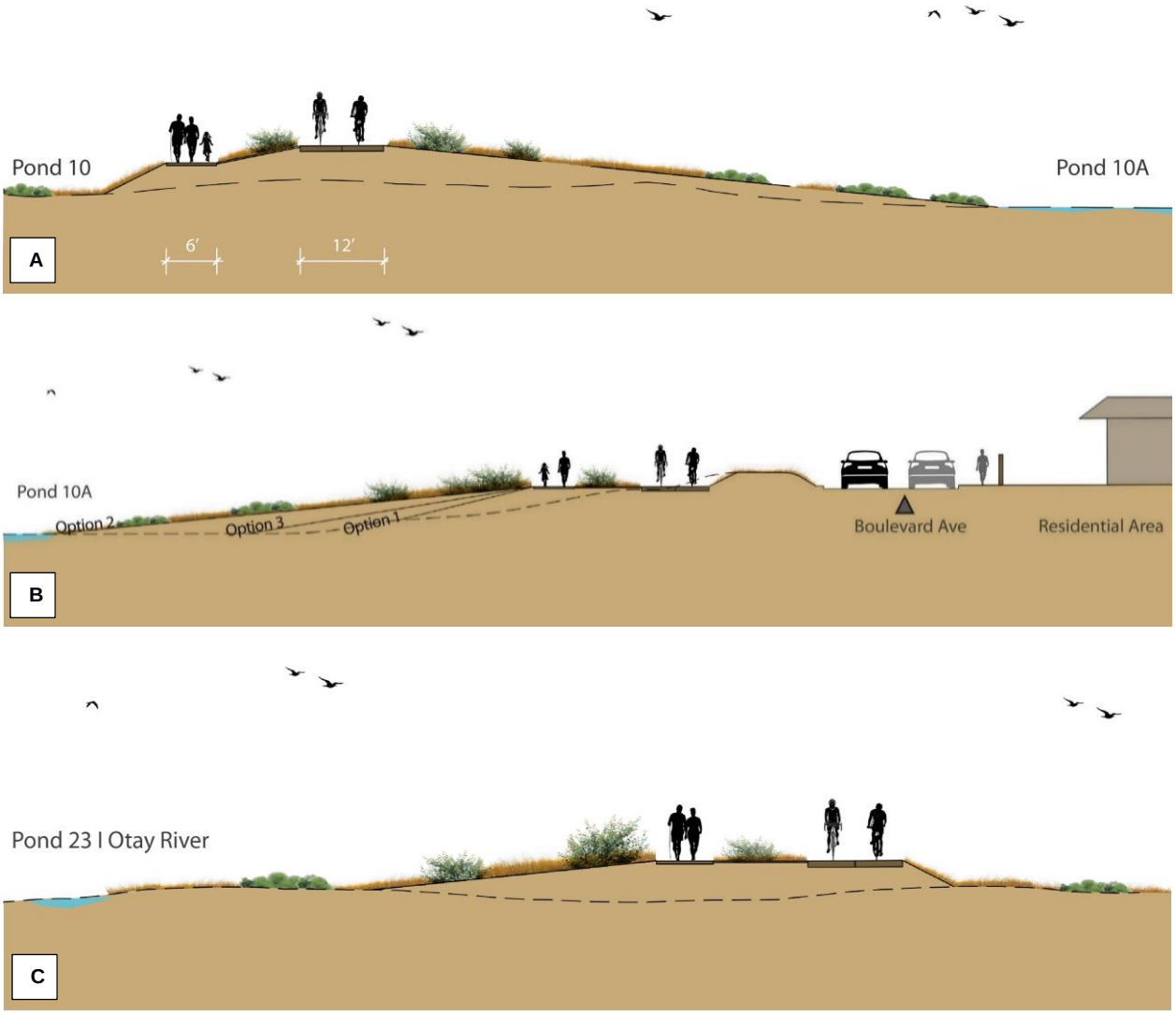

Figure 7-2. Alternative 1 – "Elevate in Place" Conceptual Cross Sections

7.2 Alternative 2 – “Replace with Bridge”

Alternative 2 involves the partial realignment of the Bikeway and the construction of an elevated bridge. The elevated bridge would be constructed along the existing Bikeway alignment through the Ponds 10/10A to provide cyclist or pedestrian connectivity across this area. The existing Bikeway and dike through the Pond 10A area would be demolished and restored with native habitats and a new tidal channel to restore hydraulics within Pond 10A. A living levee would be constructed along the Flamingo Trail alignment to provide flood protection to a low-lying portion of the Bayside Community, which becomes vulnerable to coastal flooding with the removal of tidal muting of Pond 10A. The Bikeway would also be realigned along the Bayside Elementary School within this alternative to improve safety along the Bikeway and to potentially restore additional Bay habitat. Alternative 2 is shown in plan and section in Figure 7-3 and Figure 7-4; respectively.

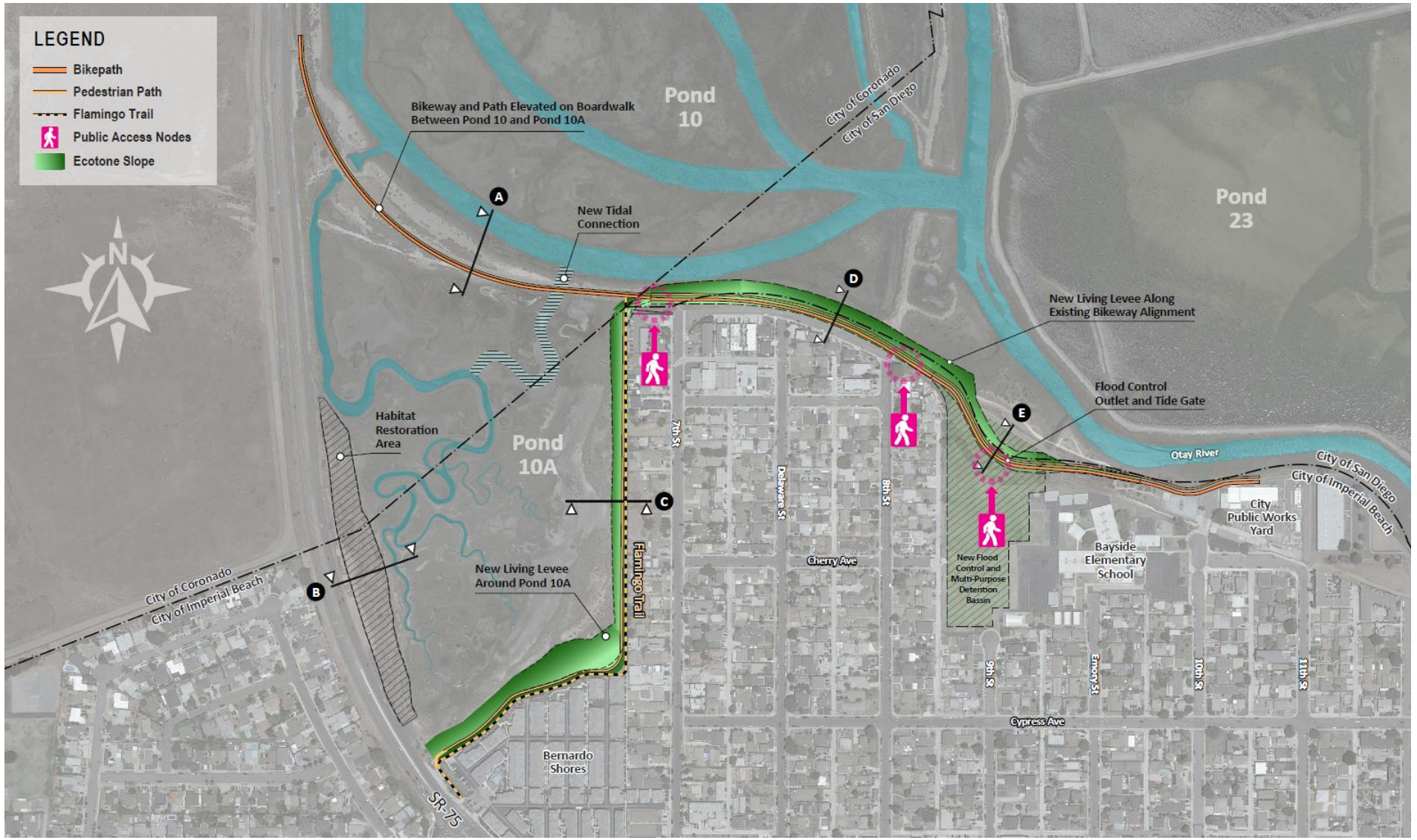

Figure 7-3. Alternative 2 – "Replace with Bridge" Plan View

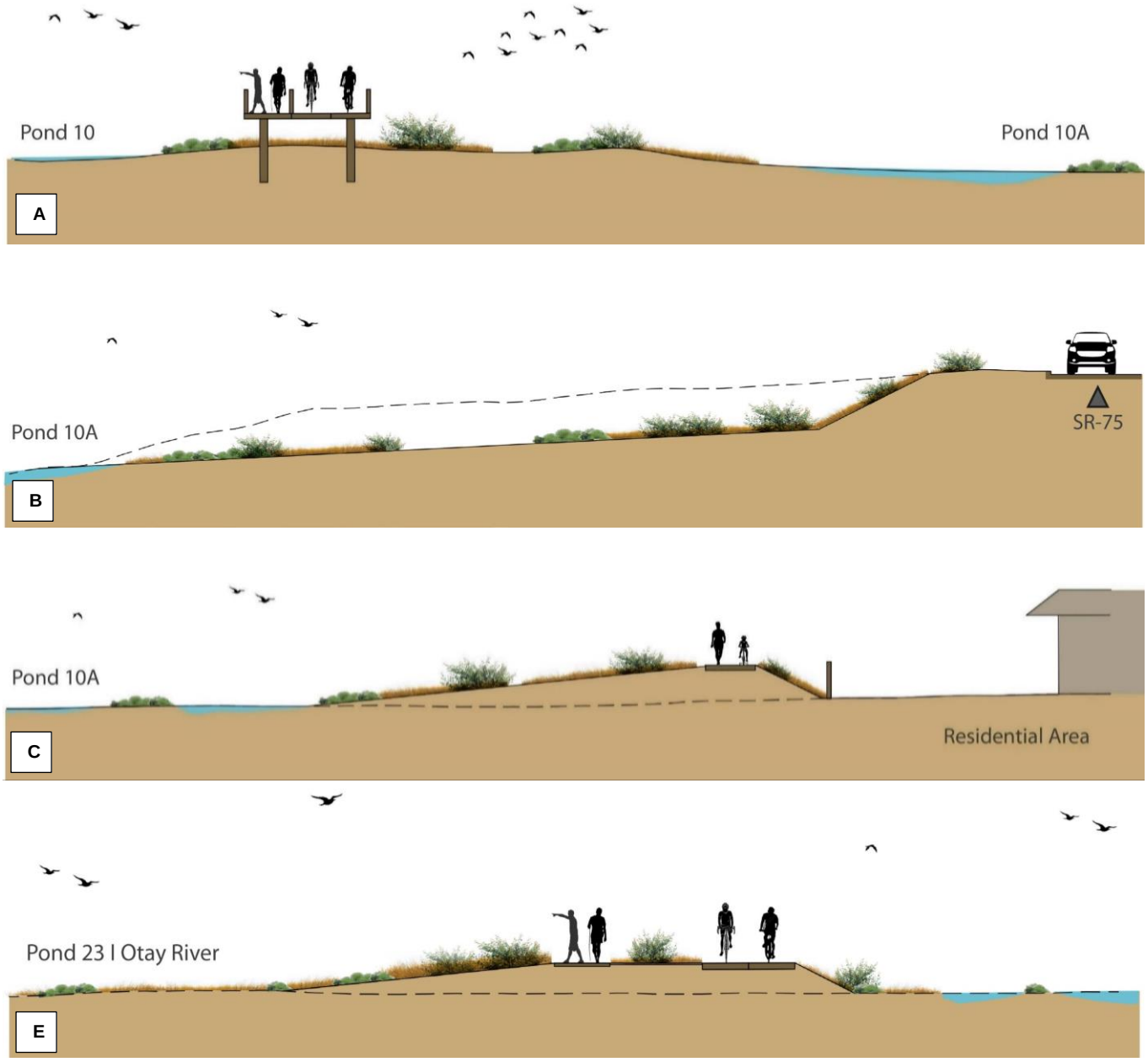

Figure 7-4. Alternative 2 – "Replace with Bridge" Cross Sections

7.3 Alternative 3 – “Remove and Reroute”

Alternative 3 involves the realignment of the Bikeway around the perimeter of Pond 10A. The new alignment of the Bikeway would follow the existing Flamingo trail and then run parallel to SR-75. The existing Bikeway and dike would be demolished, habitats would be restored, and a new channel would be created to improve tidal hydraulics to Pond 10A. Like, Alternative 2, Alternative 3 would realign a portion of the Bikeway along the Bayside Elementary School to improve safety and to potentially restore Bay habitat. Alternative 3 is shown in plan and section in Figure 7-5 and Figure 7-6; respectively.

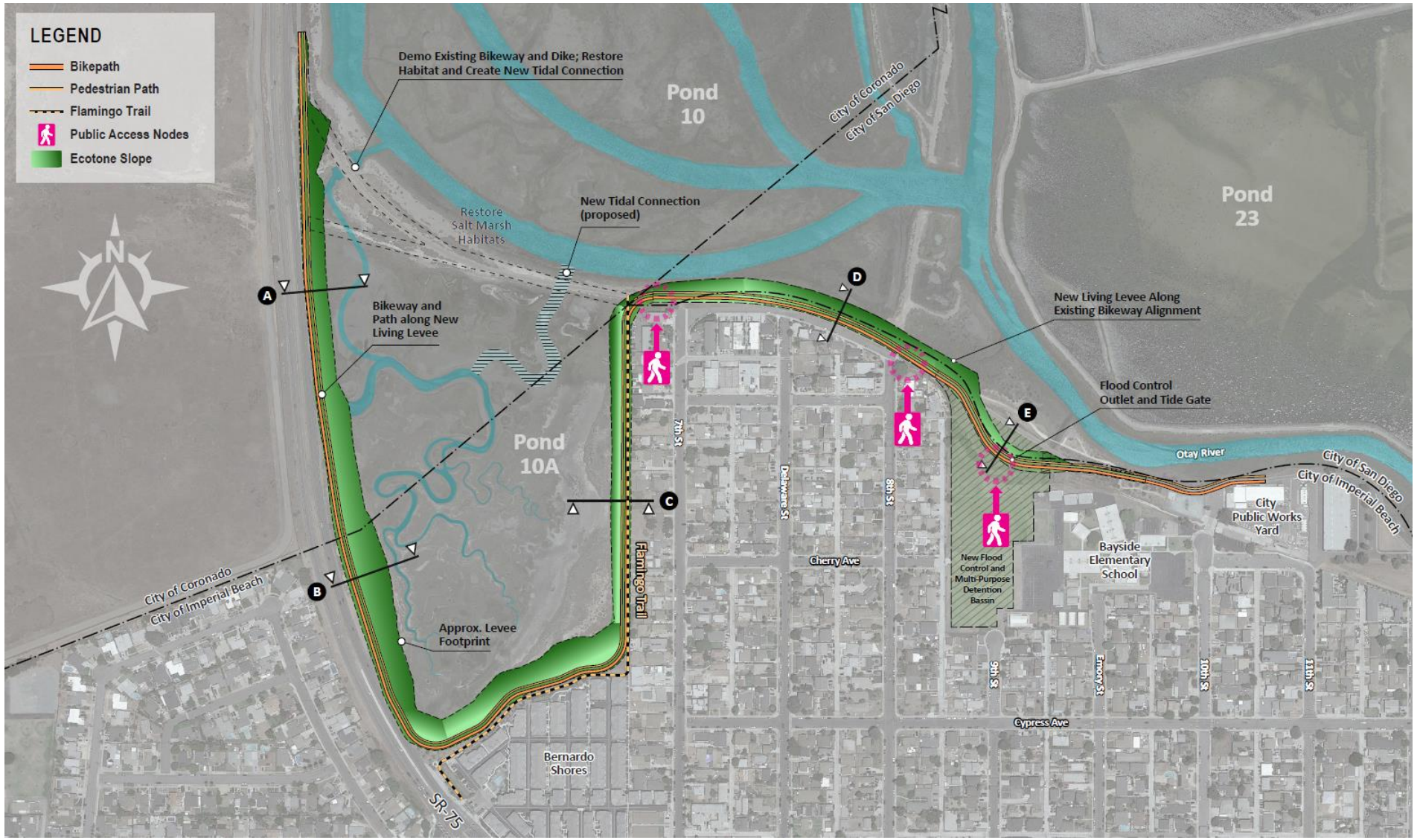

Figure 7-5. Alternative 3 Plan View

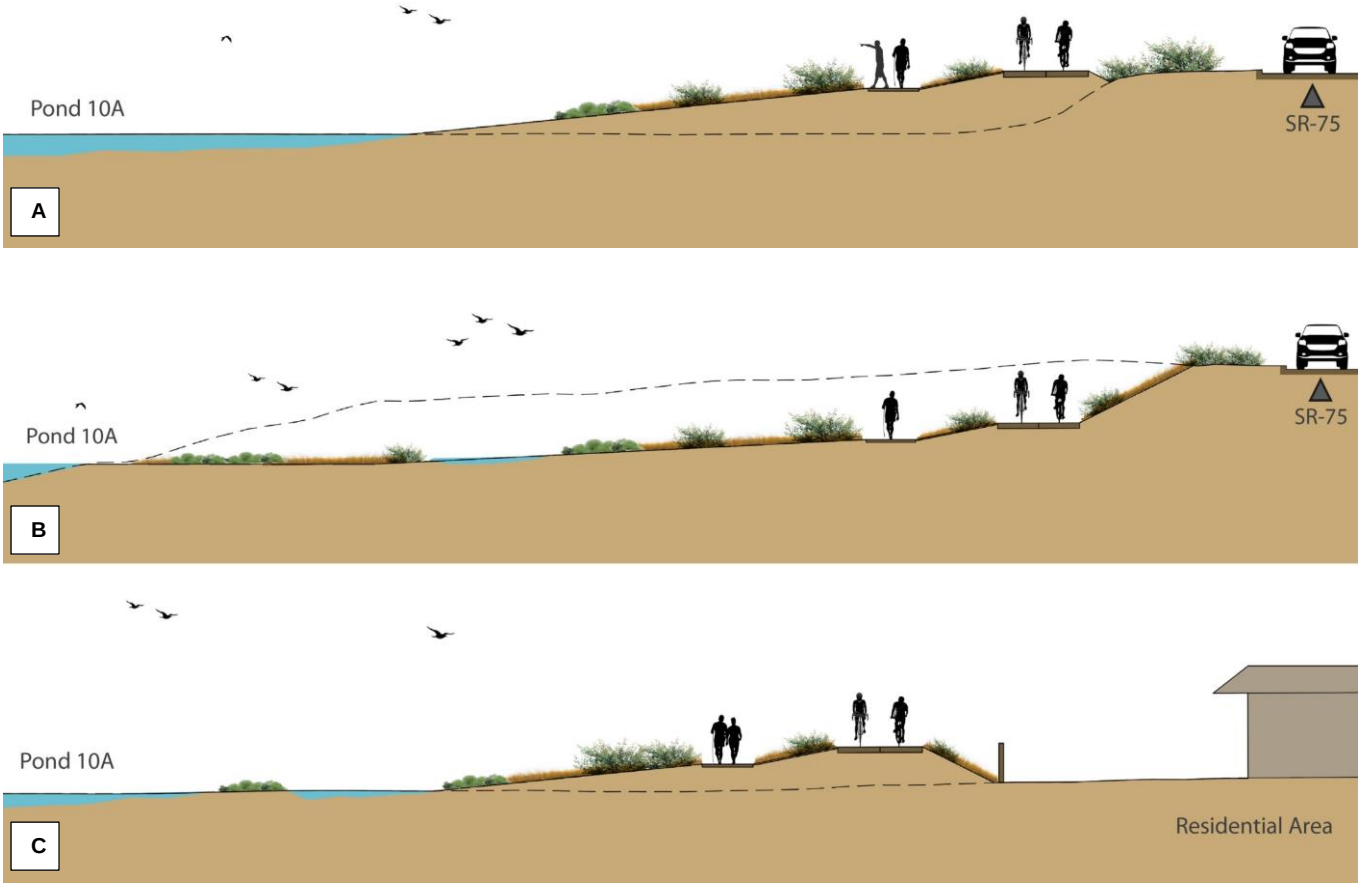

Figure 7-6. Alternative 3 Conceptual Cross Sections

8. Construction Cost Estimates

Estimates of probable construction costs were developed for each of the three Project Alternatives. The cost estimates included major elements of the alternatives as well as some level of maintenance and contingency. The estimates for each of the alternatives are summarized in Table 8-1.

Table 8-1. Opinions of Probable Construction Costs for each of the Alternatives

Alternative	Total Estimated Construction Cost (USD, Million)
Alternative 1: Elevate in Place	$11.2 M
Alternative 2: Replace with Bridge	$33.7 M
Alternative 3: Remove and Reroute	$21.7 M

The estimates assume prevailing wage rates and that the project will be completed in a single phase. Construction indirects, including mobilization and demobilization, site facilities, and temporary utilities, were estimated as a percentage of the total construction cost. Direct construction costs, including demolition, earthworks, and site work, were estimated using pricing databases and subcontractor pricing for similar construction. Construction costs were updated to reflect current conditions specific to the project location. In the absence of a detailed design, some of the utilities and site work items were estimated using pricing for equivalent features that have been designed for similar projects. An additional allowance was included to account for undeveloped design details and potential design changes for these items.

9. Multi-Criteria Analysis of Alternatives

The multi-criteria analysis (MCA) provides an opportunity to analyze each alternative against a wide range of criteria that reflects the multiple goals and objectives of the Project. Rather than rely solely on economics, or a benefit-cost ratio (largely influenced by economics), the multi-criteria analysis allows for consideration of a diverse range of criteria that reflects the feedback from public engagement activities and Project stakeholders.

9.1 Alternatives Analysis Criteria

The Project alternatives aim to provide flood protection to the Bayside Neighborhood while also balancing Bikeway user experience and ecological values of the Bay. The analysis criteria have been organized into five general categories:

- Coastal Hazards
- Public Access & Public Safety
- Habitat Enhancement
- Regulatory
- Financial / Economic

These categories are aligned with the Project objectives and public feedback gathered from workshops and online surveys. The specific criteria within each category along with the basis for evaluation is provided in Table 9-1.

Table 9-1. Categories and Criteria for Alternative Analysis

Category & Criteria	Basis of Evaluation
Coastal Hazards	
Coastal Flood Protection	Does the project mitigate overtopping of the Bikeway and minimize (tidal) flood hazards for the community? (1 = no improvement in flood reduction, 5 = resilient to extreme water levels+3.5' SLR,)
Flood protection from extreme rain events	Does the Project reduce the risk of flooding from extreme precipitation events in combination with SLR in the Project area? (1=no change, 3=mitigates 1-yr storm+3.5' SLR, 5=mitigates 10-yr storm+3.5' SLR)
Public Access, Safety, and Consistency with Public Vision	
Public Access	Coastal access, trail connectivity to neighbourhood (1 = impact to access, 3 = no change, 5 = improvement)
User Experience	Does the project align with the community vision? (1=little or no change to the existing experience, 5= Project includes elements from public outreach)
Safety	Balance between pedestrian and cyclists. Will the Project separate user groups to increase safety along the Bikeway? (1=little or no change, 5=improved Bikeway & pedestrian separation)
Community impacts during construction	How long will Project construction disturb access/use of the Bikeway and community? (1= long construction/disturbance duration along Bikeway and neighbourhood, 5=minimal construction/disturbance along Bikeway and neighbourhood)
Aesthetics	Does the Project enhance the aesthetics or view corridors of the Bikeway, corridor and the community? (1 = negative impact, 3 = no change, 5 = improved aesthetics)
Habitat Enhancement	
Habitat Enhancement Area	Does the alt. enhance and diversify habitat types? (1 = little or no enhance/diversification, 5 = maximum enhancement/diversification potential)
Temporary Habitat Disturbance from Construction	Does the Project result in disturbance to sensitive habitat? (1 = extensive disturbance, 3=some disturbance, 5 = no impacts or disturbance)

Category & Criteria	Basis of Evaluation
Pond 10A Hydraulics	Does the Project enhance or restore the tidal connection, circulation, and range in water levels in Pond 10A? (1=little or no change, 5= full tidal connection restored)
Ecosystem Resilience (Sustainability)	Does the alt. provide habitat transgression for resilience to SLR? (1 = little ability to transgress, 5=adequate room to transgress to 3.5' SLR)
Regulatory	
CEQA/NEPA Process	Length and complexity of environmental process
Permitting Process	Length and complexity of permits (CCC, USACE, RWQCB)
USFWS Jurisdictional Impacts	Does the Project impact USFWS lands/habitat? And to what extent? (1=significant impact, 3=moderate impacts, 5=no impact)
Financial	
Construction Cost	Initial cost of construction to implement each alternative
Long-term Maintenance & Operation Costs	Costs to maintain and adaptively manage the Project

9.2 Weighting and Scoring System

The MCA scoring and weighting presented in this report reflect input from the multi-disciplinary Project team and input collected during the stakeholder and public outreach process. The maximum potential score for each alternative is based on how well the alternative satisfies the criteria within the five general categories (Coastal Hazards, Public Safety and Access, Habitat Enhancement, Regulatory, and Financial). The MCA results presented in this report are based on a category weighting shown in Table 9-2, in which the total score in each category combine for a maximum score of 100 percent. In other words, the Coastal Hazards category has a maximum score of 25 percent, while Habitat Enhancement and Beach Access and Amenities each account for up to 25 percent of the total score. Regulatory and Financial each account for up to 10 percent and 15 percent of the total score; respectively.

Table 9-2. Multi-Criteria Analysis Category Weighting

Category	Weighting
Coastal Hazards	25%
Public Safety and Access	25%
Habitat Enhancement	25%
Regulatory	10%
Financial	15%
Total	**100%**

9.3 Results and Analysis

The results of the MCA indicated the highest-ranking alternative was Alternative 3, which involves rerouting the Bikeway around Pond 10A. Alternative 2, which involves a new bridge, was the second highest scoring alternative. The No Project alternative scored significantly lower than all three alternatives, with only a 50 percent in total score. The top two alternatives were separated only by 6 percent in total score, a relatively close spread. The top scoring alternative was separated from the lowest scoring alternative (Alt. 1) by 11 percent in total score, which is considerable given the sensitivity of the weighing and scoring system. A summary of the MCA results is shown below in Table 9-3 and a summary of the rationale used to assign scores and differentiate among alternatives is provided in the following sections. The detailed scoring matrix, including comments and individual scores, is included in Appendix C.

Table 9-3. Multi-Criteria Analysis Results Summary

Category		Alternative 1	Alternative 2	Alternative 3
	No Project	Elevate in Place	Replace with Bridge	Remove and Reroute
Coastal Hazards (25%)	5%	25%	25%	25%
Public Access, Safety, & Consistency with Public Vision (25%)	13%	17%	20%	20%
Habitat Enhancement (25%)	10%	14%	21%	21%
Regulatory (10%)	7%	4%	5%	6%
Financial (15%)	15%	11%	5%	9%
Total Weighted Score out of 100%	50%	70%	75%	81%
Alternative Ranking	*4*	*3*	*2*	*1*

9.3.1 Coastal Hazards

The scoring of coastal hazards was consistent across each alternative, as all alternatives received the highest possible score for this category. This is because each alternative provides the same minimum flood protection for the Bikeway and community from coastal and stormwater flooding.

9.3.2 Public Access, Safety, and Consistency with Public Vision

The scoring of alternatives in this category were all relatively close, as each alternative was developed with public access, safety, and community input in mind. Alternatives 2 and 3 scored the highest and both finished with a score a 21 percent (out of 25 percent). Alternative 1 scored the lowest, with a final score of 14 percent. In the individual Public Access and Safety categories, each Alternative received the same (high) scores. This is because each alternative effectively separates user groups by creating a pedestrian trail and Bikeway.

Alternatives 2 and 3 scored the same in the user experience (public vision) category, which largely judged Alternatives against the community outreach results. Based on the community outreach results, Alternative 2 and 3 both align with the public's vision for the Project area. The bridge for Alternative 2 allows cyclists to maintain the same route as the existing alignment and the bridge is ideal for pedestrians. Alternative 3 reroutes the Bikeway but is the most environmentally beneficial alternative, which is a value that is highly supported by the community. Alternative 3 scored the highest in the aesthetics category. Aesthetics can be subjective, so it was judged simply on visual obstacles. Alternative 1 and 2 both involve the Bikeway to follow the same alignment through Pond 10A, while Alternative 3 removes this obstacle and restores the native aesthetic, so Alternative 3 scored the highest.

9.3.3 Habitat Enhancement

9.3.3.1 Long-term Habitat Resiliency

The SLAMM model was utilized to understand how habitats would transgress with SLR within each of the proposed alternatives. The alternatives were modelled for 1, 2, and 3.5 feet of SLR and results were used to guide the scoring of alternatives in the MCA. The model results are shown graphically and also in tabular form to allow for direct comparison of the alternatives. The SLAMM model provides guidance on the scoring of alternatives for the habitat enhancement and the ecosystem resiliency categories. That is, the overall changes in area with SLR, the diversity of those changes, and the ability for habitat to transgress upslope with SLR. The temporary habitat disturbances from construction and Pond 10A hydraulics category were scored separately from the SLAMM results.

Alternative 1 – "Elevate in Place"

Alternative 1 would create a living levee and transitional habitat area along the existing Bikeway corridor. The living levee would create a more gradual marsh fringe and allow the zonation of coastal marsh to adapt to rising water levels by allowing for upslope migration, as opposed to subtidal habitat dominating vegetation communities. The built conditions of Alternative 1 would initially provide an increase in upland, high and mid marsh habitat in comparison to the existing conditions.

Alternative 2 – "Replace with Bridge"

Alternative 2, "Replace with Bridge" assumes that the Pond 10A tidal connection will be fully restored, and a boardwalk would be constructed in place of the existing Bikeway across Pond 10 and 10A. The proposed conditions would restore the tidal connection to Pond 10A, construct a boardwalk while restoring habitat in the bikeway fill prism, and provide a habitat gradient along the constructed living levee.

In comparison to the existing conditions, restoration of the tidal connection under the proposed conditions would initially convert much of the existing subtidal to low marsh in Pond 10A as the marsh will be fully draining during low tides. In addition, the proposed conditions would initially convert much of the low marsh to mid marsh. Construction of the boardwalk would revert the bikeway fill prism, which is currently disturbed/developed upland habitat, to mid and high marsh habitat. In comparison to the existing conditions, Alternative 2, once constructed, would initially provide about 16 more acres of mid marsh.

The built conditions of Alternative 2 were simulated using SLAMM to understand how habitat and tidal marsh would respond to 1, 2, and 3.5 feet of SLR. The habitat projection results are shown below in Figure 9-1, Figure 9-2, and in tabular format in Table 9-4. Key findings are as follows:

- Overall, there is no change in the total marsh area (low, mid, and high) from built conditions with 1 foot of SLR and only a 4 percent increase with 2 feet of SLR. However, with 3.5 feet of SLR, subtidal dominates as the total marsh decreases by 61 percent.
- In comparison to the existing conditions, Alternative 2 allows marsh to migrate upslope with 1 and 2 feet of SLR; Alternative 2 allows for 22 and 25 additional acres of total marsh area (low, mid, and high marsh) than that of the existing conditions with 1 and 2 feet of SLR.

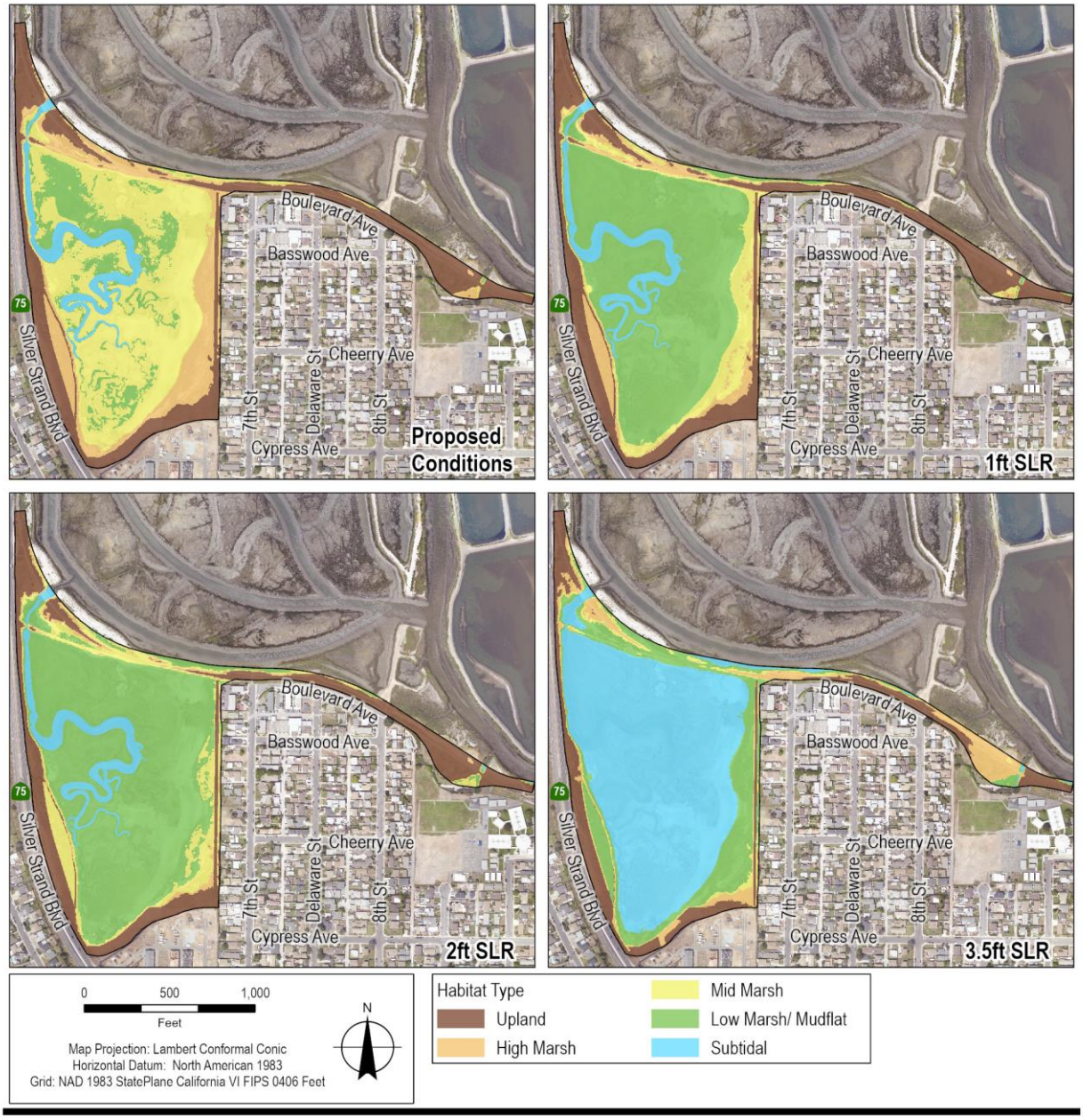

Figure 9-1. Alternative 2 Habitat Projection Results

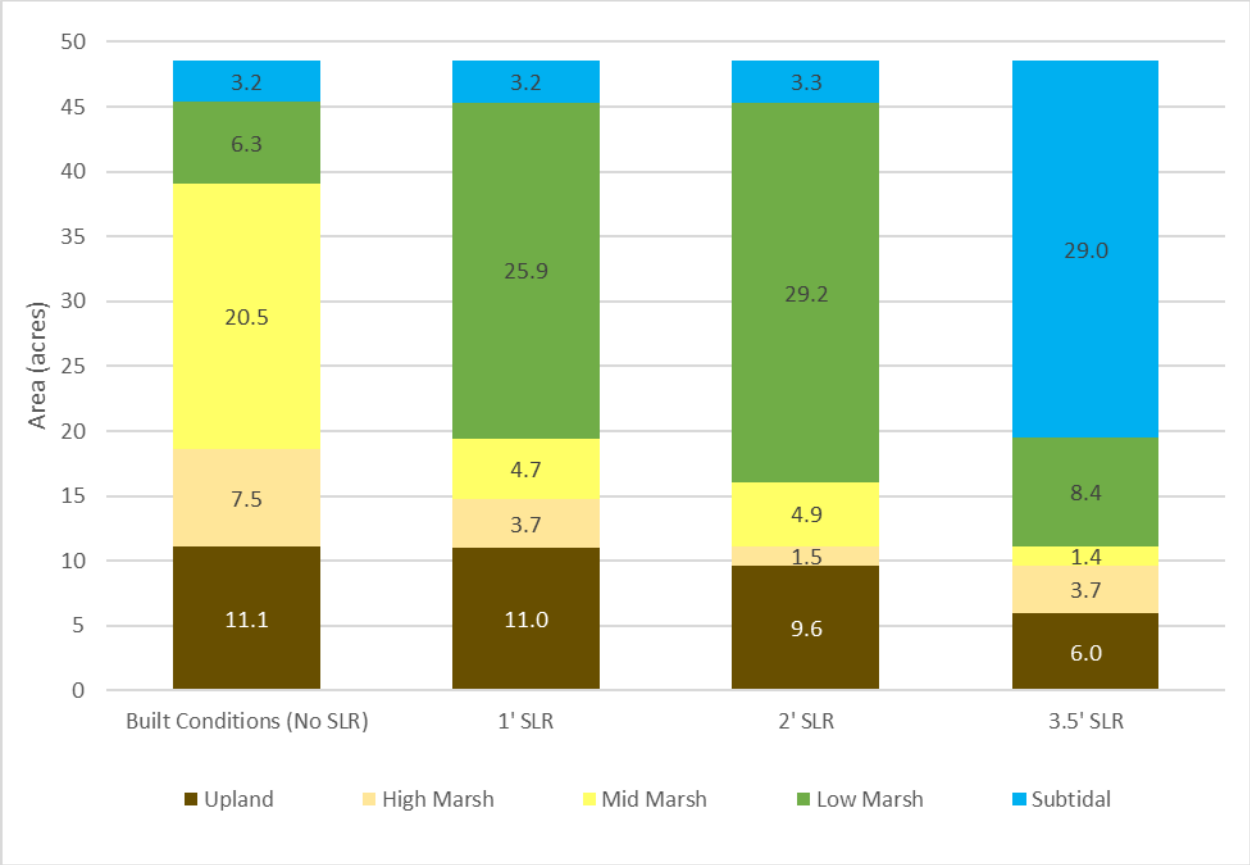

Figure 9-2. Alternative 2 Habitat Migration Projections

Table 9-4. Percent Change from Built Conditions for Alternative 2

Habitat Type	Area (acres)				Percent Change from Built Condition (%)		
	Built Condition	1' SLR	2' SLR	3.5' SLR	1' SLR	2' SLR	3.5' SLR
Upland	11.1	11.0	9.6	6.0	-0.5%	-12.9%	-46.3%
High Marsh	7.5	3.7	1.5	3.7	-50.5%	-79.9%	-50.6%
Mid Marsh	20.5	4.7	4.9	1.4	-77.1%	-76.2%	-93.0%
Low Marsh	6.3	25.9	29.2	8.4	313.0%	366.3%	34.3%
Subtidal	3.2	3.2	3.3	29.0	0.9%	2.7%	810.4%

Alternative 3 – "Remove and Reroute"

Similar to Alternative 2, Alternative 3 "Remove and Reroute" assumes that the tidal connection will be fully restored, a new tidal channel would be created, and the Bikeway would be rerouted along the perimeter of Pond 10A. This would involve the removal of the existing Bikeway and fill prism, and restoration of habitat within Pond 10A.

Alternative 3, once built, would initially result in habitat changes very similar to the initial built conditions of Alternative 2. That is, much of the existing subtidal habitat would be converted to low marsh, existing low marsh will be converted to mid marsh, and some of the disturbed and developed upland habitat will be converted to mid and high marsh. Overall, the projected acreages for each zonation under the Alternative 3 built condition are very similar to that of the built conditions for Alternative 2. However, there are some spatial differences in the distribution of habitat. For instance, the constructed living levee around the perimeter of Pond 10A under Alternative 3 would provide additional habitat gradient for marsh migration.

To better understand how habitat under Alternative 3 would respond with SLR, Alternative 3 was simulated for 1, 2, and 3.5 feet of SLR using SLAMM. The habitat projection results that demonstrate how habitats may transgress with sea level rise within the built conditions are shown below in Figure 9-3, Figure 9-4, and in tabular format in Table 9-5. Overall, the results are very similar to that of Alternative 2. The differences between Alternative 2 and 3 were typically less than one acre when comparing the habitat types for each SLR scenario. Thus, the key findings are identical to that of Alternative 2.

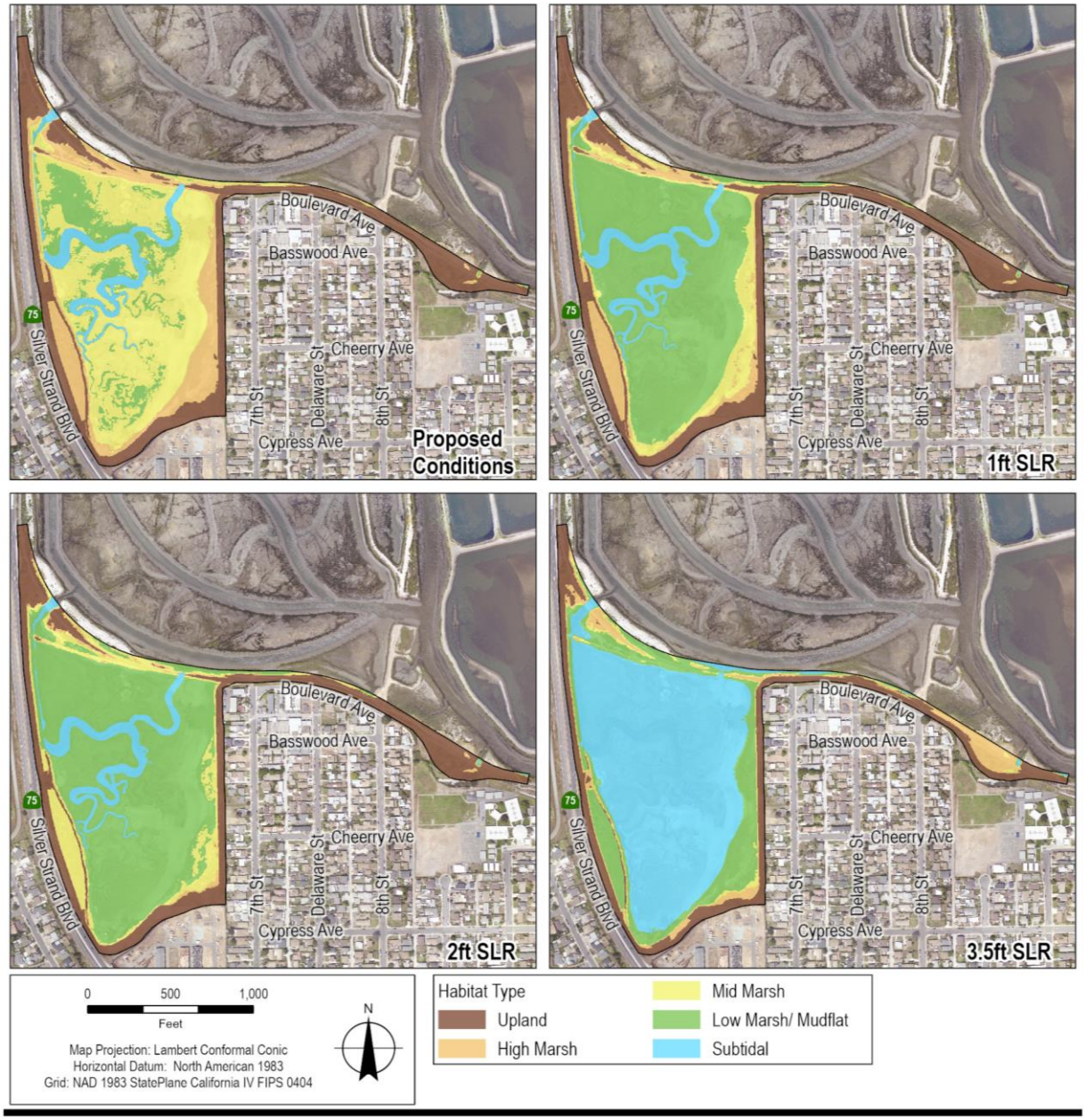

Figure 9-3. Alternative 3 Habitat Projection Results

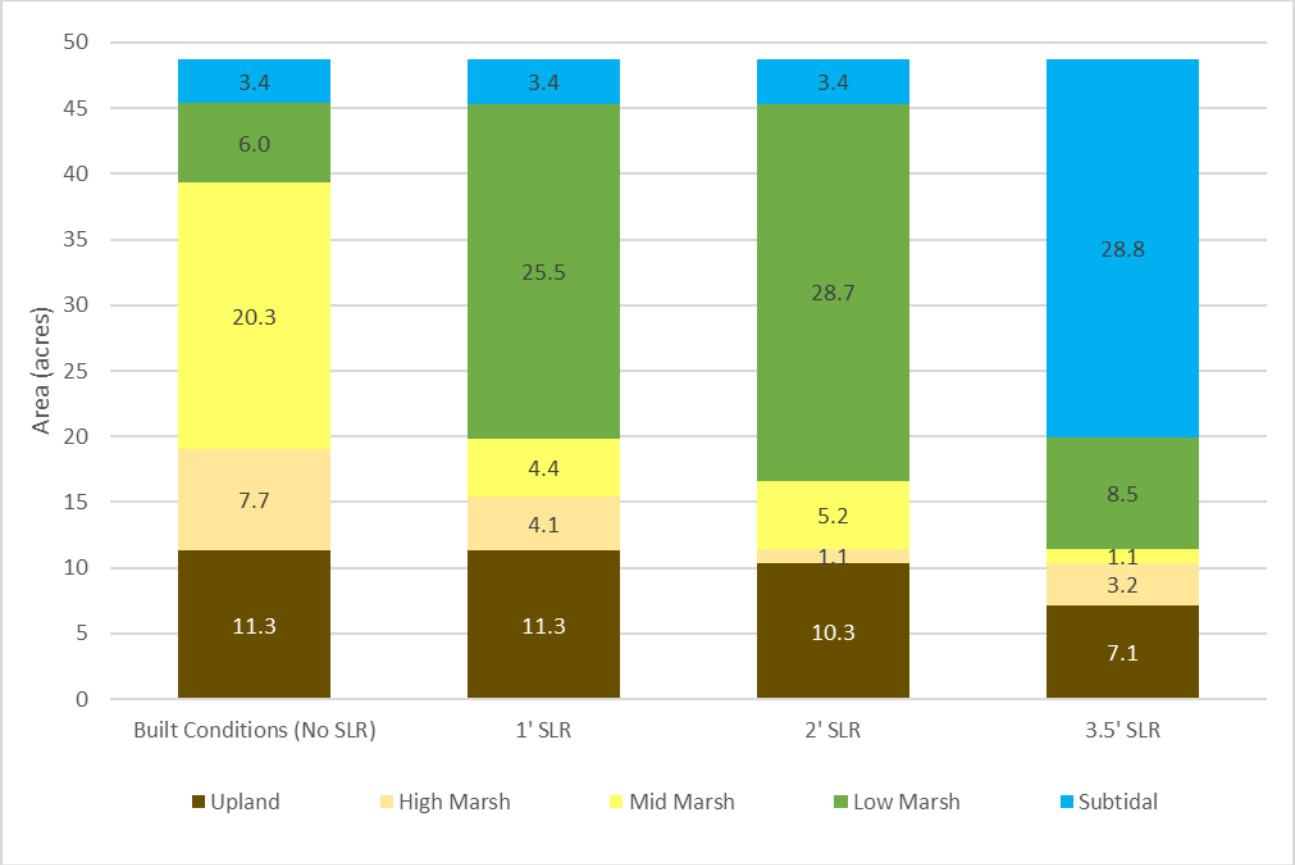

Figure 9-4. Alternative 3 Wetland Migration Projections

Table 9-5. Percent Change from Built Conditions for Alternative 3

Habitat Type	Area (acres)				Percent Change from Built Condition (%)		
	Built Conditions	1' SLR	2' SLR	3.5' SLR	1' SLR	2' SLR	3.5' SLR
Upland	11.3	11.3	10.3	7.1	0.0%	-9.1%	-37.0%
High Marsh	7.7	4.1	1.1	3.2	-46.7%	-85.3%	-58.4%
Mid Marsh	20.3	4.4	5.2	1.1	-78.2%	-74.5%	-94.6%
Low Marsh	6.0	25.5	28.7	8.5	322.9%	376.1%	40.9%
Subtidal	3.4	3.4	3.4	28.8	0.2%	0.9%	745.8%

Comparison of Alternatives

A comparison of the habitat projections for each of the implementation alternatives is shown below in Figure 9-5 and Table 9-6. Percent change is shown relative to the built conditions for each Alternative in Table 9-7. The key findings from these assessments are as follows:

- Habitat projections for Alternatives 2 and 3 are similar in that habitat will transgress upslope, whereas the existing conditions yield negligible upslope migration. Specifically, low marsh and mid marsh habitat will increase with 1 foot of SLR and persist from 1 to 2 feet of SLR.
- With 1 and 2 feet of SLR, Alternatives 2 and 3 allow for approximately 26 more acres of low marsh than that of the existing conditions.
- With 3.5 feet of SLR, subtidal dominates each alternative. However, Alternatives 2 and 3 provide approximately 3.2 and 2.5 more acres of total marsh habitat (low, mid, and high) than the existing conditions; respectively.

- Overall, Alternatives 2 and 3 revealed no change in total marsh area (low, mid, and high) with 1 foot of SLR, displayed a 4 percent gain in total marsh with 2 feet of SLR, and a 62 percent loss with 3.5 feet of SLR.
- As the design advances, opportunities to modify the grading can be considered to better diversify habitat types under both current and future SLR conditions.

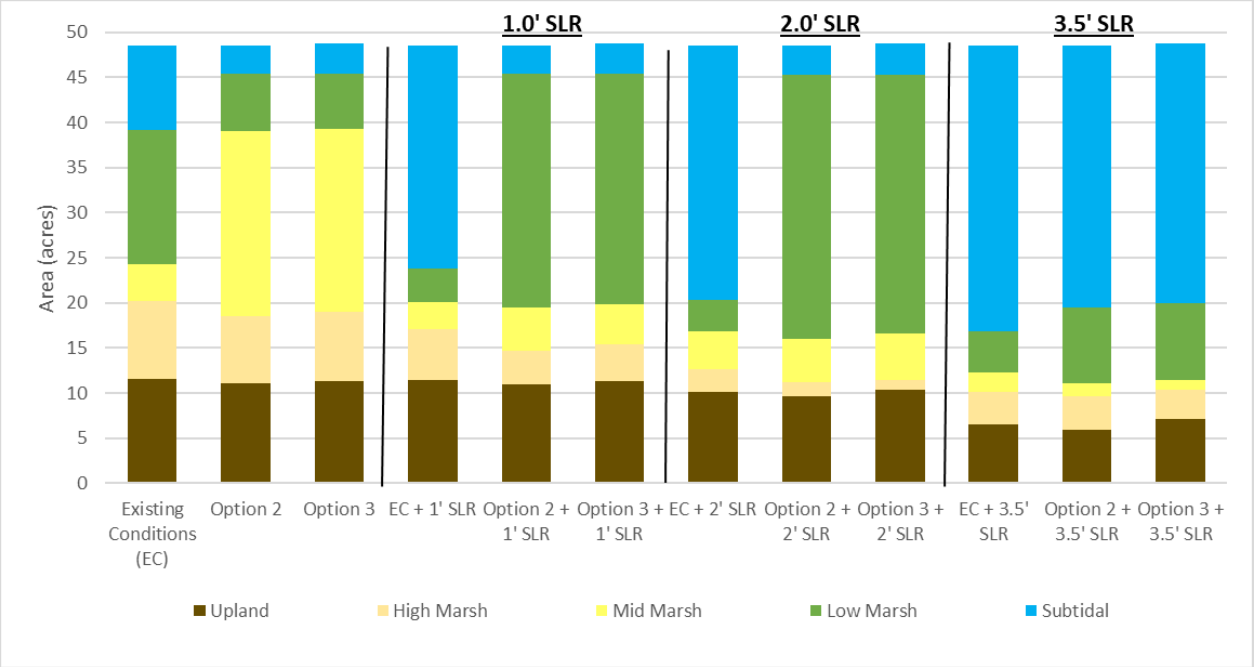

Figure 9-5. Wetland Migration Projections for Existing Conditions (EC) and Proposed Conditions

Table 9-6. SLAMM Habitat Projection Results – area by SLAMM category

Project Alternative		Habitat Area (acres)				
		Upland	High Marsh	Mid Marsh	Low Marsh	Subtidal
No SLR	Existing Conditions	11.5	8.7	4.1	14.9	9.4
	Alternative 2	11.1	7.5	20.5	6.3	3.2
	Alternative 3	11.3	7.7	20.3	6.0	3.4
1' SLR	Existing Conditions	11.5	5.6	2.9	3.8	24.7
	Alternative 2	11.0	3.7	4.7	25.9	3.2
	Alternative 3	11.3	4.1	4.4	25.5	3.4
2' SLR	Existing Conditions	10.1	2.5	4.2	3.5	28.3
	Alternative 2	9.6	1.5	4.9	29.2	3.3
	Alternative 3	10.3	1.1	5.2	28.7	3.4
3.5' SLR	Existing Conditions	6.5	3.6	2.1	4.6	31.7
	Alternative 2	6.0	3.7	1.4	8.4	29.0
	Alternative 3	7.1	3.2	1.1	8.5	28.8

Table 9-7. SLAMM Habitat Projection – Percent Change from Existing Conditions

Habitat Type	Percent Change (%)								
	Existing Conditions / Alternative 1			Alternative 2			Alternative 3		
	1' SLR	2' SLR	3.5' SLR	1' SLR	2' SLR	3.5' SLR	1' SLR	2' SLR	3.5' SLR
Upland	-0.4%	-12.2%	-43.4%	-0.5%	-12.9%	-46.3%	0.0%	-9.1%	-37.0%
High Marsh	-34.9%	-71.0%	-58.0%	-50.5%	-79.9%	-50.6%	-46.7%	-85.3%	-58.4%
Mid Marsh	-28.9%	1.3%	-48.7%	-77.1%	-76.2%	-93.0%	-78.2%	-74.5%	-94.6%
Low Marsh	-74.4%	-76.6%	-68.9%	313.0%	366.3%	34.3%	322.9%	376.1%	40.9%
Subtidal	163.2%	201.1%	237.3%	0.9%	2.7%	810.4%	0.2%	0.9%	745.8%

9.3.3.2 Habitat Enhancement Rankings

Based on the findings of the SLAMM analysis, Alternative 3 scored the highest in the habitat enhancement area category and Alternatives 2 and 3 scored the same in the ecosystem resiliency category. Alternatives 3 scored slightly higher than Alternative 2 mainly because of the Bikeway prism between Pond 10 and 10A, as the prism is removed and restored under Alternative 3, but not removed under Alternative 2. The total area of habitat restored is reflected in the SLAMM results. For instance, Alternative 3 displayed a 6 to 10 percent higher percent increase in low marsh habitat with SLR. The SLAMM results for Alternatives 2 and 3 both displayed adequate habitat transgression with SLR, so each Alternative received a high score.

Overall, Alternatives 2 and 3 scored the highest in the habitat enhancement category. Alternatives 2 and 3 received very similar scores and both finished with a total of 21 percent (out of 25 percent). The primary differences between the results of Alternative 2 and 3 lie in the temporary construction disturbances and overall habitat enhancement area as described above. Alternative 3 scored slightly lower for temporary construction impacts and Alternatives 2 and 3 both received the highest score for the ecosystem resilience and Pond 10A hydraulics categories. These alternatives both restore the tidal connection for Pond 10A and provide a similar area of transitional habitats.

Alternative 1 received the lowest ranking with a total score of 14 percent, primarily due to a lower overall habitat restoration area and lack of change to the Pond 10A hydraulics. Out of all three alternatives, Alternative 1 provides the least amount of total restored habitat and provides no benefits to the Pond 10A hydrology.

9.3.4 Regulatory

Alternative 3 scored the highest in the regulatory category, however the total scores for all alternatives were relatively close. Alternative 2 was ranked second and Alternative 1 received the lowest ranking. Alternatives 2 and 1 were separated from Alternative 3 by only 1 and 2 percent, respectively. The primary differences between Alternatives 2 and 3 were in the CEQA/NEPA process and USFWS impacts categories, for which Alternative 3 scored slightly higher. For the CEQA/NEPA process, Alternative 3 provides more ecosystem benefits in wetlands and transitional habitat area than Alternative 2, which should serve to benefit the overall permitting process. The USFWS impacts category was judged largely on the development footprint of each Alternative, and the bridge involved in Alternative 2 will have a more significant impact on USFWS managed habitat.

9.3.5 Financial

With the exception of No Project, the results of the financial category reflect that the lowest cost alternative is Alterative 1. Alternative 3 was a close second, scoring only 2 percent lower than Alternative 1. This is because both Alternatives 1 and 3 consist of very similar elements, with the biggest difference being the length of proposed living levee. Alternative 2 received the lowest score because of the bridge cost, both the construction and long-term operation / maintenance costs are much higher for the bridge in comparison to the living levee.

9.4 Sensitivity

9.4.1 Scoring of Individual Criteria

The MCA scoring matrix generated questions from the Project team regarding sensitivity of the analysis. The key question being “How would these results change if one or two scores were revised up or down for each alternative?” There were only a few criteria in which the Project team had more difficulty arriving at a consensus score for a given alternative. For instance, aesthetics is a category which can be subjective and depends on the perspective and interests of the individual. Sensitivity of the individual scores for debated criteria was tested to determine the change in the final scores and rankings. This was performed by independently adjusting each score and noting any change to the total score. It was determined that changing a single score by one increment would result in a 1 percent change to the total score. And as there were only one for two debatable criteria for each category, the overall scoring sensitivity was determined to be ± 2 percent. Given the separation in the final scores, minor adjustments to the criteria would not result in changes to the final ranking of alternatives.

9.4.2 Weighing of Overall Categories

Sensitivity of category weightings was another area of interest to understand how the breakdown between Habitat Enhancement, Public Access/Safety/Community Vision, Coastal Hazards, Regulatory and Financial Considerations influence overall results. The results presented in Section 1.2 are based on a breakdown of 25 percent for Habitat Enhancement, 25 percent for Public Access/Safety/Community Vision, 25 percent for Coastal Hazards, 10 percent for Regulatory, and 15 percent Financial. The consensus of the Project team was that Coastal Hazards, Habitat Enhancement and Beach Access & Amenities warranted a higher emphasis because their criteria closely match the Project objectives, feedback from key stakeholders, and provide the best indicator for Project success.

Figure 9-6 displays the total scores for each alternative for several different combinations of category weightings. The results of this sensitivity analysis indicate that Alternative 3 emerges as the highest ranked alternative regardless of the category weighing combination. Alternatives 1 and 2 display a similar pattern to the initial results, although there is much less spread between Alternatives 1 and 2 among the varying category weights. For instance, with emphasis on the financial category and less weight for the access/safety/community vision, Alternatives 1 and 2 result in the same score. The findings of this sensitivity analysis give the Project team high confidence that Alternative 3 has the best chance to satisfy the Project objectives.

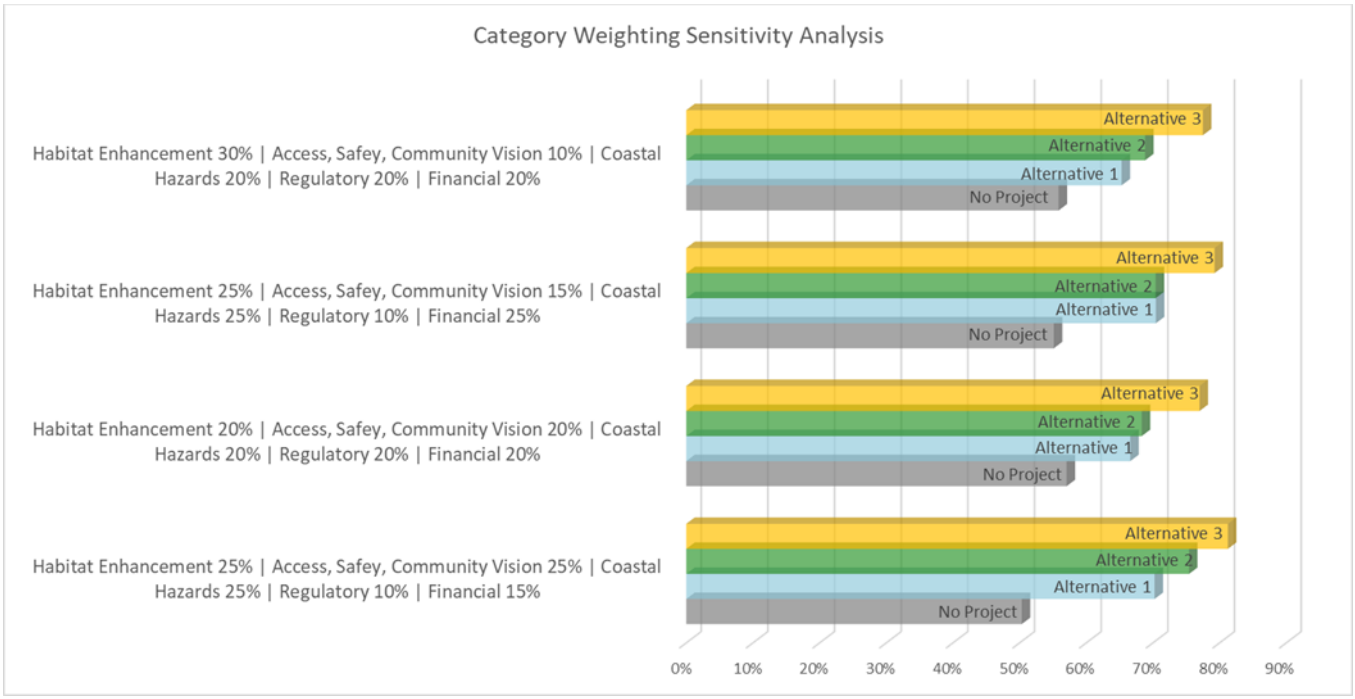

Figure 9-6. Sensitivity to Category Weighting

10. Community & Stakeholder Outreach

Outreach was coordinated with local and regional partners to identify and address stakeholder goals throughout the concept development process. The outreach process also included public notification and engagement. The main objectives of the stakeholder engagement process were to:

- Inform the public of the proposed Project
- Identify stakeholder issues
- Collect relevant, pertinent information to guide the planning and design process

The types of engagement included:

- Agency Coordination: Facilitated agency stakeholder meetings on relevant interests
- Workshops: Planned and facilitated in-person workshops at diverse locations and times
- Pop-up events: Staffed booths at local and regional recreational and community events
- Online Surveys: Performed in-person, intercept surveys at locations near the Project site and provided on-line surveys accessed directly through the project website

This section will describe the stakeholder meetings and public outreach events that were involved throughout the concept development. The full public engagement summary and results is provided as Appendix D.

10.1 Stakeholder Meetings

The Project area is predominantly located within the jurisdiction of Imperial Beach, however there are multiple jurisdictional authorities within the proposed development footprint. The agencies with land use authority potentially affected by the Project include the City, City of San Diego, City of Coronado, California Department of Transportation, San Diego Unified Port District, Metropolitan Transit Systems, U.S. Fish and Wildlife Service, South Bay Union School District, and private property.

In addition to land use authorities, other stakeholders of this Project consist of regulatory agencies and governmental groups and committees. Stakeholder meetings included Project presentations, design workshops and discussions to recognize Project priorities and potential constraints. The stakeholder meetings are as follows:

- United States Fish & Wildlife
- United States Department of Navy
- San Diego Unified Port District
- California Coastal Commission
- California Department of Transportation
- California State Lands Commission
- California Ocean Protection Council
- City of Imperial Beach City Council
- City of Imperial Beach Tidelands Advisory Committee
- City of Imperial Beach Design Review Board
- City of Coronado Planning Department
- City of Coronado Mobility Commission
- City of San Diego Planning Department
- San Diego Association of Governments
- Metropolitan Transit District
- San Diego Regional Bicycle Coalition
- San Diego Regional Climate Collaborative

- San Diego State University
- The San Diego Foundation
- Silver Strand Beautification Project

10.2 Public Workshops

A total of three in-person and four virtual public workshops were held throughout the engagement process. The in-person workshops were held at the Imperial Beach Library and at the Bikeway Village. The first workshop included a brief presentation and open discussion that was facilitated with descriptive posterboards. The second and third public workshops were carried out in a similar manner at the Bikeway Village and was aimed at capturing input from Bikeway users. A total of five posterboards were used at these workshops, one for the existing conditions, two for Project alternatives, one for public access, and one for activation concepts. For both workshops, community members were able to document input directly on the posterboards. Input was saved and noted by the Project team.

Virtual workshops were held via Zoom to provide the opportunity to participate for those with constraints to access or because of public health concerns related to Covid-19. In-person and virtual workshops were offered in English and Spanish with virtual workshops used breakout rooms. The total attendance was 57 and 12 for the in person and virtual workshops, respectively.

10.3 Pop-Up Events

Pop-up events were integrated with planned local and regional recreational and community events. The Project team set up booths with snacks, water, and coloring books for kids to entice participants to engage with the team and provide feedback on the Project. The pop-up events are as follows:

- 2021 Bike the Bay: October 9th, 2021 - Bikeway Village
- 2022 National Night Out: August 2nd, 2022 - Veterans Park
- 2022 Bike the Bay: August 28th, 2022 - Bikeway Village

The Bike the Bay annual event is a 25-mile, non-timed and non-competitive, ride that starts and finishes at Embarcadero Marina Park South, located on San Diego Bay via the Bayshore Bikeway. An estimated 15,000 riders travel through the surrounding cities of Coronado, Imperial Beach, Chula Vista, and National City. The Project team staffed a booth at Bikeway Village, providing snacks and water for cyclists, affording them the opportunity to provide comment on the conceptual designs while they took a break. National Night Out is annual community-building campaign that promotes police-community partnerships and neighborhood camaraderie. The Project team partnered with the Imperial Beach Parks and Recreation Department to engage with community members. The attendance for the pop-up events totaled 200 participants.

10.4 Surveys

Surveys where designed and implemented to gain feedback from the community. The surveys were as follows:

- **Online surveys** are structured questionnaires that respondents completed by responding to questions about concerns, constraints, and opportunities related to Project planning and design. These surveys were online-only and allowed for participants to complete them at their leisure.
  - September 27th - October 15th, 2021 - Opportunities and Constraints
  - March 7th - March 25th, 2022 - Conceptual Designs (Resiliency Only)
- **Intercept surveys** were used to collect feedback from respondents during an experience. The Project team directly asked participants questions “live” during events, such as Bike the Bay or National Night Out.
  - 2021 Bike the Bay: October 9th, 2021, Bikeway Village - Opportunities and Constraints
  - 2022 Bike the Bay: August 28th, 2022 - Bikeway Village - Conceptual Designs (Public Access and Resiliency)

In total, there were 112 submissions recorded for the online surveys and 168 submissions recorded for the intercept surveys.

11. Conclusions

This Study assessed the feasibility of retrofitting a 1.2-mile segment of the Bayshore Bikeway into a multi-benefit community flood protection and ecosystem resilience corridor in the City. The Project would utilize the existing developed corridor to provide flood protection to the Bayside Community while also creating wetland habitat transition areas, enhanced safe, public access, and greater recreational opportunities along the Bikeway. This Project area is currently vulnerable to coastal flooding and stormwater flooding and these conditions are projected to worsen in frequency and severity with projected sea level rise.

Through the Project development phase, various unique opportunities and constraints were identified. Key identified Project constraints were as follows:

- **Multiple landowners and land managers require continuous coordination**. Various land ownerships and management authorities within the Project area required continuous coordination during the Project development phase and highlight a slightly more complicated implementation pathway. These entities have differing interests, some which will require frequent collaboration during the next phase of work.
- **Complexities in stormwater management solutions**. The low-lying nature of the City leads to complexities in developing stormwater management solutions. The existing system in the Project area is undersized and the outfalls are intermittently submerged by tides – both of which have resulted in periods of prolonged or nuisance flooding.
- **Limited Project development footprint.** The Bikeway corridor is located on a narrow strip of land between highly sensitive habitats within the San Diego Bay and coastal development on the landside (primarily residential). Thus, space to build a living levee and other supporting public amenities is limited without impacting sensitive habitat areas or encroaching on coastal development.

The primary opportunities identified in the Project are as follows:

- **Significant ecological benefits through relief of existing tidal muting**. The muting at Pond 10A as a result of the culvert under the Bikeway in Segment 1 represents a significant opportunity for ecological restoration within the Project area. Removal of the tidal muting was considered in prior studies, but not carried forward due to potential flood implications to the Bayside Community. This Project is intended to restore tidal hydraulics to Pond 10A while providing the needed flood protection to the Bayside Community through construction of living levee along the existing Flamingo Trail alignment.
- **Existing marsh habitats are vulnerable to sea level rise**. The high marsh habitat areas in the Project area exist along relatively steep slopes along the boundaries of the San Diego Bay. These will limit the upslope habitat migration of the marsh habitat types (i.e., high, mid and low marsh) with sea level rise. Creating flatter slopes (i.e., ecotone slope) along the edge of the proposed living levee will allow for wetland habitat along the Bay to transgress more effectively with projected sea level rise.
- **Bikeway public use and assess improvements**. Community and stakeholder outreach identified several public use issues with the Bikeway that could be improved through implementation of this Project. The issues included the desire to separate user groups (e.g., cyclists and pedestrian), relieve a safety issue that has been identified in Segment 3 (i.e., blind curve), and provide safer public access to the Bikeway from the Bayside Community.

Three alternatives were developed that address the Projects goals and objectives. Each of the three alternatives propose to:

1. Construct a living levee to resolve coastal flooding. The levee would have the following specifications:
    a. 12.5 ft crest (minimum)
    b. Bayside, ecotone slope with a minimum (no steeper than) of 7:1 (H:V) slope
2. Separate user groups (pedestrians and cyclists) along the Bikeway by creating a bike path and pedestrian pathway with the following specifications:
    a. 10 ft wide Class 1 Bikeway with 2ft shoulders (14-foot width total)

b. 8 ft wide pedestrian trail

3. Construct a tide gate and multi-purpose detention basin to resolve stormwater flooding in the vicinity of the Bayside Elementary School.

The three alternatives are described as follows:

- Alternative 1 - "Elevate in Place": Alternative 1 utilizes the existing developed Bikeway footprint across the entire Project area to construct the living levee. This alternative would result in the least amount of change to the Bikeway corridor and would not relieve the tidal muting in Pond 10A.
- Alternative 2 – "Replace with Bridge": Alternative 2 would partially realign the Bikeway in the east end to relieve a safety concern (blind corner) and would construct an elevated bridge across Ponds 10/10A to relieve the tidal muting in Pond 10A. The existing Bikeway and dike through the Pond 10A area would be demolished and restored with native habitats and a new tidal channel would be constructed to restore the tidal hydraulics to Pond 10A. A living levee would be constructed along the Flamingo Trail alignment to provide flood protection to a low-lying portion of the Bayside Community, which becomes vulnerable to coastal flooding with the removal of tidal muting in Pond 10A.
- Alternative 3 – "Remove and Reroute": Alternative 3 would reroute the Bikeway around the perimeter of Pond 10A along the existing Flamingo trail and then run parallel to State Route 75 – signifying the most significant change to the existing conditions. The existing Bikeway and dike would be demolished, habitats would be restored, and a new channel would be created to improve tidal hydraulics to Pond 10A. Pond 10A, in this option, would be reconnected to the Bay without bisection (via dike or bridge) as would occur in Alternatives 1 and 2. Because of the reconnection, this alternative provides the greatest ecological benefits; however, rerouting the Bikeway around Pond 10A would be increase the Bikeway length and limit public access to the Bay to the only edges in this area. Similar to Alternative 2, Alternative 3 would realign a portion of the Bikeway along the Bayside Elementary School to improve safety and potentially restore Bay habitat.

Estimates of construction costs were developed for each of the alternatives. The estimates for each of the alternatives are summarized in Table 11. Alternative 2 was the most expensive due to the proposed bridge. Alternative 1 was the least expensive because it results in the least change - utilizes the existing Bikeway alignment to develop the living levee.

Table 11-1. Opinions of Probable Construction Costs for each of the Alternatives

Alternative	Total Estimated Construction Cost (USD, Million)
Alternative 1: Elevate in Place	$11.2 M
Alternative 2: Replace with Bridge	$33.7 M
Alternative 3: Remove and Reroute	$21.7 M

A multi-criteria analysis of the alternatives was conducted to analyze each alternative against a range of criteria that reflects the multiple goals and objectives of the Project. Alternatives were evaluated against the following criteria:

- Coastal Hazards
- Public Access and Safety
- Consistency with Public Vision
- Habitat Enhancement
- Regulatory Considerations
- Financial Considerations

Results from the analysis are provided below in Table ES1. Based on the evaluation, the highest-ranking alternative was Alternative 3. Alternative 2, which involves a new bridge, was the second highest scoring alternative.

Table 11-2. Multi-Criteria Analysis Results Summary

Category & Relative Weighting (%)		Alternative 1	Alternative 2	Alternative 3
	No Project	Elevate in Place	Replace with Bridge	Remove and Reroute
Coastal Hazards (25%)	5%	25%	25%	25%
Public Access, Safety, & Consistency with Public Vision (25%)	13%	17%	20%	20%
Habitat Enhancement (25%)	10%	14%	21%	21%
Regulatory (10%)	7%	4%	5%	6%
Financial (15%)	15%	11%	5%	9%
Total Weighted Score out of 100%	50%	70%	75%	81%
Alternative Ranking	*4*	*3*	*2*	*1*

Preliminary design of Alternative 3 is provided in Figure 11-1 and Figure 11-2. Alternative 3 was developed to the 30 percent engineering design level to complete this phase of the Project.

Next steps for the Project include progression to, and completion of, the final engineering design and environmental compliance (i.e., CEQA/NEPA and permits). It is expected that the Project will require permits and approvals through the U.S. Army Corps of Engineers, U.S. Fish and Wildlife Service, Regional Water Quality Control Board, FEMA (levee accreditation), and the California Coastal Commission (consolidated permit). It is estimated that the next phase of work would take approximately two years to complete.

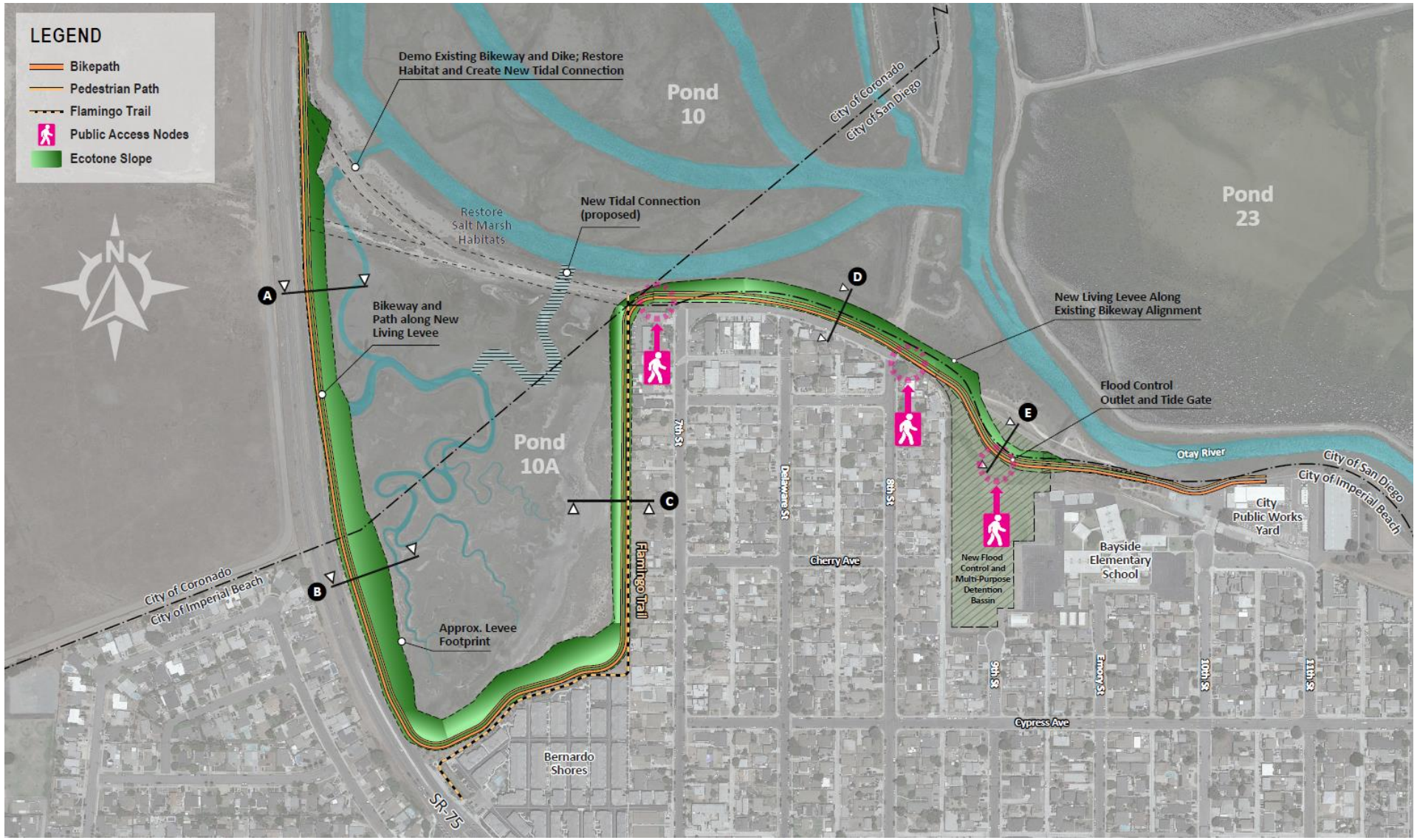

Figure 11-1. Preferred Alternative (Alternative 3) Plan View

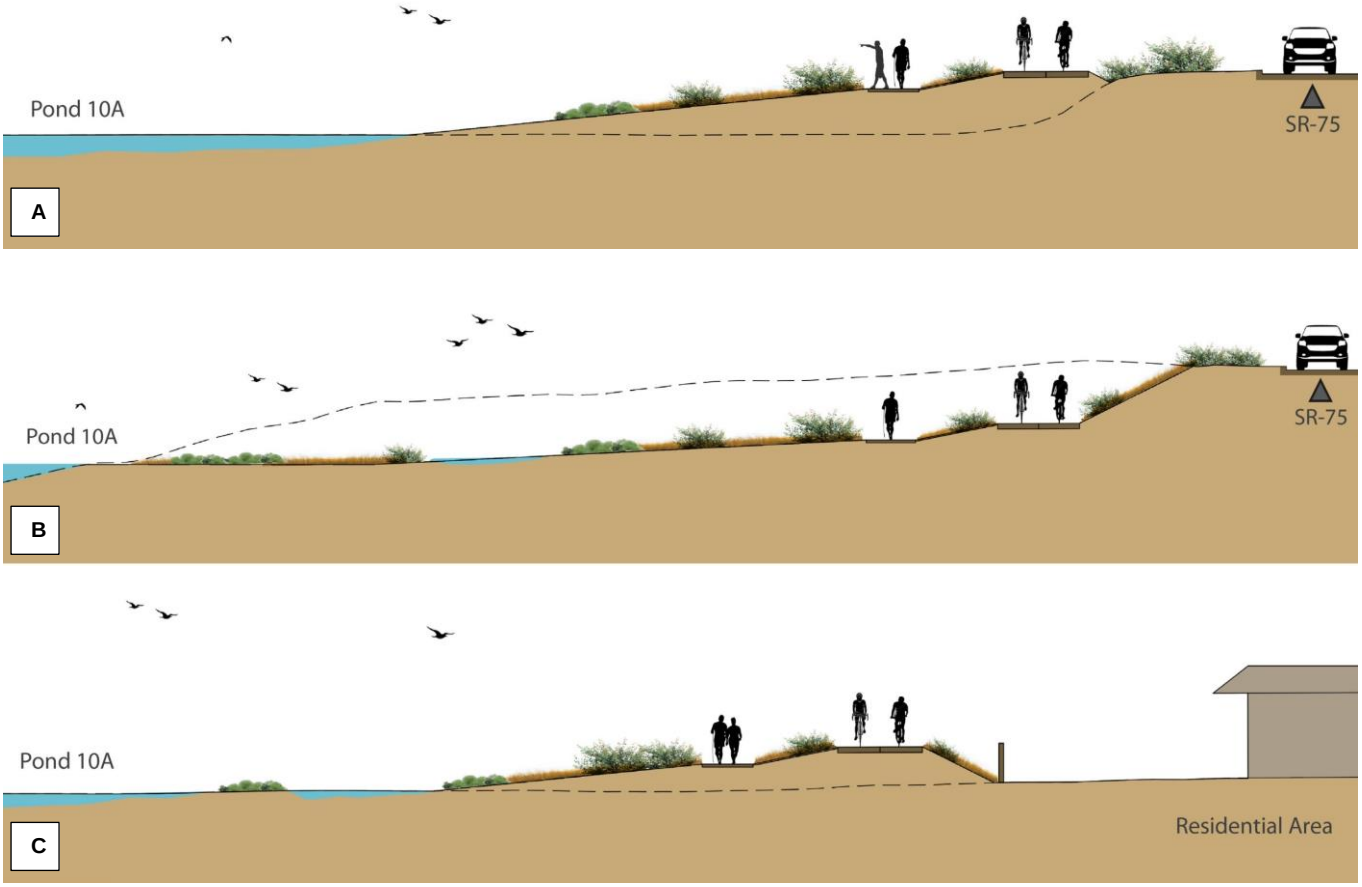

Figure 11-2. Preferred Alternative (Alternative 3) Conceptual Cross Sections

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Appendices

Appendix A

Hydraulic Modeling Technical Memorandum

Technical Memorandum

June 15, 2022

To	Dennis Larson, Nexus Planning	**Tel**	(707) 443-8326
Copy to	Brian Leslie	**Email**	Brett.Vivyan@ghd.com
From	Brett Vivyan PE, Patrick Sullivan PE	**Ref. No.**	11228822
Subject	Bayshore Bikeway Resiliency Project - Bayside Elementary and Park Proposed Stormwater Improvements Hydraulic Modeling Summary Memo		

1. Introduction

This technical memorandum summarizes the hydraulic analyses of conceptual stormwater flood reduction alternatives for the City of Imperial Beach's Bayshore Bikeway Resiliency Project (project). Currently, tidal waters from the San Diego Bay flow into the stormdrain system and result in nuisance flooding at numerous stormdrain inlets within this drainage basin. The project seeks to protect the Bayside community from tidal and stormwater flooding from the construction of a living levee in combination with the stormwater improvements presented in this memo.

Stormwater flood reduction alternatives developed for this project focus on the utilization of Bayside Park (park) and Bayside Elementary School (school) properties in combination with the recommended stormdrain project in NV5's Preliminary Hydrologic and Hydraulic Analyses Summary for Stormwater Basin H (NV5, 2022). Hydrologic and hydraulic model files were provided to GHD by NV5. NV5 developed the model in XP-SWMM (NV5, 2022) and exported to EPA SWMM file format. These files, containing stormdrain system geometry, parameters, and assigned hydrographs were then imported to PC-SWMM for analysis of flood reduction alternatives.

Measured groundwater information was not available at the time of this analysis. Work presented by University of California San Diego (UCSD) and San Diego State University (SDSU) utilized modeled groundwater levels from Befus et al (2020) in their work on Vulnerability of Coastal Stormdrain System to Compound Seawater, Groundwater, and Stormwater Flooding under Climate Change. UCSD and SDSU indicate that the park and school properties are within areas subject to existing groundwater shoaling between 0 and 2 meters of the ground surface and subject to marine inundation with two meters of sea level rise. Groundwater was assumed to be at Mean High Water for San Diego Bay (NOAA Station 11201972) of 4.56 feet (NAVD88), resulting in a groundwater depth of approximately 3.4 feet (1.1 meters). All elevations referenced in this memorandum are relative to the NAVD88 datum.

1.1 Purpose of Modeling

The purpose of the stormwater modeling effort is to evaluate storm drainage system modifications within the Bayside Park and Bayside Elementary School properties to mitigate flooding in the vicinity of Calla Avenue, Cypress Avenue, 8th Street and 9th Street in Drainage Basin H. Additionally, variations in tidal boundary conditions were modeled to evaluate a variety of conditions representing typical, low recurrence, and future conditions with sea level rise.

Figure 1 ***Study area for proposed stormwater flood reduction alternatives.***

Storm drainage system modifications within the park and school properties were analyzed with and without the NV5 recommended project. Analyzed modifications include the sequential implementation of a tide gate at the existing outfall (under the proposed living levee) and replacement of the existing, underground, 4-foot diameter pipe with a daylighted open channel (at the park), and the creation of a multi-purpose detention basin.

2. Hydraulic Model

2.1 Model Setup

The imported NV5 model files were modified to include overland flow pathways (called conduits in PCSWMM), variations to tidal boundaries, and components of alternatives, that included proposed: channel geometry, structures (tide gate), and storage areas (detention basin).

2.1.1 Overland Flow Paths

Overland flow paths were added to allow surcharged or flooded junctions to flow through and be stored in the roadway. Channel geometry for overland flow was based on roadway cross sections, from curb to centerline, extracted from the 2016 USGS CoNED topobathymetric Model LiDAR data.

2.1.2 Boundary Conditions

GHD utilized the hydrology provided by NV5 with rainfall run-off applied at drain inlets. Hydrology data was provided for the 2-year, 5-year, 10-year, and 100-year recurrence intervals with 6-hour duration for existing conditions. NV5 included a recommended project that included additional pipe alignments and hydrology data for that model was limited to the 10-year and 100-year.

The San Diego County Hydraulic Design Manual states that “in cases where the stormdrain outfall condition is tidally influenced, it is usually sufficient to use the historic high tide elevation as the tailwater elevation” (County of San Diego, 2014). The use of historic high tide in combination with extreme rainfall events may be overly conservative for alternative analysis. In order to evaluate the potential effects on flooding reduction between alternative scenarios, multiple tidal boundary conditions, both dynamic and static were utilized to assess flooding volume and duration, including the tide of record. Time series data and datums for Station 11201972 San Diego Bay were used for the tidal boundary.

The model provided by NV5 assigned a free outfall (low tide) boundary condition for the stormdrain system which represents a tidal condition remaining below elevation 2 feet (outfall invert elevation). Time series tidal boundary conditions were added to the model to assess the historic high tide (tide of record) of 7.8 feet and the 85th percentile higher high tide of 7.1 feet. Tides of these magnitudes occurred on November 24, 2015 and November 20, 1972, respectively. A static boundary of Mean Higher High Water (MHHW) of 5.3 feet was also evaluated. The timing of the design storm and high tide peaks were adjusted to be coincident, to assess the maximum flooding volume and duration. An example tidal boundary condition and rainfall hydrograph is shown in Figure 2. Tidal boundaries and rainfall hydrographs utilized are shown in Appendix A.

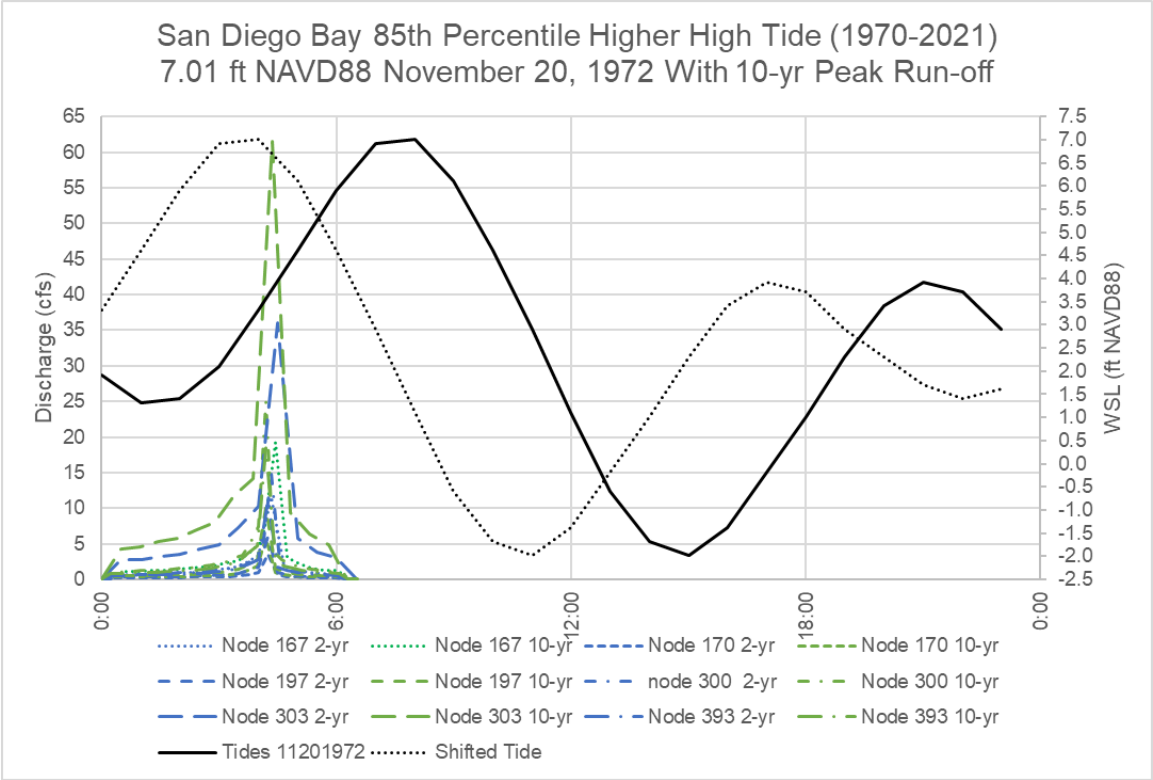


Figure 2 ***Peak tide and rainfall hydrographs were adjusted to be coincident.***

The combined probability of a peak storm event occurring with the high tide of record or 85th percentile higher high tide is a lower probability than either of the individual probabilities. Chapter 820 Cross Drainage of the Highway Design Manual provides one-percent compound frequency curves for location-specific areas subject to tidal and storm (flood) events (Caltrans, 2019). The compound frequency curve for San Diego Bay (NOAA Station 9410170) is shown in Figure 3. Based on the compound frequency curve for San Diego Bay, the frequency of a tide greater than 7 feet in combination with a 2-year flood or larger return period (10-year and 100-year) is less than one percent (intersection above the curve). The tidal boundaries were selected as a conservative approach, with consideration of higher future tidal water levels, to assess the alternatives. Select analyses utilize a tidal boundary of MHHW, resulting in a recurrence more similar to that of the rainfall runoff recurrence, for example, the 2-year storm event occurring during a tide reaching MHHW is more similar to a combined 2-year recurrence.

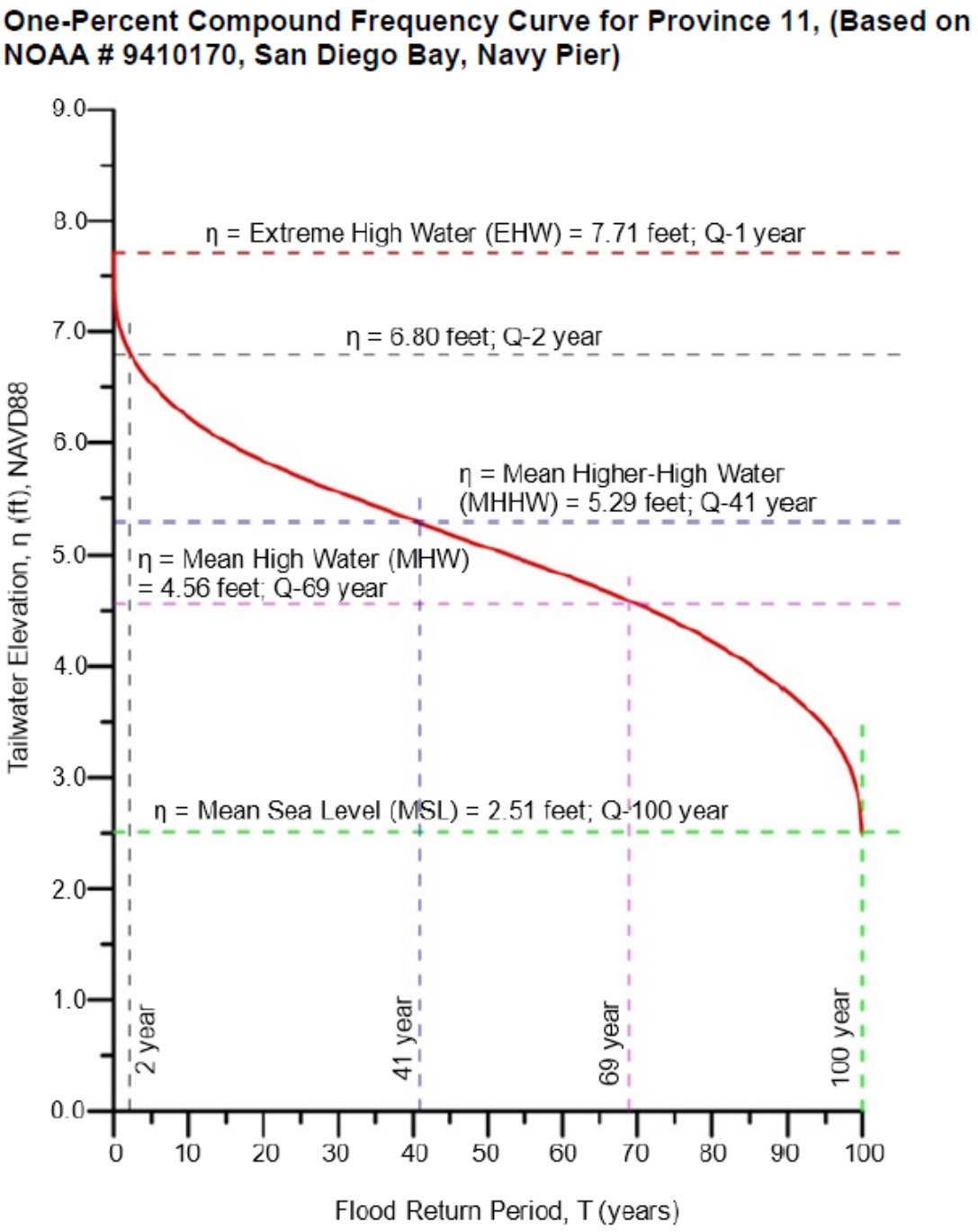


Figure 3 *Compound frequency curve for San Diego Bay, as reported in the Highway Design Manual (Figure 821.3M)*

2.2 Design Alternatives

Design alternatives were developed to assess the sequential implementation of a tide gate and replacement of existing 4-foot diameter pipe with a daylighted open channel, and creation of a multi-purpose detention basin spanning the school and park properties. This sequence was assessed with and without the NV5 recommended parallel system project, resulting in six design alternatives. A summary of the alternatives developed for analysis are provided in Table 1.

Table 1 Configuration of alternatives analyzed

Configuration Description
1- Existing Conditions
1a- Existing Conditions with Open Channel at School, Tide Gate
1b- Existing Conditions with Detention Basin, Open Channel at School, Tide Gate
2- Parallel System
2a- Parallel System with Open Channel at School, Tide Gate
2b- Parallel System with Detention Basin, Open Channel at School, Tide Gate

An overview of existing conditions model components are shown in Figure 4A and components of each alternative in Figure 4B. Design alternatives were modeled under multiple runoff and tidal boundary conditions.

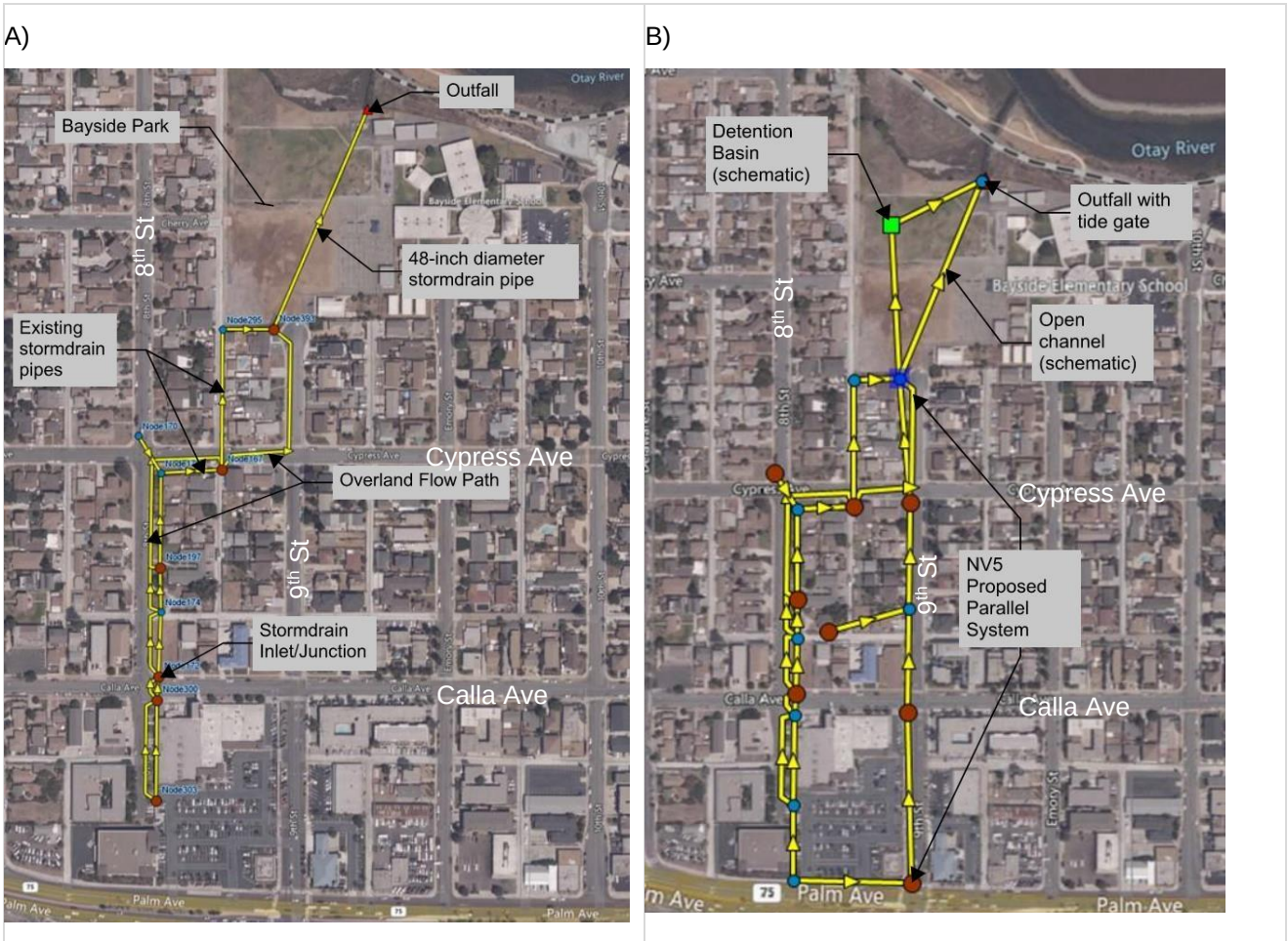


Figure 4 (A) Existing conditions and (B) model components of alternatives

Component geometry for the alternatives includes the following:

- Tide gate: a 4-foot diameter outfall with tide gate within the proposed living levee. Outfall invert elevation matches existing 4-foot diameter pipe invert or elevation 2.05 feet.
- Trapezoidal channel: the open channel geometry consists of a 4-foot bottom width and 2H:1V side slopes
- Multi-Purpose Detention Basin: approximately 2.5 acres basin with bottom elevation of 5 ft and top elevation of 8 ft. Invert to detention basin is at elevation 5.6 ft.

3. Stormwater Modeling Results

The following section provides an overview of the modeled alternatives that includes various proposed stormwater improvements. Peak tidal water levels included in this analysis range from MHHW or 5.3 feet to the tide of record or 7.8 feet. Storm event duration is 6 hours, and the magnitude of the storm event ranges from the 2-year (0.949 inches in 6 hours) to 100-year (2.09 inches in 6 hours). The duration of flooding varies by location and storm magnitude, but is typically less than 1 hour, even during the 100-year storm event and peak tide. This overview focuses on the 10-year 6-hour storm event and variations in tidal boundary conditions, as these combinations best exhibit the benefits and changes with each alternative. As described previously, the coincident peak tide of 7.8 feet and the 10-year storm events have a combined annual probability of less than one percent. All model outputs are provided in Appendix B.

3.1 Changes to Tidal Boundary Condition (Free Outfall and Historic High Tide with 10-year Storm Event)

The existing stormdrain outfall is ungated, allowing tidal waters to flow into the system. Tides above elevation 2 feet reduce the available storage within the stormdrain system. The difference between the 10-year storm event with a free outfall (low tide) condition and the tide of record is shown in Figure 5. This intrusion of tide water results in increased flooding volume and duration north of Calla Avenue but does not change flooding south of Calla Avenue.

Figure 5 ***Difference between the 10-year storm event with a free outfall (low tide) condition and the tide of record.***

3.2 Implementation of Tide Gate and Open Channel (Historic High Tide with 10-year Storm Event)

The installation of a tide gate at the outfall of the stormdrain system prevents tidal flows from occupying storage within the system. Replacing the existing 48-inch diameter pipe under Bayside Park and replacing it with an open channel increases the available storage in the system. Implementing these components, decreases flood volume and duration north of Cypress Avenue, but does not change flooding further south in the system. Figure 6 shows the changes in flooding for the 10-year storm event coincident with the high tide of record, comparing existing conditions to the implementation of a tide gate and open channel.

Figure 6 Implementation of a tide gate and open channel decreases flood volume and duration north of Cypress Avenue, but does not change flooding further south in the system.

3.3 Typical Tides and Implementation of Tide Gate and Open Channel

Implementation of the tide gate and open channel preserves and increases available storage within the stormdrain system. However, stored runoff within the stormdrain system is not conveyed through the tide gate until the hydraulic head within the stormdrain system is higher than the tide. Lowering the tidal boundary to represent more typical conditions of MHHW (5.3 feet), shows reduced water levels between the outfall and Cypress Avenue, but does not affect the water levels upstream (south) of Cypress due to insufficient pipe capacity. Figure 7 shows the difference in the water level profile in the system. In the MHHW boundary condition profile, the steeper hydraulic grade line, compared to the drainage system slope, indicates that conveyance capacity is limited by the pipe size but additional capacity may be available downstream.

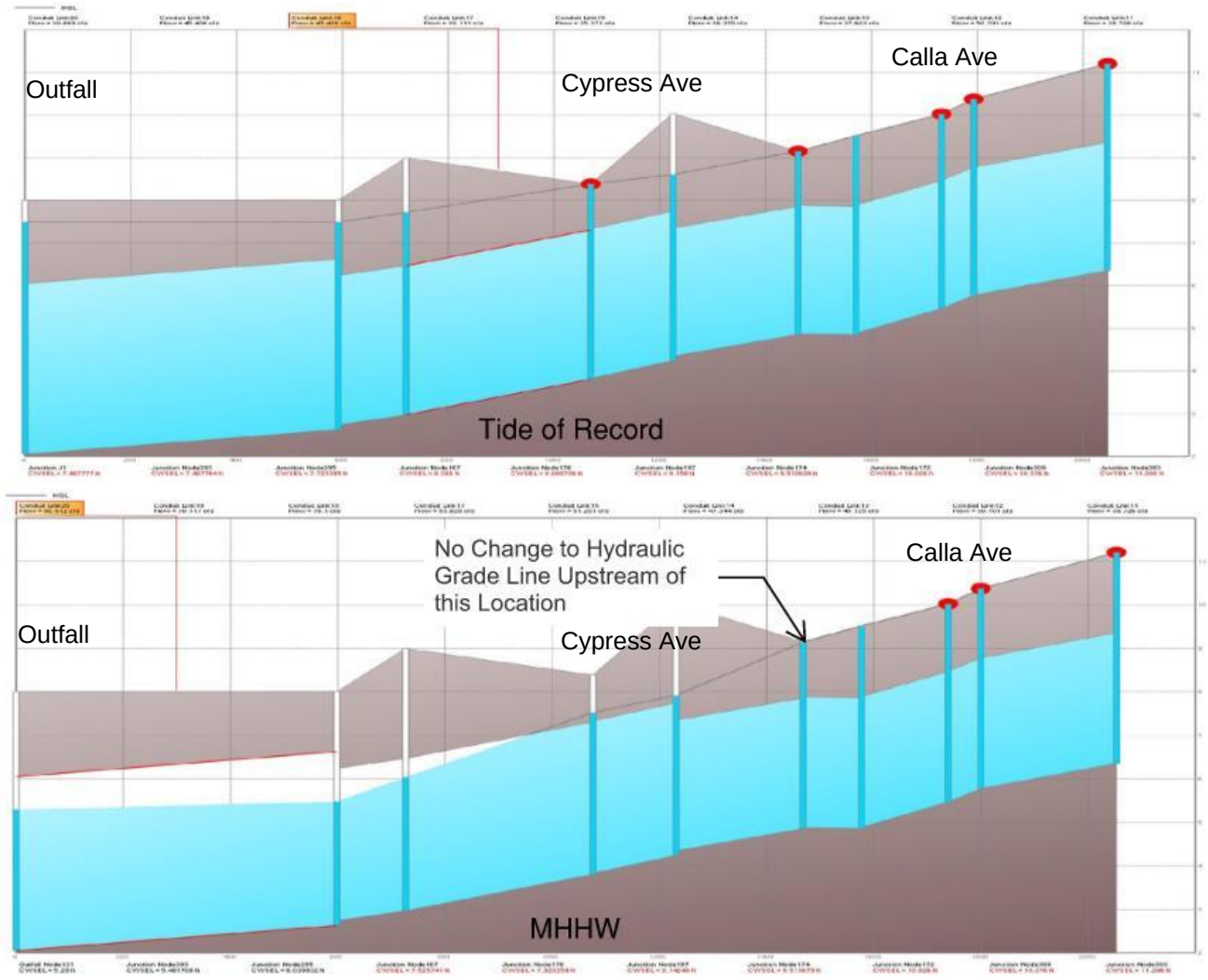


Figure 7 Comparison of boundary conditions shows conveyance capacity is limited by the pipe size but additional capacity may be available downstream.

3.4 Implementation of Tide Gate, Open Channel with Detention Basin (Historic High Tide with 10-year Storm Event)

The addition of a detention basin to the other improvements at Bayside Park shows isolated flood reduction benefit at Cypress Avenue, but not in areas upstream (south), due to the limited conveyance capacity in the of stormdrain system between Cypress Avenue and Palm Avenue. Figure 8 shows the changes in flood volume and duration for the 10-year storm event and tide of record with the additional implementation of a detention basin at Bayside Park.

Figure 8 Implementing a detention basin provides isolated flood reduction benefit at Cypress Avenue, but not in areas south, due to the limited conveyance capacity in the stormdrain system between Cypress Avenue and Palm Avenue.

3.5 Implementation of Parallel Stormdrain System (Historic High Tide with 10-year Storm Event)

The recommended project in NV5's Preliminary Hydrologic and Hydraulic Analyses Summary adds a stormdrain line from Palm Avenue, north beneath 9th Avenue, to increase conveyance capacity and reduce flooding (NV5, 2022). The implementation of this improvement, under free outfall (low tide) conditions, as reported in the Preliminary Hydrologic and Hydraulic Analyses Summary, conveys all stormwater within the stormdrain system and flooding does not occur. However, under the record tide and 10-year storm event, flood reduction and increased flooding varies. The implementation of the parallel system removes the flooding south of Calla Avenue and reduces the flooding along the existing alignment on Cypress Avenue and the north end of 9th Street, but results in new flooding along the new alignment on Cypress Avenue and west of 9th Street, as shown in Figure 9.

Figure 9 The historic high tide and 10-year storm event, flood reduction and increased flooding varies with implementation of the proposed NV5 parallel system.

3.6 Implementation of Parallel Stormdrain System, Tide Gate and Open Channel (Historic High Tide with 10-year Storm Event)

The implementation of a tide gate at the outfall and replacement of the existing 48-inch diameter pipe with an open channel, in addition to the parallel stormdrain system, results in the removal of flooding at the northern end of 9th Street and decreases the amount of flooding on Cypress Avenue and the ally way between Cypress and Calla Avenues. Flood reduction benefit south of Calla Avenue is maintained and all flooding is limited to less than 15 minutes. Figure 10 shows the location and magnitude of decreased flooding.

Figure 10 ***All flooding is limited to less than 15 minutes with implementation of the parallel system, tide gate and open channel.***

3.7 Implementation of Parallel Stormdrain System, Tide Gate, Open Channel and Detention Basin (Historic High Tide with 10-year Storm Event)

The implementation of a detention basin, in addition to the parallel system, tide gate and open channel removes flooding of the 10-year storm coincident with the historic tide throughout the system. The tide gate, open channel and detention basin provide conveyance and storage between the outfall and Cypress Avenue, while the parallel system on 9th Street increases the capacity of the overall system and reduces flows along the existing 8th Street alignment. Figure 11 shows the location and magnitude of further decreases in flood volume and duration, with the additional of the detention basin.

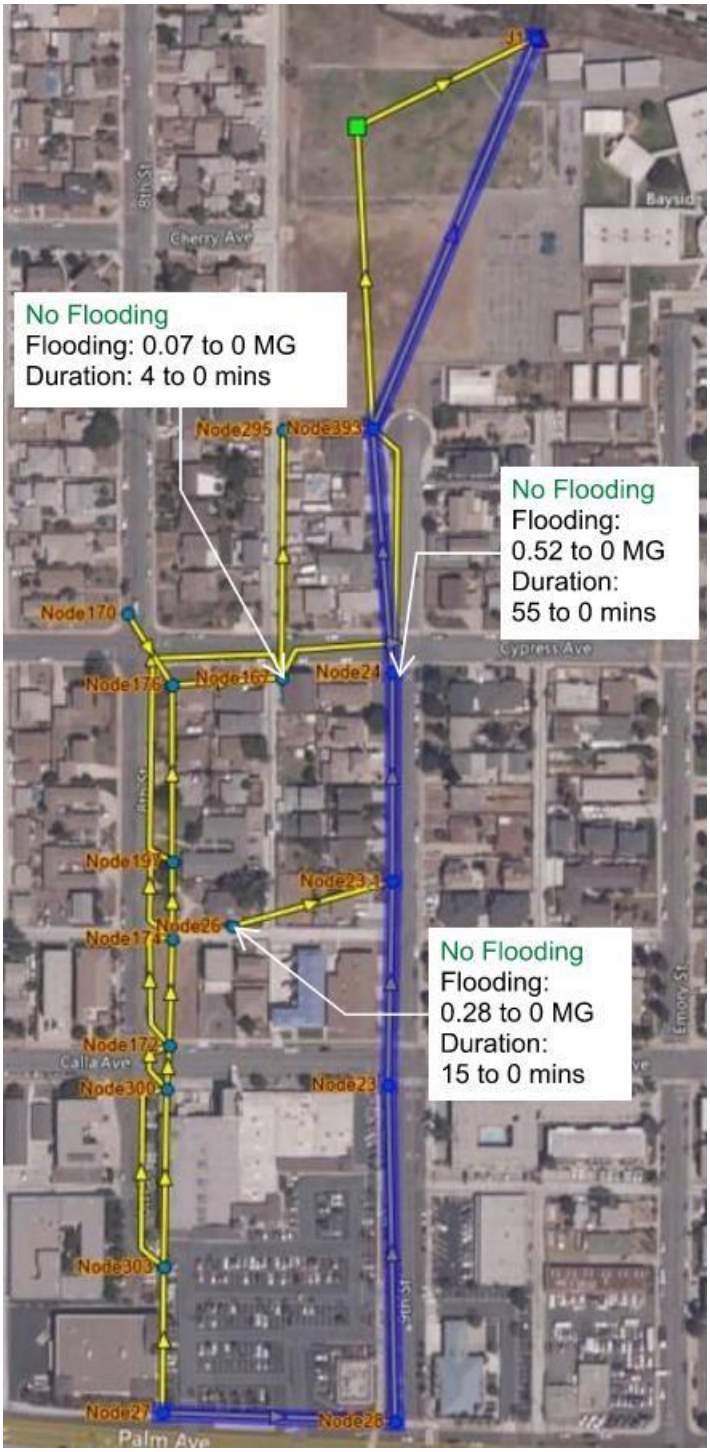


Figure 11 The tide gate, open channel and detention basin provide conveyance and storage in the system between the outfall and Cypress Avenue, while the parallel system increases the capacity of the overall system and reduces flows along the existing alignment.

3.8 Sea Level Rise and Implementation of Parallel Stormdrain System, Tide Gate, Open Channel and Detention Basin

Tidal water levels could potentially increase by up to 3.5 feet due to sea level rise within the life of the project. Future conditions with sea level rise were modeled by adding 3.5 feet to the tidal of record (peak at 7.8 feet) boundary condition, resulting in a peak water level of 11.3 feet coincident with the peak of the storm event. This

combination of events has a likelihood of less than 1% annual chance. Under these tidal conditions, the existing storm drain system would allow the tide to flow into the system, completely filling the available storage in the system and flow into the streets and nearby areas, as drain inlets within the system are below elevation 11.3 feet. The added rainfall runoff would combine with tidal flooding. The duration of the flooding, for these tidal conditions and the 10-year storm event would be up to nearly 10 hours in the lowest elevation areas of the system near 9th Street and Cypress Avenue, and as low as 15 minutes in the vicinity of Calla Avenue and Palm Avenue. Flooding ranges from approximately 5 hours at the north end of 9th Street near the park and is between 15 and 45 minutes along Calla Avenue and 8th Street (Figure 12). The implementation of the tide gate prevents the tide from propagating up through the storm drain system and the open channel and detention basin increase the available storage. Much of the storm event runoff is conveyed and stored withing the existing system and proposed improvements, reducing the flooding to 1 to 2 minutes in nearly all locations. The flooding that occurs between 8th and 9th Streets, north of Calla Avenue, is due to the low elevation of the drain inlet and lack of available storage in the system.

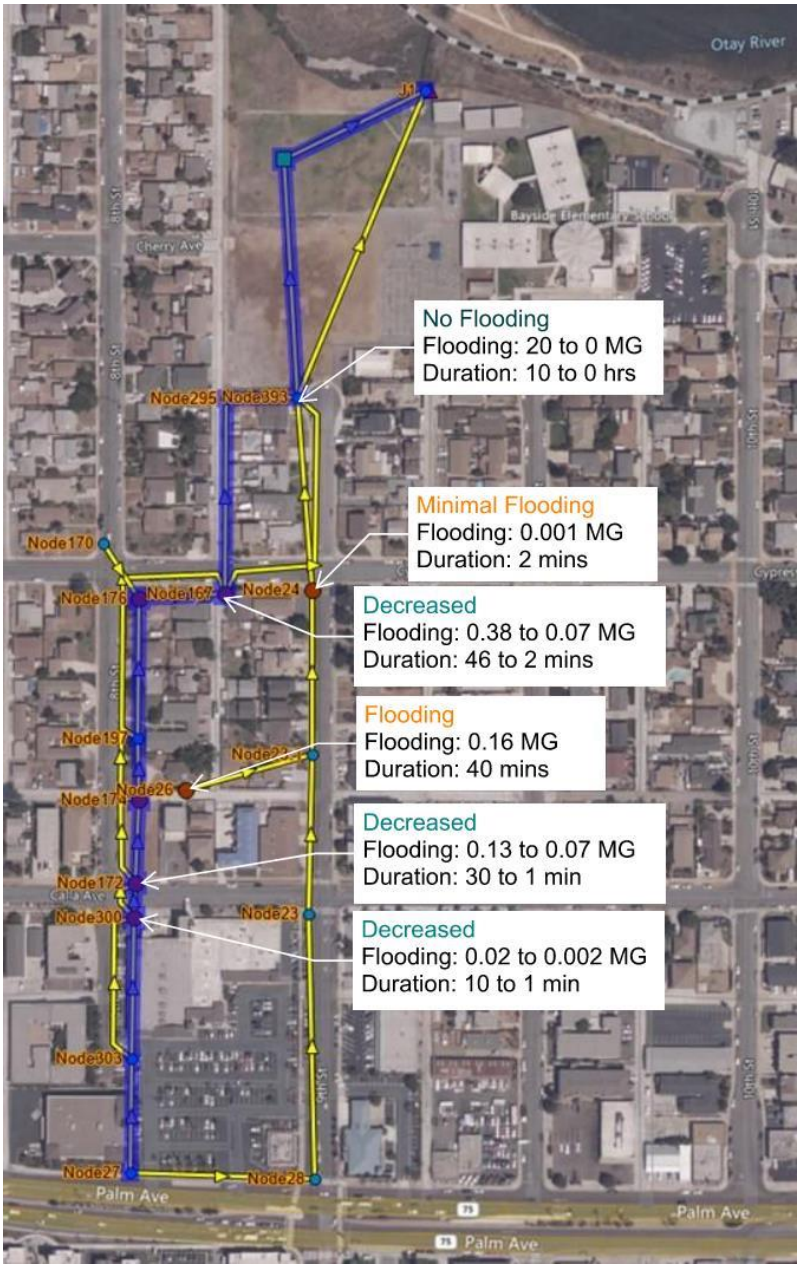


Figure 12 With 3.5 feet of sea level rise, the tide gate prevents large volumes of tidal flooding and the open channel and detention basin provide conveyance and storage of the storm event. The volume and duration of flooding is reduced throughout the project area.

4. Conclusions

The sequence of project component implementation and tidal conditions affect the flood location, volume and duration throughout the portion of the stormdrain system analyzed. The following conclusions were made as a result of the analysis:

1) Tidal Boundary Conditions:

   The storm drain system is very sensitive to the tidal boundary condition. Tidal waters reduce the storage capacity of the stormdrain system. Higher tides, coincident with storm events, result in increased flooding, compared to the free outfall (low tide) condition for both the existing system and the parallel system along 9th Street.

2) Design Features:

   a) Parallel System

      Benefits: Implementation of the parallel system increases the conveyance of stormwater from Palm Avenue to Cypress Avenue, reducing flooding.

      Sensitivity/Consideration as a Standalone Design Feature: A combined storm event with higher tides (in addition to precipitation) may result in flooding along the parallel system alignment, in locations that do not currently flood during the same event.

   b) Tide Gate and Open Channel

      Benefits: Implementation of the tide gate and open channel provide flood reduction benefits on Cypress Avenue and the north end of 9th Street.

      Sensitivity/Consideration as a Standalone Design Feature: Implementation of only the tide gate and open channel do not reduce flooding along 8th Street, south of Cypress Avenue. Implementation of the tide gate and open channel, in combination with the parallel system, reduces flooding along the new alignment during higher tidal water levels.

   c) Multi-purpose Detention Basin

      Benefits: The proposed detention basin helps to significantly reduce flooding when combined with all other improvements.

      Sensitivity/Consideration as a Standalone Design Feature: Compared to the implementation of the tide gate and open channel, limited additional flood reduction benefit is provided by the detention basin, unless the parallel system has been implemented.

   Implementation of all design features is recommended to preserve existing capacity in the system with a tide gate (limit tidal water encroachment into the system); improve the conveyance of stormwater through the basin with the parallel system and open channel; and increase storage capacity with the multi-purpose detention basin.

3) Impact on Projected Sea Level Rise:

   The proposed combination of all project components provides significant reductions in flooding due to sea level rise and combined extreme tide and storm events. The implementation of these components could achieve the Project objective to become resilient to 3.5 feet of sea level rise.

4) Recommended Next Steps:

   - Further evaluation of the parallel system or other improvements to increase storm drain conveyance capacity and reduce flooding south of Cypress Avenue along 8th Street.
   - Expansion of the existing hydraulic model to include portions of the system south of Palm Avenue is recommended to account for additional storage and hydraulic characteristics of the upper watershed and storm drain system.

5. References

Caltrans. (2019). *Highway Design Manual Seventh Edition.* Sacramento: California Department of Transportation.

County of San Diego. (2014). *San Diego County Hydraulic Design Manual.* San Diego: San Diego County.

NV5. (2022). *Preliminary Hydrologic and Hydraulic Analyses Summary.* San Diego: NV5.

Appendix A – Tidal Boundaries and Rainfall Runoff Hydrographs.

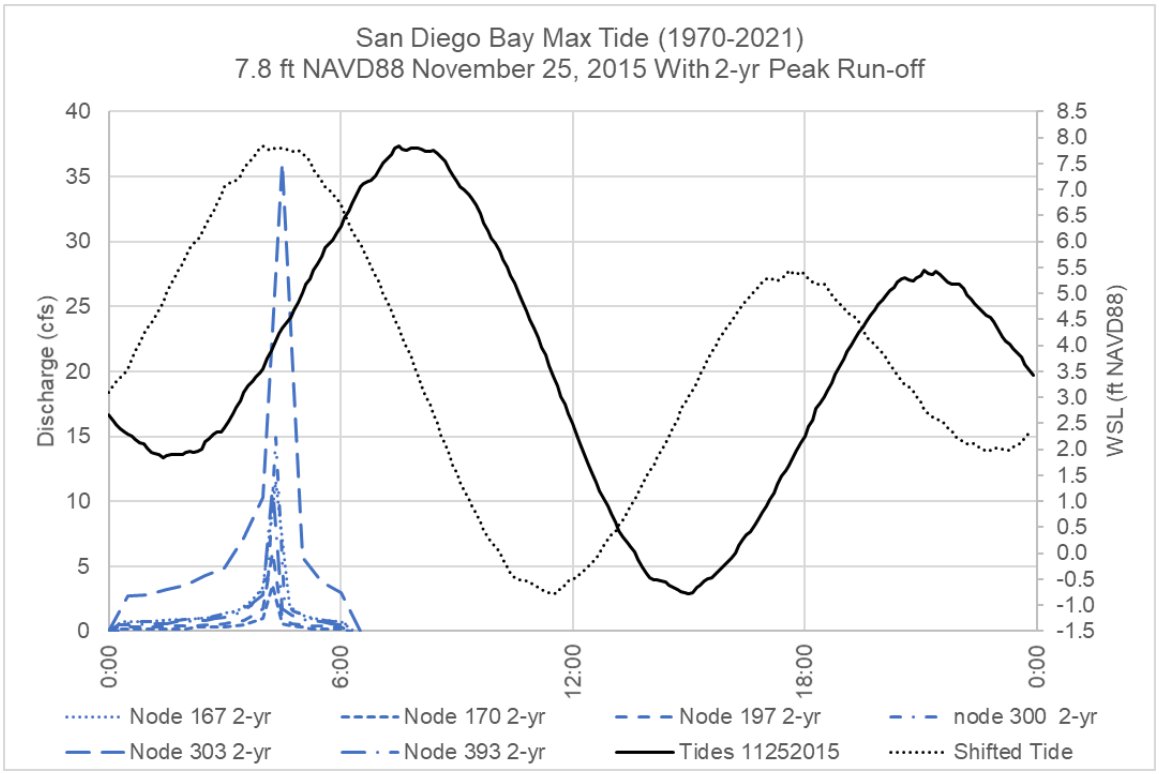


Figure 13. 2-yr Storm Event and Historic High Tide

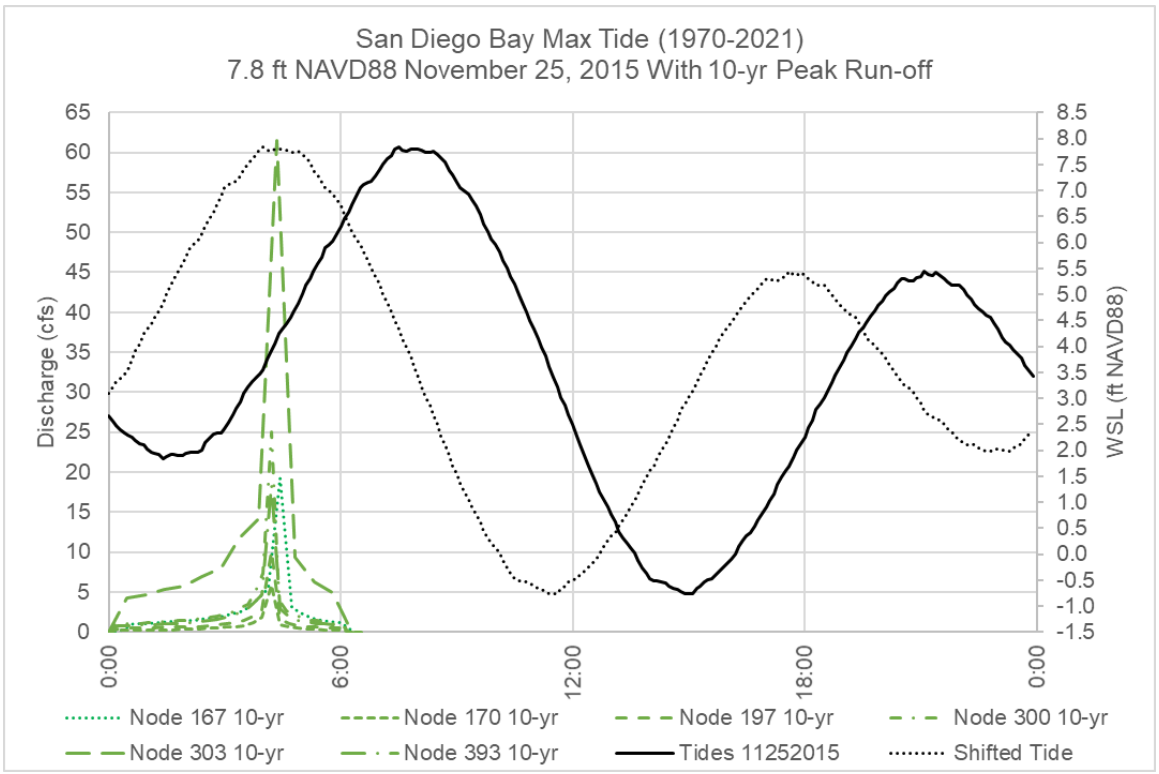


Figure 14. 10-yr Storm Event and Historic High Tide

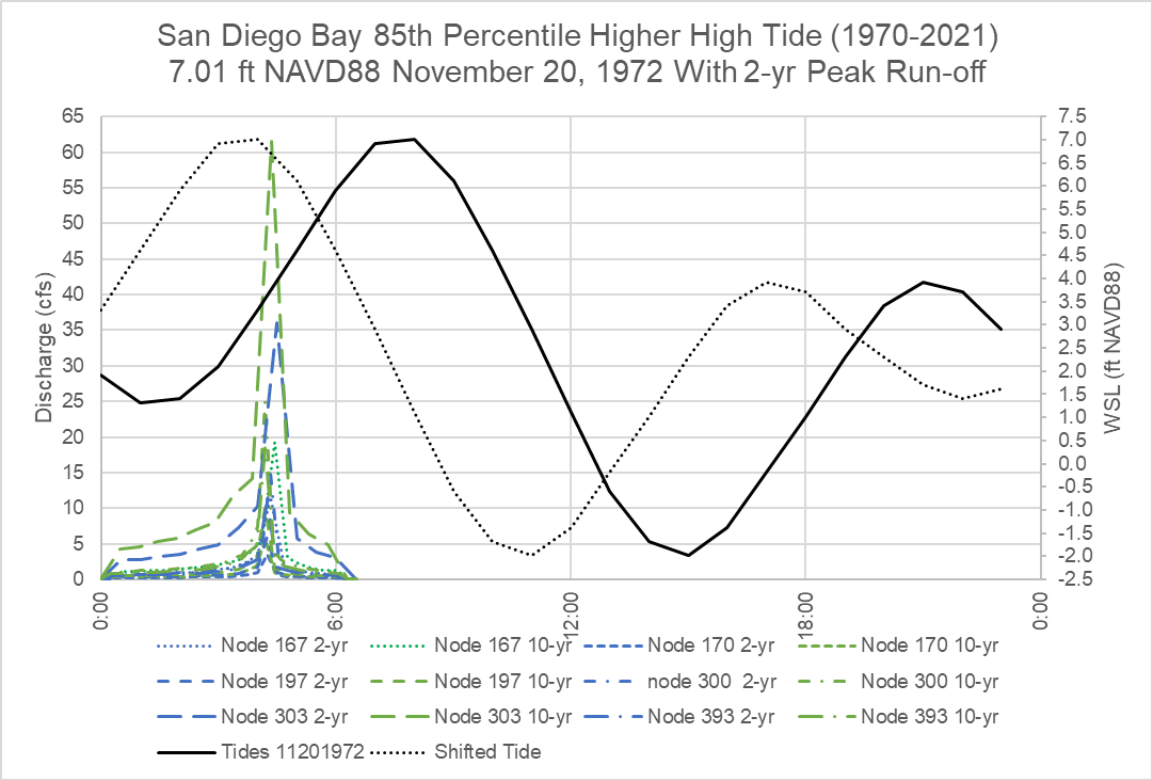


Figure 15. 2-yr Storm Event and 85th Percentile Higher High Tide

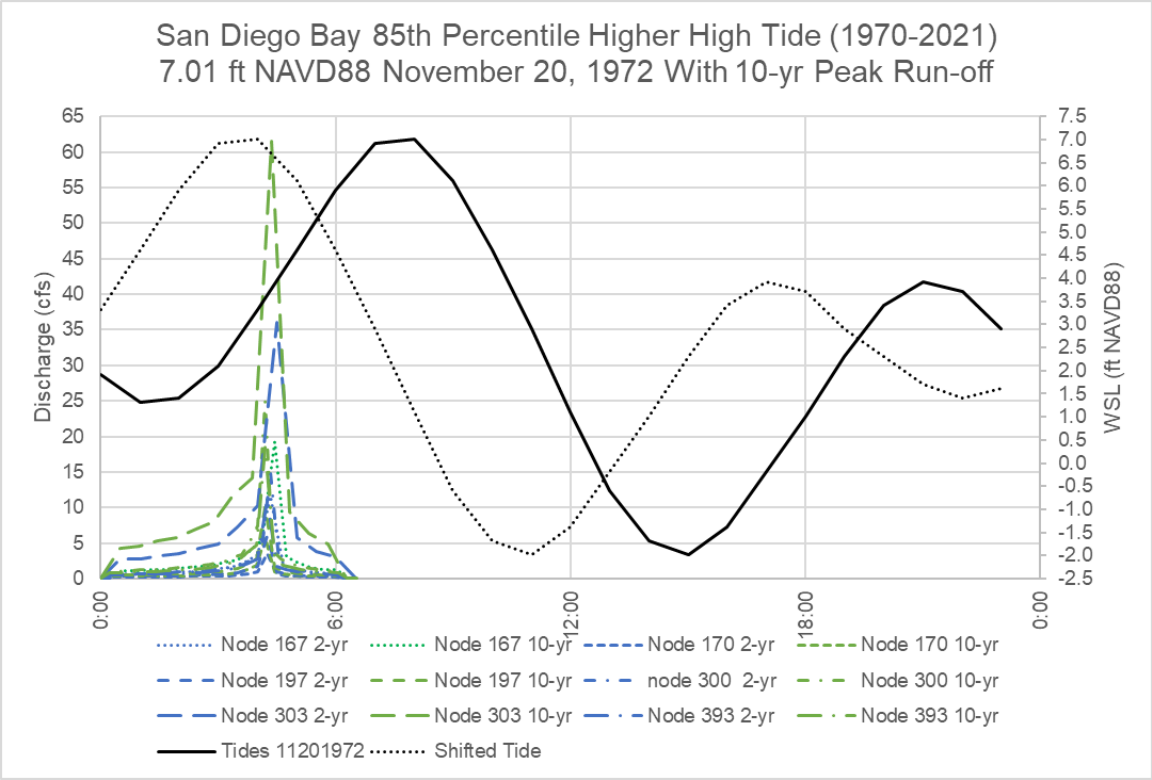


Figure 16. 10-yr Storm Event and 85th Percentile Higher High Tide

Appendix B– Model Results

Existing Conditions, Historic High Tide

	Name	Time Series	Avg. Depth (ft)	Max. Depth (ft)	Max. HGL (ft)	Rep. Max. Depth (ft)	Max. Lat. Inflow (cfs)	Max. Total Inflow (cfs)	Total Lat. Inflow (MG)	Total inflow (MG)	Hours Surcharged (h)	Max. Surcharge (ft)	Min. Freeboard (ft)	Hours Flooded (h)	Max. Flood Rate (cfs)	Total Flood Vol. (MG)
2-yr	Node167	Node167-2yr	0.97	4.58	8.39	4.58	11.54	52.81	0.293	1.95	0.54	0	0	0.54	20.49	0.19
	Node170	Node170-2yr	0.04	0.48	10.61	0.47	3.53	3.53	0.074	0.074	0	0	2.08	0	0	0
	Node172		0.44	4.51	9.98	4.51	0	41.89	0	1.46	0	0	0.046	0	0	0
	Node174		0.61	4.62	9.48	4.62	0	41.88	0	1.46	0	0	0.046	0	0	0
	Node176		0.78	4.33	8.58	4.33	0	35.75	0	1.58	1.32	0.834	1.456	0	0	0
	Node197	Node197-2yr	0.58	4.3	9.16	4.3	6.06	45.45	0.126	1.59	0.27	0	0	0.27	6.68	0.032
	Node295		1.39	5.14	8.11	5.14	0	28.38	0	1.71	3.54	1.638	0.892	0	0	0
	Node300	Node300-2yr	0.38	4.42	10.2	4.42	14.94	42.05	0.283	1.46	0	0	0.176	0	0	0
	Node303	Node303-2yr	0.33	4.56	10.92	4.56	36.01	36.01	1.18	1.18	0	0	0.286	0	0	0
	Node393	Node393-2yr	1.59	5.38	8.01	5.38	11.09	43.41	0.227	2.06	0.72	0	0	0.72	14.84	0.161
10-yr	Node167	Node167-10yr	0.99	4.58	8.39	4.58	19.33	59.34	0.462	2.74	0.78	0	0	0.78	27.01	0.377
	Node170	Node170-10yr	0.05	0.73	10.86	0.72	5.83	5.83	0.118	0.118	0	0	1.83	0	0	0
	Node172		0.5	4.56	10.03	4.56	0	60.58	0	2.23	0.47	0	0	0.47	15.63	0.13
	Node174		0.67	4.66	9.52	4.66	0	44.96	0	2.1	0	0	0.006	0	0	0
	Node176		0.81	4.36	8.61	4.36	0	37.95	0	2.16	1.64	0.859	1.431	0	0	0
	Node197	Node197-10yr	0.63	4.3	9.16	4.3	10.17	55.12	0.201	2.31	0.58	0	0	0.58	17.26	0.165
	Node295		1.4	5.14	8.11	5.14	0	28.38	0	2.3	3.56	1.638	0.892	0	0	0
	Node300	Node300-10yr	0.45	4.6	10.38	4.6	24.98	70.7	0.457	2.25	0.15	0	0	0.15	10.11	0.021
	Node303	Node303-10yr	0.4	4.85	11.21	4.85	61.47	61.47	1.85	1.85	0.28	0	0	0.28	14.78	0.056
	Node393	Node393-10yr	1.6	5.38	8.01	5.38	18.51	50.83	0.36	2.8	0.9	0	0	0.89	22.01	0.268
100-yr	Node167	Node167-100yr	1.04	4.58	8.39	4.58	31.46	77.74	0.731	3.84	1.02	0	0	1.02	45.41	0.604
	Node170	Node170-100yr	0.07	2.56	12.69	2.36	9.36	9.36	0.185	0.185	0.07	1.39	0	0.01	0.34	0
	Node172		0.58	4.56	10.03	4.56	0	60.58	0	3.07	0.66	0	0	0.66	15.63	0.222
	Node174		0.74	4.66	9.52	4.66	0	44.96	0	2.85	0	0	0.006	0	0	0
	Node176		0.86	4.5	8.75	4.39	0	40.55	0	2.95	2.14	0.996	1.294	0	0	0
	Node197	Node197-100yr	0.69	4.3	9.16	4.3	16.59	61.54	0.322	3.18	0.74	0	0	0.74	23.44	0.275
	Node295		1.43	5.14	8.11	5.14	0	32.2	0	3.13	3.62	1.638	0.892	0	0	0
	Node300	Node300-100yr	0.53	4.6	10.38	4.6	40.78	86.82	0.712	3.18	0.33	0	0	0.33	26.23	0.114
	Node303	Node303-100yr	0.49	4.85	11.21	4.85	102.59	102.59	2.91	2.91	0.56	0	0	0.56	56.53	0.44
	Node393	Node393-100yr	1.62	5.38	8.01	5.38	30.03	62.35	0.569	3.87	0.99	0	0	0.98	34.99	0.385
10-yr + 3.5 SLR	Node167	Node167-10yr	2.79	4.58	8.39	4.58	19.33	59.34	0.462	2.98	0.78	0	0	0.78	27.01	0.377
	Node170	Node170-10yr	0.05	0.73	10.86	0.72	5.83	5.83	0.118	0.118	0	0	1.83	0	0	0
	Node172		1.52	4.56	10.03	4.56	0	60.58	0	2.31	0.47	0	0	0.47	15.63	0.13
	Node174		1.98	4.66	9.52	4.66	0	44.96	0	2.21	0	0	0.006	0	0	0
	Node176		2.43	4.36	8.61	4.36	0	38.24	0	2.35	10.3	0.859	1.431	0	0	0
	Node197	Node197-10yr	1.96	4.3	9.16	4.3	10.17	55.12	0.201	2.45	0.58	0	0	0.58	17.26	0.165
	Node295		3.53	6.03	9	5.14	0	53.23	0	2.56	14.12	2.53	0	0.01	21.94	0
	Node300	Node300-10yr	1.31	4.6	10.38	4.6	24.98	70.7	0.457	2.3	0.15	0	0	0.15	10.11	0.021
	Node303	Node303-10yr	0.98	4.85	11.21	4.85	61.47	61.47	1.85	1.87	0.28	0	0	0.28	14.78	0.056
	Node393	Node393-10yr	3.86	5.38	8.01	5.38	18.51	156.78	0.36	20.2	9.6	0	0	9.6	156.78	19.555
100-yr + 3.5 SLR	Node167	Node167-100yr	2.81	4.58	8.39	4.58	31.46	77.74	0.731	4.07	1.2	0	0	1.2	45.41	0.629
	Node170	Node170-100yr	0.07	2.56	12.69	2.36	9.36	9.36	0.185	0.185	0.07	1.39	0	0.01	0.34	0
	Node172		1.58	4.56	10.03	4.56	0	60.58	0	3.15	0.66	0	0	0.66	15.63	0.222
	Node174		2.03	4.66	9.52	4.66	0	44.96	0	2.96	0	0	0.006	0	0	0
	Node176		2.45	4.5	8.75	4.39	0	40.55	0	3.14	10.34	0.996	1.294	0	0	0
	Node197	Node197-100yr	2	4.3	9.16	4.3	16.59	61.54	0.322	3.32	0.74	0	0	0.74	23.44	0.275
	Node295		3.54	6.03	9	5.14	0	53.41	0	3.32	14.12	2.53	0	0.01	22.02	0
	Node300	Node300-100yr	1.38	4.6	10.38	4.6	40.78	86.82	0.712	3.24	0.33	0	0	0.33	26.23	0.114
	Node303	Node303-100yr	1.06	4.85	11.21	4.85	102.59	102.59	2.91	2.93	0.56	0	0	0.56	56.53	0.44
	Node393	Node393-100yr	3.86	5.38	8.01	5.38	30.03	168.81	0.569	21.2	9.63	0	0	9.63	168.8	20.456

Tide Gate and Open Channel, Historic High Tide

	Name	Time Series	Avg. Depth (ft)	Max. Depth (ft)	Max. HGL (ft)	Rep. Max. Depth (ft)	Max. Lat. Inflow (cfs)	Max. Total Inflow (cfs)	Total Lat. Inflow (MG)	Total inflow (MG)	Hours Surcharged (h)	Max. Surcharge (ft)	Min. Freeboard (ft)	Hours Flooded (h)	Max. Flood Rate (cfs)	Total Flood Vol. (MG)
2-yr	Node167	Node167-2yr	0.77	4.58	8.39	4.58	11.54	52.81	0.293	1.92	0.41	0	0	0.41	14.6	0.104
	Node170	Node170-2yr	0.04	0.48	10.61	0.47	3.53	3.53	0.074	0.074	0	0	2.08	0	0	0
	Node172		0.43	4.51	9.98	4.51	0	41.88	0	1.46	0	0	0.046	0	0	0
	Node174		0.58	4.62	9.48	4.62	0	41.88	0	1.46	0	0	0.046	0	0	0
	Node176		0.66	4.33	8.58	4.33	0	35.74	0	1.56	1.25	0.834	1.456	0	0	0
	Node197	Node197-2yr	0.54	4.3	9.16	4.3	6.06	45.45	0.126	1.59	0.27	0	0	0.26	6.68	0.032
	Node295		1.01	5	7.97	5	0	35.98	0	1.77	3.53	1.497	1.033	0	0	0
	Node300	Node300-2yr	0.38	4.42	10.2	4.42	14.94	42.05	0.283	1.46	0	0	0.176	0	0	0
	Node303	Node303-2yr	0.32	4.56	10.92	4.56	36.01	36.01	1.18	1.18	0	0	0.286	0	0	0
	Node393	Node393-2yr	1.11	5.22	7.85	5.22	11.09	49.6	0.227	2.05	0	0	0.156	0	0	0
10-yr	Node167	Node167-10yr	0.79	4.58	8.39	4.58	19.33	59.34	0.462	2.71	0.68	0	0	0.68	21.09	0.252
	Node170	Node170-10yr	0.05	0.73	10.86	0.72	5.83	5.83	0.118	0.118	0	0	1.83	0	0	0
	Node172		0.49	4.56	10.03	4.56	0	60.58	0	2.23	0.47	0	0	0.47	15.63	0.13
	Node174		0.62	4.66	9.52	4.66	0	44.96	0	2.1	0	0	0.006	0	0	0
	Node176		0.69	4.36	8.61	4.36	0	37.95	0	2.15	1.48	0.859	1.431	0	0	0
	Node197	Node197-10yr	0.58	4.3	9.16	4.3	10.17	55.12	0.201	2.3	0.58	0	0	0.58	17.26	0.164
	Node295		1.01	5.04	8.01	5.04	0	36.47	0	2.4	3.53	1.535	0.995	0	0	0
	Node300	Node300-10yr	0.44	4.6	10.38	4.6	24.98	70.7	0.457	2.25	0.15	0	0	0.15	10.11	0.021
	Node303	Node303-10yr	0.39	4.85	11.21	4.85	61.47	61.47	1.85	1.85	0.28	0	0	0.28	14.78	0.056
	Node393	Node393-10yr	1.11	5.24	7.87	5.24	18.51	57.06	0.36	2.83	0	0	0.136	0	0	0
100-yr	Node167	Node167-100yr	0.83	4.58	8.39	4.58	31.46	77.74	0.731	3.81	0.8	0	0	0.79	39.14	0.425
	Node170	Node170-100yr	0.07	2.56	12.69	2.36	9.36	9.36	0.185	0.185	0.07	1.39	0	0.01	0.34	0
	Node172		0.56	4.56	10.03	4.56	0	60.58	0	3.07	0.66	0	0	0.66	15.63	0.222
	Node174		0.69	4.66	9.52	4.66	0	44.96	0	2.85	0	0	0.006	0	0	0
	Node176		0.73	4.5	8.75	4.39	0	40.55	0	2.95	1.84	0.996	1.294	0	0	0
	Node197	Node197-100yr	0.64	4.3	9.16	4.3	16.59	61.54	0.322	3.17	0.74	0	0	0.73	23.44	0.274
	Node295		1.03	5.02	7.99	5.02	0	38.47	0	3.31	3.55	1.523	1.007	0	0	0
	Node300	Node300-100yr	0.52	4.6	10.38	4.6	40.78	86.82	0.712	3.18	0.33	0	0	0.33	26.23	0.114
	Node303	Node303-100yr	0.48	4.85	11.21	4.85	102.59	102.59	2.91	2.91	0.56	0	0	0.56	56.53	0.44
	Node393	Node393-100yr	1.12	5.22	7.85	5.22	30.03	67.34	0.569	3.95	0	0	0.156	0	0	0

Tide Gate, Open Channel and Detention Basin, Historic High Tide

	Name	Time Series	Avg. Depth (ft)	Max. Depth (ft)	Max. HGL (ft)	Rep. Max. Depth (ft)	Max. Lat. Inflow (cfs)	Max. Total Inflow (cfs)	Total Lat. Inflow (MG)	Total inflow (MG)	Hours Surcharged (h)	Max. Surcharge (ft)	Min. Freeboard (ft)	Hours Flooded (h)	Max. Flood Rate (cfs)	Total Flood Vol. (MG)
2-yr	J1		1.72	5.31	7.36	5.31	0	23.08	0	2.16	4.1	1.311	0.639	0	0	0
	Node167	Node167-2	0.73	4.58	8.39	4.58	11.54	53.04	0.293	1.93	0.08	0	0	0.07	3.72	0.003
	Node170	Node170-2	0.04	0.48	10.61	0.47	3.53	3.53	0.074	0.074	0	0	2.08	0	0	0
	Node172		0.38	4.51	9.98	4.51	0	41.88	0	1.46	0	0	0.046	0	0	0
	Node174		0.53	4.62	9.48	4.62	0	41.87	0	1.46	0	0	0.046	0	0	0
	Node176		0.61	4.33	8.58	4.33	0	37.47	0	1.58	0.58	0.828	1.462	0	0	0
	Node197	Node197-2	0.49	4.3	9.16	4.3	6.06	45.41	0.126	1.59	0.24	0	0	0.24	6.63	0.028
	Node295		1.09	4.67	7.64	4.67	0	46.84	0	1.91	3.53	1.166	1.364	0	0	0
	Node300	Node300-2	0.33	4.42	10.2	4.42	14.94	42.05	0.283	1.46	0	0	0.176	0	0	0
	Node303	Node303-2	0.29	4.56	10.92	4.56	36.01	36.01	1.18	1.18	0	0	0.286	0	0	0
	Node393	Node393-2	1.27	4.73	7.36	4.73	11.09	57.17	0.227	2.24	0	0	0.646	0	0	0
10-yr	J1		1.75	5.44	7.49	5.44	0	36.63	0	3.01	4.1	1.438	0.512	0	0	0
	Node167	Node167-1	0.78	4.58	8.39	4.58	19.33	59.34	0.462	2.72	0.47	0	0	0.47	10.86	0.086
	Node170	Node170-1	0.05	0.73	10.86	0.72	5.83	5.83	0.118	0.118	0	0	1.83	0	0	0
	Node172		0.46	4.56	10.03	4.56	0	60.58	0	2.23	0.46	0	0	0.46	15.63	0.129
	Node174		0.6	4.66	9.52	4.66	0	44.96	0	2.1	0	0	0.006	0	0	0
	Node176		0.66	4.36	8.61	4.36	0	39.12	0	2.16	0.84	0.859	1.431	0	0	0
	Node197	Node197-1	0.56	4.3	9.16	4.3	10.17	55.12	0.201	2.3	0.54	0	0	0.54	17.25	0.154
	Node295		1.13	4.75	7.72	4.75	0	45.44	0	2.6	3.53	1.253	1.277	0	0	0
	Node300	Node300-1	0.41	4.6	10.38	4.6	24.98	70.7	0.457	2.25	0.15	0	0	0.15	10.11	0.021
	Node303	Node303-1	0.37	4.85	11.21	4.85	61.47	61.47	1.85	1.85	0.28	0	0	0.28	14.78	0.056
	Node393	Node393-1	1.31	4.86	7.49	4.86	18.51	66.25	0.36	3.34	0	0	0.516	0	0	0
100-yr	J1		1.78	5.75	7.8	5.75	0	50.85	0	4.1	4.1	1.75	0.2	0	0	0
	Node167	Node167-1	0.83	4.58	8.39	4.58	31.46	77.74	0.731	3.81	0.64	0	0	0.64	31.55	0.293
	Node170	Node170-1	0.07	2.56	12.69	2.36	9.36	9.36	0.185	0.185	0.07	1.39	0	0.01	0.34	0
	Node172		0.56	4.56	10.03	4.56	0	60.58	0	3.07	0.65	0	0	0.65	15.63	0.221
	Node174		0.69	4.66	9.52	4.66	0	44.97	0	2.85	0	0	0.006	0	0	0
	Node176		0.72	4.5	8.75	4.39	0	40.55	0	2.96	1.76	0.996	1.294	0	0	0
	Node197	Node197-1	0.64	4.3	9.16	4.3	16.59	61.54	0.322	3.17	0.7	0	0	0.7	23.44	0.267
	Node295		1.16	5.05	8.02	5.05	0	46.39	0	3.47	3.55	1.555	0.975	0	0	0
	Node300	Node300-1	0.51	4.6	10.38	4.6	40.78	86.82	0.712	3.18	0.33	0	0	0.33	26.23	0.114
	Node303	Node303-1	0.48	4.85	11.21	4.85	102.59	102.59	2.91	2.91	0.56	0	0	0.56	56.53	0.44
	Node393	Node393-1	1.34	5.26	7.89	5.26	30.03	68.16	0.569	4.63	0	0	0.116	0	0	0

Parallel System, Historic High Tide

	Name	Time Series	Avg. Depth (ft)	Max. Depth (ft)	Max. HGL (ft)	Rep. Max. Depth (ft)	Max. Lat. Inflow (cfs)	Max. Total Inflow (cfs)	Total Lat. Inflow (MG)	Total inflow (MG)	Hours Surcharged (h)	Max. Surcharge (ft)	Min. Freeboard (ft)	Hours Flooded (h)	Max. Flood Rate (cfs)	Total Flood Vol. (MG)
10-yr	Node167	Node167-10yr	2.19	4.58	8.39	4.58	19.28	186.45	0.461	1.48	0.36	0	0	0.35	102.33	0.116
	Node170	Node170-10yr	0.13	0.71	10.84	0.71	5.83	5.83	0.119	0.119	0	0	1.85	0	0	0
	Node172		1.1	3.78	9.25	3.77	0	25.68	0	0.804	0	0	0.776	0	0	0
	Node174		1.49	4.17	9.03	4.16	0	25.63	0	0.809	0	0	0.496	0	0	0
	Node176		1.85	4.28	8.53	4.27	0	28.03	0	0.947	1.44	0.778	1.512	0	0	0
	Node197		1.45	4.01	8.87	4.01	0	25.63	0	0.819	0	0	0.286	0	0	0
	Node23	Node23-10yr	1.38	5.07	10.2	5.06	24.96	49.3	0.457	1.52	0.91	2.07	1.8	0	0	0
	Node23.1		1.63	4.17	8.79	4.16	0	49.32	0	1.63	1.77	1.17	3.21	0	0	0
	Node24		1.93	3.88	8	3.88	0	36.62	0	1.46	2.61	0.88	0	0.9	36.62	0.529
	Node26	Node26-10yr	1.25	2.92	8	2.92	10.16	23.1	0.202	0.406	2.69	0.916	0	1.13	23.07	0.307
	Node27	Node27-10yr	0.77	5.51	12.33	5.49	61.42	61.42	1.86	1.86	0.45	2.506	5.672	0	0	0
	Node28		0.97	5.14	11.19	5.14	0	35.73	0	1.05	0.55	2.143	3.217	0	0	0
	Node295		2.88	5.14	8.11	5.14	0	74.71	0	1.36	3.48	1.573	0.887	0	0	0
	Node300		0.95	3.56	9.34	3.55	0	25.62	0	0.802	0	0	1.036	0	0	0
	Node303		0.74	3.35	9.71	3.35	0	25.68	0	0.801	0	0	1.496	0	0	0
	Node393	Node393-10yr	3.17	5.38	8.01	5.38	18.5	50.02	0.362	2.76	0.62	0	0	0.62	20.99	0.163
100-yr	Node167	Node167-100yr	2.2	4.58	8.39	4.58	31.3	196.91	0.731	2.28	0.53	0	0	0.53	111.79	0.41
	Node170	Node170-100yr	0.16	2.3	12.43	2.17	9.3	9.3	0.185	0.185	0.08	1.133	0.257	0	0	0
	Node172		1.15	4.46	9.93	4.46	0	93.34	0	1.28	0	0	0.096	0	0	0
	Node174		1.54	4.61	9.47	4.61	0	67.99	0	1.28	0	0	0.056	0	0	0
	Node176		1.86	5.79	10.04	4.38	0	39.96	0	1.43	1.77	2.29	0	0.01	18.08	0.001
	Node197		1.48	4.3	9.16	4.3	0	47.77	0	1.29	0.15	0	0	0.15	3.99	0.011
	Node23	Node23-100yr	1.49	6.87	12	6.87	40.45	87.44	0.713	2.34	1.19	3.87	0	0.23	19.66	0.066
	Node23.1		1.69	4.81	9.43	4.8	0	67.46	0	2.41	2.19	1.813	2.567	0	0	0
	Node24		1.96	3.88	8	3.88	0	52.13	0	2.13	2.79	0.88	0	1.05	52.13	0.798
	Node26	Node23.1-100yr	1.29	2.92	8	2.92	16.59	32.05	0.321	0.65	2.92	0.916	0	1.62	32.05	0.52
	Node27	Node27-100yr	1	10.9	17.73	10.84	102.56	102.56	2.91	2.91	0.65	7.904	0.274	0	0	0
	Node28		1.14	8.36	14.41	8.36	0	61.33	0	1.66	0.71	5.36	0	0.2	14.3	0.04
	Node295		2.88	5.17	8.14	5.15	0	82.35	0	1.86	3.52	1.6	0.86	0	0	0
	Node300		1.01	4.6	10.38	4.56	0	40.48	0	1.26	0.02	0	0	0	0	0
	Node303		0.84	4.66	11.02	4.66	0	41.2	0	1.26	0	0	0.186	0	0	0
	Node393	Node393-100yr	3.17	5.38	8.01	5.38	30.02	62.32	0.567	3.88	0.7	0	0	0.69	32.44	0.312

Parellel System, Tide Gate and Open Channel, Historic High Tide

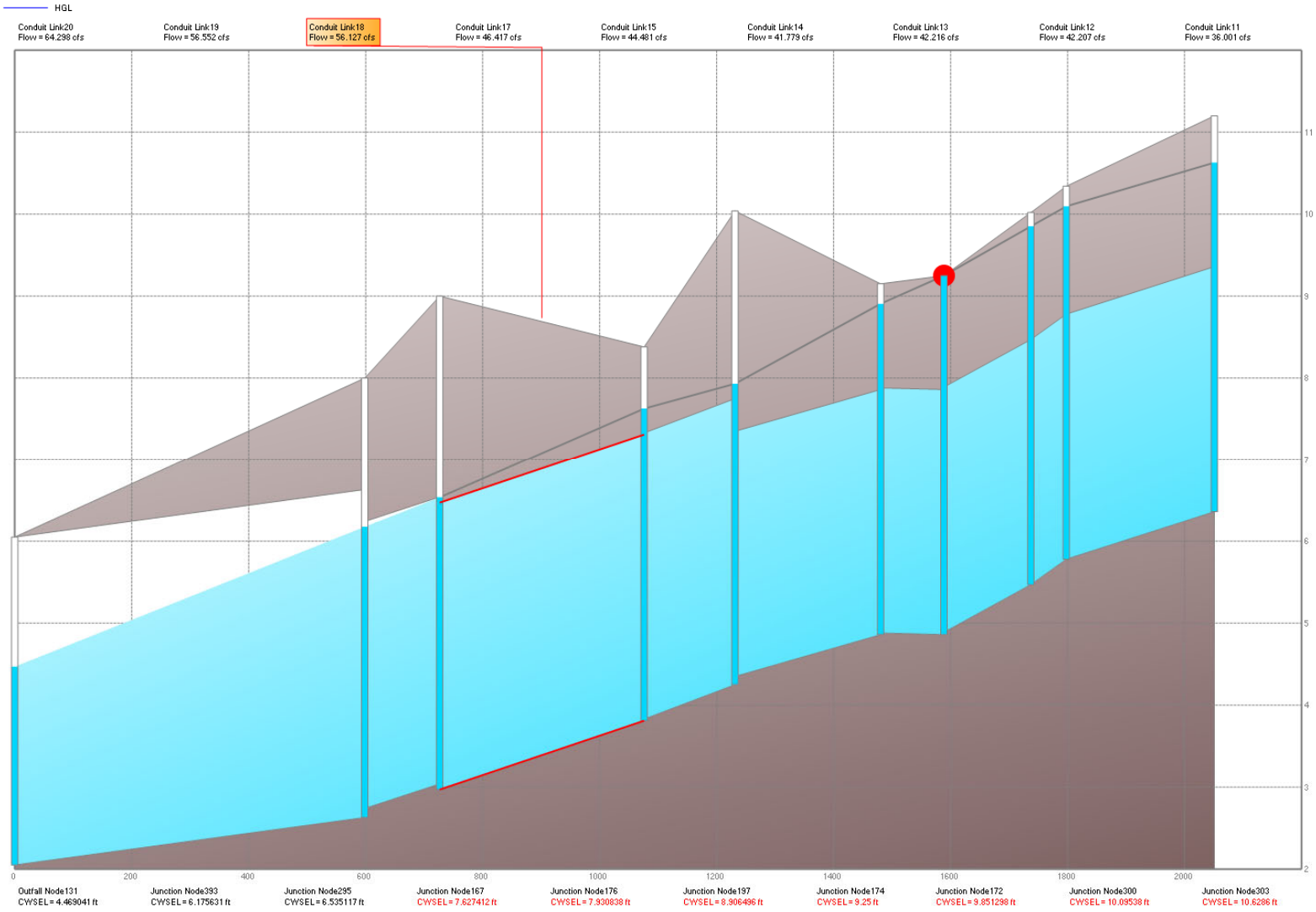
	Name	Time Series	Avg. Depth (ft)	Max. Depth (ft)	Max. HGL (ft)	Rep. Max. Depth (ft)	Max. Lat. Inflow (cfs)	Max. Total Inflow (cfs)	Total Lat. Inflow (MG)	Total inflow (MG)	Hours Surcharged (h)	Max. Surcharge (ft)	Min. Freeboard (ft)	Hours Flooded (h)	Max. Flood Rate (cfs)	Total Flood Vol. (MG)
10-yr	Node167	Node167-10yr	2.23	4.58	8.39	4.58	19.27	186.45	0.461	1.45	0.21	0	0	0.21	120.4	0.066
	Node170	Node170-10yr	0.15	0.7	10.83	0.7	5.82	5.82	0.119	0.119	0	0	1.86	0	0	0
	Node172		1.19	3.78	9.25	3.77	0	25.63	0	0.81	0	0	0.776	0	0	0
	Node174		1.59	4.17	9.03	4.16	0	25.62	0	0.813	0	0	0.496	0	0	0
	Node176		1.92	4.28	8.53	4.26	0	33.34	0	0.939	1.18	0.778	1.512	0	0	0
	Node197		1.55	4.01	8.87	4.01	0	25.64	0	0.819	0	0	0.286	0	0	0
	Node23	Node23-10yr	1.51	5.04	10.17	5.04	24.91	49.01	0.457	1.51	0.81	2.042	1.828	0	0	0
	Node23.1		1.74	4.15	8.77	4.15	0	49	0	1.62	1.65	1.151	3.229	0	0	0
	Node24		2.01	3.88	8	3.88	0	36.15	0	1.43	2.54	0.88	0	0.66	20.52	0.197
	Node26	Node26-10yr	1.35	2.92	8	2.92	10.15	23	0.202	0.383	2.63	0.916	0	0.95	22.99	0.277
	Node27	Node27-10yr	0.86	5.51	12.33	5.49	61.46	61.46	1.86	1.86	0.45	2.513	5.665	0	0	0
	Node28		1.07	5.15	11.2	5.14	0	35.73	0	1.05	0.54	2.151	3.209	0	0	0
	Node295		2.85	5.03	8	5.02	0	72.57	0	1.38	3.43	1.463	0.997	0	0	0
	Node300		1.02	3.56	9.34	3.55	0	25.63	0	0.807	0	0	1.036	0	0	0
	Node303		0.79	3.35	9.71	3.35	0	25.7	0	0.805	0	0	1.496	0	0	0
	Node393	Node393-10yr	3.09	5.23	7.86	5.23	18.46	67.48	0.362	3.01	0	0	0.146	0	0	0
100-yr	Node167	Node167-100yr	2.26	4.58	8.39	4.58	31.28	196.87	0.731	2.25	0.46	0	0	0.46	111.72	0.338
	Node170	Node170-100yr	0.18	2.28	12.41	2.16	9.29	9.29	0.185	0.185	0.08	1.111	0.279	0	0	0
	Node172		1.25	4.56	10.03	4.52	0	50.77	0	1.28	0.02	0	0	0.02	3.88	0.002
	Node174		1.65	4.61	9.47	4.61	0	65.24	0	1.28	0	0	0.056	0	0	0
	Node176		1.95	5.53	9.78	4.39	0	39.89	0	1.42	1.37	2.034	0.256	0	0	0
	Node197		1.59	4.3	9.16	4.3	0	40.45	0	1.29	0.15	0	0	0.15	4.02	0.011
	Node23	Node23-100yr	1.65	6.87	12	6.87	40.42	87.41	0.713	2.33	1.03	3.87	0	0.23	19.62	0.066
	Node23.1		1.83	4.8	9.42	4.8	0	67.46	0	2.42	1.88	1.801	2.579	0	0	0
	Node24		2.05	3.88	8	3.88	0	49.82	0	2.14	2.62	0.88	0	0.74	35.21	0.429
	Node26	Node23.1-100yr	1.42	2.92	8	2.92	16.55	32.06	0.321	0.6	2.77	0.916	0	1.18	32.04	0.447
	Node27	Node27-100yr	1.12	10.89	17.72	10.84	102.48	102.48	2.91	2.91	0.64	7.893	0.285	0	0	0
	Node28		1.26	8.36	14.41	8.36	0	61.34	0	1.65	0.69	5.36	0	0.2	14.3	0.04
	Node295		2.85	5.06	8.03	5.05	0	82.06	0	1.91	3.44	1.489	0.971	0	0	0
	Node300		1.09	4.37	10.15	4.37	0	72.84	0	1.27	0	0	0.226	0	0	0
	Node303		0.9	4.66	11.02	4.66	0	41.18	0	1.26	0	0	0.186	0	0	0
	Node393	Node393-100yr	3.09	5.22	7.85	5.22	29.95	80.9	0.567	4.22	0	0	0.156	0	0	0

Parallel System, Tide Gate, Open Channel and Detention Basin, Historic High Tide

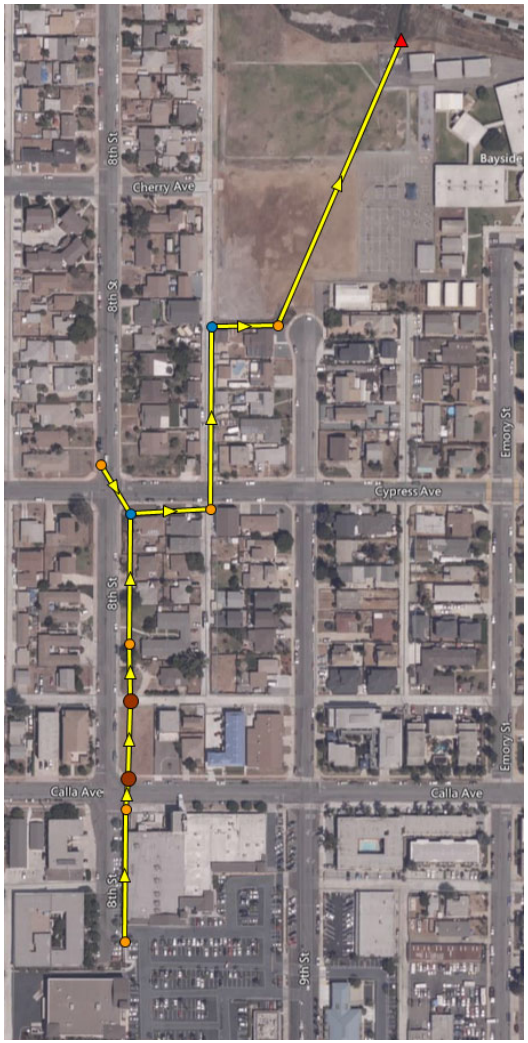
	Name	Time Series	Avg. Depth (ft)	Max. Depth (ft)	Max. HGL (ft)	Rep. Max. Depth (ft)	Max. Lat. Inflow (cfs)	Max. Total Inflow (cfs)	Total Lat. Inflow (MG)	Total inflow (MG)	Hours Surcharged (h)	Max. Surcharge (ft)	Min. Freeboard (ft)	Hours Flooded (h)	Max. Flood Rate (cfs)	Total Flood Vol. (MG)
10-yr	J1		1.59	4.7	6.75	4.69	0	123.56	0	3.39	1.06	0.695	1.255	0	0	0
	Node167	Node167-10yr	0.71	4.58	8.39	4.54	19.33	186.45	0.461	1.46	0.02	0	0	0.02	120.4	0.044
	Node170	Node170-10yr	0.07	0.63	10.76	0.63	5.83	5.83	0.118	0.118	0	0	1.93	0	0	0
	Node172		0.32	3.16	8.63	3.15	0	26.1	0	0.822	0	0	1.396	0	0	0
	Node174		0.49	3.55	8.41	3.54	0	26.07	0	0.826	0	0	1.116	0	0	0
	Node176		0.55	3.63	7.88	3.6	0	33.34	0	0.953	0.1	0.126	2.164	0	0	0
	Node197		0.42	3.38	8.24	3.38	0	26.09	0	0.832	0	0	0.916	0	0	0
	Node23	Node23-10yr	0.49	4.56	9.69	4.54	24.97	46.58	0.456	1.49	0.48	1.559	2.311	0	0	0
	Node23.1		0.55	3.8	8.42	3.78	0	46.58	0	1.63	0.51	0.801	3.579	0	0	0
	Node24		0.64	3.62	7.74	3.61	0	37.72	0	1.57	0.52	0.616	0.264	0	0	0
	Node26	Node26-10yr	0.36	2.92	8	2.92	10.16	19.05	0.201	0.263	0.65	0.916	0	0.41	19.05	0.12
	Node27	Node27-10yr	0.41	5.05	11.87	5.05	61.47	61.47	1.85	1.85	0.34	2.047	6.131	0	0	0
	Node28		0.41	4.75	10.8	4.75	0	34.51	0	1.04	0.4	1.755	3.605	0	0	0
	Node295		1.1	4.06	7.03	4.06	0	72.57	0	1.45	0.48	0.489	1.971	0	0	0
	Node300		0.29	2.94	8.72	2.92	0	26.35	0	0.82	0	0	1.656	0	0	0
	Node303		0.32	2.65	9.01	2.63	0	27.08	0	0.818	0	0	2.196	0	0	0
	Node393	Node393-10yr	1.23	4.17	6.8	4.16	18.5	113.47	0.361	4.27	0	0	1.206	0	0	0
100-yr	J1		1.71	4.92	6.97	4.92	0	168.87	0	4.89	1.58	0.925	1.025	0	0	0
	Node167	Node167-100yr	0.85	4.58	8.39	4.58	31.45	196.87	0.73	2.25	0.25	0	0	0.25	111.72	0.122
	Node170	Node170-100yr	0.12	2.56	12.69	2.35	9.36	9.36	0.184	0.184	0.07	1.39	0	0.01	0.34	0
	Node172		0.48	4.56	10.03	4.52	0	50.77	0	1.27	0.02	0	0	0.02	3.88	0.002
	Node174		0.67	4.61	9.47	4.61	0	65.24	0	1.28	0	0	0.056	0	0	0
	Node176		0.7	5.53	9.78	4.38	0	39.97	0	1.43	0.47	2.034	0.256	0	0	0
	Node197		0.58	4.3	9.16	4.3	0	40.33	0	1.28	0.13	0	0	0.13	3.96	0.009
	Node23	Node23-100yr	0.76	6.87	12	6.87	40.77	87.75	0.712	2.33	0.67	3.87	0	0.25	23.7	0.085
	Node23.1	Node23.1-100yr	0.76	5.23	9.85	5.21	16.59	77.05	0.322	2.57	0.7	2.228	2.152	0	0	0
	Node24		0.78	3.88	8	3.88	0	56.89	0	2.32	0.72	0.88	0	0.41	20	0.159
	Node26		0.47	2.92	8	2.92	0	20.16	0	0.25	0.82	0.916	0	0.66	20.16	0.247
	Node27	Node27-100yr	0.75	10.9	17.72	10.85	102.58	102.58	2.91	2.91	0.58	7.9	0.278	0	0	0
	Node28		0.7	8.36	14.41	8.36	0	61.36	0	1.65	0.6	5.36	0	0.19	14.37	0.037
	Node295		1.22	4.4	7.37	4.4	0	82.06	0	2.14	0.77	0.827	1.633	0	0	0
	Node300		0.45	4.36	10.14	4.36	0	72.84	0	1.27	0	0	0.236	0	0	0
	Node303		0.49	4.66	11.02	4.66	0	41.22	0	1.26	0	0	0.186	0	0	0
	Node393	Node393-100yr	1.34	4.39	7.02	4.39	30.02	156.38	0.569	5.98	0	0	0.986	0	0	0
10-yr + 3.5 SLR	J1		2.94	5.92	7.97	5.88	0	90.31	0	3.46	4.69	1.919	0.031	0	0	0
	Node167	Node167-10yr	1.45	4.58	8.39	4.58	19.33	185.71	0.462	1.58	0.05	0	0	0.04	120.06	0.065
	Node170	Node170-10yr	0.03	0.63	10.76	0.63	5.83	5.83	0.118	0.118	0	0	1.93	0	0	0
	Node172		0.58	4.56	10.03	4.38	0	285.2	0	1.01	0.02	0	0	0.02	143.13	0.066
	Node174		0.87	4.67	9.53	4.62	0	131.95	0	0.974	0.06	0	0	0.04	66.06	0.057
	Node176		1.17	5.79	10.04	4.25	0	42.63	0	1.05	1.74	2.29	0	0.01	39.53	0.002
	Node197		0.85	4.27	9.13	4.27	0	89.64	0	0.954	0	0	0.026	0	0	0
	Node23	Node23-10yr	0.76	4.6	9.73	4.6	24.96	46.44	0.455	1.55	0.6	1.604	2.266	0	0	0
	Node23.1		0.98	4	8.62	3.88	0	46.44	0	1.69	3.26	1.005	3.375	0	0	0
	Node24		1.26	3.88	8	3.88	0	36.72	0	1.6	3.84	0.88	0	0.03	1.9	0.001
	Node26	Node26-10yr	0.75	2.92	8	2.92	10.16	19.88	0.201	0.295	3.91	0.916	0	0.65	19.88	0.159
	Node27	Node27-10yr	0.26	5.19	12.01	5.19	61.39	61.39	1.86	1.9	0.37	2.191	5.987	0	0	0
	Node28		0.44	4.89	10.94	4.89	0	34.78	0	1.07	0.43	1.893	3.467	0	0	0
	Node295		2.07	5.06	8.03	5.04	0	72.59	0	1.56	4.09	1.49	0.97	0	0	0
	Node300		0.47	4.6	10.38	3.34	0	121.31	0	0.944	0.01	0	0	0.01	74.8	0.002

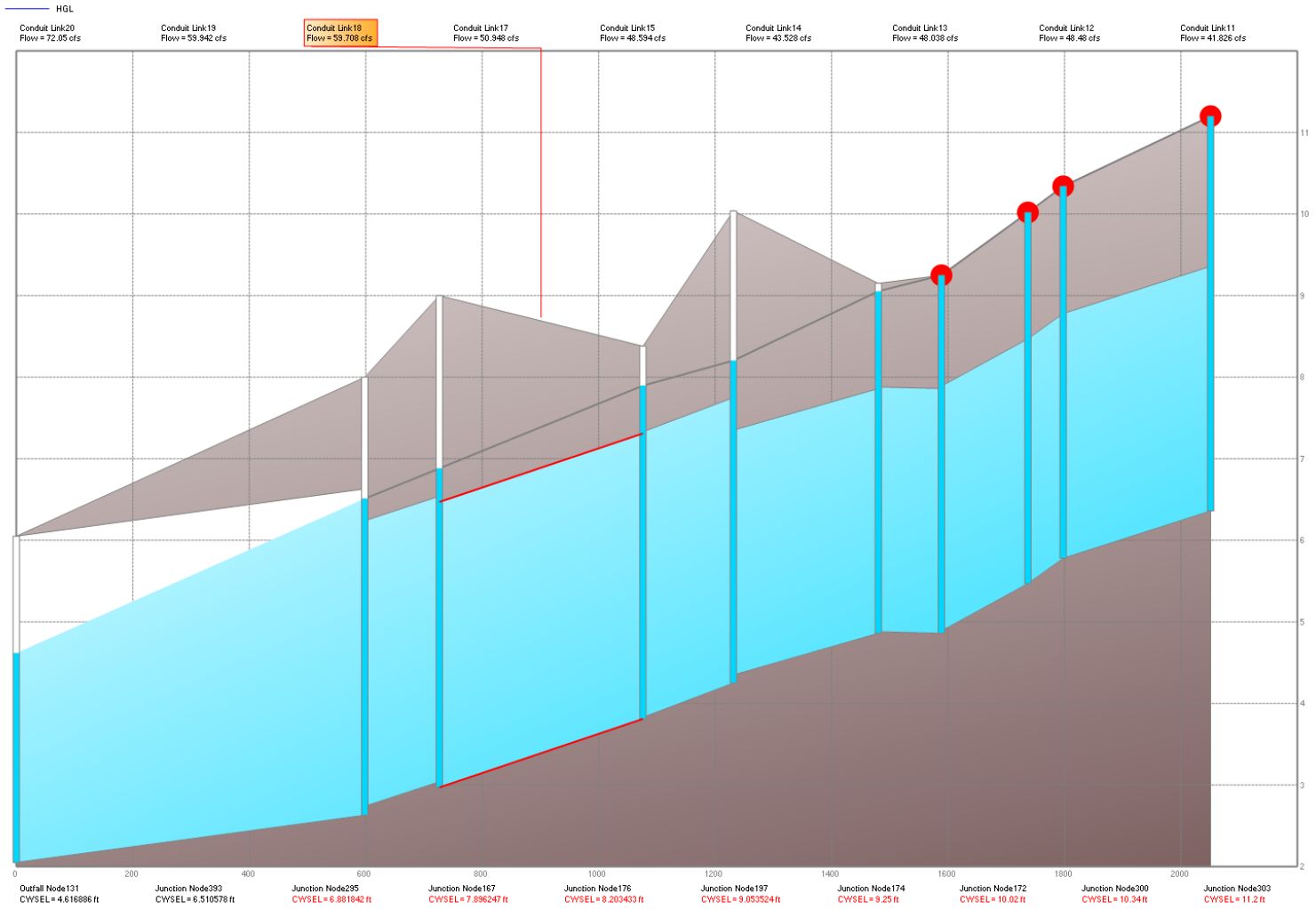
	Node303		0.32	4.81	11.17	4.72	0	48.07	0	0.886	0	0	0.036	0	0	0
	Node393	Node393-10yr	2.37	5.27	7.9	5.27	18.49	90.1	0.361	5.55	0	0	0.106	0	0	0
100-yr + 3.5 SLR	J1		3.03	5.95	8	5.95	0	90.37	0	3.81	5.55	1.95	0	2.05	6.92	0.195
	Node167	Node167-100yr	1.53	4.58	8.39	4.58	31.44	199.89	0.731	2.27	0.39	0	0	0.37	123.24	0.24
	Node170	Node170-10yr	0.02	0.72	10.85	0.72	5.82	5.82	0.118	0.118	0	0	1.84	0	0	0
	Node172		0.64	4.56	10.03	4.52	0	84.96	0	1.38	0.05	0	0	0.02	3.88	0.002
	Node174		0.94	4.67	9.53	4.67	0	124.08	0	1.42	0.04	0	0	0.04	62.04	0.052
	Node176		1.25	5.79	10.04	5.59	0	40.56	0	1.46	3.61	2.29	0	0.01	23.47	0.001
	Node197		0.92	4.3	9.16	4.3	0	64.66	0	1.38	0.12	0	0	0.12	3.07	0.007
	Node23	Node23-100yr	0.83	6.87	12	6.87	40.73	87.72	0.713	2.37	0.94	3.87	0	0.25	23.55	0.085
	Node23.1	Node23.1-100yr	1.06	5.23	9.85	5.22	16.58	77.02	0.322	2.62	3.86	2.228	2.152	0	0	0
	Node24		1.33	3.88	8	3.88	0	56.87	0	2.25	4.2	0.88	0	2.9	40.32	0.689
	Node26		0.8	2.92	8	2.92	0	20.15	0	0.399	4.32	0.916	0	3.1	20.14	0.395
	Node27	Node27-100yr	0.32	10.88	17.7	10.83	102.54	102.54	2.91	2.96	0.62	7.882	0.296	0	0	0
	Node28		0.51	8.36	14.41	8.36	0	61.32	0	1.7	0.67	5.36	0	0.19	14.24	0.037
	Node295		2.16	5.37	8.34	5.17	0	78.32	0	2.04	4.69	1.8	0.66	0	0	0
	Node300		0.53	4.6	10.38	4.4	0	75.72	0	1.37	0.01	0	0	0.01	32.79	0.01
	Node303		0.37	4.66	11.02	4.66	0	41.19	0	1.32	0	0	0.186	0	0	0
	Node393	Node393-100yr	2.46	5.38	8.01	5.38	30.01	84.86	0.569	6.32	0.08	0	0	0.07	18.89	0.02

Existing Conditions, 2-yr, Free Outfall

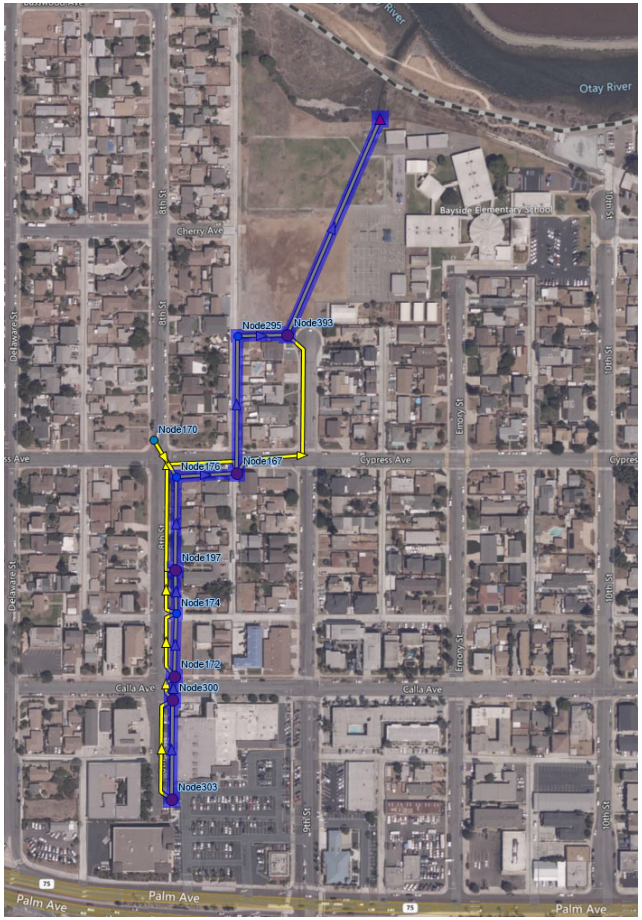


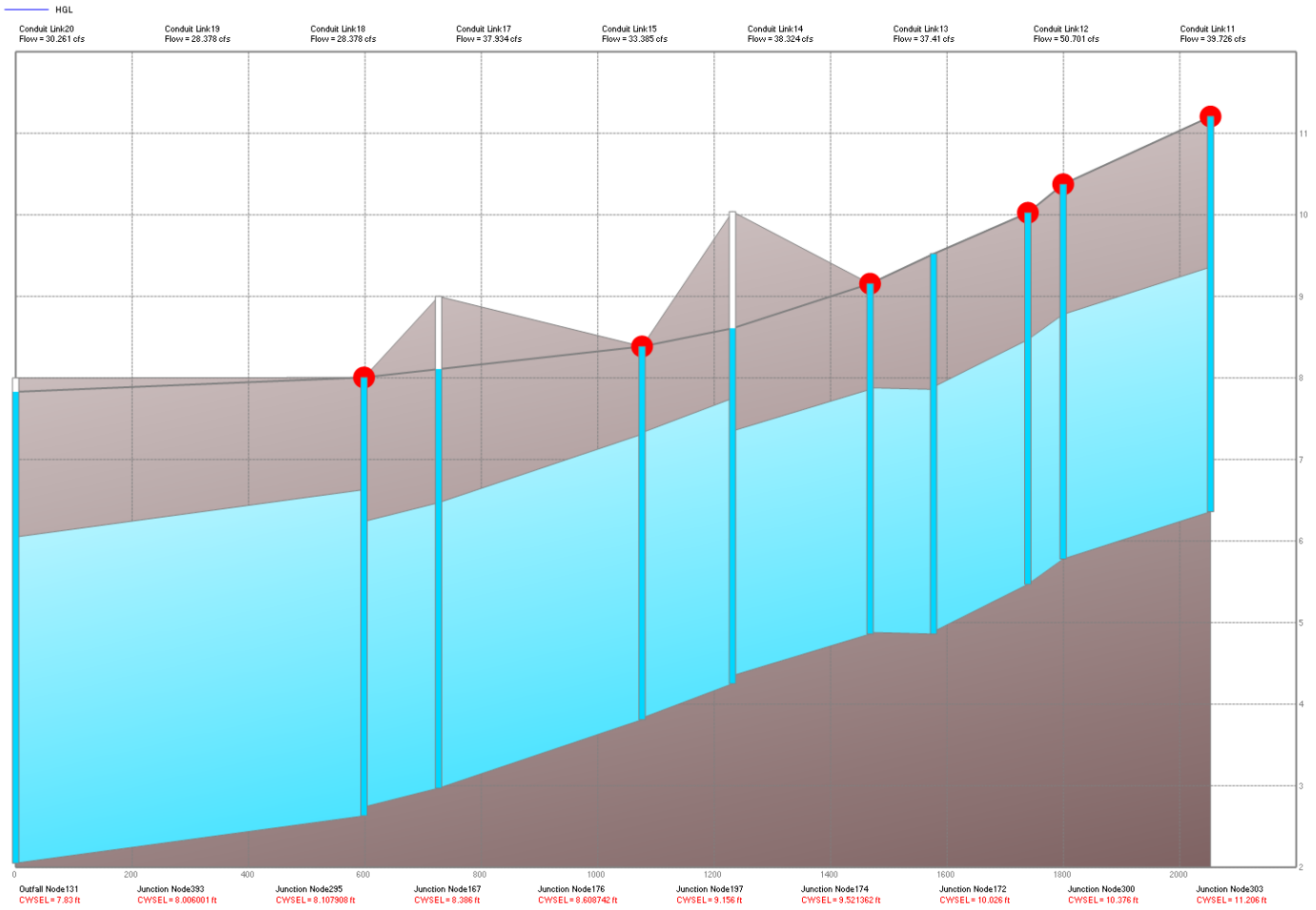
Existing Conditions, 10-yr, Free Outfall



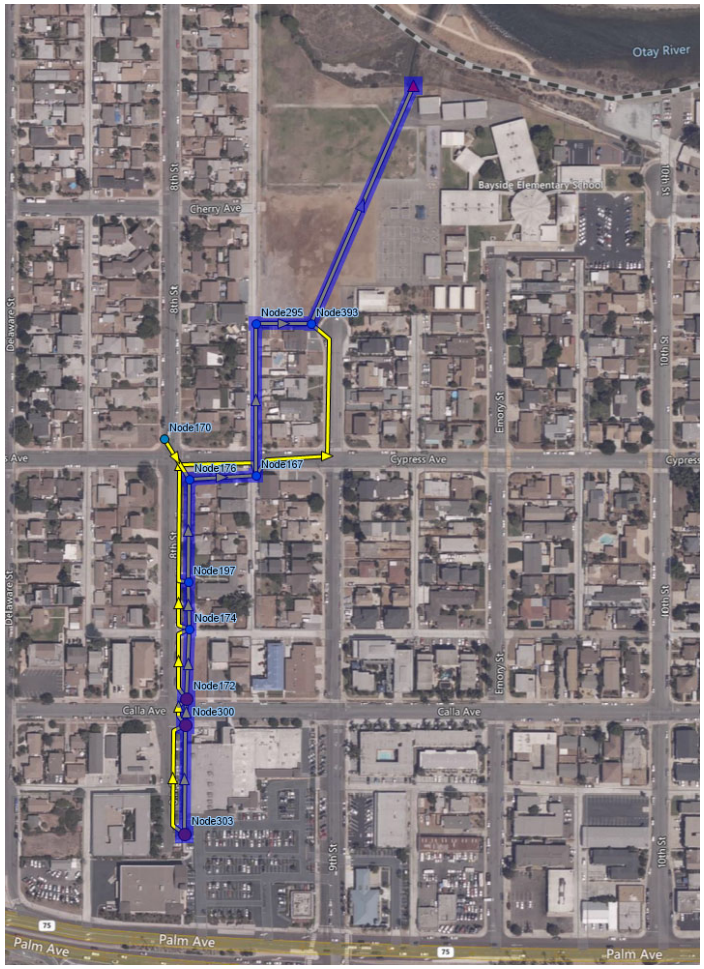


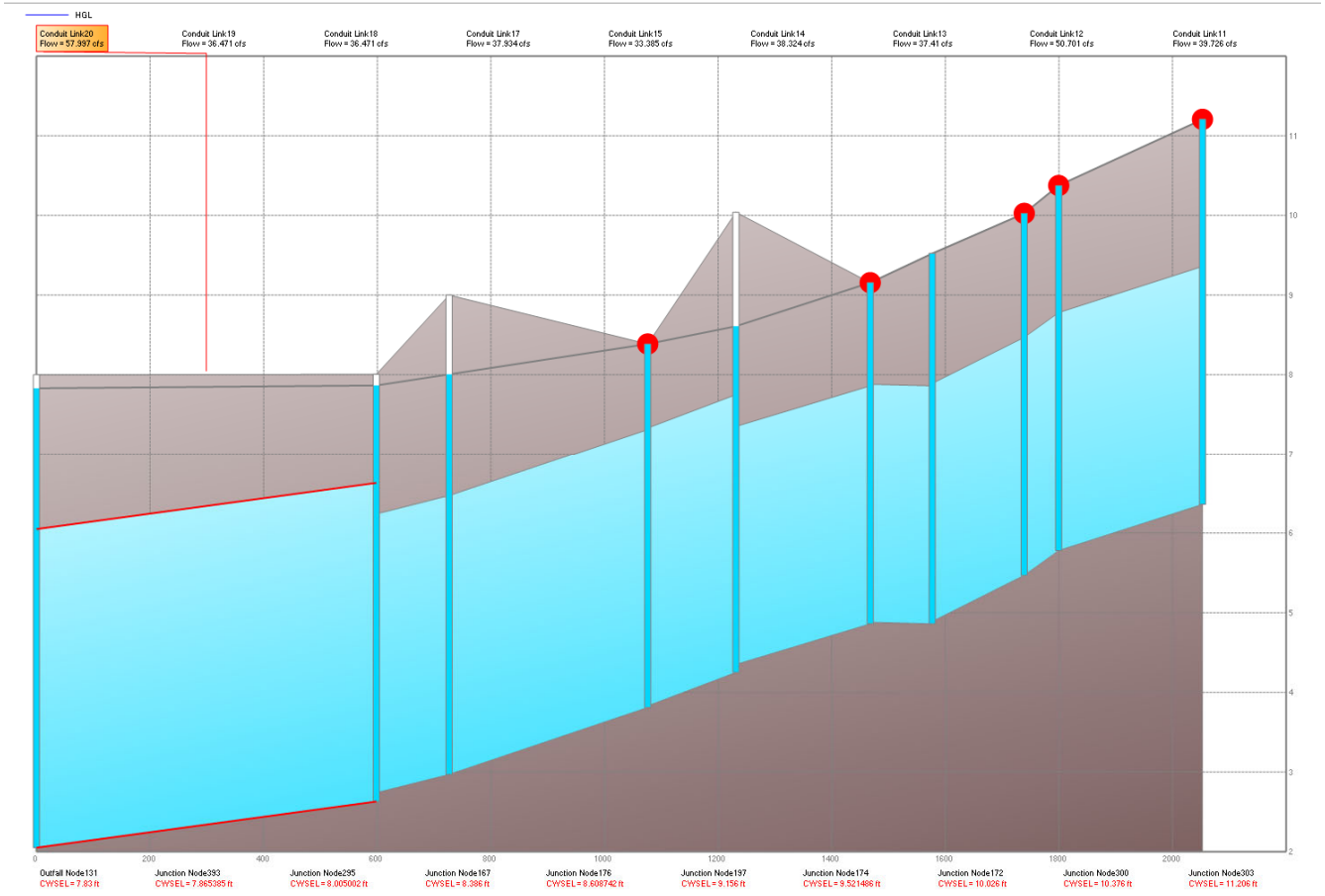
Existing Conditions, 10-yr, 7.8 ft tide



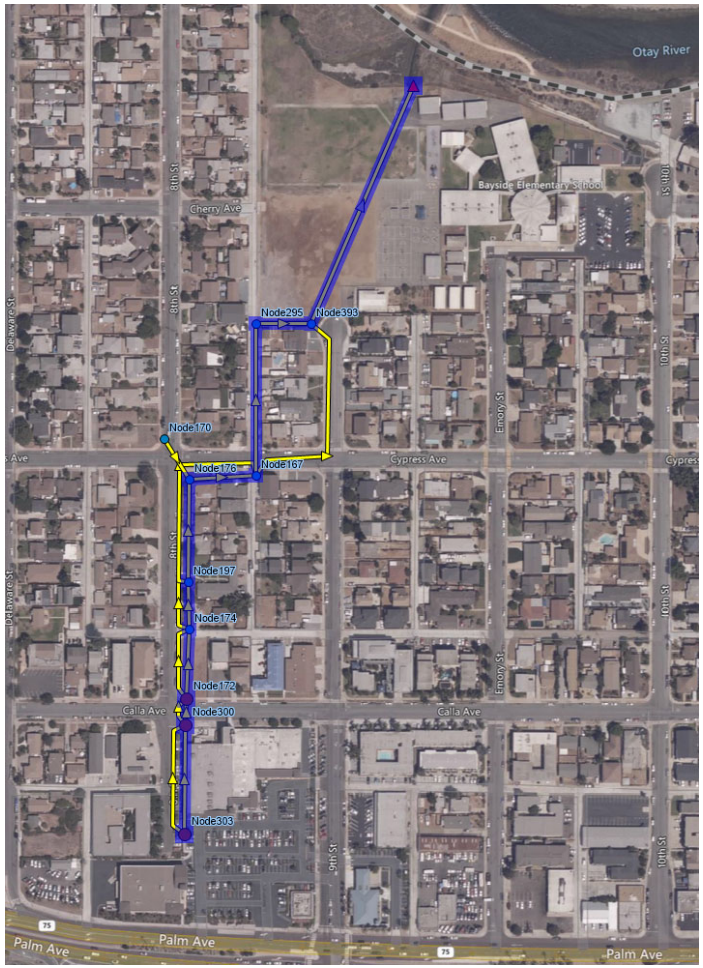


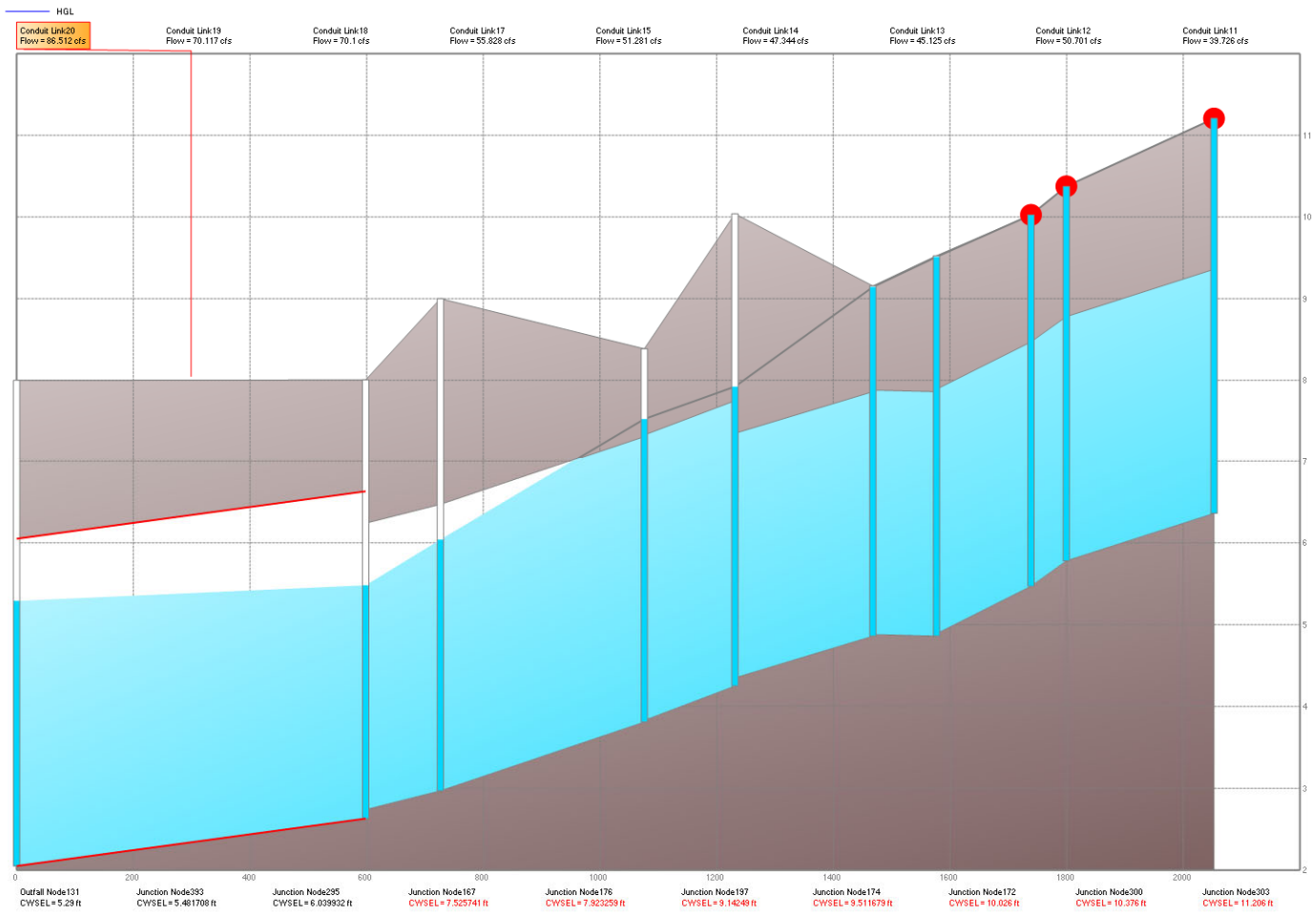
Tide Gate and Open Channel, 10-yr, 7.8 ft tide



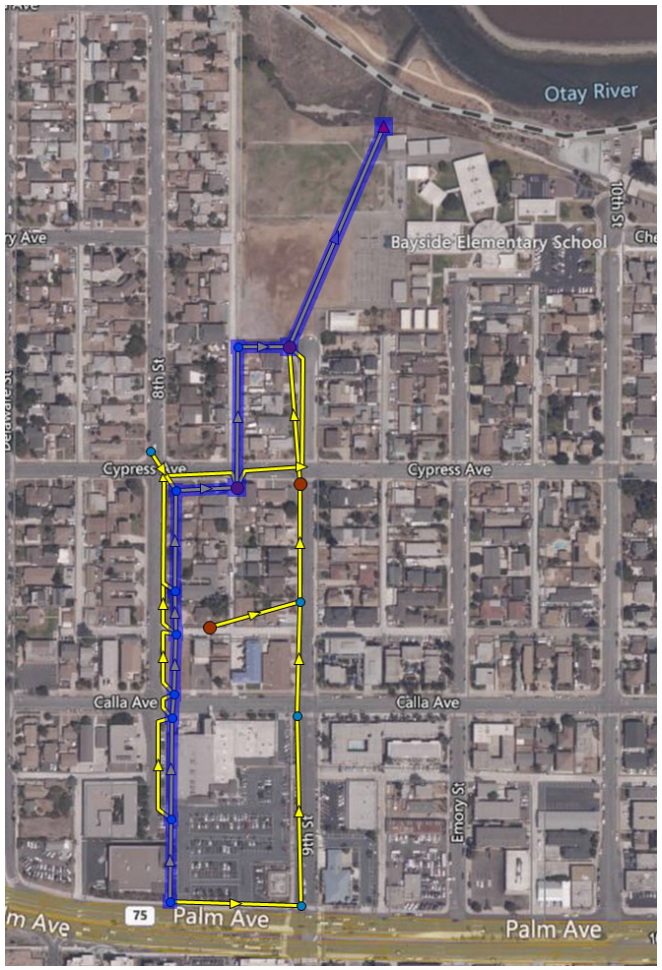


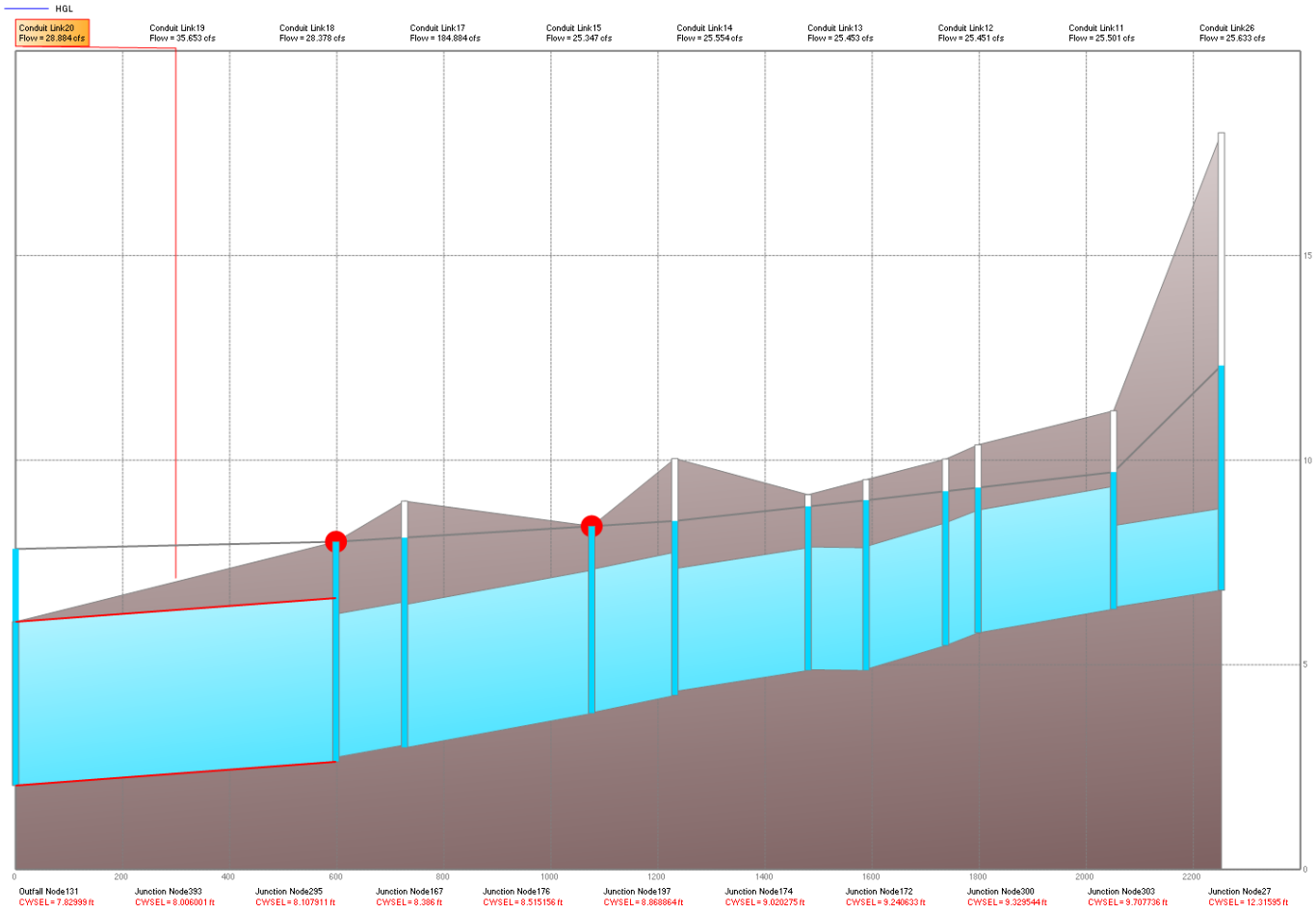
Tide Gate and Open Channel, 10-yr, MHH 5.3 ft tide



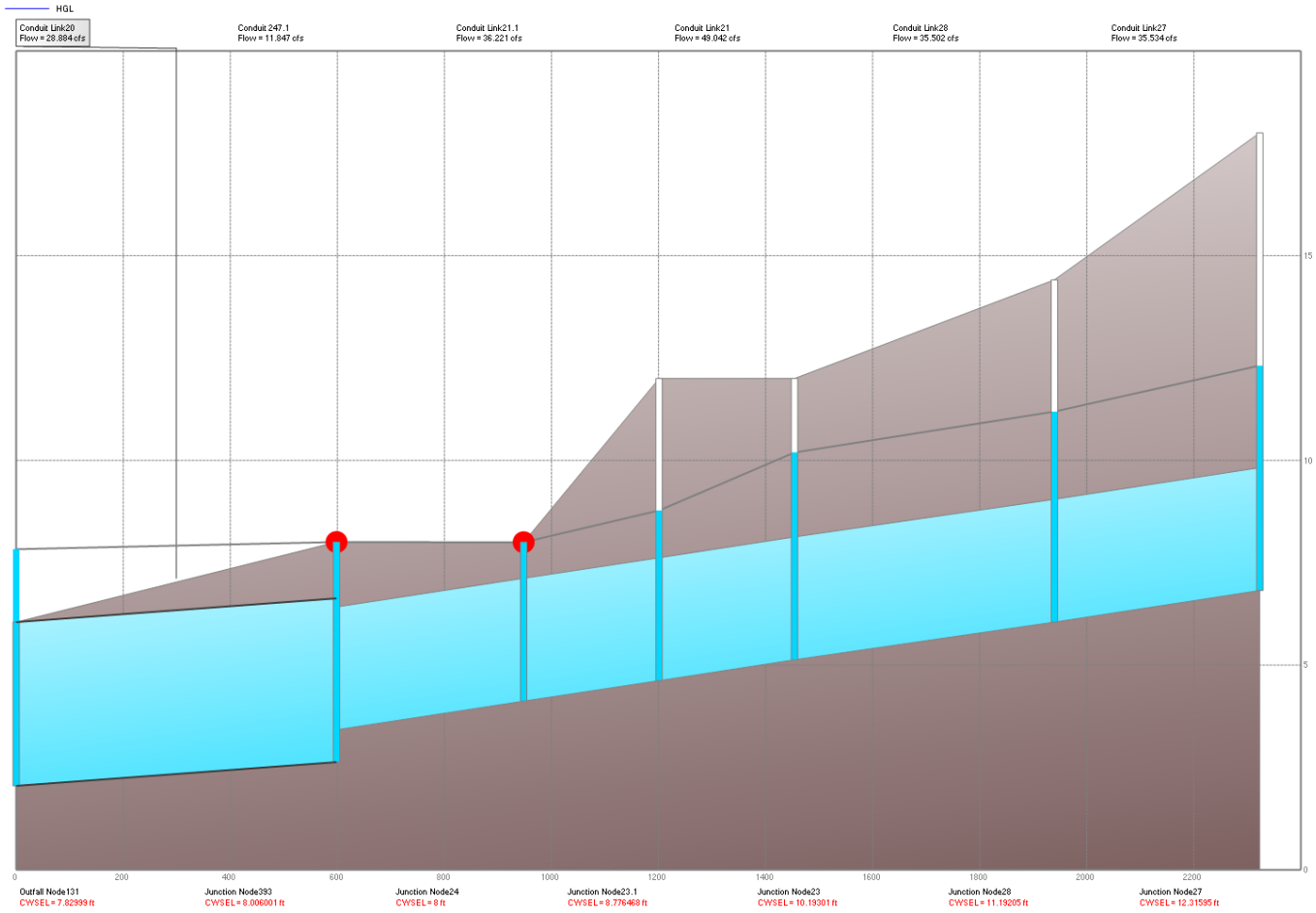


Parallel System, Tide Gate, 10-yr, 7.8 ft tide
Profile 1

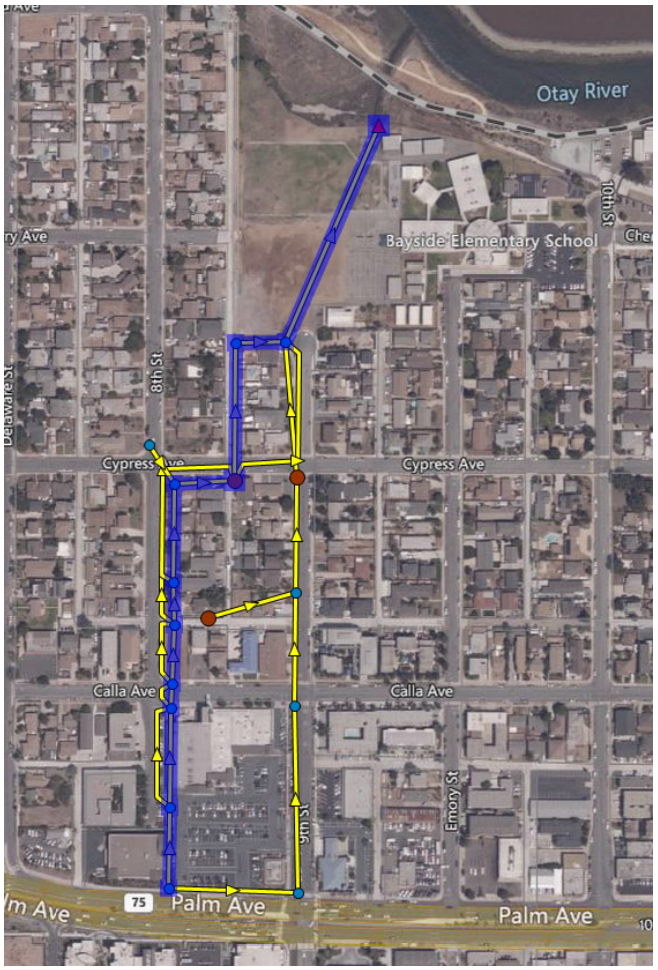


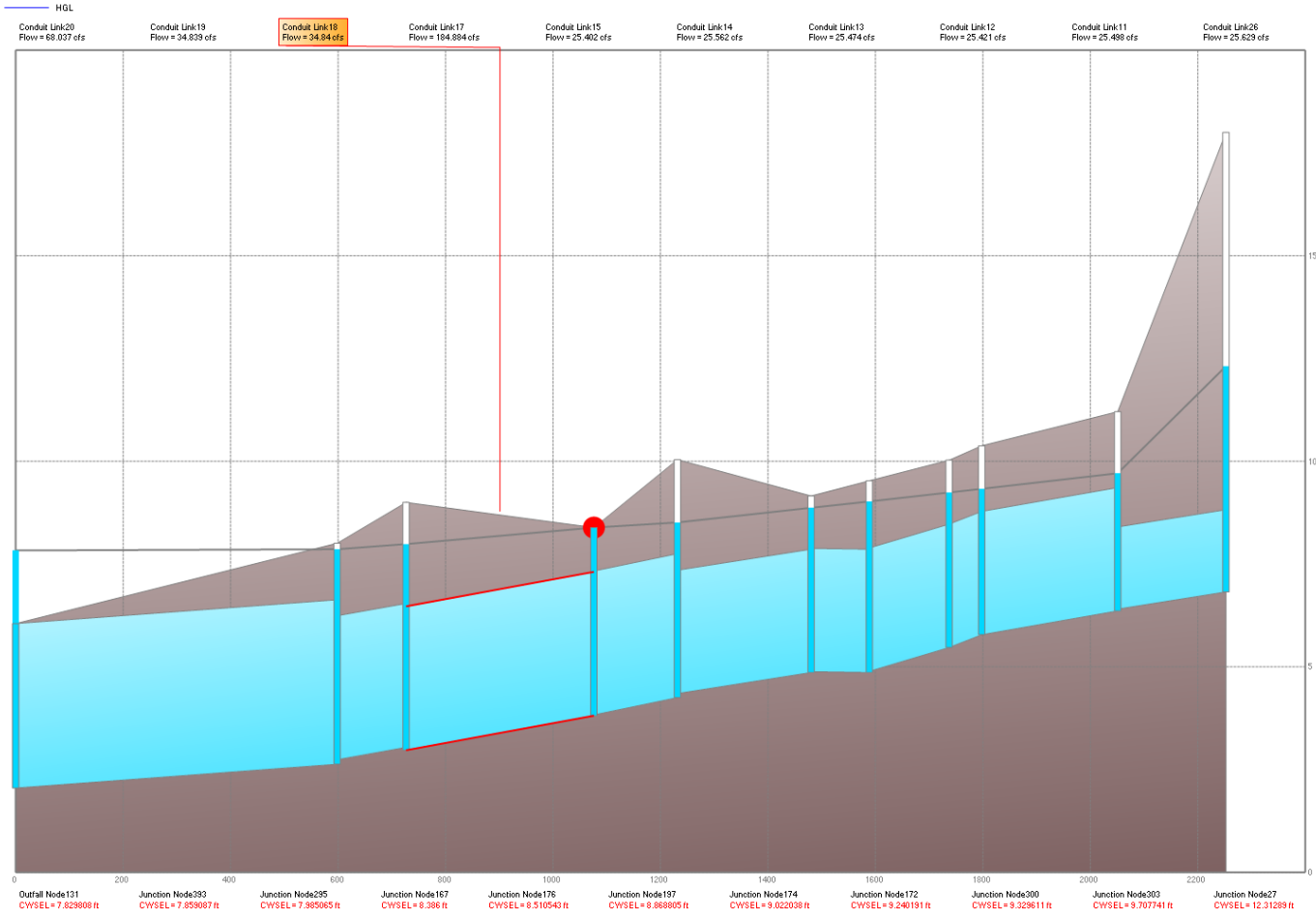


Parallel System, Tide Gate, 10-yr, 7.8 ft tide
Profile 2

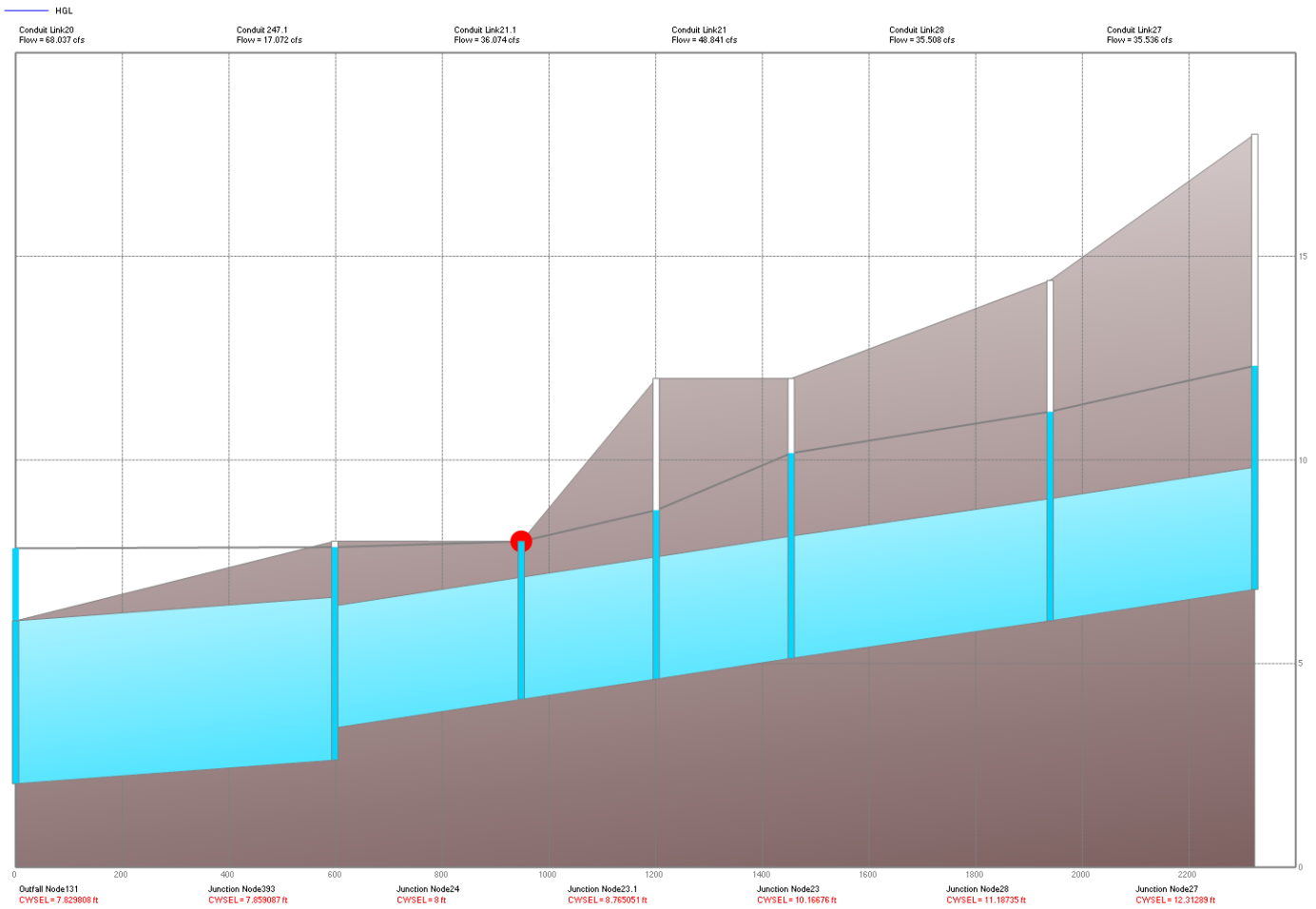


Parallel System, Tide Gate, Open Channel, 10-yr, 7.8 ft tide
Profile 1

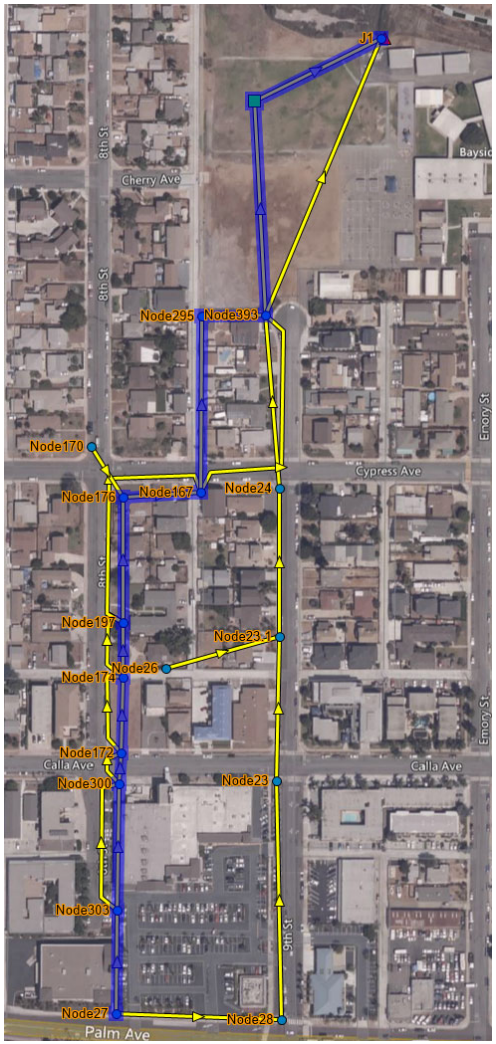


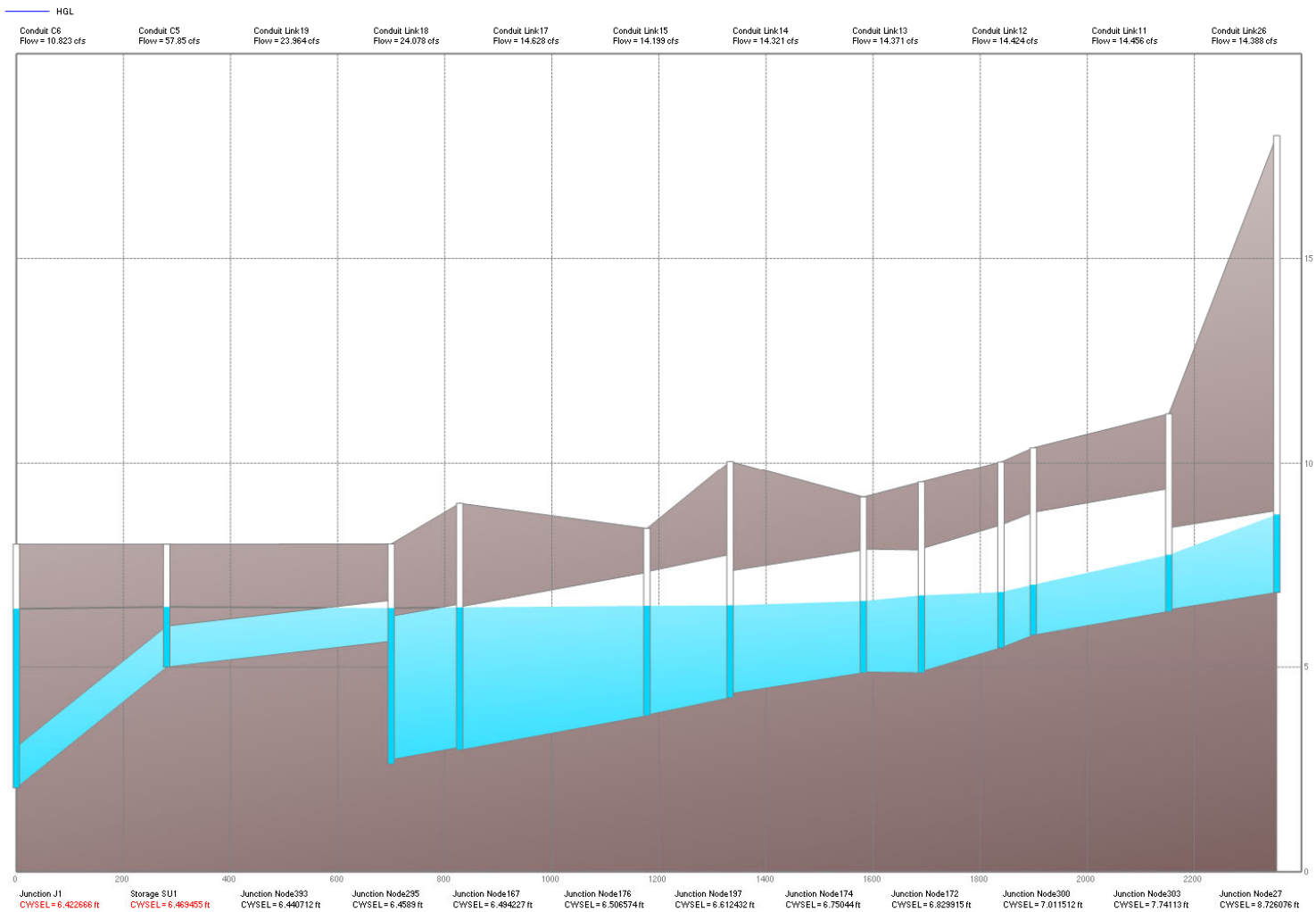


Parallel System, Tide Gate, Open Channel, 10-yr, 7.8 ft tide
Profile 2

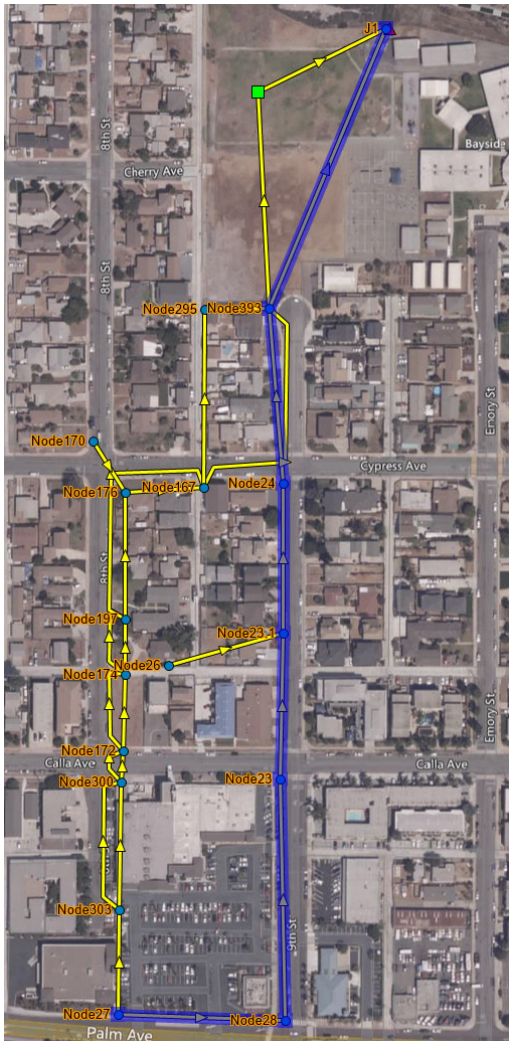


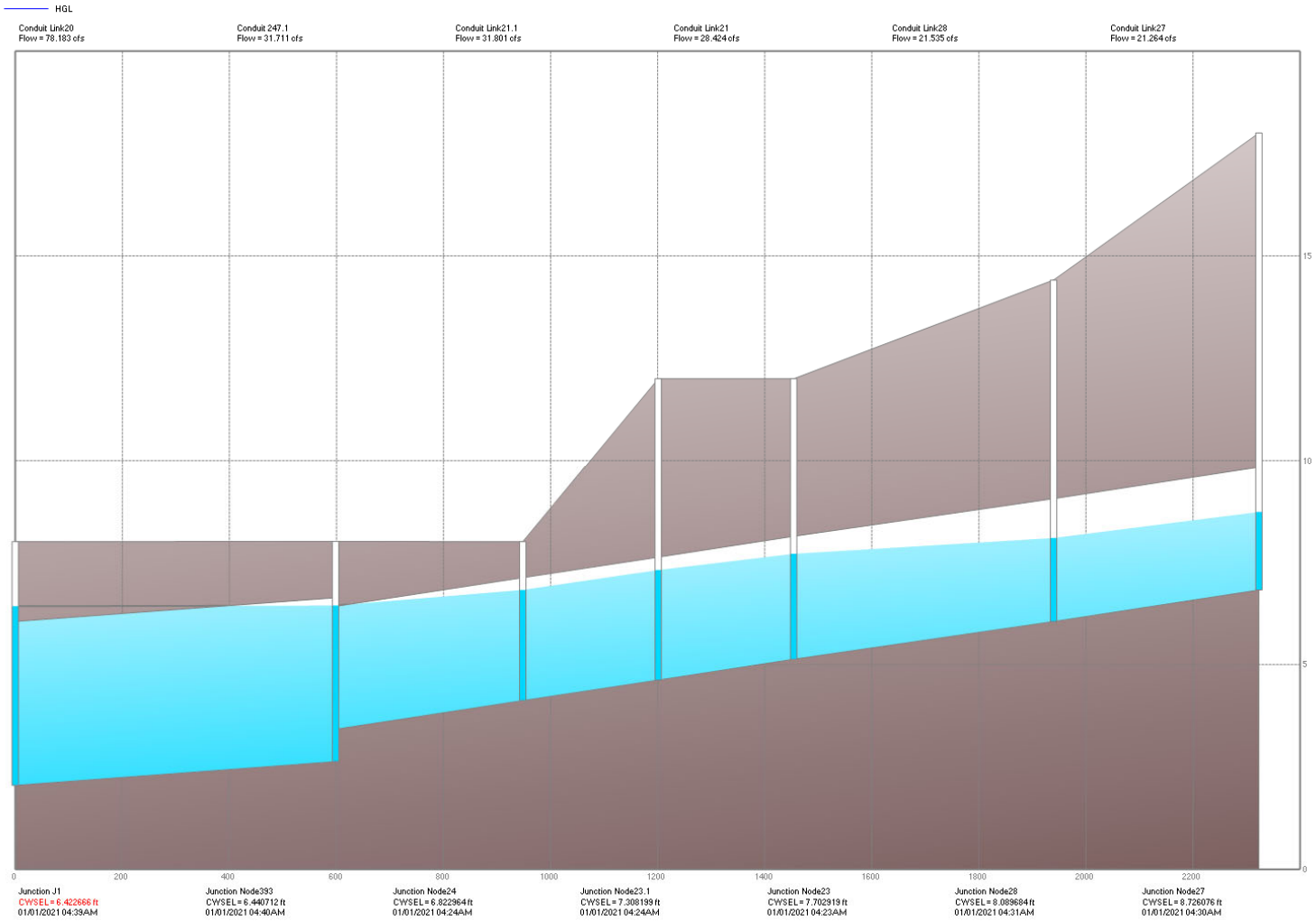
Parallel System, Tide Gate, Open Channel and Detention Basin
2-YR 85% Tide 7.0 BC Profile 1



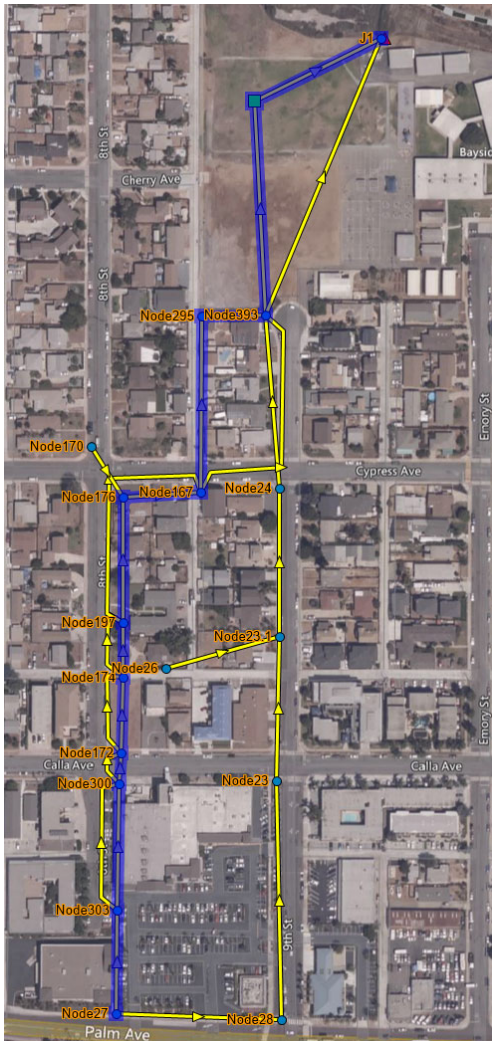


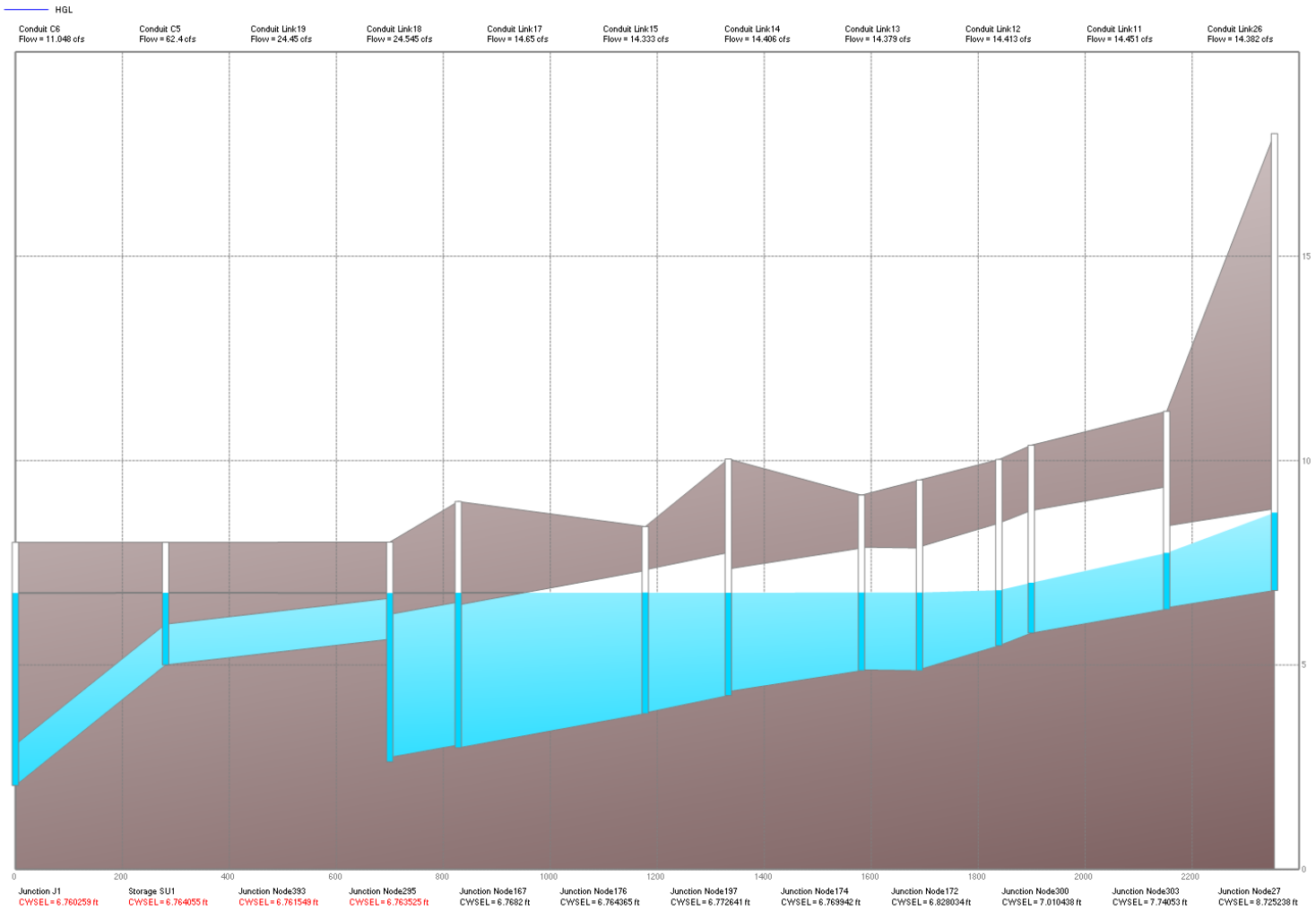
Parallel System, Tide Gate, Open Channel and Detention Basin
2-YR 85% Tide 7.0 BC Profile 2



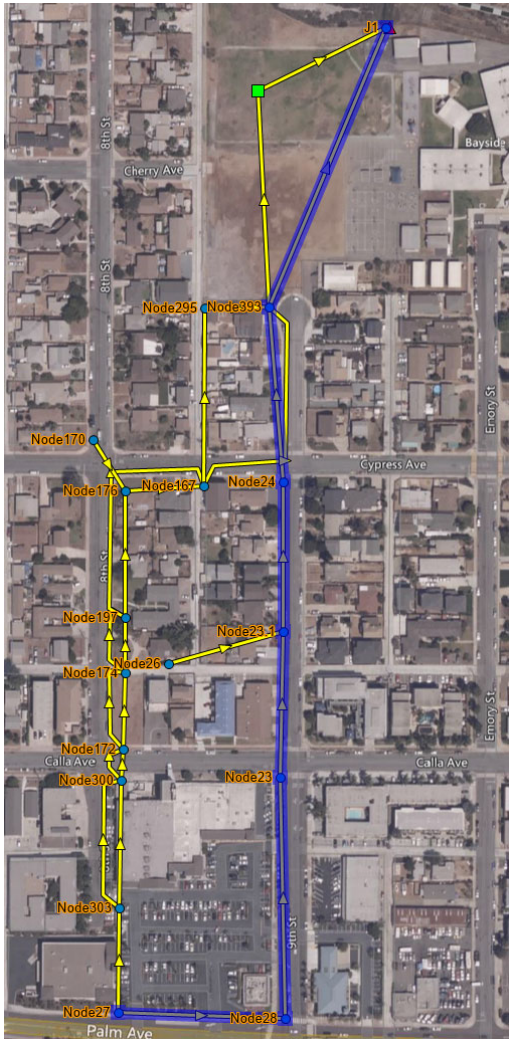


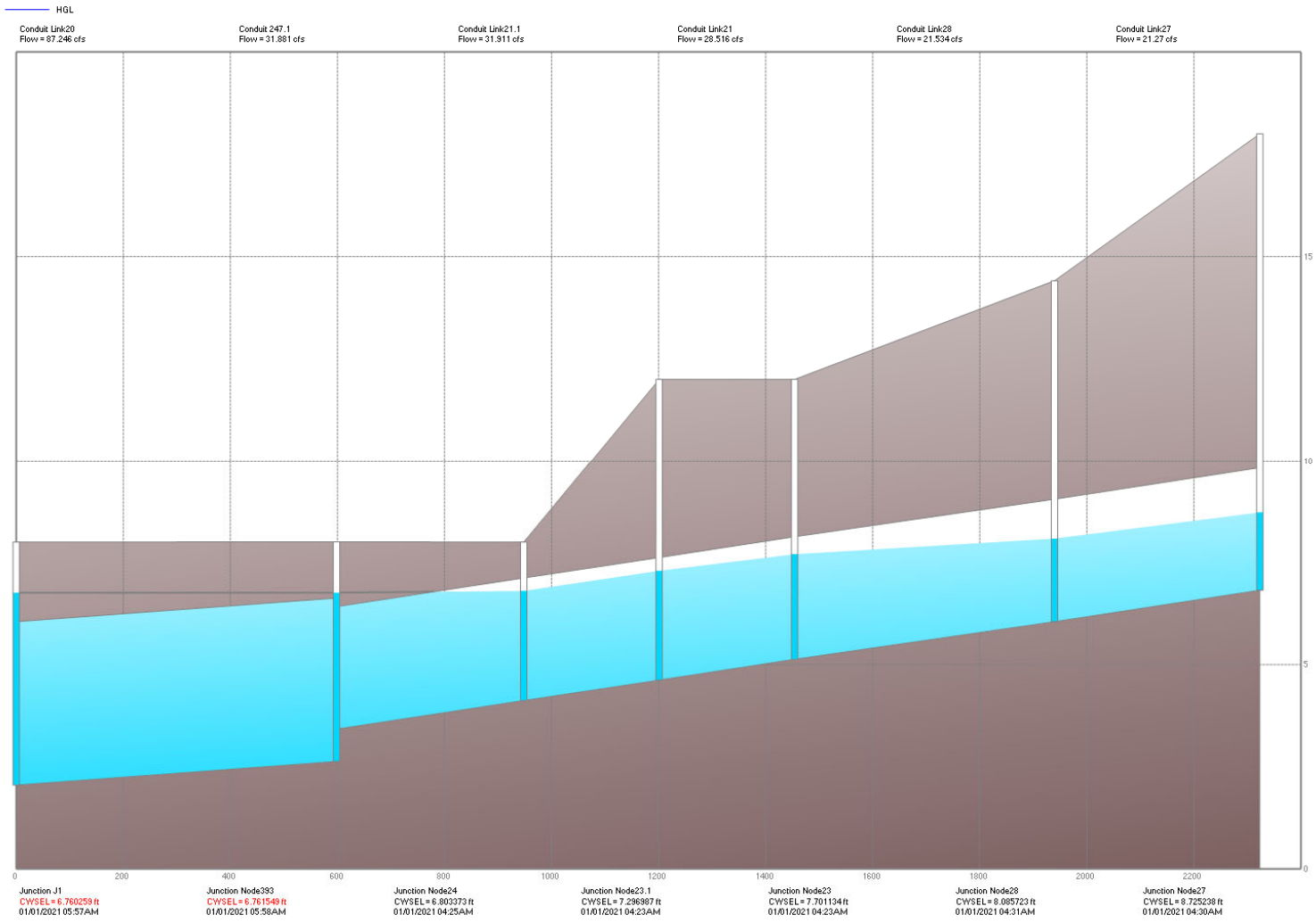
Parallel System, Tide Gate, Open Channel and Detention Basin
2-YR Max Tide 7.8 BC Profile 1



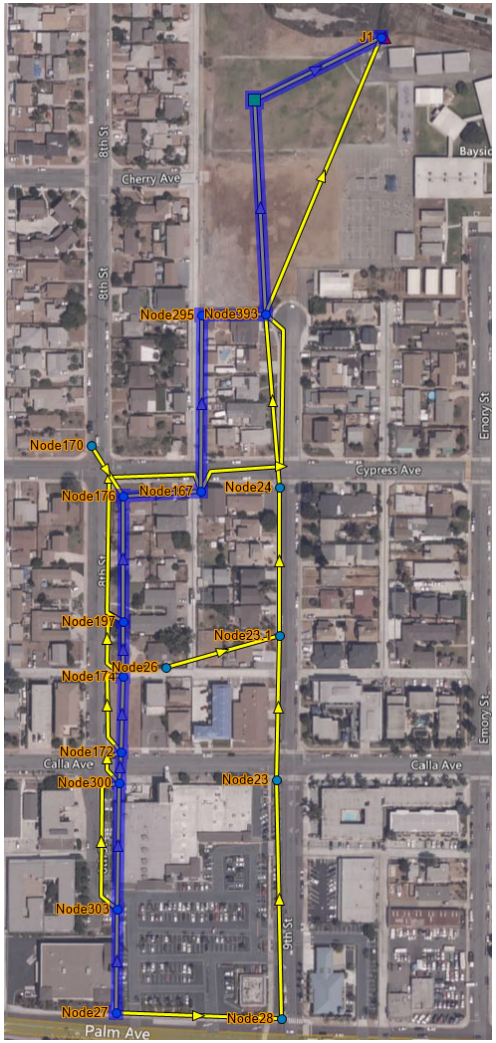


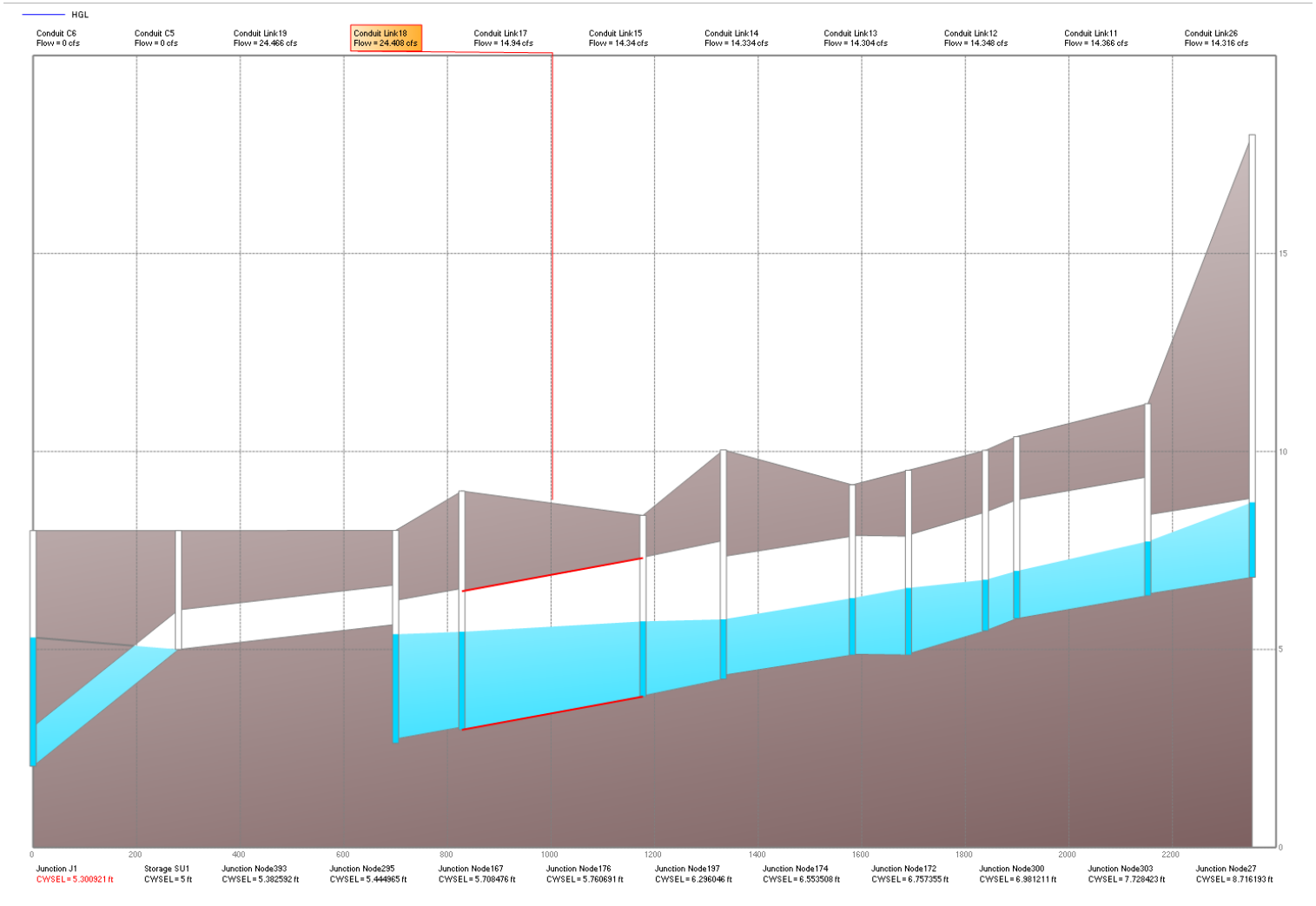
Parallel System, Tide Gate, Open Channel and Detention Basin
2-YR Max Tide 7.8 BC Profile 2



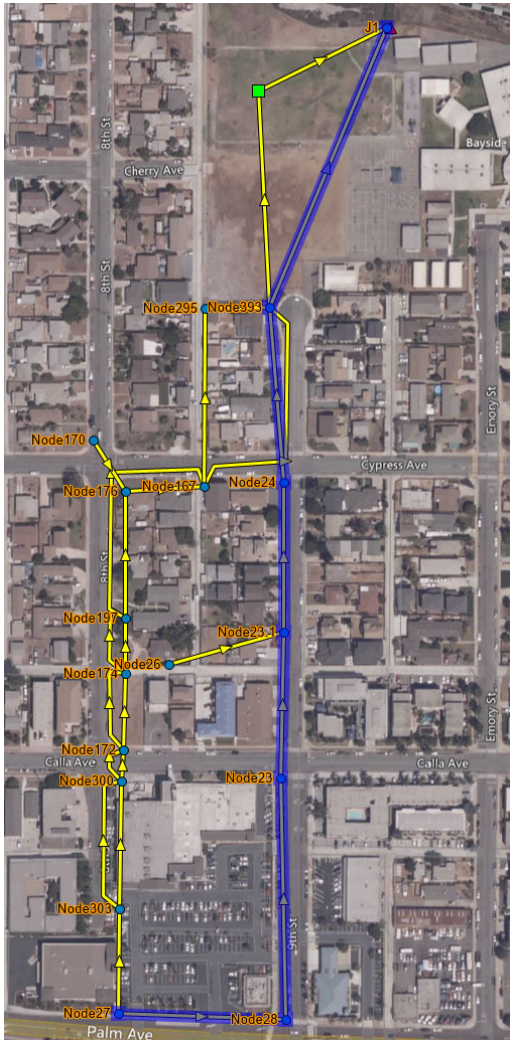


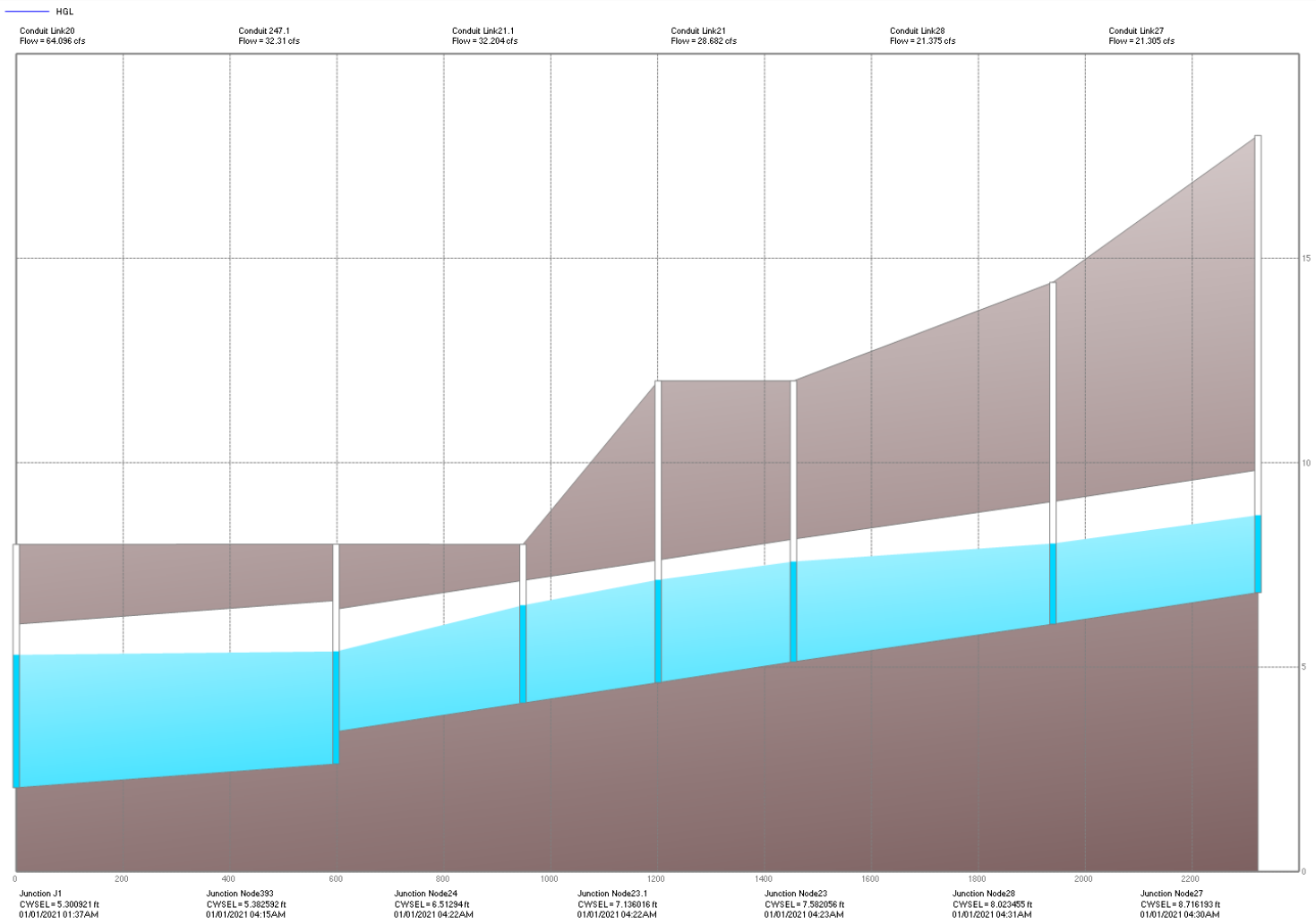
Parallel System, Tide Gate, Open Channel and Detention Basin
2-YR MHH Tide 5.3 BC Profile 1



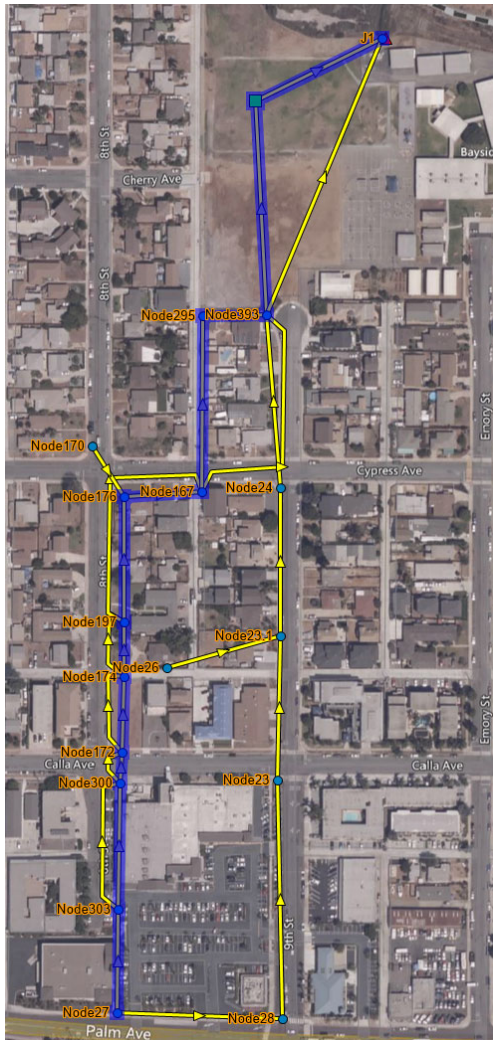


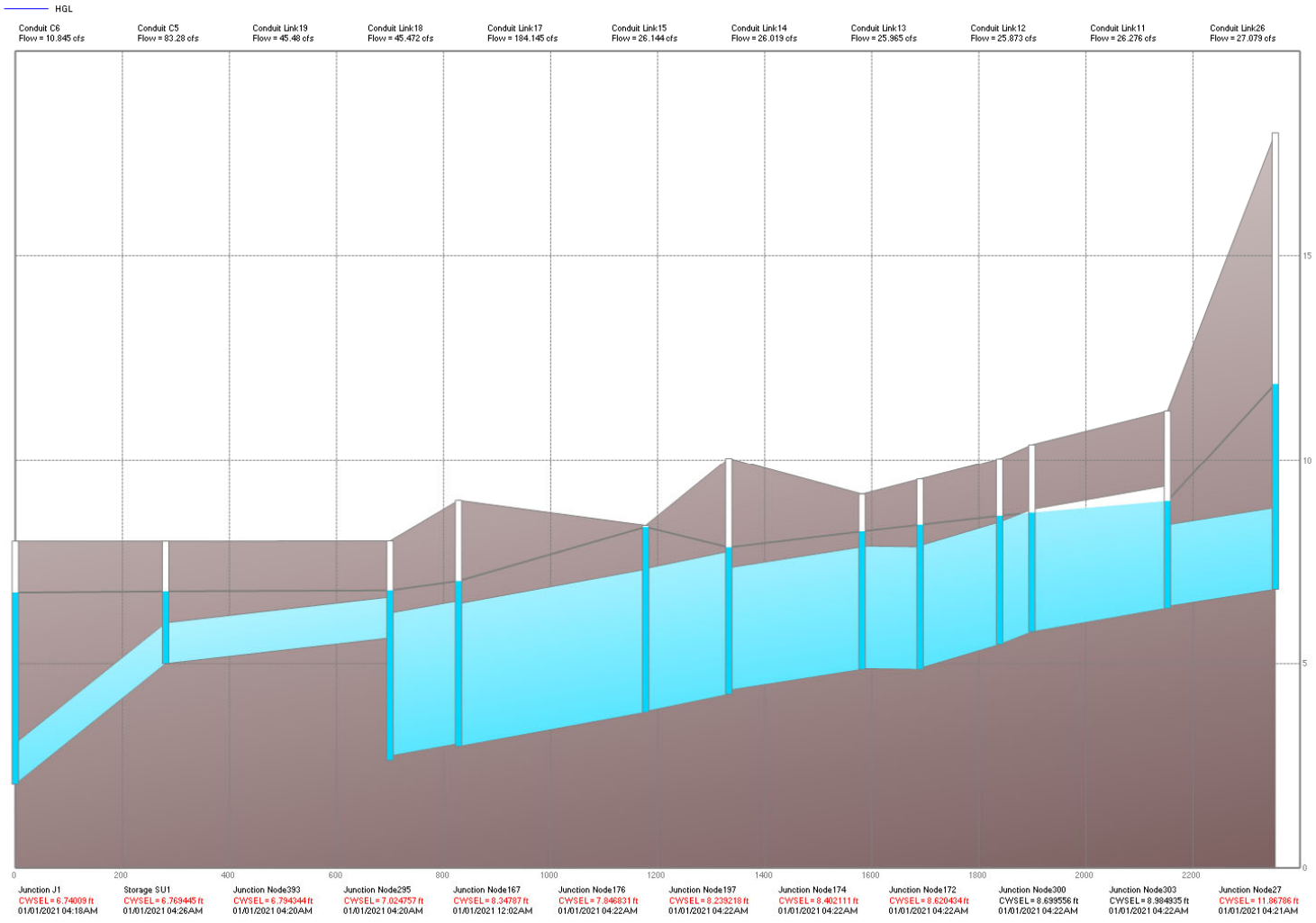
Parallel System, Tide Gate, Open Channel and Detention Basin
2-YR MHH Tide 5.3 BC Profile 2



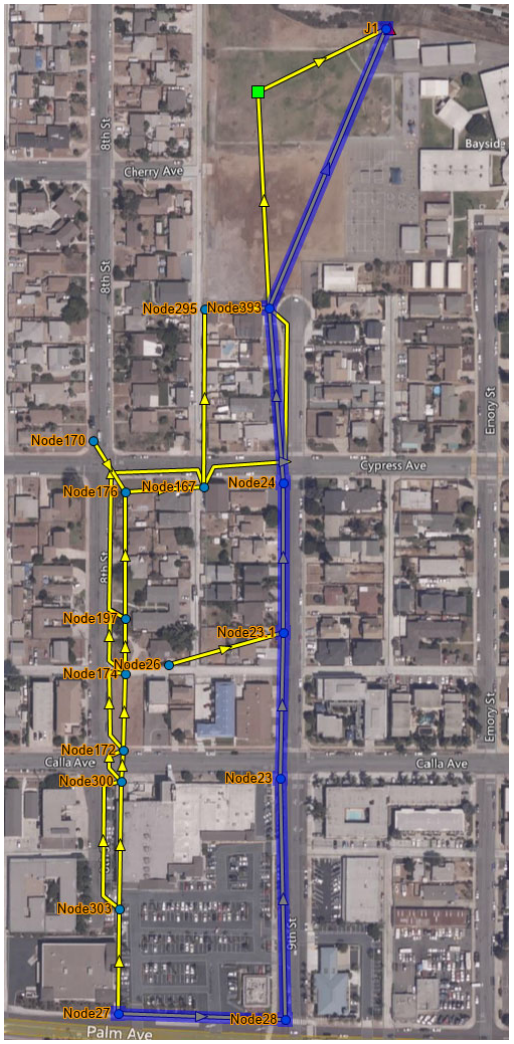


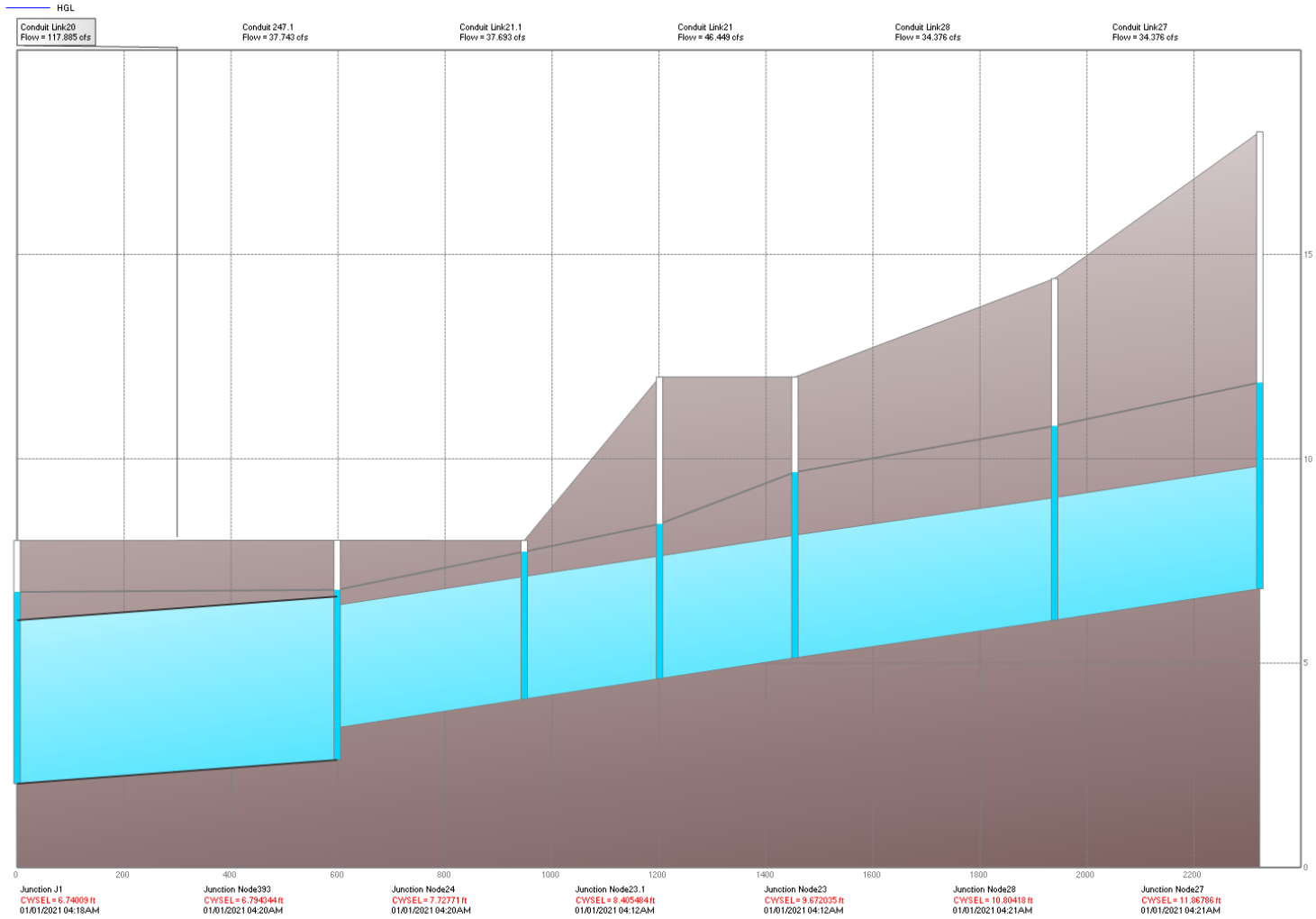
Parallel System, Tide Gate, Open Channel and Detention Basin
10-YR 85% Tide 7.0 BC Profile 1



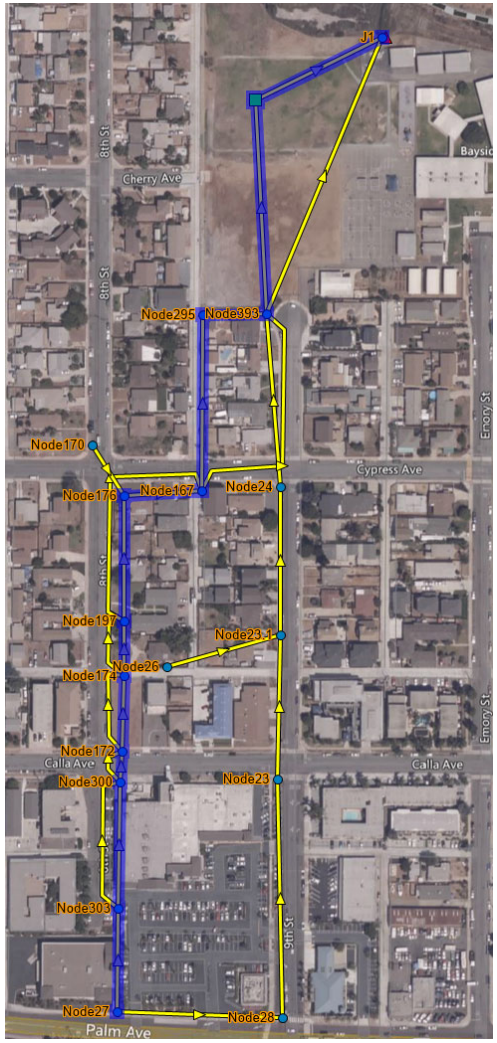


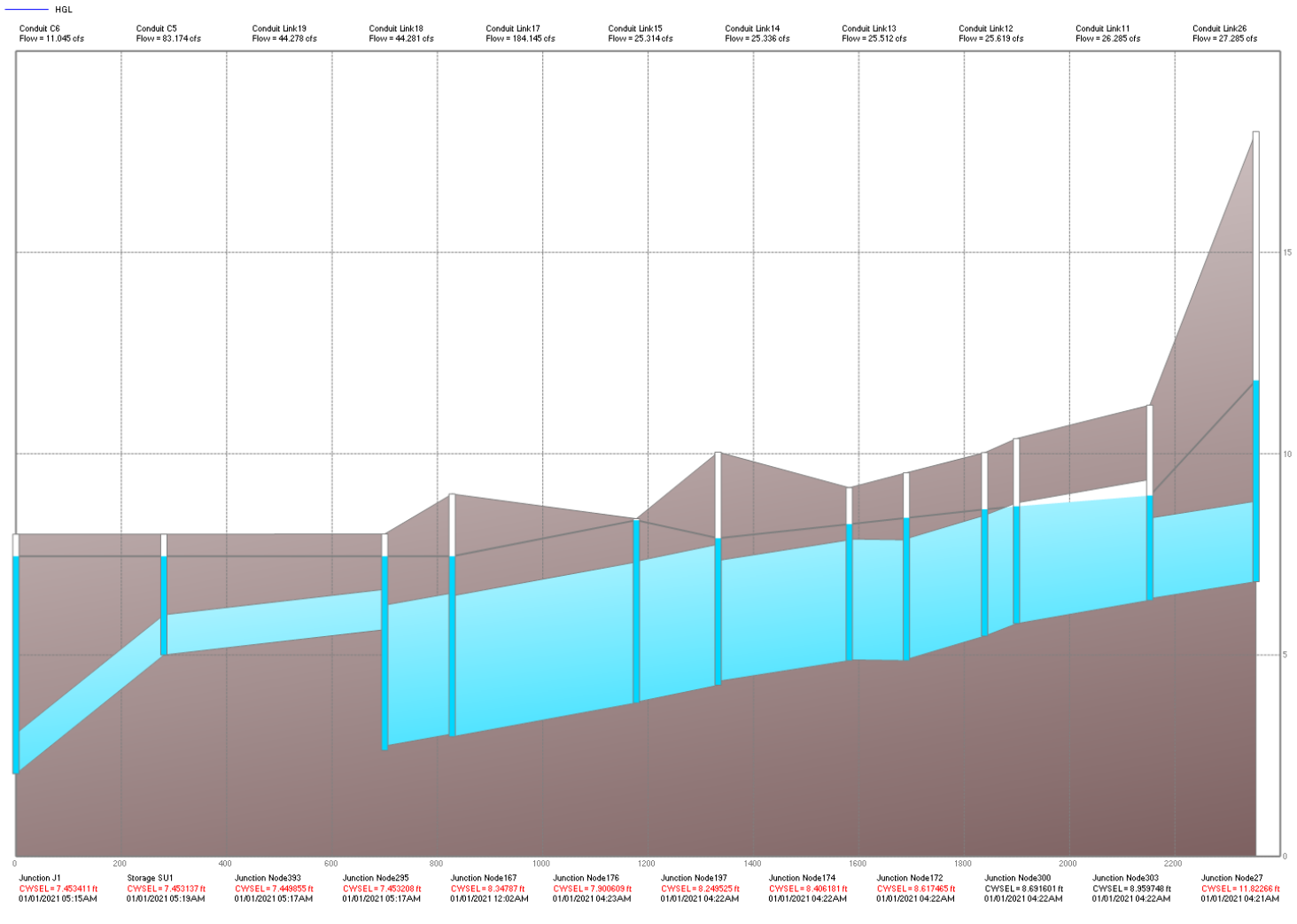
Parallel System, Tide Gate, Open Channel and Detention Basin
10-YR 85% Tide 7.0 BC Profile 2



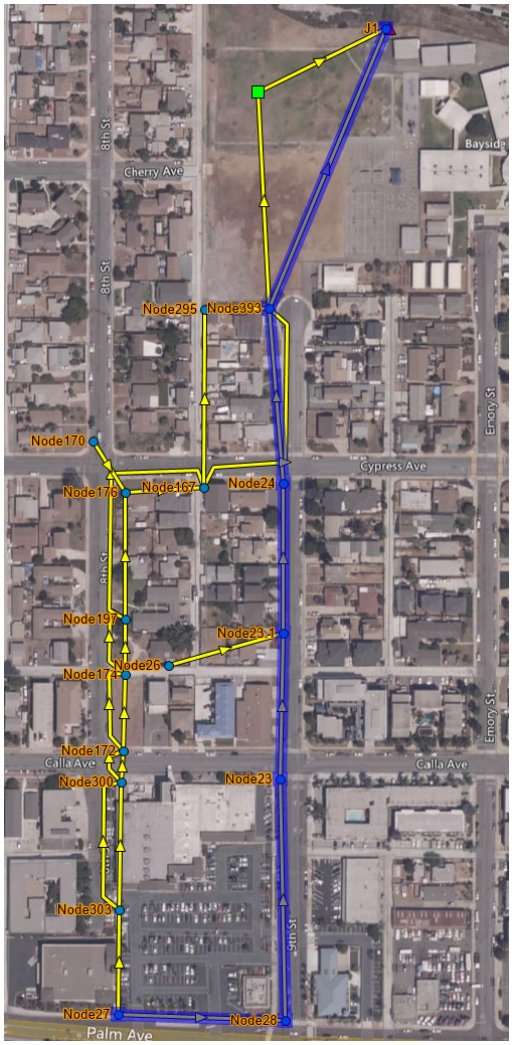


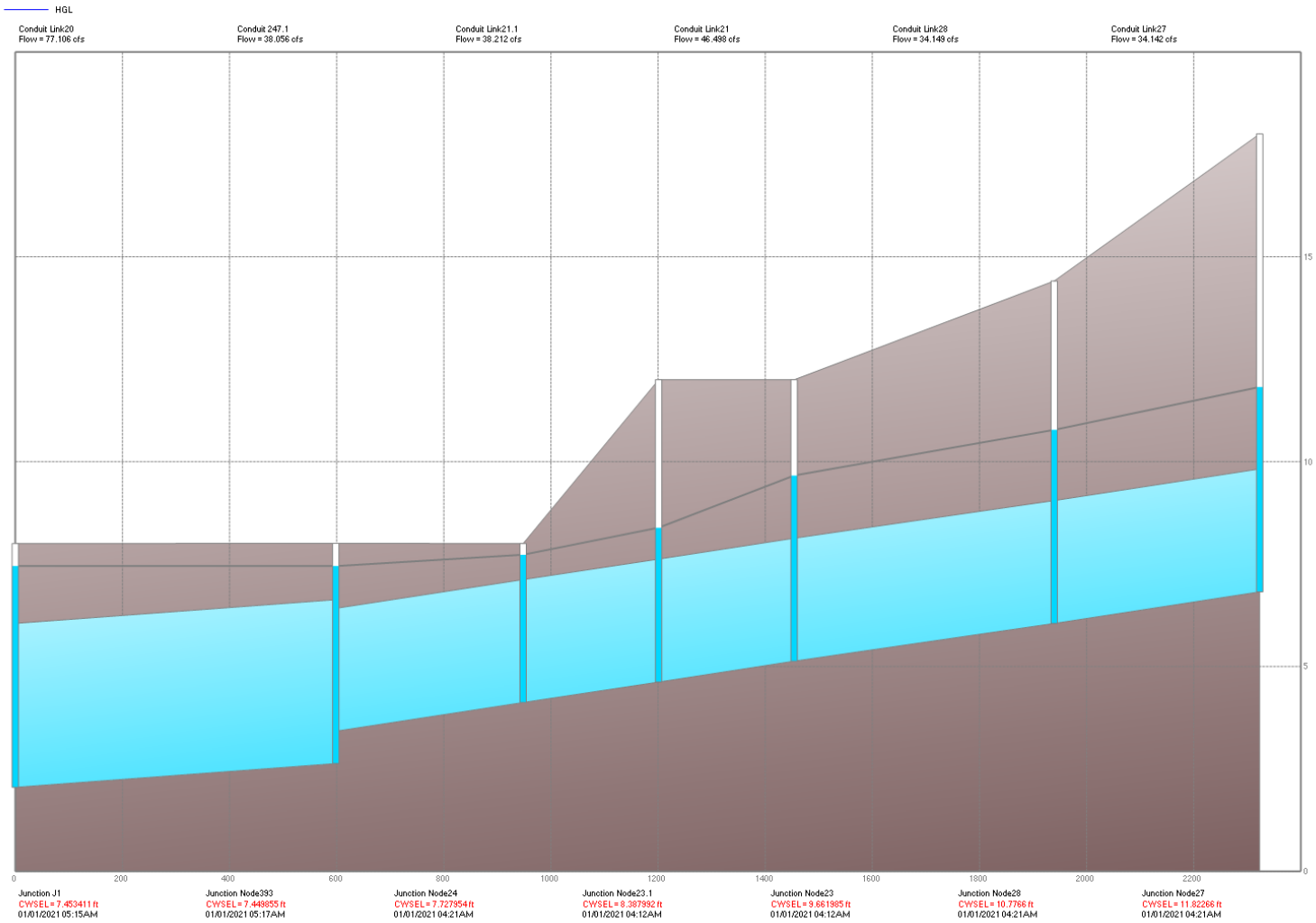
Parallel System, Tide Gate, Open Channel and Detention Basin
10-YR Max Tide 7.8 BC Profile 1



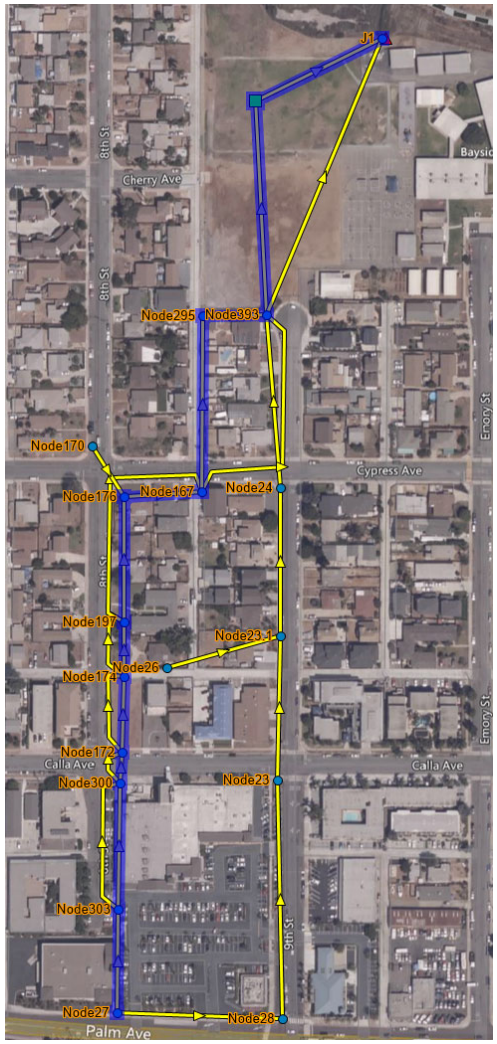


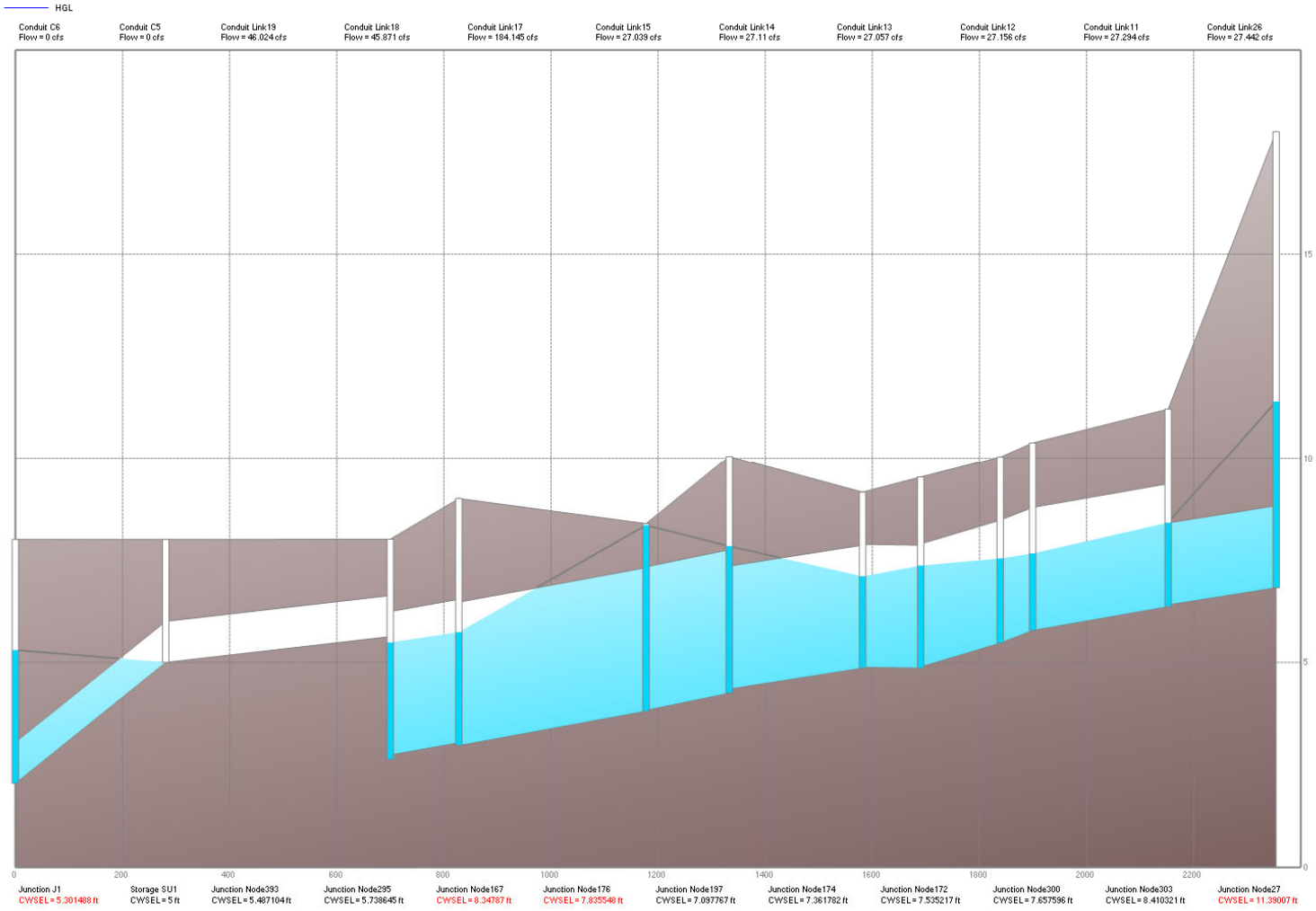
Parallel System, Tide Gate, Open Channel and Detention Basin
10-YR Max Tide 7.8 BC Profile 2



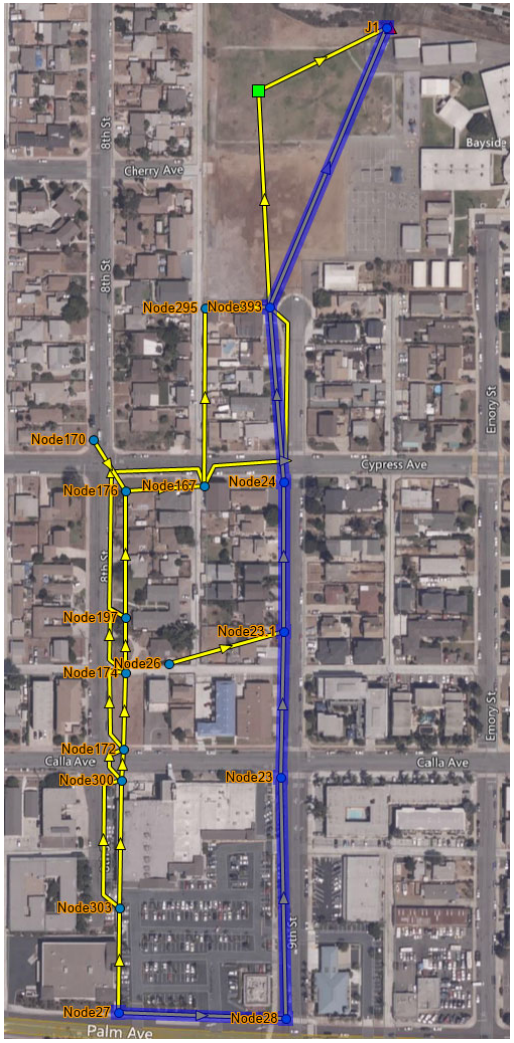


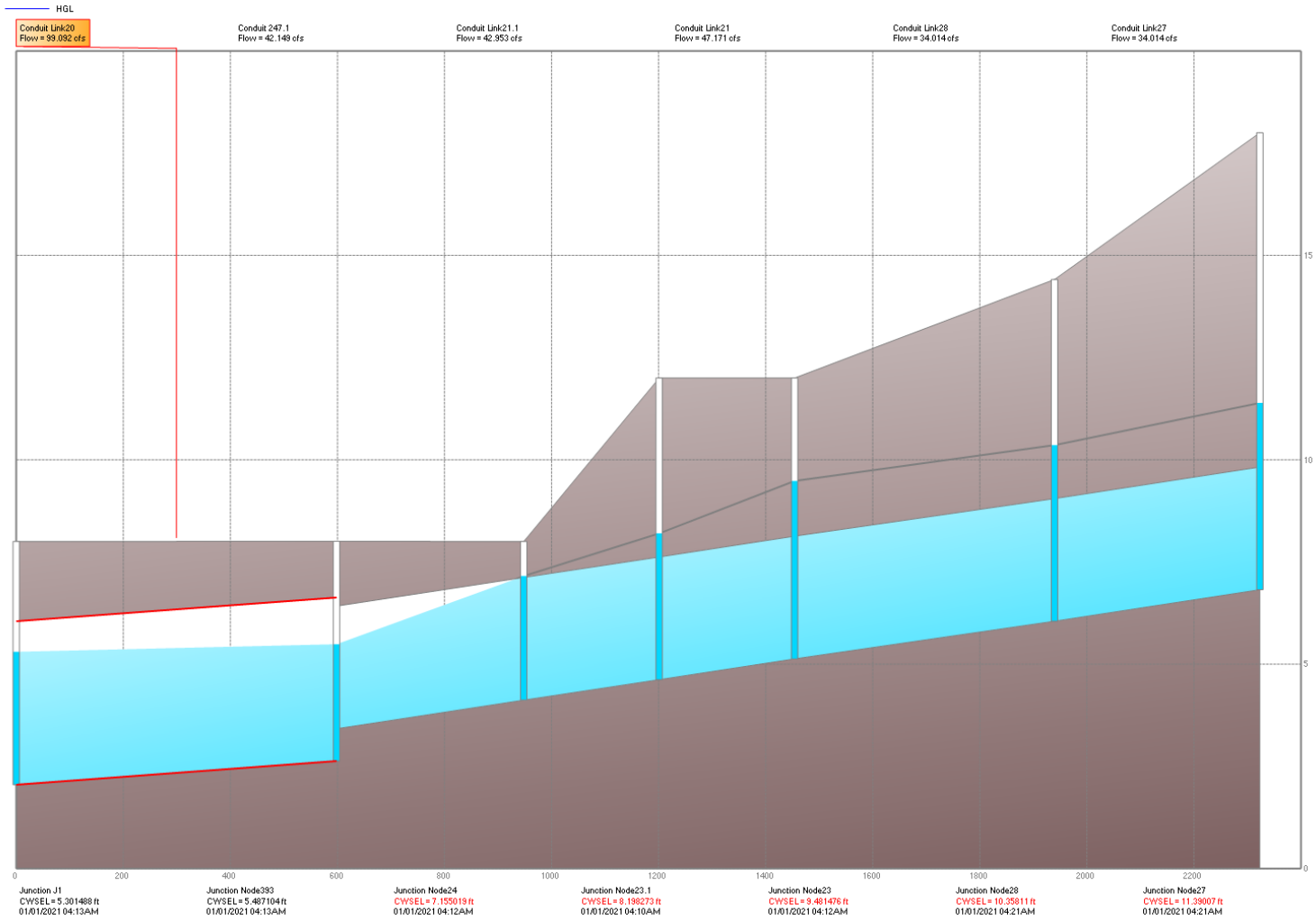
Parallel System, Tide Gate, Open Channel and Detention Basin
10-YR MHH Tide 5.3 BC Profile 1



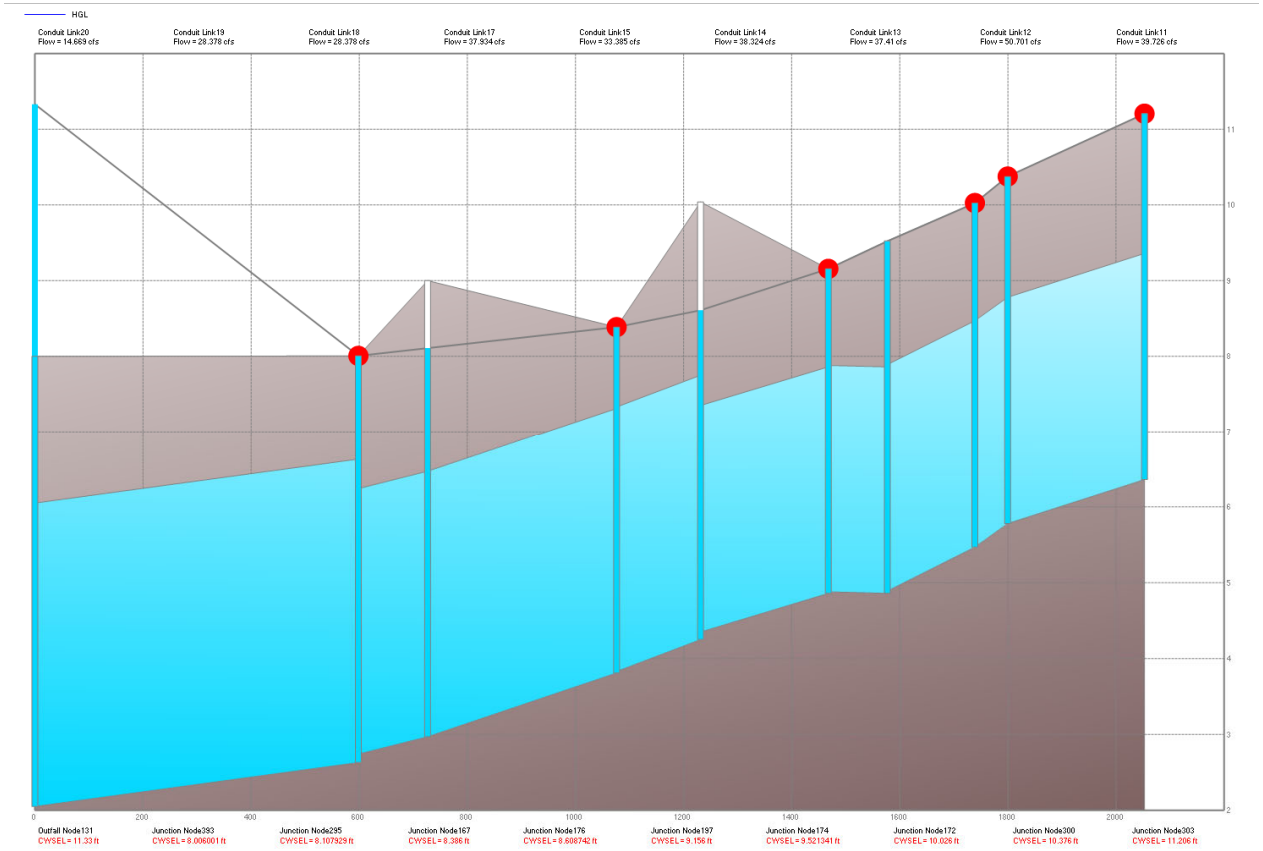


Parallel System, Tide Gate, Open Channel and Detention Basin
10-YR MHH Tide 5.3 BC Profile 2

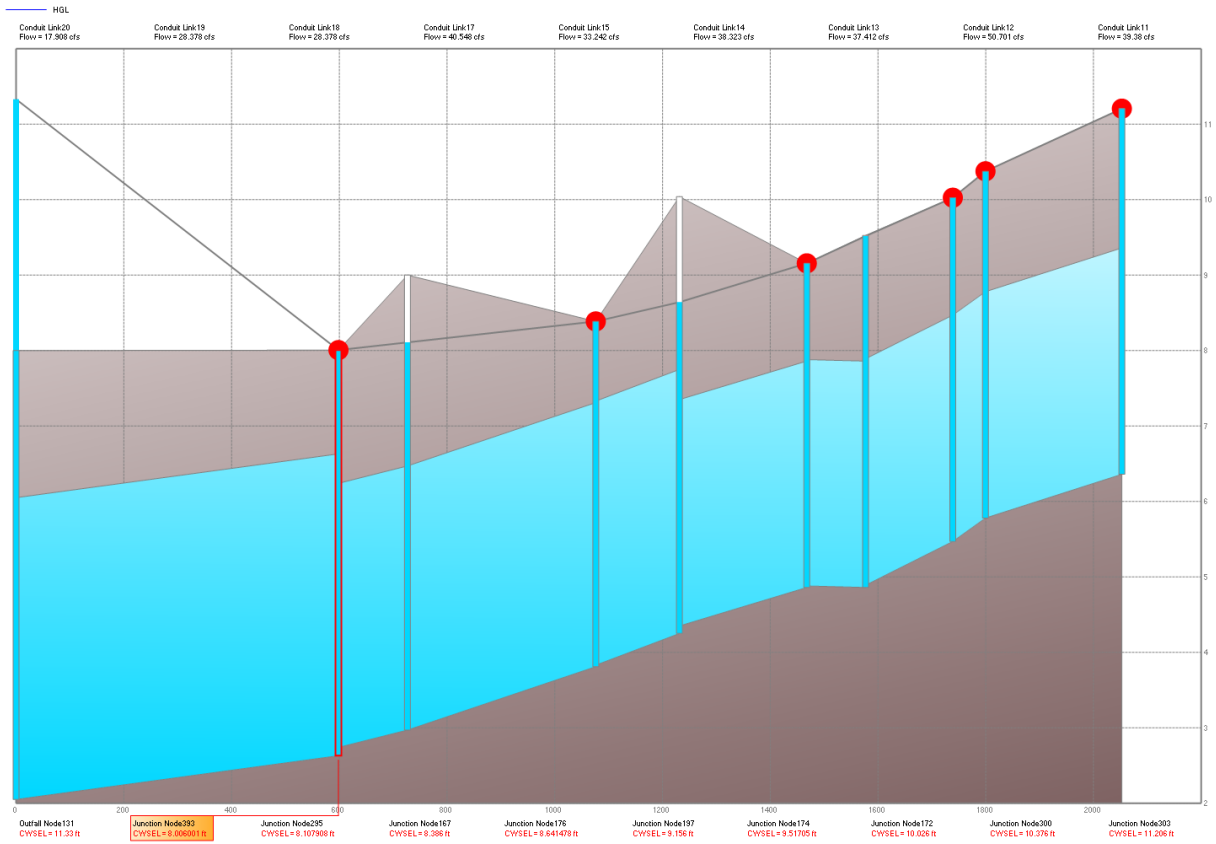




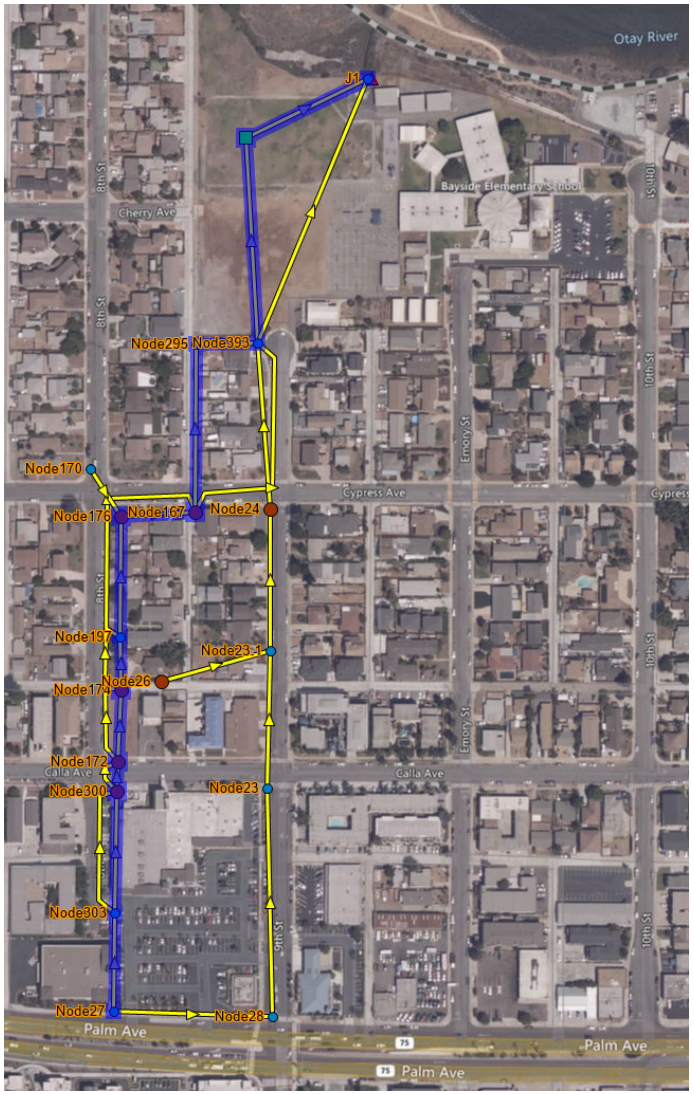
Existing System
10-YR Max Tide with 3.5 ft SLR 11.3 BC

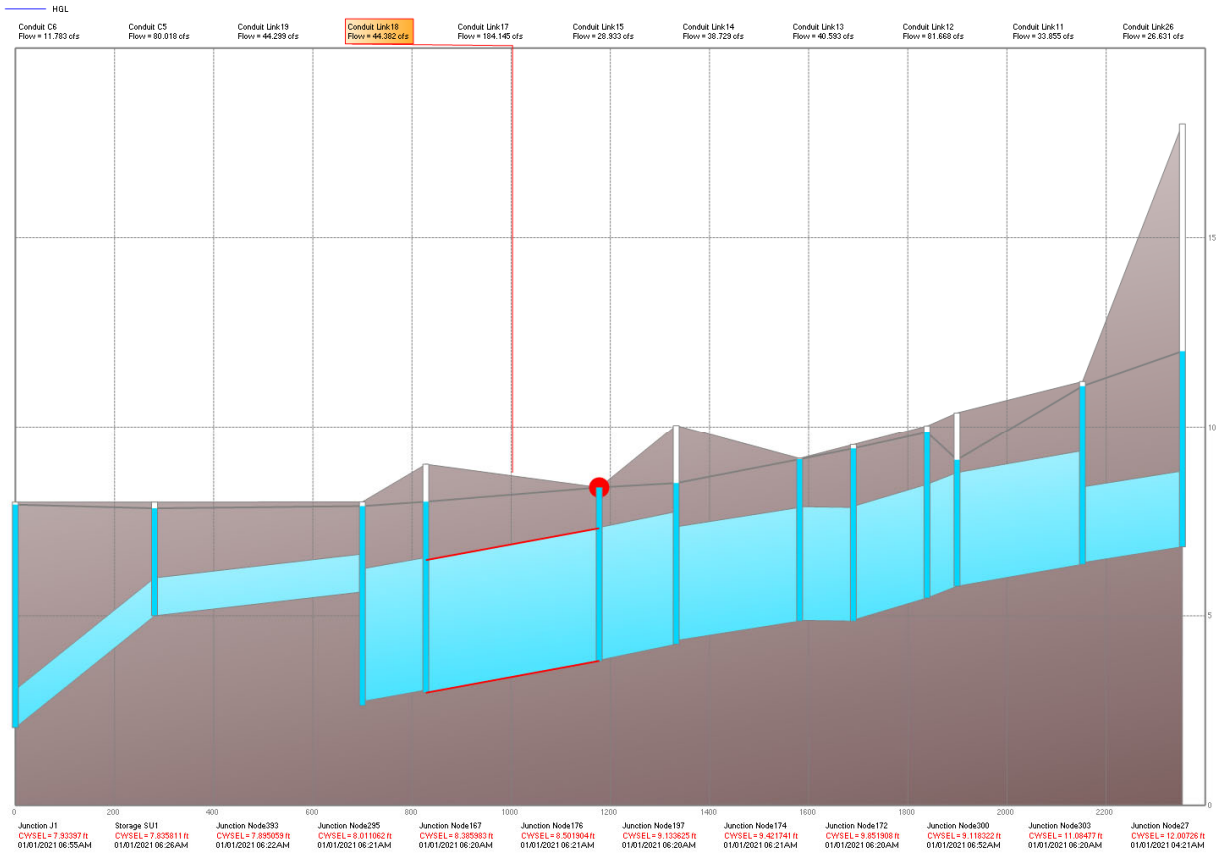


Existing System
100-YR Max Tide with 3.5 ft SLR 11.3 BC

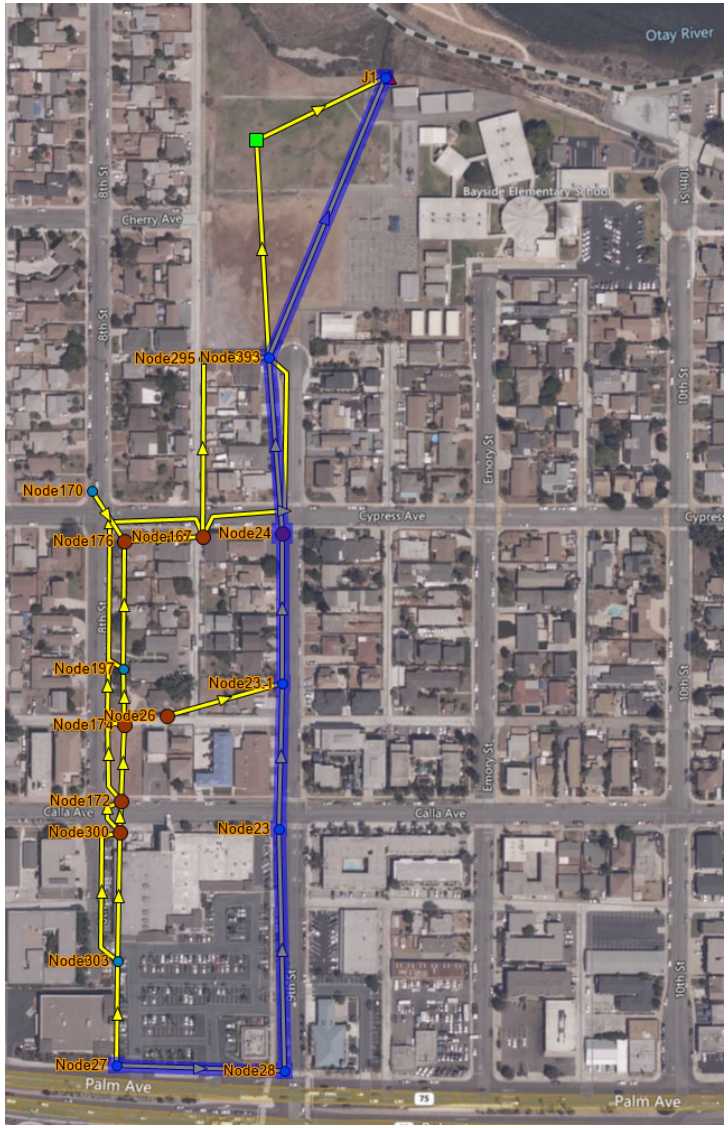


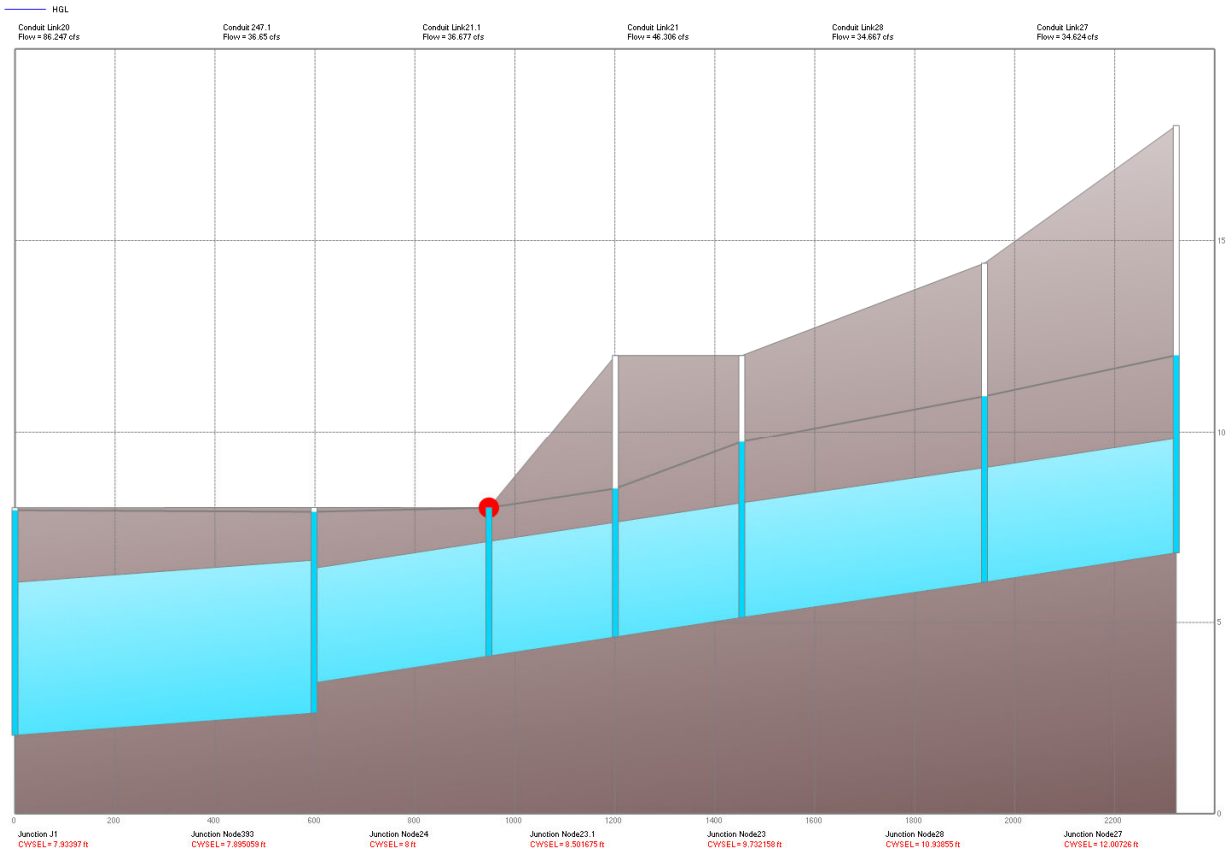
Parallel System, Tide Gate, Open Channel and Detention Basin
10-YR Max Tide with 3.5 ft SLR 11.3 BC Profile 1



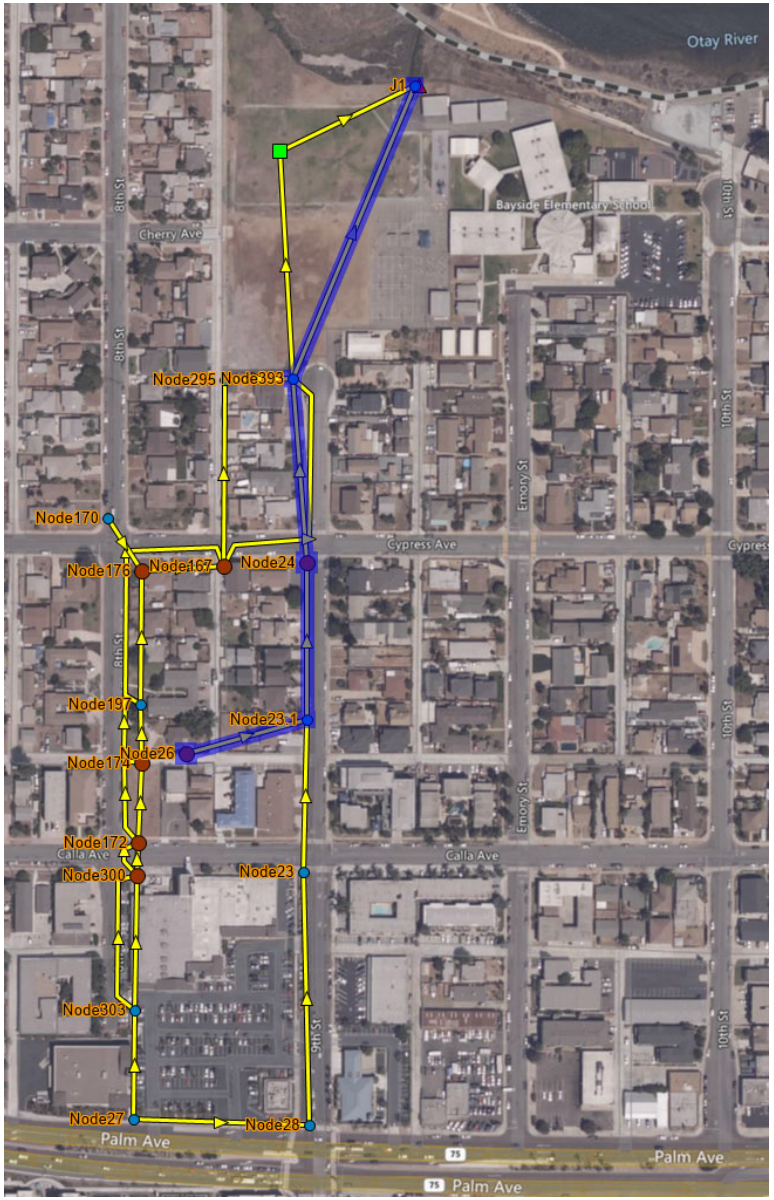


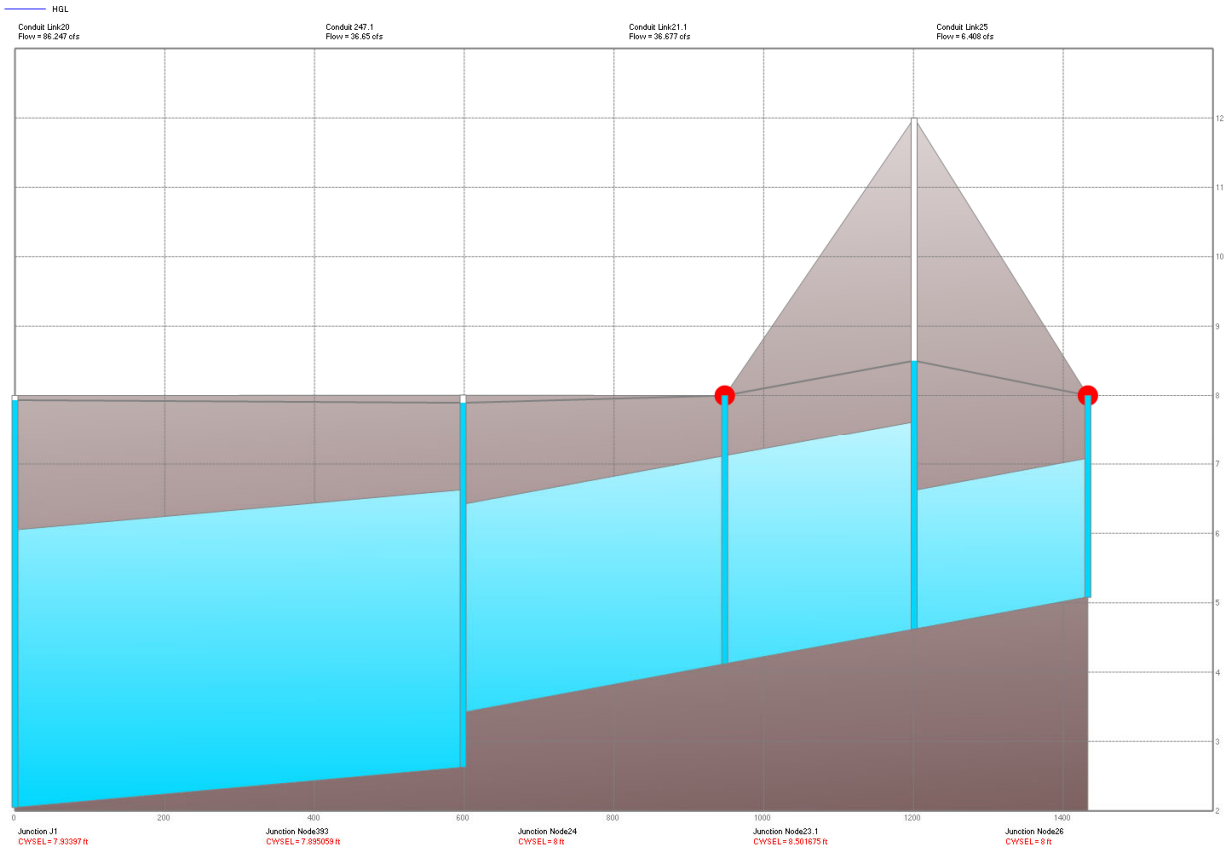
Parallel System, Tide Gate, Open Channel and Detention Basin
10-YR Max Tide with 3.5 ft SLR 11.3 BC Profile 2



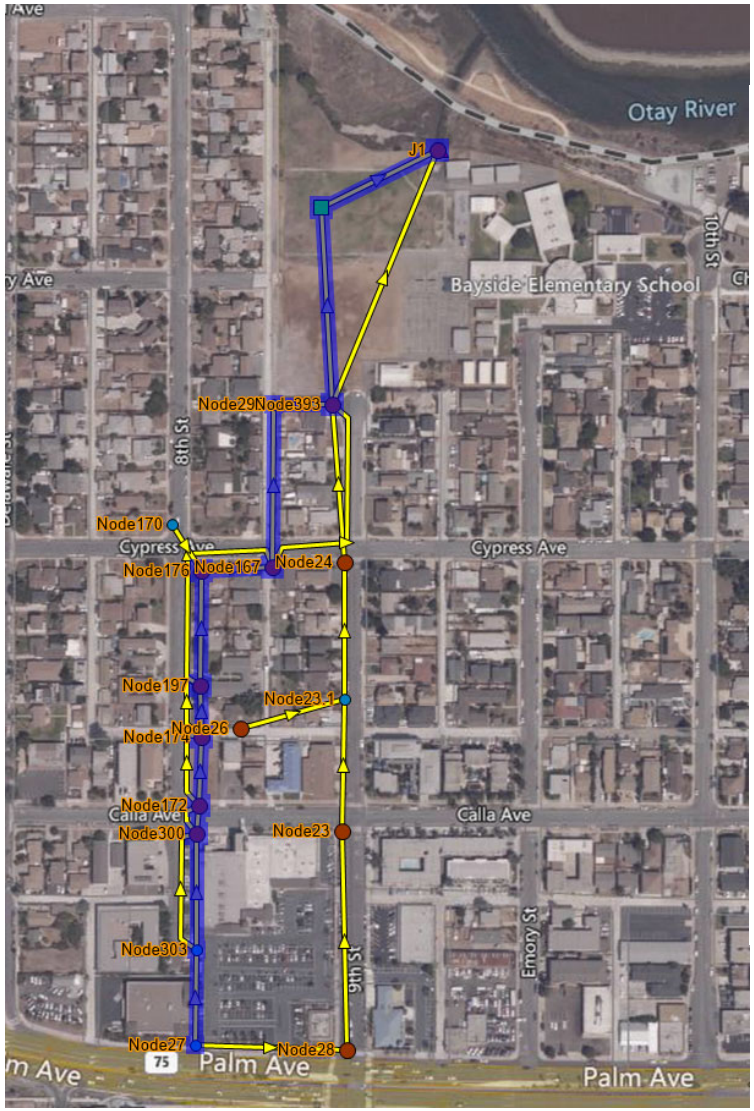


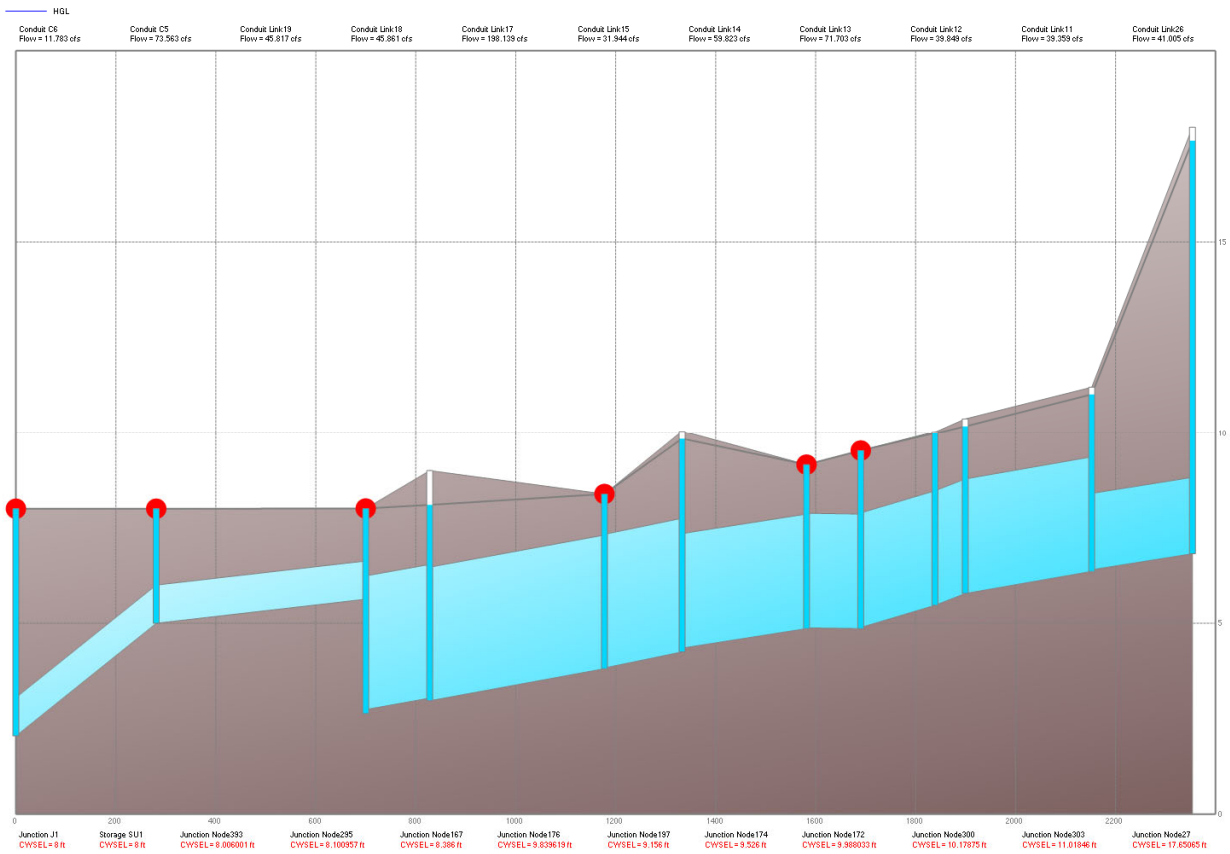
Parallel System, Tide Gate, Open Channel and Detention Basin
10-YR Max Tide with 3.5 ft SLR 11.3 BC Profile 3



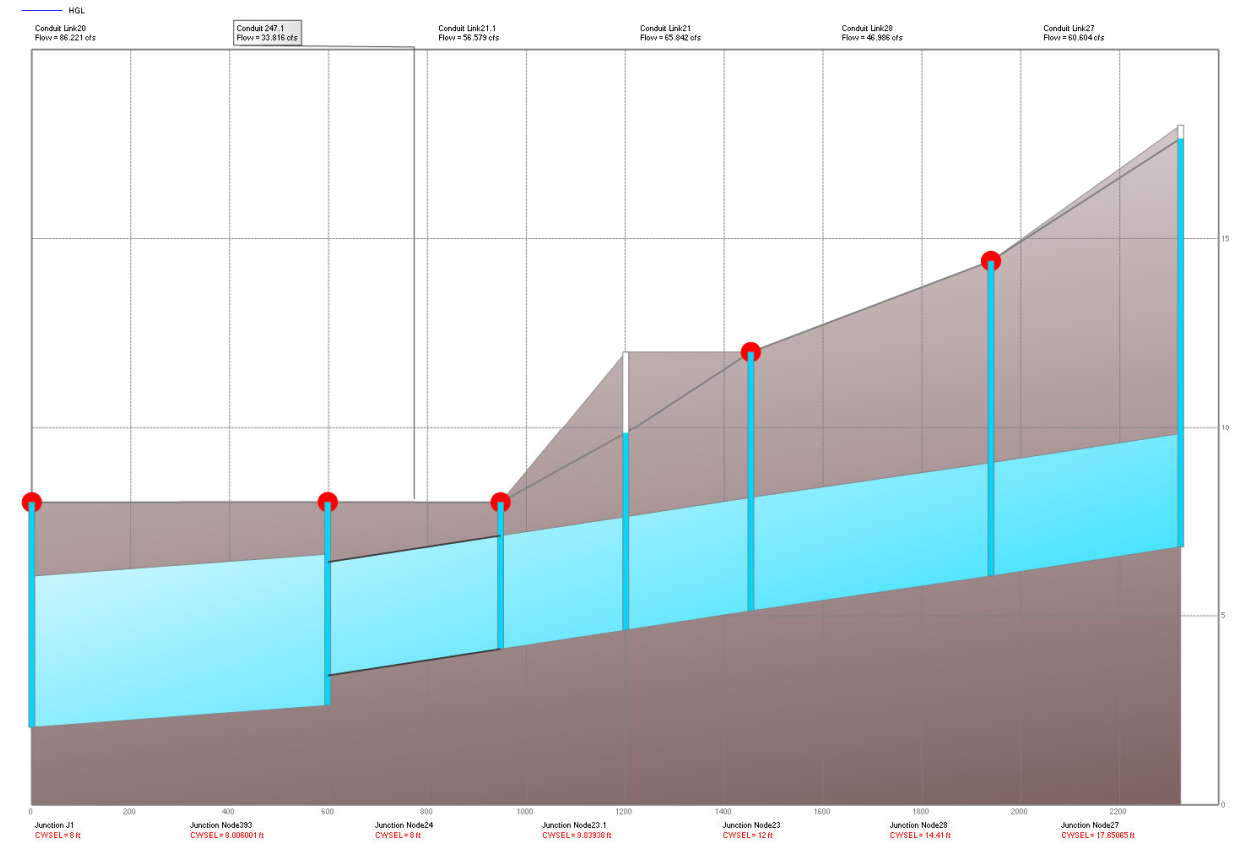


Parallel System, Tide Gate, Open Channel and Detention Basin
100-YR Max Tide with 3.5 ft SLR 11.3 BC Profile 1

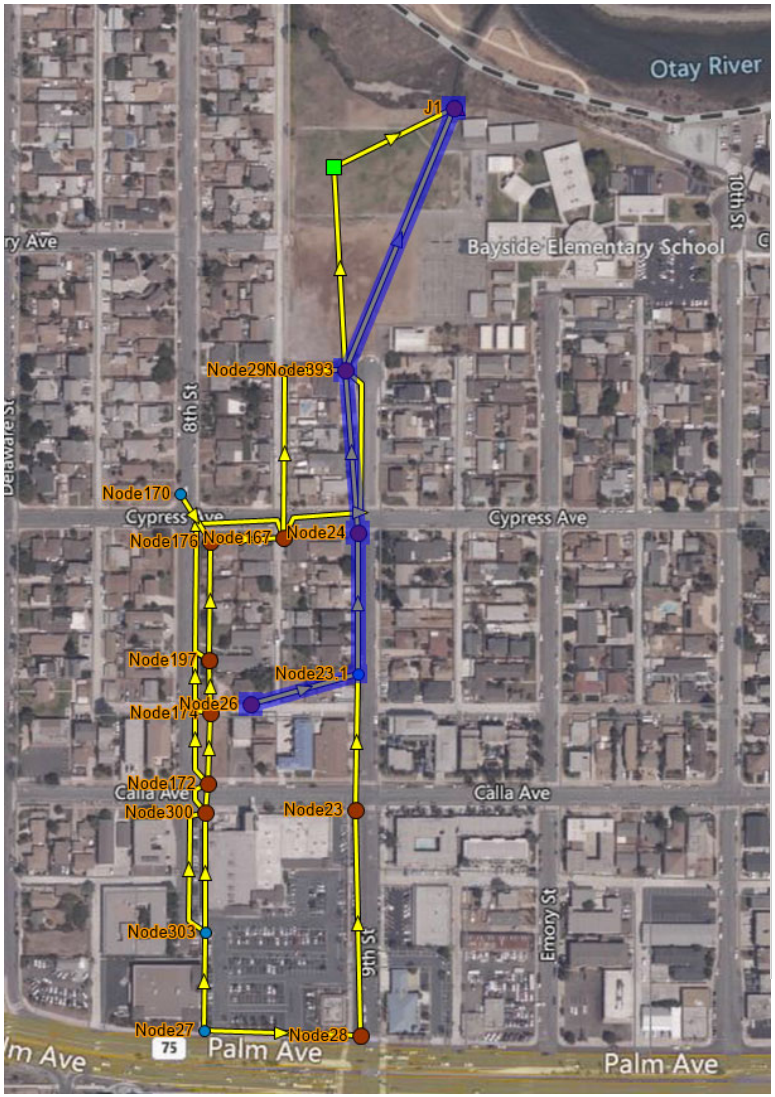


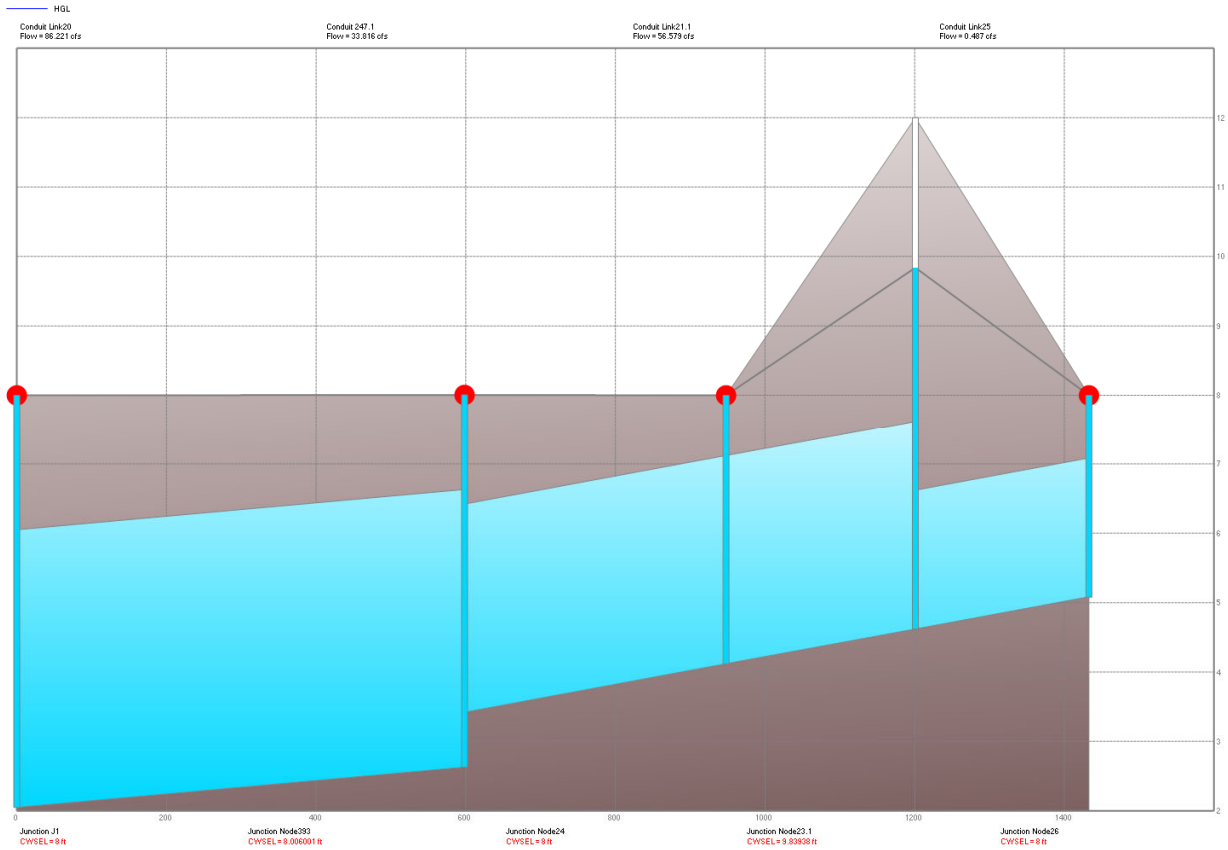


Parallel System, Tide Gate, Open Channel and Detention Basin
100-YR Max Tide with 3.5 ft SLR 11.3 BC Profile 2



Parallel System, Tide Gate, Open Channel and Detention Basin
100-YR Max Tide with 3.5 ft SLR 11.3 BC Profile 3





Appendix B

30% Engineering Design of Preferred Alternative

IMPERIAL BEACH, CALIFORNIA

BAYSHORE BIKEWAY RESILIENCY PROJECT

PROJECT NO. SP2111

CITY OF IMPERIAL BEACH GENERAL NOTES

1. THE APPROVAL OF THE PLANS BY THE CITY OF IMPERIAL BEACH DOES NOT AUTHORIZE THE CONTRACTOR TO VIOLATE ANY FEDERAL, STATE OR CITY LAWS, ORDINANCES, REGULATIONS, OR POLICIES, INCLUDING, BUT NOT LIMITED TO, THE FEDERAL ENDANGERED SPECIES ACT OF 1973 AND AMENDMENTS THERETO (16 USC SECTION I 1531 ET.SEQ.).

2. IMPORTANT NOTICE: SECTION 4216 OF THE GOVERNMENT CODE REQUIRES A DIG ALERT IDENTIFICATION NUMBER TO BE ISSUED BEFORE A "PERMIT TO EXCAVATE" WILL BE VALID. FOR YOUR DIG ALERT I.D. NUMBER, CALL UNDERGROUND SERVICE ALERT, TOLL FREE 1-800-227-2600, TWO DAYS BEFORE YOU DIG.

3. THE CONTRACTOR SHALL BE RESPONSIBLE FOR SURVEY MONUMENTS AND/OR VERTICAL CONTROL BENCHMARKS, WHICH ARE DISTURBED, OR DESTROYED BY CONSTRUCTION. A LAND SURVEYOR MUST FIELD LOCATE, REFERENCE, AND/OR PRESERVE ALL HISTORICAL OR CONTROLLING MONUMENTS PRIOR TO ANY EARTHWORK. IF DESTROYED, SUCH MONUMENTS SHALL BE REPLACED WITH APPROPRIATE MONUMENTS BY A LAND SURVEYOR OR AN AUTHORIZED CIVIL ENGINEER. A CORNER RECORD OR RECORD OF SURVEY, AS APPROPRIATE, SHALL BE FILED AS REQUIRED BY THE PROFESSIONAL LAND SURVEYORS ACT. IF ANY VERTICAL CONTROL BENCHMARKS ARE TO BE DISTURBED OR DESTROYED, THE CITY OF IMPERIAL BEACH PUBLIC WORKS DIRECTOR (ERIC MINICILLI) MUST BE NOTIFIED, IN WRITING, AT LEAST 3 DAYS PRIOR TO THE CONSTRUCTION. THE CONTRACTOR WILL BE RESPONSIBLE FOR THE COST OF REPLACING ANY VERTICAL CONTROL BENCHMARKS DESTROYED BY THE CONSTRUCTION.

4. PRIOR TO ANY DISTURBANCE TO THE SITE, EXCLUDING UTILITY MARK-OUTS AND SURVEYING, THE CONTRACTOR SHALL MAKE ARRANGEMENTS FOR THE PRE-CONSTRUCTION MEETING WITH THE CITY OF IMPERIAL BEACH PUBLIC WORKS DEPARTMENT (619) 423-8311.

5. CONTRACTOR SHALL IMPLEMENT AN EROSION CONTROL PROGRAM DURING THE PROJECT GRADING AND OR CONSTRUCTION ACTIVITIES. THE PROGRAM SHALL MEET ALL APPLICABLE REQUIREMENT OF THE STATE WATER RESOURCE CONTROL BOARD, REGIONAL WATER CONTROL BOARD SAN DIEGO REGION AND THE CITY OF IMPERIAL BEACH MUNICIPAL CODE AND STORM WATER STANDS MANUAL.

6. ISSUANCE OF THE CITY'S NOTICE TO PROCEED SHALL NOT RELIEVE THE APPLICANT OR ANY OF THEIR REPRESENTATIVES OR CONTRACTORS FROM COMPLYING WITH ANY STATE OR FEDERAL REQUIREMENTS BY AGENCIES INCLUDING BUT NOT LIMITED TO CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD, CALIFORNIA DEPARTMENT OF FISH AND WILDLIFE, OR OTHER AGENCIES. COMPLIANCE MAY INCLUDE OBTAINING PERMITS, OTHER AUTHORIZATIONS, OR COMPLIANCE WITH MANDATES OF ANY APPLICABLE STATE/FEDERAL AGENCY.

7. AS-BUILT DRAWINGS MUST BE SUBMITTED TO THE ENGINEER OR INSPECTOR AND APPROVED BY THE ENGINEER OR INSPECTOR PRIOR TO ACCEPTANCE OF THE PROJECT BY THE CITY OF IMPERIAL BEACH.

8. DEVIATIONS FROM THESE SIGNED PLANS WILL NOT BE ALLOWED UNLESS A CONSTRUCTION CHANGE IS APPROVED IN WRITING BY THE PUBLIC WORKS DIRECTOR AND THE CHANGE IS REQUIRED BY THE CITY INSPECTOR.

9. WEAKENED PLANE JOINTS ARE REQUIRED EVERY 5 FEET EACH WAY AND SHALL BE IN ACCORDANCE WITH REGIONAL STANDARD DRAWING G-09 AND THESE PLANS. EXPANSION JOINTS ARE REQUIRED EVERY 15 FEET AND SHALL BE IN ACCORDANCE WITH REGIONAL STANDARD DRAWING G-10 AND THESE PLANS. THEY SHALL BE PLACED IN A STRAIGHT LINE, COMPLETELY THROUGH THE CONCRETE TO THE SUBGRADE AND TO EACH EDGE OF PAVING. CONCRETE SHALL BE CURED IN ACCORDANCE WITH THE 2015 STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION (GREEN BOOK).

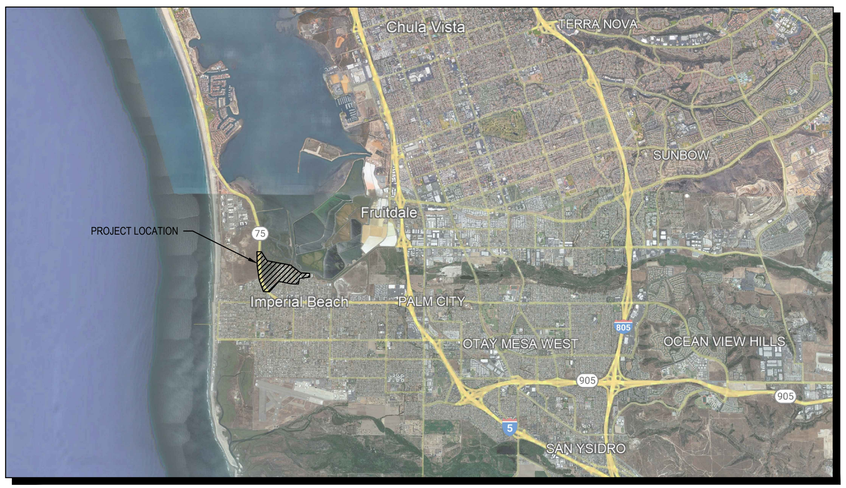
10. WHEN PERFORMING EXCAVATION WORK, CARE MUST BE TAKEN NOT TO ALLOW ANY DEBRIS TO ENTER ANY EXISTING SANITARY SEWER MANHOLES OR STORM DRAINS. CONTRACTOR WILL BE HELD RESPONSIBLE FOR ANY DEBRIS THAT HAS ENTERED MANHOLES AND STORM DRAINS FROM HIS CONSTRUCTION AND WILL HAVE TO REMOVE SAME.

11. CONTRACTOR SHALL COORDINATE HIS SCHEDULE WITH THE CITY OF IMPERIAL BEACH PUBLIC WORKS AND EDCO DISPOSAL (619) 287-7555 FOR TRASH COLLECTION IN CONJUNCTION WITH CONSTRUCTION WORK.

12. THE UPPER 12" OF SUBGRADE MUST BE COMPACTED TO A MINIMUM OF 95 PERCENT OF MAXIMUM DRY DENSITY.

13. CONTRACTOR SHALL LOCATE ALL UTILITIES WITHIN LIMITS OF WORK PRIOR TO CONSTRUCTION. FOR LOCATIONS OF UTILITIES CONTACT:

COX CABLE TV	1-800-262-1122
SAN DIEGO GAS & ELECTRIC CO.	1-800-411-7343
AT&T	1-800-288-2020
CALIFORNIA AMERICAN WATER CO.	1-619-522-6400
IMPERIAL BEACH PUBLIC WORKS (SEWER)	1-619-423-8311



VICINITY MAP
SCALE 1" = 5280'

CITY OF IMPERIAL BEACH GENERAL NOTES (CONTINUED)

14. THE CONTRACTOR SHALL NOTIFY THE SAN DIEGO GAS AND ELECTRIC COMPANY AND THE PACIFIC TELEPHONE AND TELEGRAPHY COMPANY, AT&T AND COX, CALAM PRIOR TO STARTING WORK NEAR COMPANY FACILITIES AND SHALL COORDINATE THEIR WORK WITH COMPANY REPRESENTATIVES. FOR LOCATION OF ELECTRIC CABLES, GAS PIPING, WATER LINES AND TELEPHONE CABLES AND APPURTENANCES CONTACT UNDERGROUND SERVICE ALERT: 1-800-422-4133. ALSO, REFER TO CITY STANDARDS.
15. THE CONTRACTOR SHALL NOTIFY THE CITY OF IMPERIAL BEACH PUBLIC WORKS DEPARTMENT INSPECTOR 48 HOURS PRIOR TO STARTING WORK SO THAT INSPECTION MAY BE PROVIDED. (TELEPHONE NUMBER: 619-423-8311).
16. ALL WORK SHALL BE IN ACCORDANCE WITH THE 2015 EDITION OF THE STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION, 2015 EDITION OF STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION, 2015 THE SAN DIEGO COUNTY REGIONAL STANDARD DRAWINGS (SDRSD).
17. PAVEMENT SECTIONS SHOWN ARE TO BE VERIFIED BY "R" VALUE TESTS (TEST METHOD NO. CALIFORNIA 301) AND PAVEMENT DESIGN REPORT, TO BE SUBMITTED BY SOILS ENGINEER, FOR CITY ENGINEER'S APPROVAL.
18. ALL METALS PLACED IN THE GROUND SHALL BE IN ENCASED 6 INCHES OF NEUTRAL SAND.
19. CONSTRUCTION EXPANSION JOINTS IN CURB AND GUTTER AT RETURNS AND AT DRIVEWAY INTERSECTIONS ARE REQUIRED PER SDRSD G-9 AND G-10.
20. ALL UNDERGROUND UTILITIES SHALL BE INSTALLED BEFORE CONSTRUCTION OF CURBS, CROSS GUTTERS, OR SURFACING OF THE STREETS AND SHALL BE MARKED FOR EASY LOCATION. THE ENGINEER OF WORK SHALL CERTIFY ALL IMPROVEMENTS TO WITHIN 0.1 FEET OF THE DESIGN.
21. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO OBTAIN AN EXCAVATION PERMIT FROM THE DIVISION OF INDUSTRIAL SAFETY AND ADHERE TO ALL PROVISIONS OF THE STATE CONSTRUCTION SAFETY ORDERS.
22. SOILS REPORTS ON ALL TRENCHES SHALL BE SUBMITTED TO THE ENGINEER OF WORK AND THE CITY ENGINEER BY THE SOILS ENGINEER OF RECORD, WHICH CERTIFIES THAT TRENCH BACKFILL WAS COMPACTED AS DIRECTED BY THE SOILS ENGINEER IN ACCORDANCE WITH EARTHWORK SPECIFICATIONS AND CITY OF IMPERIAL BEACH SPECIFICATIONS AND GRADING ORDINANCE.
23. TRAFFIC CONTROL SHALL BE IN ACCORDANCE WITH THE CURRENT STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION TRAFFIC CONTROL MANUAL AND SUPPLEMENTS (CALTRANS TRAFFIC CONTROL MANUAL); AND TRAFFIC CONTROL WARNING SIGNS, LIGHTS, AND DEVICES SHALL CONFORM TO THE 2010. CALIFORNIA MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (CALIFORNIA MUTCD 2010, INCLUDING REVS. 1 AND 2 OF THE FHWA'S MUTCD 2003), DEPARTMENT OF TRANSPORTATION, DIVISION OF TRAFFIC OPERATIONS. THE CONTRACTOR SHALL SUBMIT TRAFFIC CONTROL PLAN, FOR APPROVAL BY THE DEPARTMENT OF PUBLIC WORKS, 48 HOURS PRIOR TO START OF CONSTRUCTION
24. CENTERLINE MONUMENTS SHALL BE INSTALLED AT THE EC AND BC OF ALL CURVES, AT THE CENTERLINE INTERSECTION OF ALL STREETS WHERE MANHOLES ALLOW, AT THE RADIUS POINT OF CONCENTRIC CULS-DE-SAC, AND AT THE ANGLE POINT OF OFFSET CULS-DE-SAC, PER SDRSD M-10 AND M-11.
25. ALL EXISTING IMPROVEMENTS INCLUDING CURBS AND GUTTERS, SIDEWALKS, ASPHALT CONCRETE OR P.C.C. PAVING, WHICH ARE BEING JOINED OR MATCHED IN CONNECTION WITH THIS PROJECT, SHALL BE JOINED OR MATCHED IN A MANNER SATISFACTORY TO THE CITY PUBLIC WORKS DIRECTOR, INCLUDING NECESSARY SAW-CUTTING, REMOVAL, REPLACEMENT, AND CAPPING.
26. ALL OPERATIONS CONDUCTED ON THE PREMISES, INCLUDING THE WARMING-UP, REPAIR, ARRIVAL, DEPARTURE, OR RUNNING OF TRUCKS, EARTHMOVING EQUIPMENT, CONSTRUCTION EQUIPMENT, AND ANY OTHER ASSOCIATED EQUIPMENT SHALL BE LIMITED TO THE PERIOD BETWEEN 7:00 A.M. AND 5:00 P.M. MONDAY THROUGH FRIDAY; AND, NO EARTHMOVING OR GRADING OPERATIONS SHALL BE CONDUCTED ON THE PREMISES ON SATURDAYS OR SUNDAYS OR LEGAL HOLIDAYS, UNLESS WAIVED BY THE PUBLIC WORKS DIRECTOR.
27. PATCHING OF SIDEWALK IS NOT PERMITTED.
28. DAMAGED, GOUGED, BROKEN, OR GRAFFITI-MARKED SECTIONS OF CURBS, GUTTERS OR SIDEWALKS SHALL BE REMOVED AND REPLACED.
29. A MINIMUM REPLACEMENT SECTION TO BE AT LEAST EQUAL TO SCORE MARK (TYPICALLY 5 FEET X 5 FEET). FOR SIDEWALKS EXCEEDING 5 FEET WIDTH, REPLACEMENT IS TO BE FULL WIDTH SQUARED TO THE NEXT SCORE MARK
30. ALL VALVE CANS AND RISERS ON THE CITY'S OPERATIONAL SYSTEM WILL BE RAISED TO GRADE, INCLUDING COMPACTION AROUND THE RISER AND PAVING AROUND VALVE CAN, WITHIN 48 HOURS AFTER PAVEMENT HAS BEEN PLACED. THIS INCLUDES VALVE CANS AND RISERS ON THE EXISTING SYSTEM AND ON ALL NEW SYSTEMS THAT ARE TIED INTO THE CITY'S EXISTING SYSTEM.
31. ALL SEWER MANHOLES ON THE CITY'S OPERATIONAL SYSTEM WILL BE RAISED TO GRADE WITHIN 48 HOURS AFTER FINAL LIFT OF PAVEMENT HAS BEEN PLACED. THIS INCLUDES MANHOLES ON THE EXISTING SYSTEM AND ON ALL NEW SYSTEMS THAT ARE TIED INTO THE CITY'S EXISTING SYSTEM.

SHEET INDEX

FOR SHEET INDEX, SEE SHEET G-002

SPECIAL NOTES

THE FOLLOWING NOTES ARE PROVIDED TO GIVE DIRECTIONS TO THE CONTRACTOR BY THE ENGINEER OF WORK.

1. CONTRACTOR AGREES THAT HE SHALL ASSUME SOLE AND COMPLETE RESPONSIBILITY FOR THE JOB SITE CONDITIONS DURING THE COURSE OF CONSTRUCTION OF THIS PROJECT INCLUDING SAFETY OF ALL PERSONS AND PROPERTY; THAT THIS REQUIREMENT SHALL APPLY CONTINUOUSLY AND NOT BE LIMITED TO NORMAL WORKING HOURS, AND THAT THE CONTRACTOR SHALL DEFEND, INDEMNIFY, AND HOLD THE OWNER, ENGINEER AND GEOLOGIST HARMLESS FROM ANY AND ALL LIABILITY, REAL OR ALLEGED, IN CONNECTION WITH THE PERFORMANCE OF WORK ON THIS PROJECT.
2. THE CONTRACTOR SHALL VERIFY THE LOCATION OF ALL EXISTING FACILITIES (ABOVE GROUND AND UNDERGROUND) WITHIN THE PROJECT SITE SUFFICIENTLY AHEAD OF CONSTRUCTION TO PERMIT THE REVISION OF THE CONSTRUCTION PLANS IF IT IS FOUND THE ACTUAL LOCATIONS ARE IN CONFLICT WITH THE PROPOSED WORK.
3. DURING CONSTRUCTION: THE CONTRACTOR SHALL PROPERLY GRADE ALL EXCAVATED SURFACES TO PROVIDE POSITIVE DRAINAGE AND PREVENT PONDING OF WATER. CONTRACTOR SHALL CONTROL SURFACE WATER TO AVOID DAMAGE TO ADJOINING PROPERTIES OR TO FINISHED WORK ON THE SITE.
4. ALL WORK NEEDING MATERIALS TESTING REQUIRES THAT THE CONTRACTOR NOTIFY THE MATERIAL TESTING CONSULTANT BY NOON THE WORK-DAY BEFORE THE WORK IS SCHEDULED TO BEGIN TO ARRANGE FOR TESTING.
5. WORK PERFORMED WITHOUT BENEFIT OF TESTING AND/OR INSPECTION SHALL BE SUBJECT TO REJECTION AND REMOVAL.
6. THE EXISTING LOCATION OF UTILITY STRUCTURES AND FACILITIES SHOWN ON THE CONSTRUCTION PLANS WERE OBTAINED BY A SEARCH OF THE AVAILABLE RECORDS. ATTENTION IS CALLED TO THE POSSIBLE EXISTENCE OF OTHER UTILITY FACILITIES OR STRUCTURES THAT MAY NOT BE SHOWN. THE CONTRACTOR HAS THE TOTAL RESPONSIBILITY IN VERIFYING THE LOCATION AND ELEVATION OF EXISTING UNDERGROUND UTILITIES, AND DISCREPANCIES BETWEEN THE PLANS AND THE ACTUAL FIELD CONDITIONS SHALL BE BROUGHT TO THE ATTENTION OF THE CITY INSPECTOR AND THE DESIGN ENGINEER IMMEDIATELY.
7. NEITHER THE CITY NOR THE ENGINEER OF WORK WILL ENFORCE SAFETY MEASURES OR REGULATIONS. THE CONTRACTOR SHALL DESIGN, CONSTRUCT, AND MAINTAIN ALL SAFETY DEVICES INCLUDING SHORING, AND SHALL BE SOLELY RESPONSIBLE FOR CONFORMING TO ALL LOCAL, STATE AND FEDERAL SAFETY AND HEALTH STANDARDS, LAWS, AND REGULATIONS.
8. THE CONTRACTOR SHALL MAINTAIN A CONTINUOUS ADA ACCESSIBLE ROUTE FOR ALL PEDESTRIANS, INCLUDING THE DISABLED AND BICYCLISTS AT ALL TIMES DURING CONSTRUCTION. WHEN EXISTING PEDESTRIAN FACILITIES ARE DISRUPTED, THE TEMPORARY FACILITIES SHALL BE DETECTABLE AND INCLUDE ACCESSIBILITY FEATURES CONSISTENT WITH THE FEATURES PRESENT IN THE EXISTING PEDESTRIAN FACILITY.

DIGALERT

DIAL TOLL FREE
1-800-422-4133
AT LEAST TWO DAYS BEFORE YOU DIG

UNDERGROUND SERVICE ALERT OF SOUTHERN CALIFORNIA

ATTENTION IS DIRECTED TO THE POSSIBLE EXISTENCE OF UNDERGROUND FACILITIES NOT KNOWN OR IN A LOCATION DIFFERENT FROM THAT WHICH IS SHOWN ON THE PLANS OR IN THE SPECIAL PROVISIONS. THE CONTRACTOR SHALL TAKE STEPS TO ASCERTAIN THE EXACT LOCATION OF ALL UNDERGROUND FACILITIES PRIOR TO DOING WORK THAT MAY DAMAGE SUCH FACILITIES OR INTERFERE WITH THEIR SERVICE.

BEFORE EXCAVATING, THE CONTRACTOR SHALL VERIFY THE LOCATION OF UNDERGROUND UTILITIES BY CONTACTING UNDERGROUND SERVICE ALERT AT 1-(800)-422-4133.

30% PRELIMINARY

XX% PLANS - NOT FOR CONSTRUCTION - 01/XX/20XX

No.	Issue	Checked	Approved	Date

Author **XX** Drafting Check **XX** Project Manager **B. LESLIE**
Designer **P. MCKENNA** Design Check **XX** Project Director **XX**

Bar is one inch on original size sheet
0 1"

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Client **CITY OF IMPERIAL BEACH**
Project **BAYSHORE BIKEWAY RESILIENCY PROJECT**
Title **COVER SHEET**
Size **ANSI D**
Project No. **11228822** Date **NOVEMBER 2022** Scale **AS LISTED**
Sheet No. **G-001** Sheet **1 of 15**

Plot Date: 28 November 2022 - 12:00 PM Plotted By: Paula McKenna Filename: \\ghdnet\ghd\US\San Diego\Projects\561\11228822\Digital_Design\ACAD 2017\Sheets\11228822-GHD-0000-DWG-GN-0001 Cover Sheet.dwg

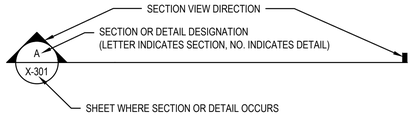
LEGEND:

GENERAL:

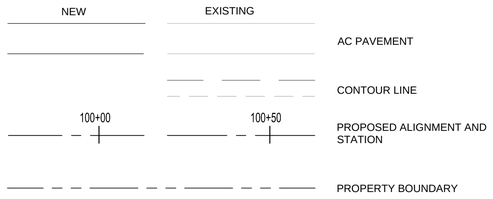
DELTA

WATER SURFACE

CENTERLINE



TOPOGRAPHY:



APPROXIMATE EARTHWORK QUANTITIES:

	CUT (CY)	FILL (CY)	NET (CY)
BAYSHORE BIKEWAY	22,887	19,708	3,179 (C)
MULTI-PURPOSED BASIN	19,389	37	19,352 (C)
TOTAL	42,276	19,745	22,531(C)

*ALL EARTHWORK QUANTITIES SHOWN ARE IN CUBIC YARDS.
CUT VOLUMES REPRESENT IN-SITU CONDITIONS AND FILL VOLUMES REPRESENT FULLY COMPACTED QUANTITIES.

TIDAL DATUM TABLE

TIDAL DATUM	STILLWATER ELEV. FT - NAVD 1988
MEAN LOWER LOW WATER (MLLW) [1]	-0.43
MEAN TIDE LEVEL (MTL) [1]	2.53
MEAN HIGHER HIGH WATER (MHHW) [2]	5.29
HIGHEST ASTRONOMICAL TIDE (HAT) [1]	7.29

[1] SAN DIEGO BAY (NOAA) STATION 9410170
[2] PROJECT AREA

NOTE: TIDAL WATER LEVELS ARE APPROXIMATE AND ARE PROVIDED FOR CONTRACTORS INFORMATION ONLY. ACTUAL WATER LEVELS AT THE TIME OF CONSTRUCTION MAY FLUCTUATE ABOVE AND BELOW THE LEVELS IN THIS TABLE. REFER TO GENERAL NOTES.

ABBREVIATIONS:

NOTE: CONTACT ENGINEER FOR ABBREVIATIONS NOT LISTED.

AB	AGGREGATE BASE
AC	ASPHALT CONCRETE
ACP	ASBESTOS CONCRETE PIPE
AGG	AGGREGATE
APPROX	APPROXIMATE
B	BERM
BFP	BACKFLOW PREVENTER
BMPS	BEST MANAGEMENT PRACTICES
CS	CENTERVILLE SLOUGH
CB	CENTERVILLE BERM
CBC	CALIFORNIA BUILDING CODE
CL, C	CENTER LINE
CLR	CLEAR
CM	CONSTRUCTION MANAGER
CMP	CORRUGATED METAL PIPE
CO	CLEANOUT
CONC	CONCRETE
CONT'D	CONTINUED
COORD	COORDINATE
COR	CONTRACTING OFFICER'S REPRESENTATIVE
COR	CORNER
CPP	CORRUGATED PLASTIC PIPE
CU	CUBIC
CY	CUBIC YARD
DIA	DIAMETER
DTL	DETAIL
DI	DROP (DRAINAGE) INLET
DI	DUCTILE IRON
DWG	DRAWING
E	EAST
(E)	EXISTING
EA	EACH
EC	END CURVE
EF	EACH FACE
EL, ELEV	ELEVATION
EG	EXISTING GRADE
ENGR	ENGINEER
EP	EDGE PAVING
EQ	EQUAL
ER	EDGE ROAD
EVC	END VERTICAL CURVE
EW	EACH WAY
FG	FINISH GRADE
FIN	FINISH
FL, F	FLOW LINE
FS	FINISH SURFACE
FT	FOOT OR FEET
G	GAS
GALV	GALVANIZED
GB	GRADE BREAK
GR	GRADE
GRD	GROUND
H, HORZ	HORIZONTAL
HMMP	HABITAT MITIGATION AND MONITORING PLAN
HYD	FIRE HYDRANT
INV/IE	INVERT ELEVATION
L	LENGTH
LF	LINEAR FOOT/FEET
LT	LEFT
LWD	LARGE WOOD OR LARGE WOODY DEBRIS
MAX	MAXIMUM
MIN	MINIMUM
MISC	MISCELLANEOUS
N	NORTHING
NO.	NUMBER
(N)	NEW
NIC	NOT IN CONTRACT
NTS	NOT TO SCALE
OC	ON CENTER
OD	OUTSIDE DIAMETER
OHE	OVERHEAD ELECTRIC
PE	POLYETHYLENE
PI	POINT OF INTERSECTION
PL, P	PROPERTY LINE
PP	POWER POLE
PCV	POLYVINYL CHLORIDE
PVI	POINT OF VERTICAL INTERSECTION
R	RIGHT
REQ'D	REQUIRED
RCP	REINFORCED CONCRETE PIPE
RSP	ROCK SLOPE PROTECTION
RT	RIGHT
R/W	RIGHT OF WAY
SCHED	SCHEDULE
SD	STORM DRAIN
SF	SQUARE FOOT/FEET
SHT	SHEET
SIM	SIMILAR
SST	STAINLESS STEEL
STA	STATION
STL	STEEL
SWPPP	STORM WATER POLLUTION PREVENTION PLAN
SY	SQUARE YARD
T	TELEPHONE
TBD	TO BE DETERMINED
TBM	TEMPORARY BENCH MARK
TYP	TYPICAL
UNO	UNLESS NOTED OTHERWISE
V, VERT	VERTICAL
W/	WITH
W	WIDE
W	WIDTH
W	WEST
XS	CROSS SECTION
YD	YARD

SHEET INDEX

TOPOGRAPHIC SURVEY NOTES

1. SOURCE TOPO DATA: 2016 U.S. GEOLOGICAL SURVEY COASTAL NATIONAL ELEVATION DATABASE (CoNED) TOPOBATHYMETRIC MODEL (NAVD88)
2. MAP PROJECTION: LAMBERT CONFORMAL CONIC
3. HORIZONTAL DATUM: BASED ON CALIFORNIA STATE PLANES COORDINATE SYSTEM (CA83-VIF), ZONE 6, NAVD 83
4. VERTICAL DATUM: BASED ON NAVD 83 DATUM

30% PRELIMINARY

No.	Issue	Checked	Approved	Date

Author **XX** Drafting Check **XX** Project Manager **B. LESLIE**
Designer **P. MCKENNA** Design Check **XX** Project Director **XX**

Bar is one inch on original size sheet
0 1"

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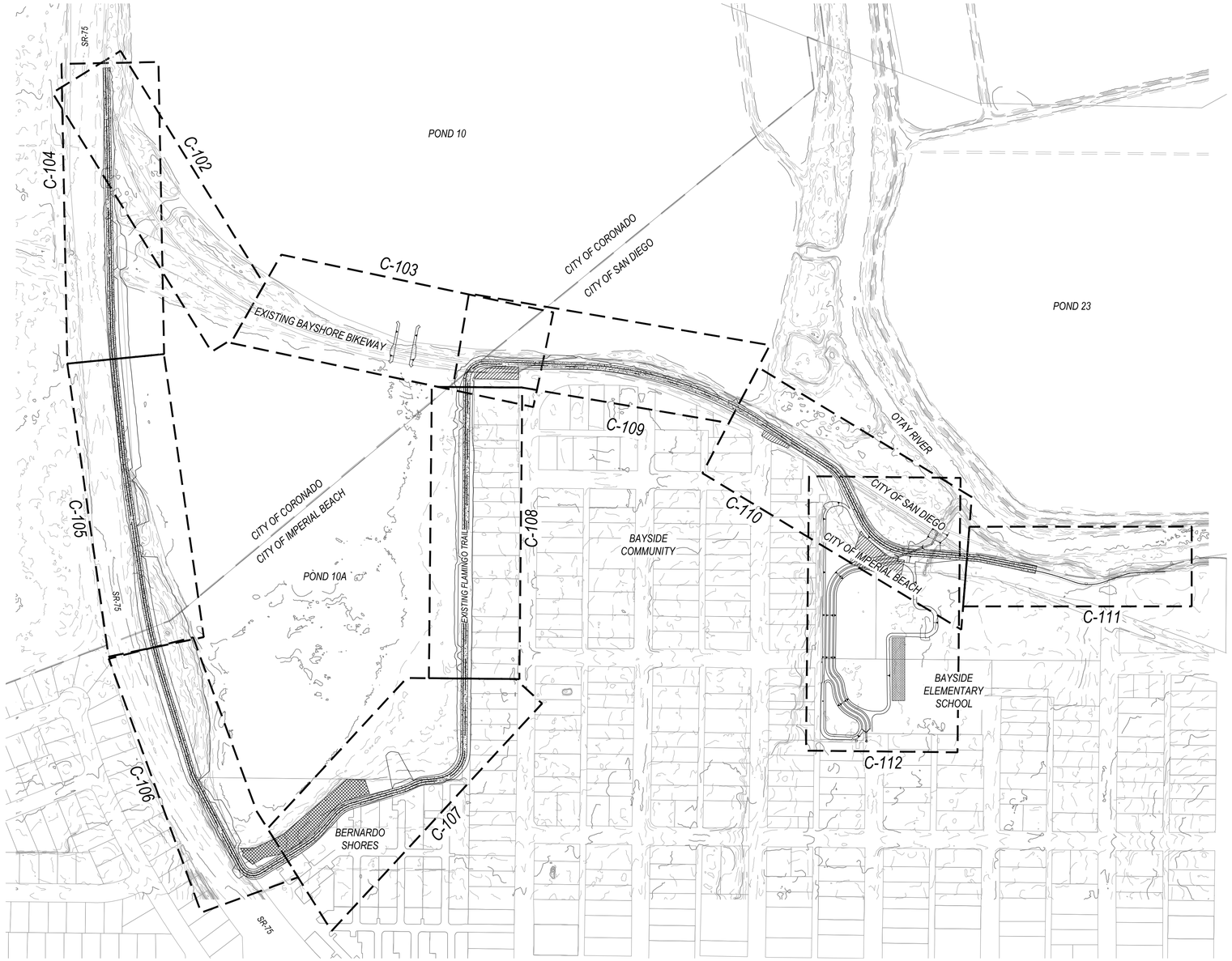
Client **CITY OF IMPERIAL BEACH**
Project **BAYSHORE BIKEWAY RESILIENCY PROJECT**
Title **ABBREVIATIONS, LEGEND, AND NOTES**
Size **ANSI D**
Project No. **11228822** Date **NOVEMBER 2022** Scale **AS LISTED**
Sheet No. **G-002** Sheet **2 of 15**

Plot Date: 28 November 2022 - 2:05 PM Plotted By: Paula McKenna Filename: \\ghdnet\ghd\US\San Diego\Projects\561\11228822\Digital_Design\ACAD 2017\Sheets\11228822-GHD-0000-DWG-GN-0002 Notes.dwg

SHEET GENERAL NOTES

1.



OVERALL SITE PLAN

1" = 200'

0 200' 400'

N

30% PRELIMINARY

No.	Issue	Checked	Approved	Date
Author	XX	Drafting Check	XX	Project Manager B. LESLIE
Designer	P. MCKENNA	Design Check	XX	Project Director XX

Bar is one inch on original size sheet
0 1"

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Client: CITY OF IMPERIAL BEACH

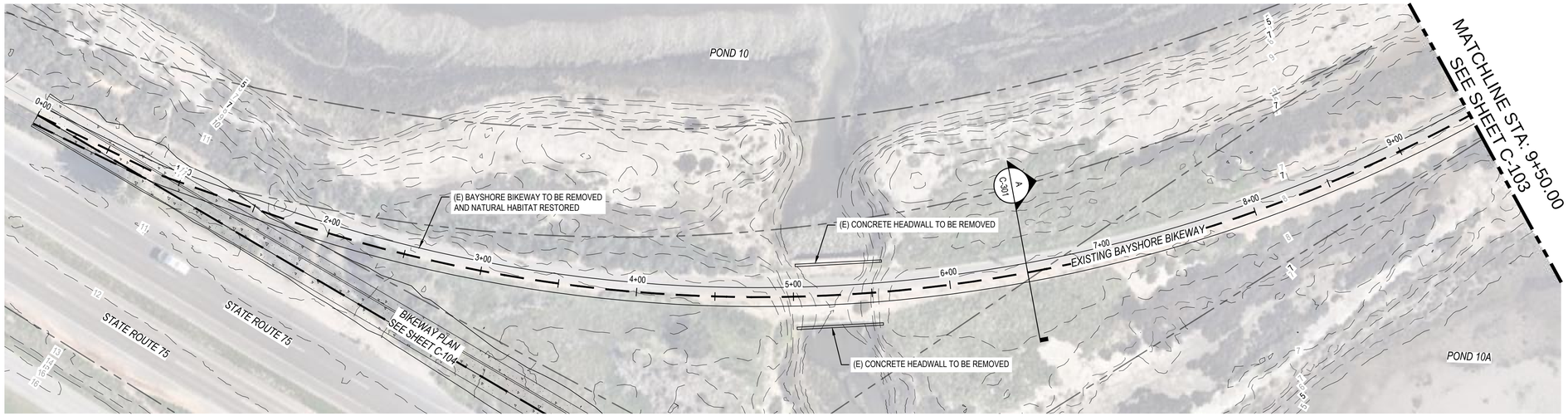
Project: BAYSHORE BIKEWAY RESILIENCY PROJECT

Title: OVERALL SITE PLAN AND SHEET INDEX

Size: ANSI D

Project No.	Date	Scale	Sheet No	Sheet
11228822	NOVEMBER 2022	1" = 200'	C-101	3 of 15

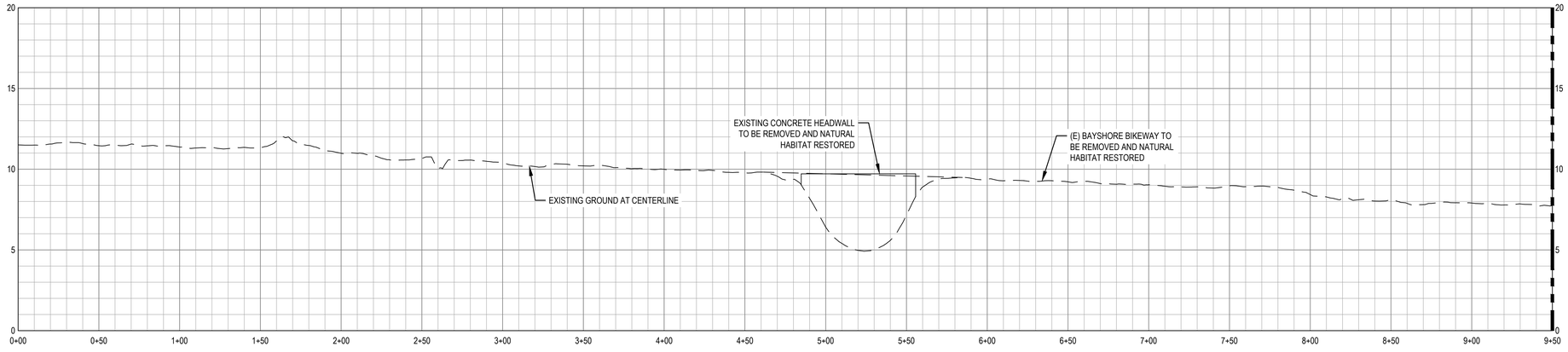
Plot Date: 28 November 2022 - 10:52 AM Plotted By: Paula McKenna Filename: \\ghdnet\ghd\US\San Diego\Projects\561\11228822\Digital_Design\ACAD 2017\Sheets\11228822-GHD-0000-DWG-CI-0101.dwg



EXISTING BIKEWAY PLAN

1" = 40'

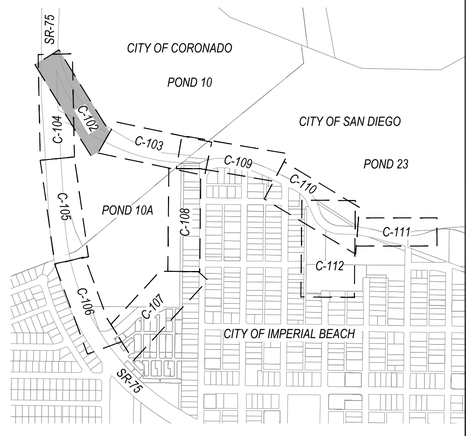
0 20' 40' 80'



EXISTING BIKEWAY PROFILE

HORZ: 1" = 40' VERT: 1" = 4'

0 20' 40' 80'



SHEET INDEX

SCALE: 1" = 700'

SHEET GENERAL NOTES

1.

30% PRELIMINARY

No.	Issue	Checked	Approved	Date
Author	XX	Drafting Check	XX	Project Manager	B. LESLIE
Designer	P. MCKENNA	Design Check	XX	Project Director	XX

Bar is one inch on original size sheet

0 1"

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2305 Historic Decatur Road, Suite 120
San Diego California 92106 USA
T 1 858 244 6977
www.ghd.com

Client: CITY OF IMPERIAL BEACH

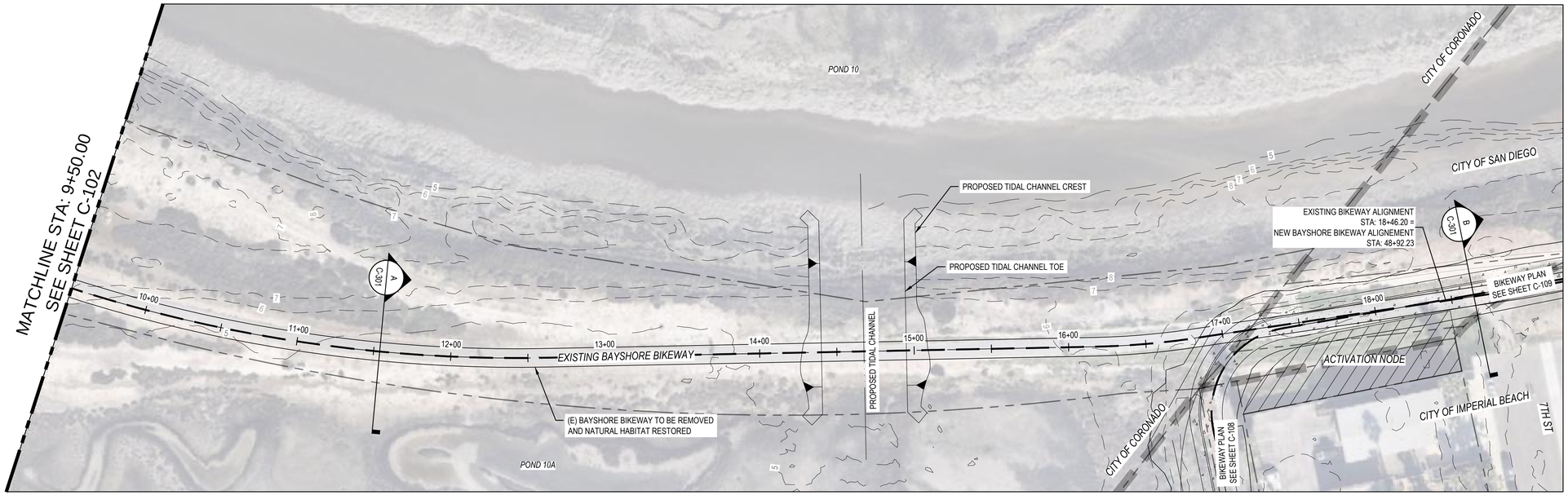
Project: BAYSHORE BIKEWAY RESILIENCY PROJECT

Title: DEMOLITION AND RESTORATION PLAN
STA: 0+00 TO 9+50

Size: ANSI D

Project No.	Date	Scale	Sheet No.	Sheet
11228822	NOVEMBER 2022	1" = 40'	C-102	4 of 15

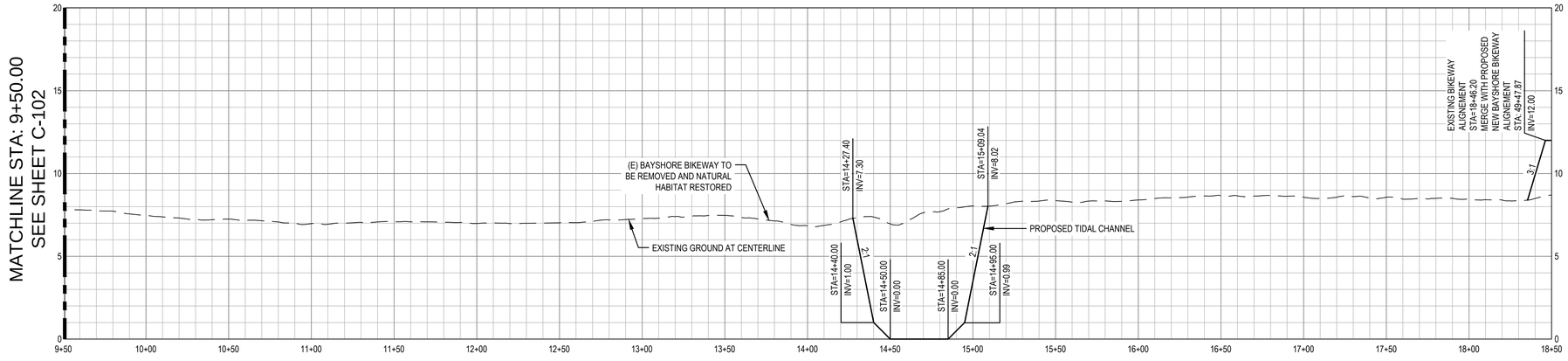
Plot Date: 28 November 2022 - 2:52 PM Plotted By: Paula McKenna Filename: \\ghdnet\ghd\US\San Diego\Projects\561\11228822\Digital_Design\ACAD 2017\Sheets\11228822-GHD-0000-DWG-CI-0102.dwg



EXISTING BIKEWAY PLAN

1" = 40'

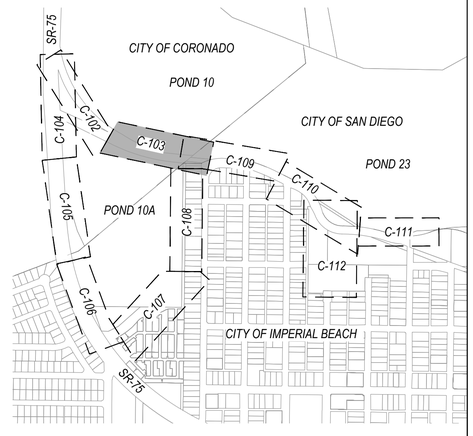
0 20' 40' 80'



EXISTING BIKEWAY PROFILE

HORZ: 1" = 40' VERT: 1" = 4'

0 20' 40' 80'



SHEET INDEX

SCALE: 1" = 700'

SHEET GENERAL NOTES

1.

30% PRELIMINARY

No.	Issue	Checked	Approved	Date
Author	XX	Drafting Check	XX	Project Manager B. LESLIE
Designer	P. MCKENNA	Design Check	XX	Project Director XX

Bar is one inch on original size sheet
0 1"

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Client CITY OF IMPERIAL BEACH

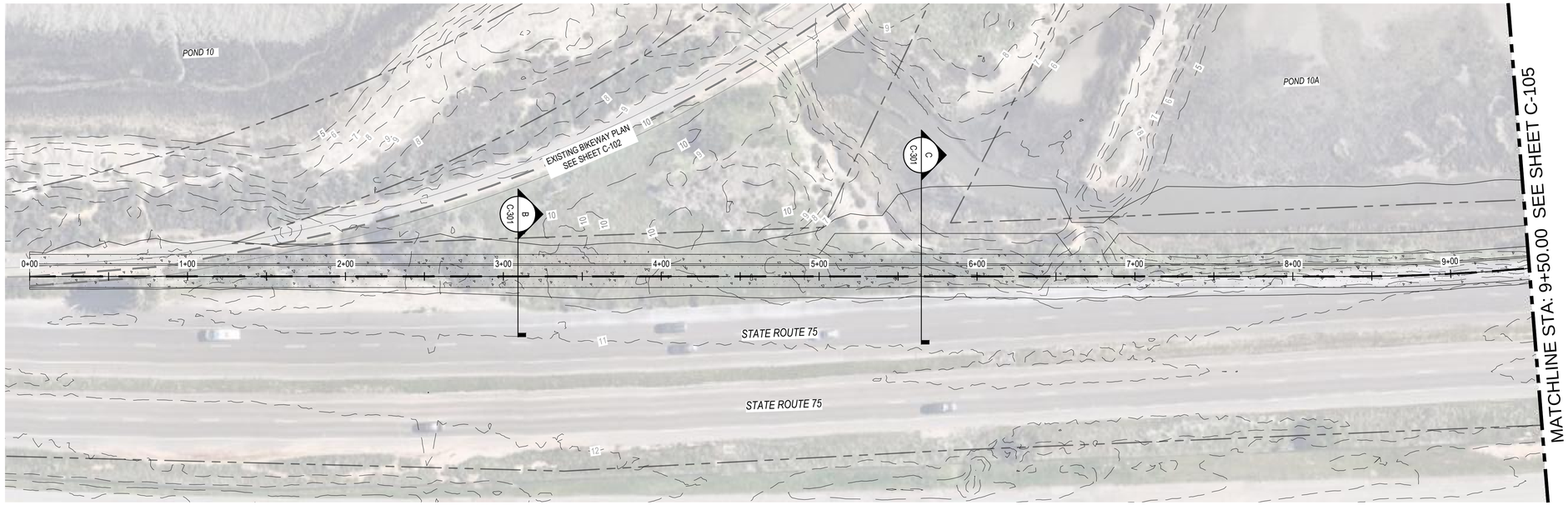
Project BAYSHORE BIKEWAY RESILIENCY PROJECT

Title DEMOLITION AND RESTORATION PLAN
STA: 9+50 TO 18+50

Size ANSI D

Project No.	Date	Scale	Sheet No.	Sheet
11228822	NOVEMBER 2022	1" = 40'	C-103	5 of 15

Plot Date: 28 November 2022 - 2:48 PM Plotted By: Paula McKenna Filename: \\ghdnet\ghd\US\San Diego\Projects\561\11228822\Digital_Design\ACAD 2017\Sheets\11228822-GHD-0000-DWG-CI-0103.dwg

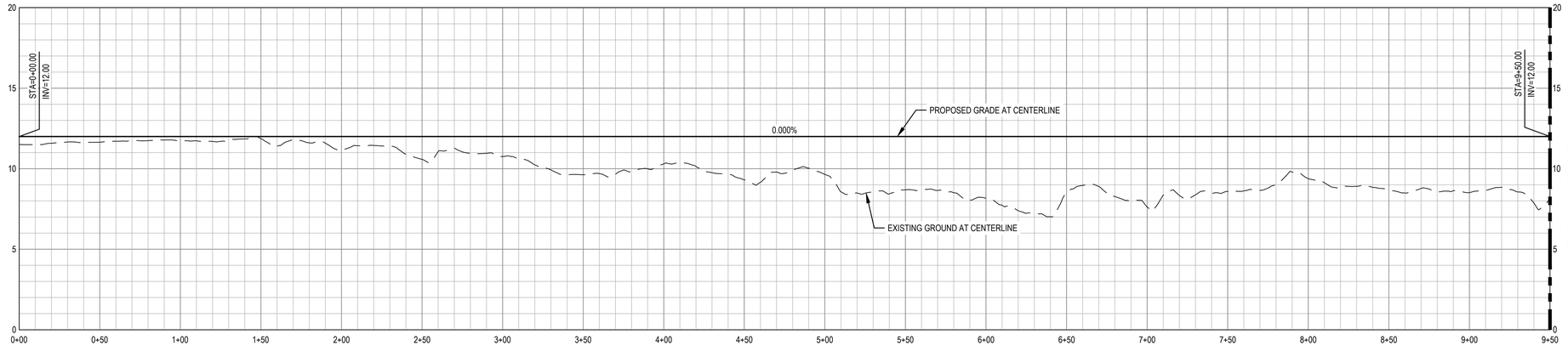


BIKEWAY PLAN

1" = 40'

0 20' 40' 80'

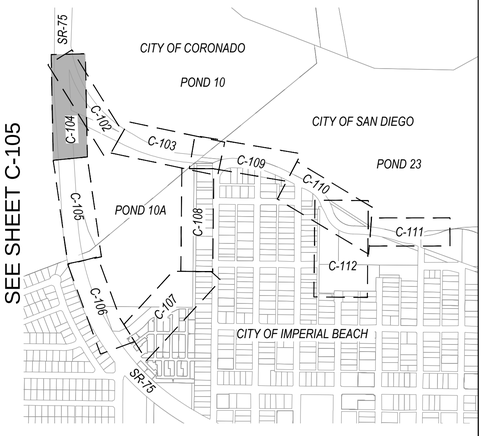
N



BIKEWAY PROFILE

HORZ: 1" = 40' VERT: 1" = 4'

0 20' 40' 80'



SHEET INDEX

SCALE: 1" = 700'

SHEET GENERAL NOTES

1.

30% PRELIMINARY

No.	Issue	Checked	Approved	Date
Author	XX	Drafting Check	XX	Project Manager	B. LESLIE
Designer	P. MCKENNA	Design Check	XX	Project Director	XX

Bar is one inch on original size sheet

0 1"

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Client: CITY OF IMPERIAL BEACH

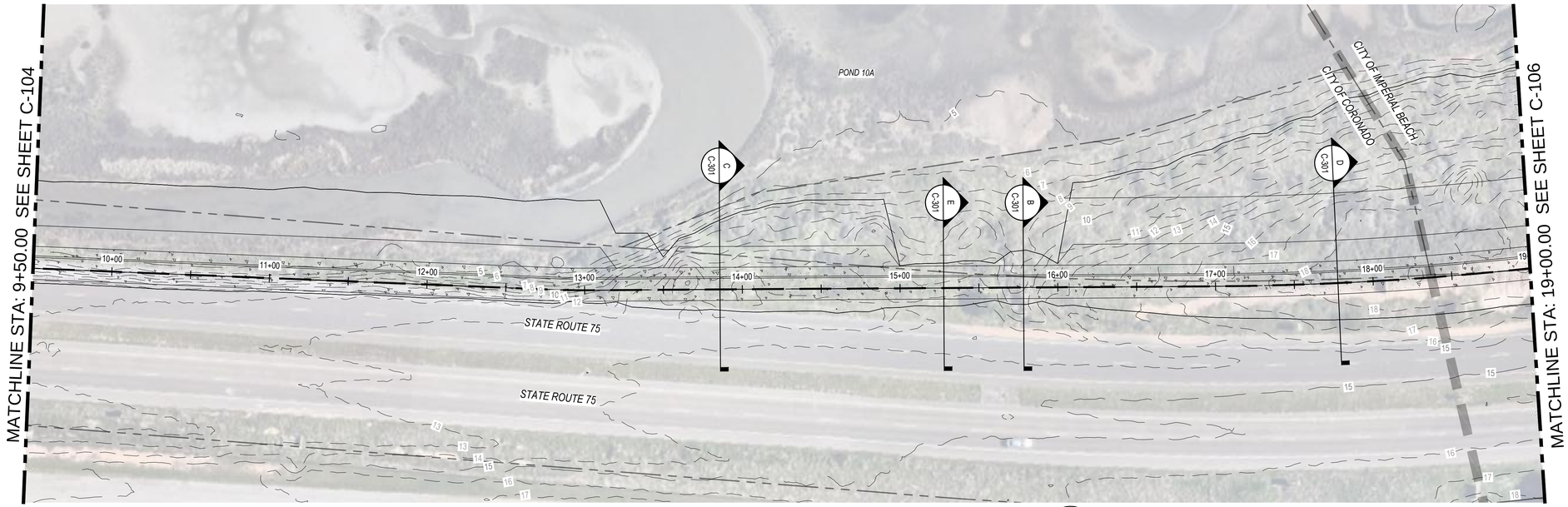
Project: BAYSHORE BIKEWAY RESILIENCY PROJECT

Title: BIKEWAY PLAN AND PROFILE STA: 0+00 TO 9+50

Size: ANSI D

Project No.	Date	Scale	Sheet No.	Sheet
11228822	NOVEMBER 2022	1" = 40'	C-104	6 of 15

Plot Date: 28 November 2022 - 2:45 PM Plotted By: Paula McKenna Filename: \\ghdnet\ghd\US\San Diego\Projects\561\11228822\Digital_Design\ACAD 2017\Sheets\11228822-GHD-0000-DWG-CI-0104.dwg

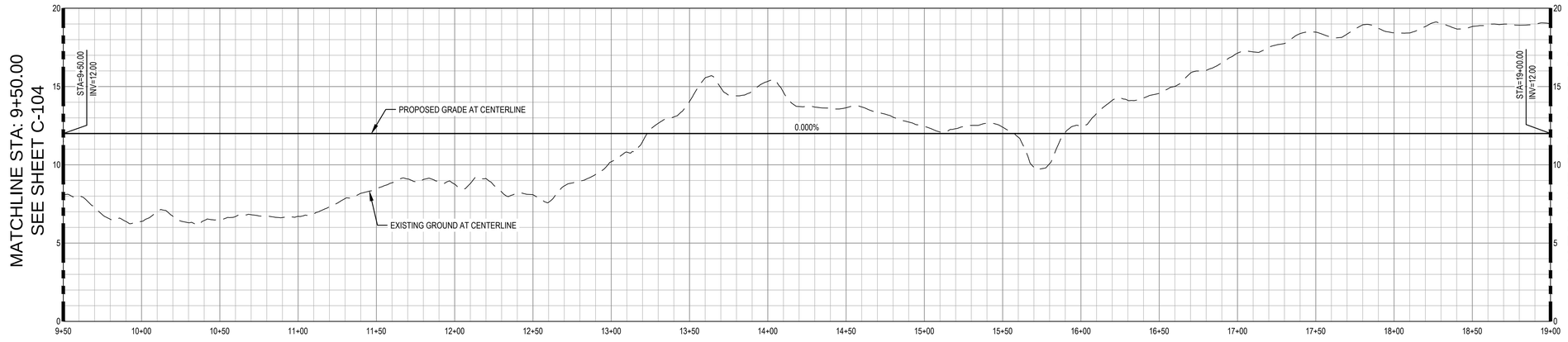


BIKEWAY PLAN

1" = 40'

0 20' 40' 80'

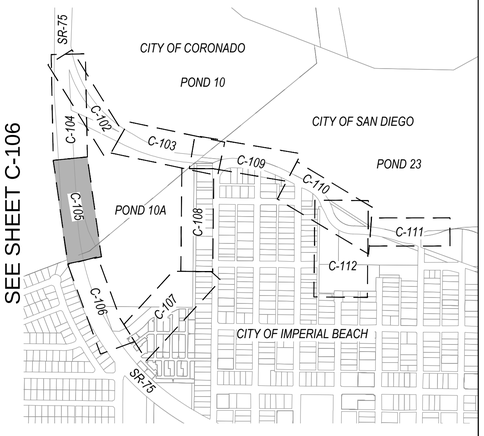
N



BIKEWAY PROFILE

HORZ: 1" = 40' VERT: 1" = 4'

0 20' 40' 80'



SHEET INDEX

SCALE: 1" = 700'

SHEET GENERAL NOTES

1.

30% PRELIMINARY

No.	Issue	Checked	Approved	Date
Author	XX	Drafting Check	XX	Project Manager	B. LESLIE
Designer	P. MCKENNA	Design Check	XX	Project Director	XX

Bar is one inch on original size sheet

0 1"

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Client: CITY OF IMPERIAL BEACH

Project: BAYSHORE BIKEWAY RESILIENCY PROJECT

Title: BIKEWAY PLAN AND PROFILE STA: 9+50 TO 19+00

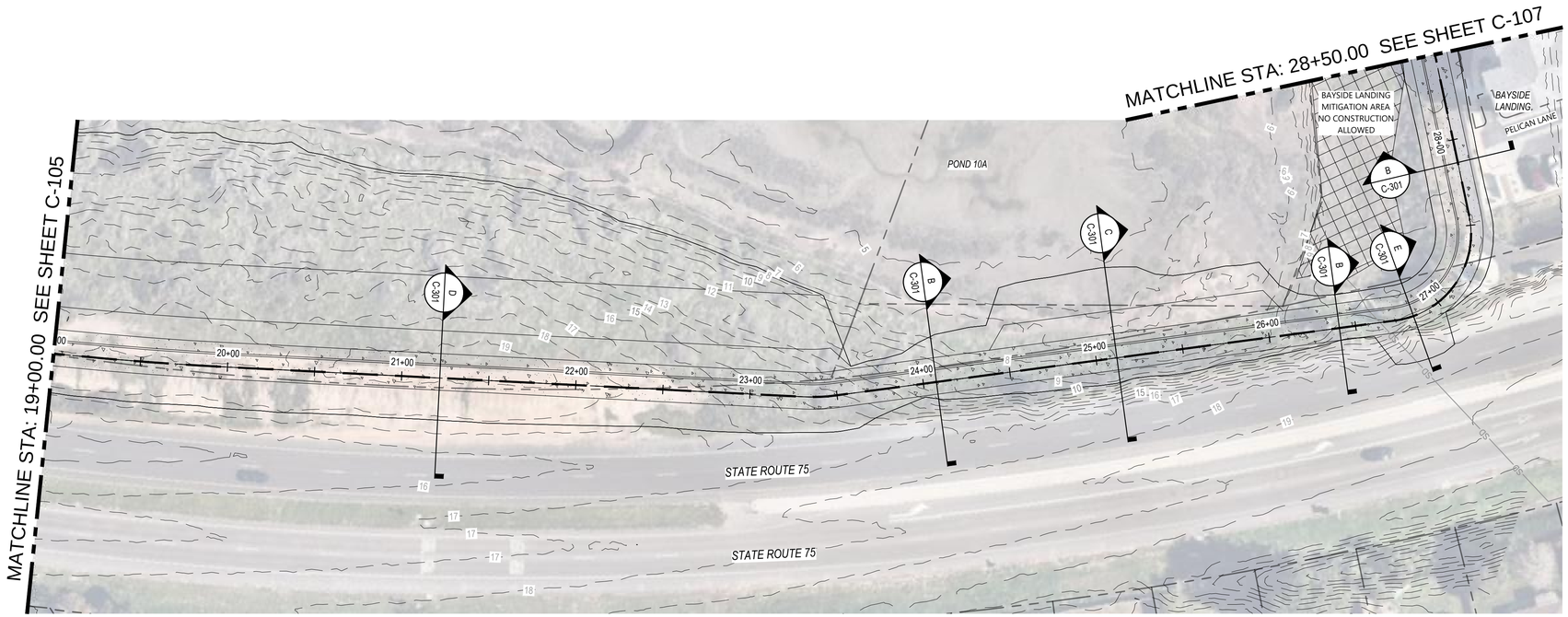
Size: ANSI D

Project No.	Date	Scale	Sheet No.	Sheet
11228822	NOVEMBER 2022	1" = 40'	C-105	7 of 15

Plot Date: 28 November 2022 - 2:41 PM Plotted By: Paula McKenna Filename: \\ghdnet\ghd\US\San Diego\Projects\561\11228822\Digital_Design\ACAD 2017\Sheets\11228822-GHD-0000-DWG-CI-0105.dwg

SHEET GENERAL NOTES

1.

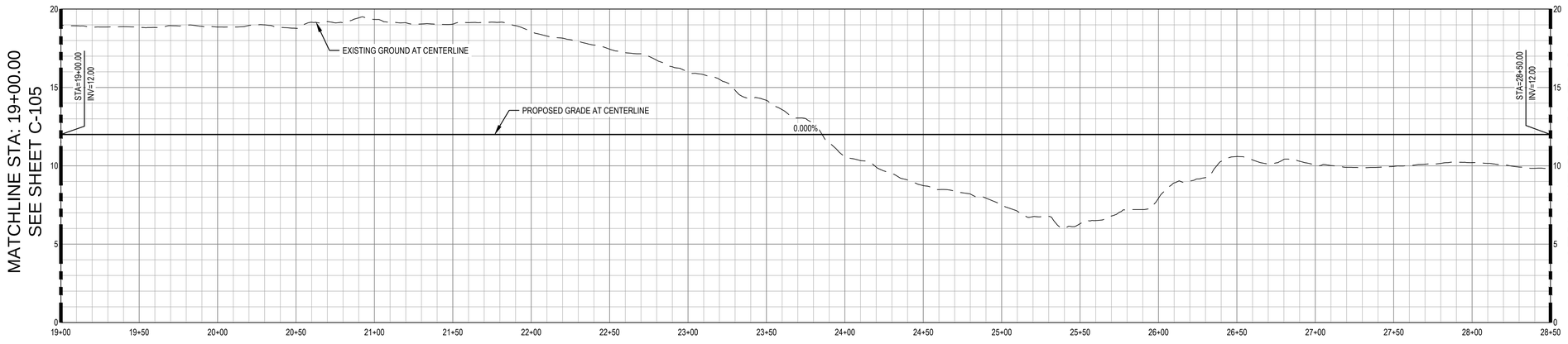


BIKEWAY PLAN

1" = 40'

0 20' 40' 80'

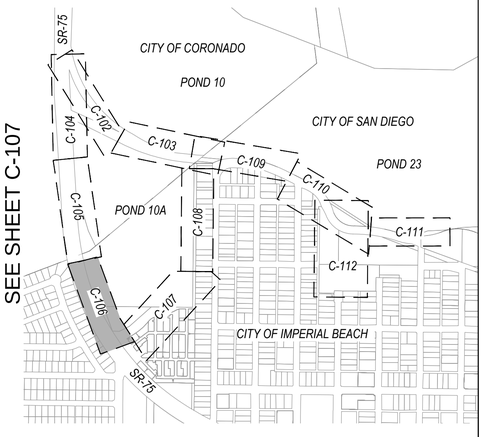
N



BIKEWAY PROFILE

HORZ: 1" = 40' VERT: 1" = 4'

0 20' 40' 80'



SHEET INDEX

SCALE: 1" = 700'

30% PRELIMINARY

No.	Issue	Checked	Approved	Date
Author	XX	Drafting Check	XX	Project Manager	B. LESLIE
Designer	P. MCKENNA	Design Check	XX	Project Director	XX

Bar is one inch on original size sheet

0 1"

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Client **CITY OF IMPERIAL BEACH**

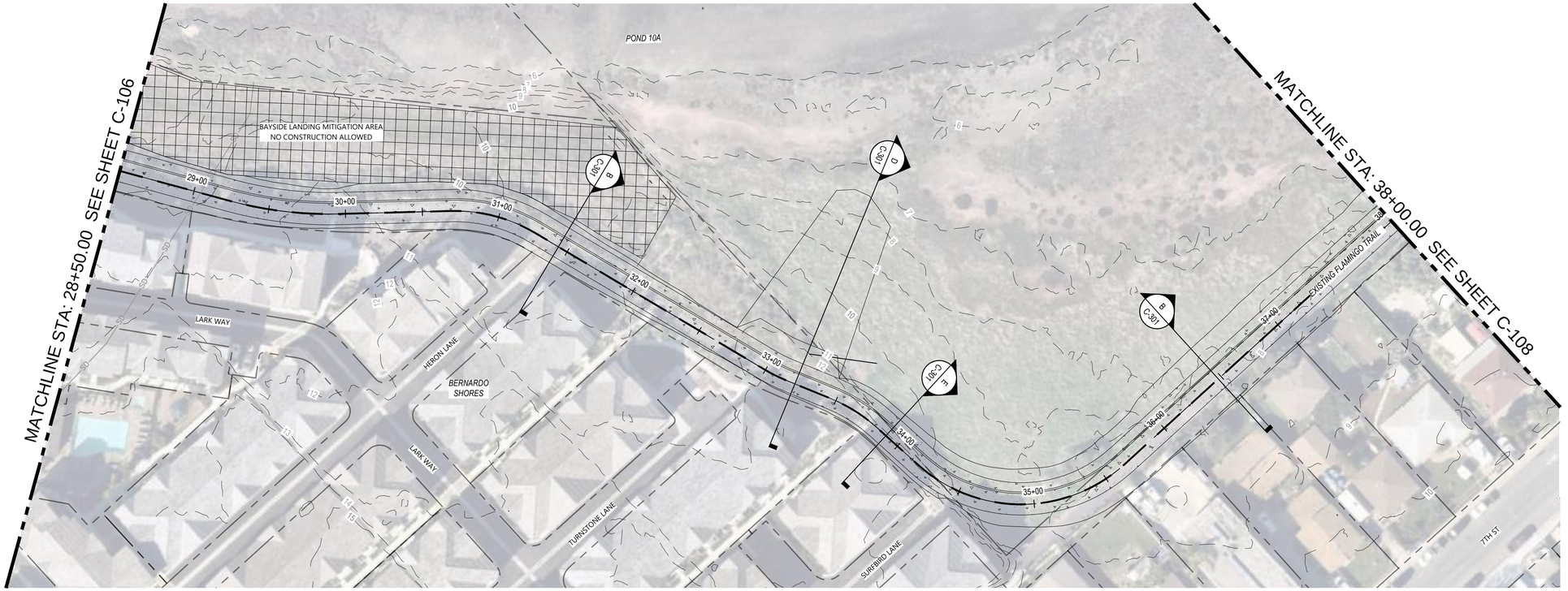
Project **BAYSHORE BIKEWAY RESILIENCY PROJECT**

Title **BIKEWAY PLAN AND PROFILE STA: 19+00 TO 28+50**

Size **ANSI D**

Project No.	Date	Scale	Sheet No.	Sheet
11228822	NOVEMBER 2022	1" = 40'	C-106	8 of 15

Plot Date: 28 November 2022 - 3:26 PM Plotted By: Paula McKenna Filename: \\ghdnet\ghd\US\San Diego\Projects\561\11228822\Digital_Design\ACAD 2017\Sheets\11228822-GHD-0000-DWG-CI-0106.dwg

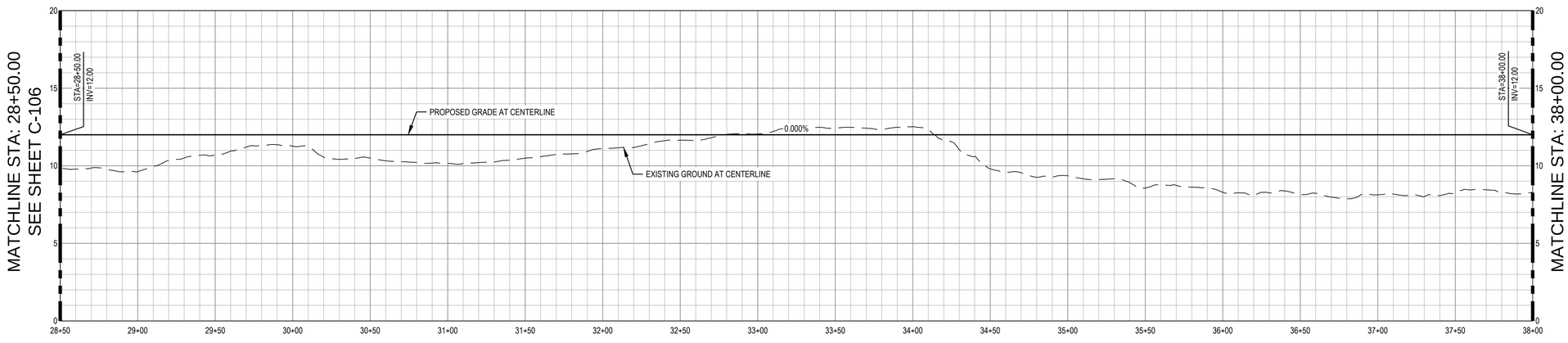


BIKEWAY PLAN

1" = 40'

0 20' 40' 80'

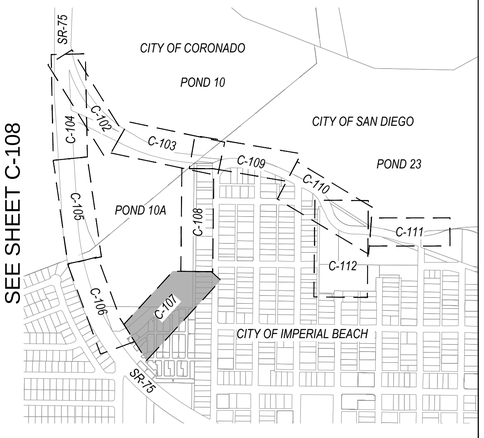
N



BIKEWAY PROFILE

HORZ: 1" = 40' VERT: 1" = 4'

0 20' 40' 80'



SHEET INDEX

SCALE: 1" = 700'

SHEET GENERAL NOTES

1.

30% PRELIMINARY

No.	Issue	Checked	Approved	Date
Author	XX	Drafting Check	XX	Project Manager	B. LESLIE
Designer	P. MCKENNA	Design Check	XX	Project Director	XX

Bar is one inch on original size sheet
0 1"

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Client: CITY OF IMPERIAL BEACH

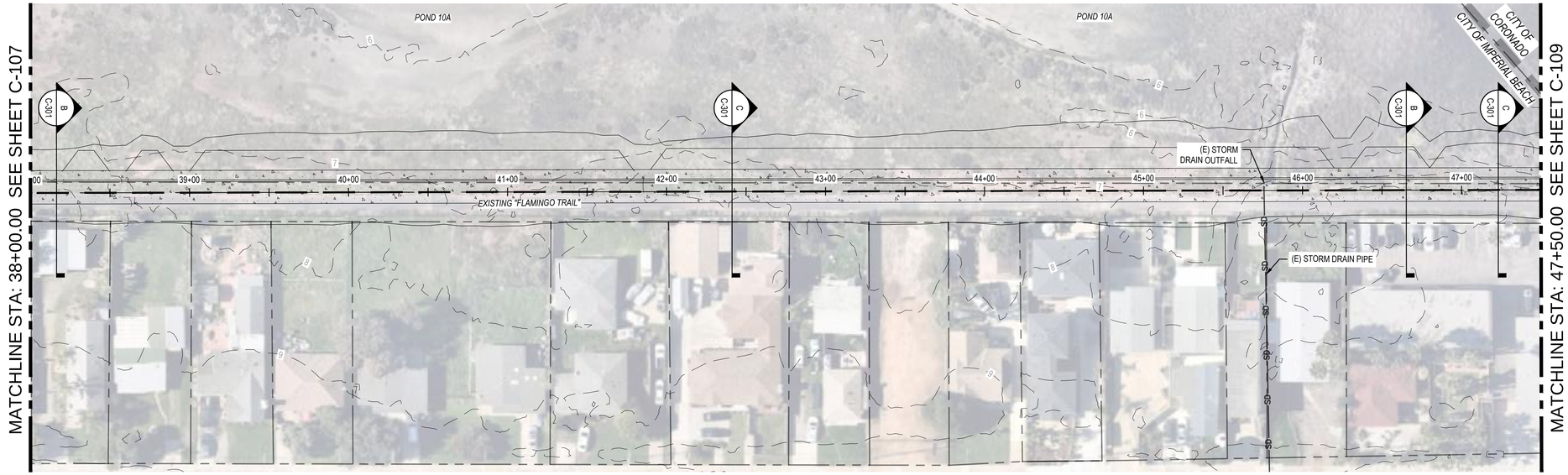
Project: BAYSHORE BIKEWAY RESILIENCY PROJECT

Title: BIKEWAY PLAN AND PROFILE STA: 28+50 TO 38+00

Size: ANSI D

Project No.	Date	Scale	Sheet No.	Sheet
11228822	NOVEMBER 2022	1" = 40'	C-107	9 of 15

Plot Date: 28 November 2022 - 3:23 PM Plotted By: Paula McKenna Filename: \\ghdnet\ghd\US\San Diego\Projects\561\11228822\Digital_Design\ACAD 2017\Sheets\11228822-GHD-0000-DWG-CI-0107.dwg

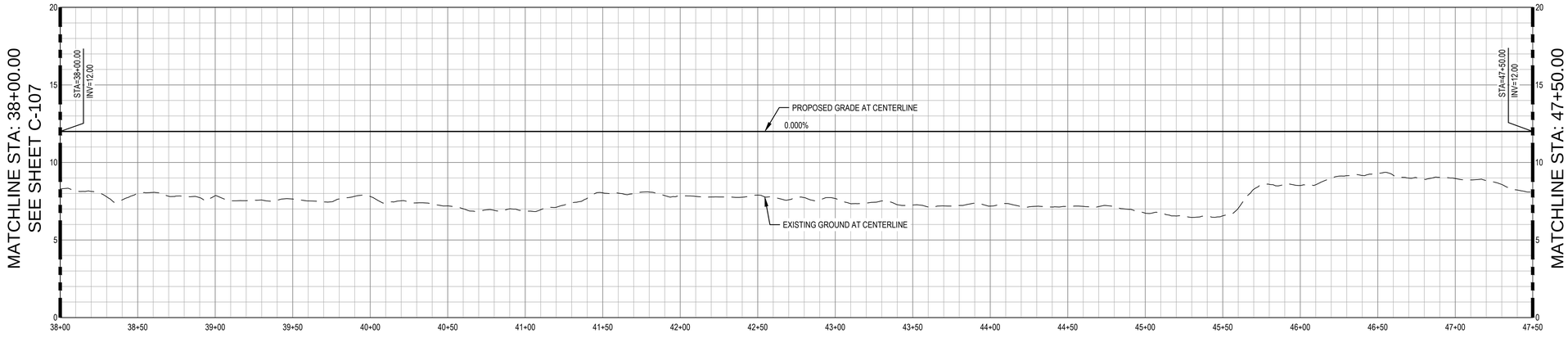


BIKEWAY PLAN

1" = 40'

0 20' 40' 80'

N



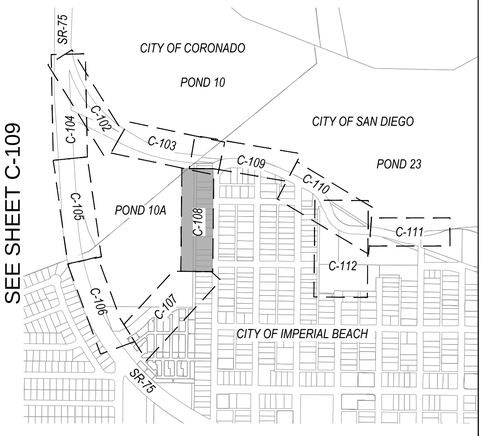
BIKEWAY PROFILE

HORZ: 1" = 40' VERT: 1" = 4'

0 20' 40' 80'

SHEET GENERAL NOTES

1.



SHEET INDEX

SCALE: 1" = 700'

30% PRELIMINARY

No.	Issue	Checked	Approved	Date
Author	XX	Drafting Check	XX	Project Manager B. LESLIE
Designer	P. MCKENNA	Design Check	XX	Project Director XX

Bar is one inch on original size sheet

0 1"

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San Diego California 92106 USA
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www.ghd.com

Client: CITY OF IMPERIAL BEACH

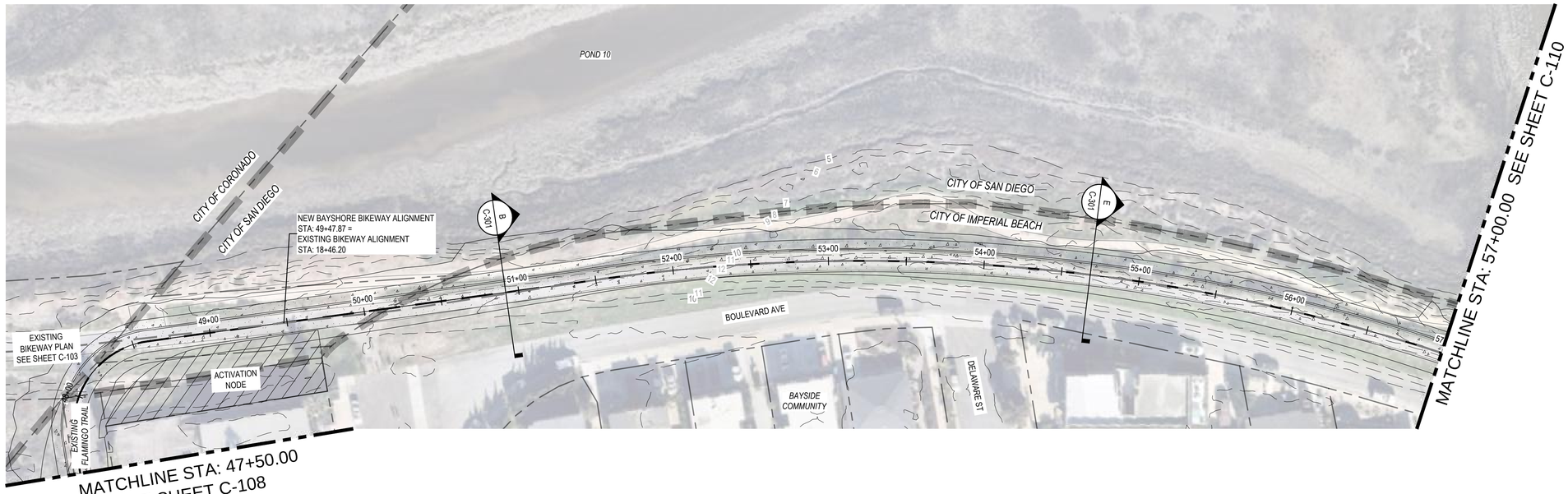
Project: BAYSHORE BIKEWAY RESILIENCY PROJECT

Title: BIKEWAY PLAN AND PROFILE STA: 38+00 TO 47+50

Size: ANSI D

Project No.	Date	Scale	Sheet No.	Sheet
11228822	NOVEMBER 2022	1" = 40'	C-108	10 of 15

Plot Date: 28 November 2022 - 3:21 PM Plotted By: Paula McKenna Filename: \\ghdnet\ghd\US\San Diego\Projects\561\11228822\Digital_Design\ACAD 2017\Sheets\11228822-GHD-0000-DWG-CI-0108.dwg

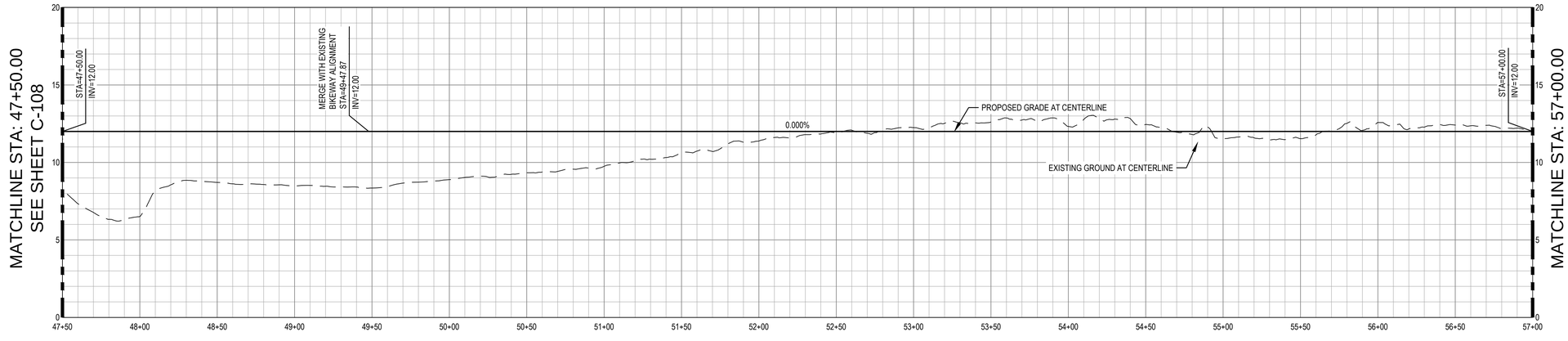


BIKEWAY PLAN

1" = 40'

0 20' 40' 80'

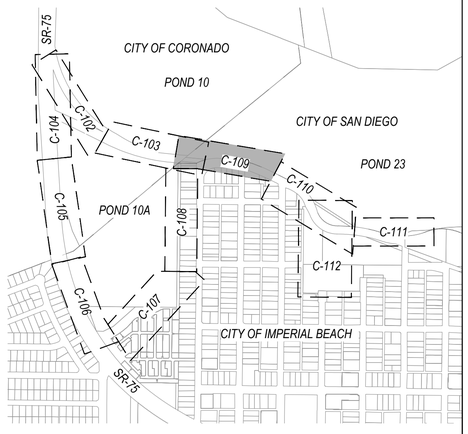
N



BIKEWAY PROFILE

HORZ: 1" = 40' VERT: 1" = 4'

0 20' 40' 80'



SHEET INDEX

SCALE: 1" = 700'

SHEET GENERAL NOTES

1.

30% PRELIMINARY

No.	Issue	Checked	Approved	Date
Author	XX	Drafting Check	XX	Project Manager B. LESLIE
Designer	P. MCKENNA	Design Check	XX	Project Director XX

Bar is one inch on original size sheet
0 1"

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Client **CITY OF IMPERIAL BEACH**

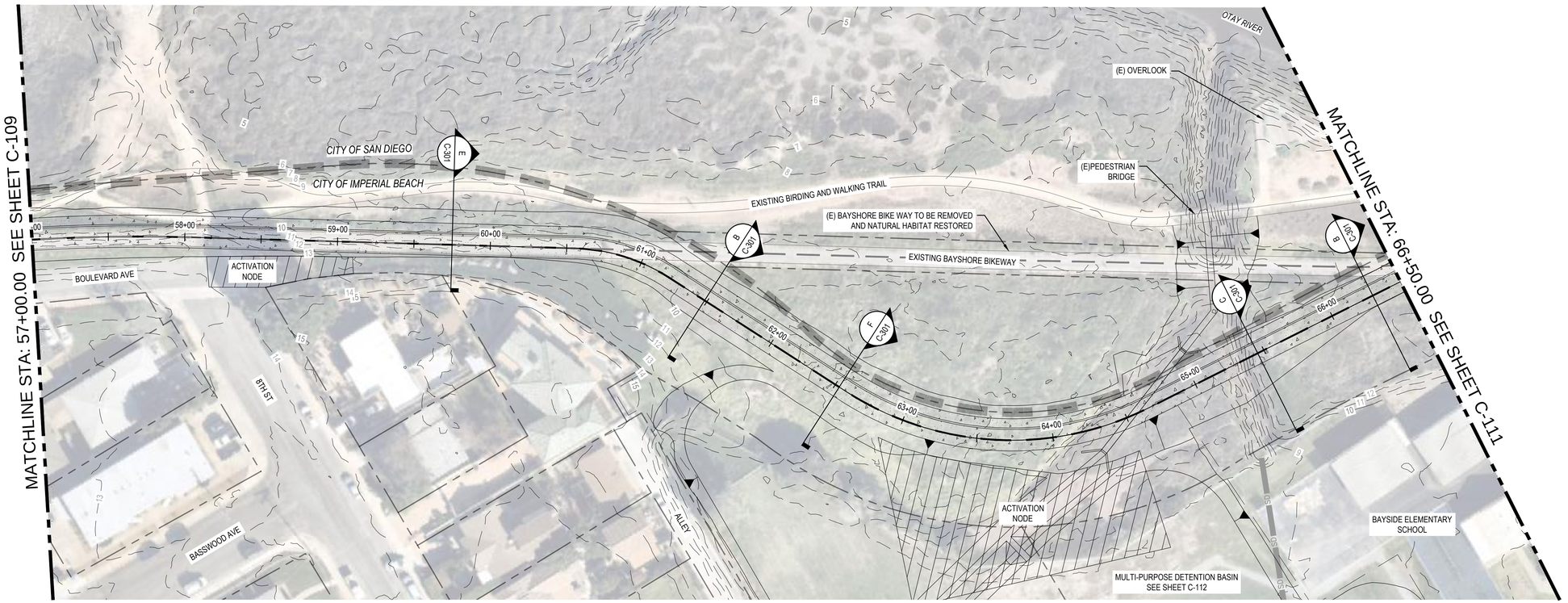
Project **BAYSHORE BIKEWAY RESILIENCY PROJECT**

Title **BIKEWAY PLAN AND PROFILE STA: 47+50 TO 57+00**

Size **ANSI D**

Project No.	Date	Scale	Sheet No.	Sheet
11228822	NOVEMBER 2022	1" = 40'	C-109	11 of 15

Plot Date: 28 November 2022 - 3:40 PM Plotted By: Paula McKenna Filename: \\ghdnet\ghd\US\San Diego\Projects\561\11228822\Digital_Design\ACAD 2017\Sheets\11228822-GHD-0000-DWG-CI-0109.dwg

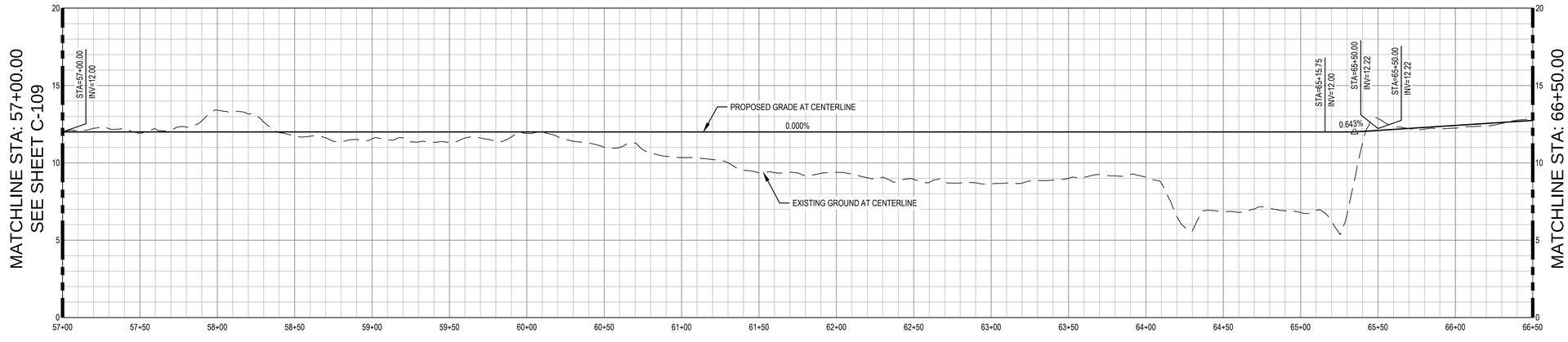


BIKEWAY PLAN

1" = 40'

0 20' 40' 80'

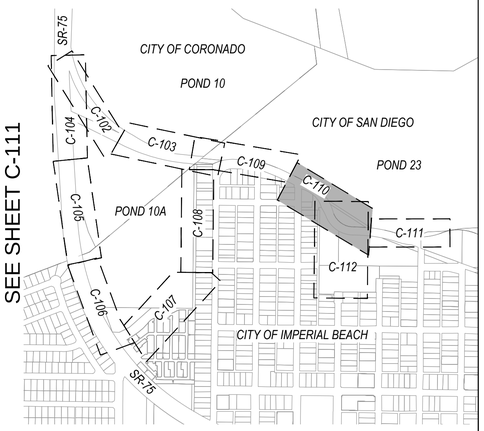
N



BIKEWAY PROFILE

HORZ: 1" = 40' VERT: 1" = 4'

0 20' 40' 80'



SHEET INDEX

SCALE: 1" = 700'

SHEET GENERAL NOTES

1.

30% PRELIMINARY

No.	Issue	Checked	Approved	Date
Author	XX	Drafting Check	XX	Project Manager B. LESLIE
Designer	P. MCKENNA	Design Check	XX	Project Director XX

Bar is one inch on original size sheet

0 1"

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Client: CITY OF IMPERIAL BEACH

Project: BAYSHORE BIKEWAY RESILIENCY PROJECT

Project No. 11228822 | Date NOVEMBER 2022 | Scale 1" = 40'

Title: BIKEWAY PLAN AND PROFILE STA: 57+00 TO 66+50

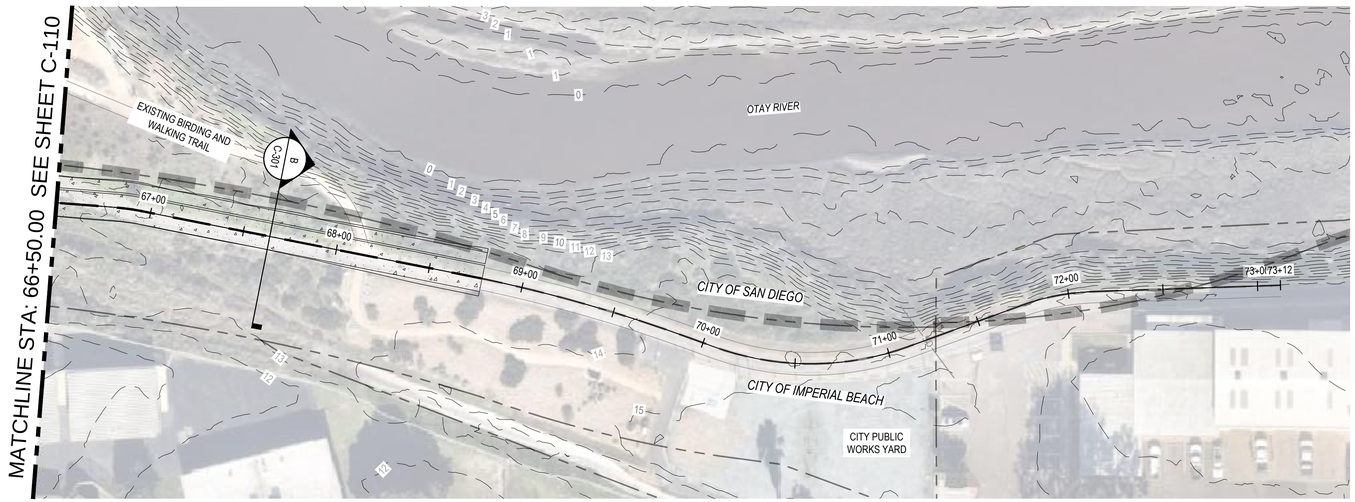
Size: ANSI D

Sheet No. C-110 | Sheet 12 of 15

Plot Date: 28 November 2022 - 3:15 PM Plotted By: Paula McKenna Filename: \\ghdnet\ghd\US\San Diego\Projects\561\11228822\Digital_Design\ACAD 2017\Sheets\11228822-GHD-0000-DWG-CI-0110.dwg

SHEET GENERAL NOTES

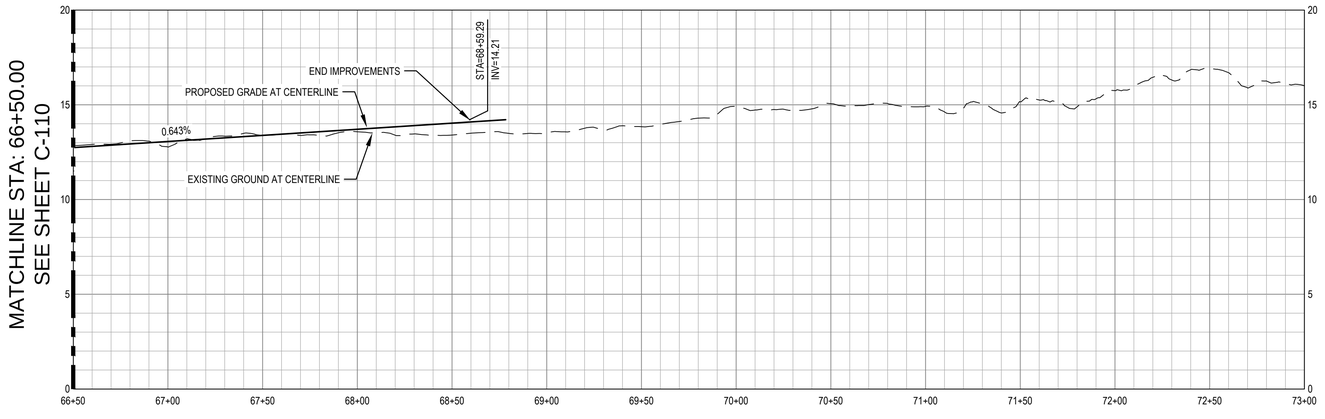
1.



BIKEWAY PLAN

1" = 40'

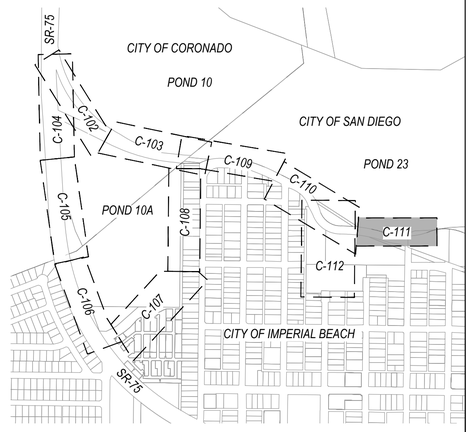
0 20' 40' 80'



BIKEWAY PROFILE

HORZ: 1" = 40' VERT: 1" = 4'

0 20' 40' 80'



SHEET INDEX

SCALE: 1" = 700'

30% PRELIMINARY

No.	Issue	Checked	Approved	Date
Author	XX	Drafting Check	XX	Project Manager	B. LESLIE
Designer	P. MCKENNA	Design Check	XX	Project Director	XX

Bar is one inch on original size sheet

0 1"

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Client **CITY OF IMPERIAL BEACH**

Project **BAYSHORE BIKEWAY RESILIENCY PROJECT**

Title **BIKEWAY PLAN AND PROFILE STA: 66+50 TO END**

Size **ANSI D**

Project No.	Date	Scale	Sheet No.	Sheet
11228822	NOVEMBER 2022	1" = 40'	C-111	13 of 15

Plot Date: 28 November 2022 - 3:13 PM Plotted By: Paula McKenna Filename: \\ghdnet\ghd\US\San Diego\Projects\561\11228822\Digital_Design\ACAD 2017\Sheets\11228822-GHD-0000-DWG-CI-0111.dwg

SHEET GENERAL NOTES

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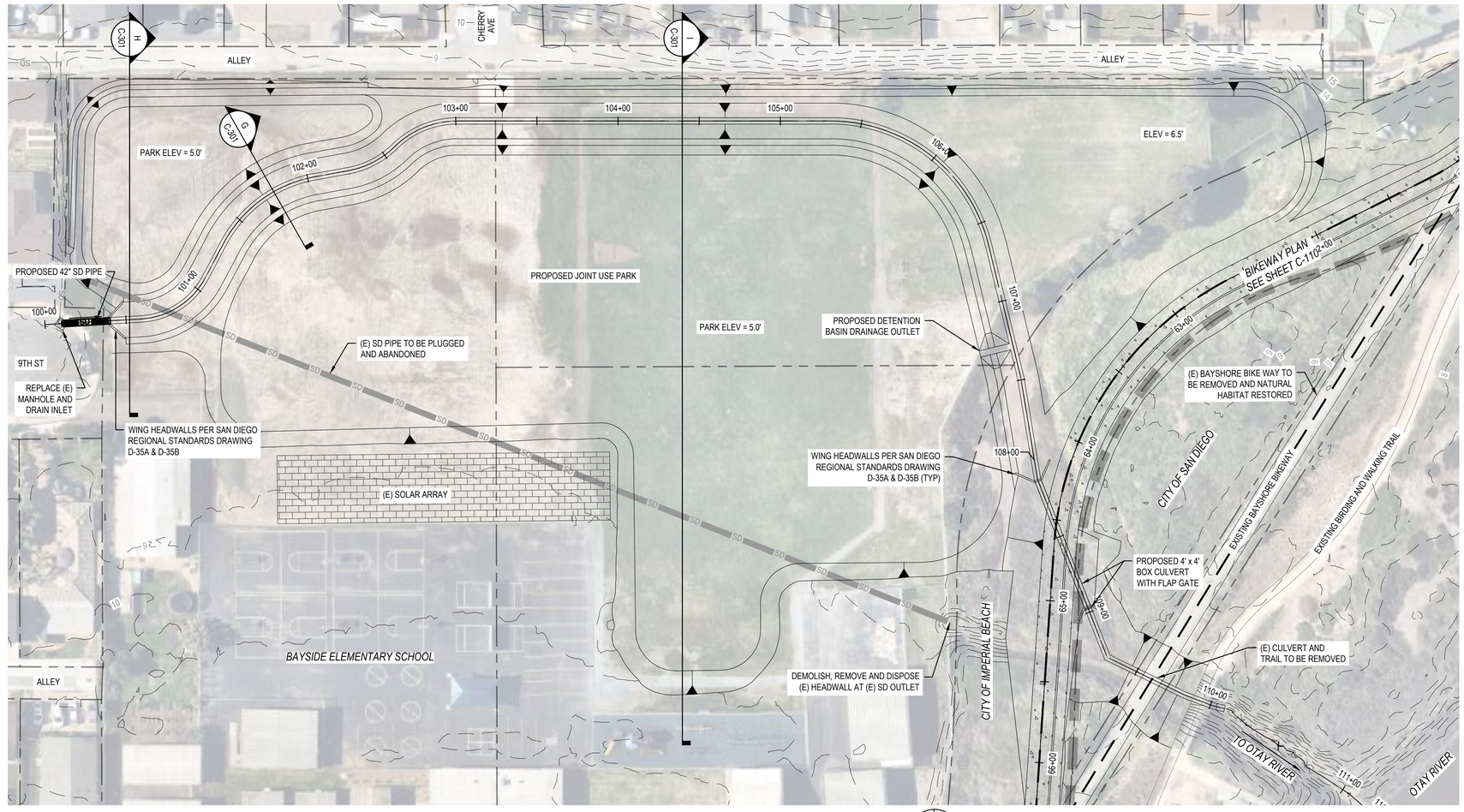
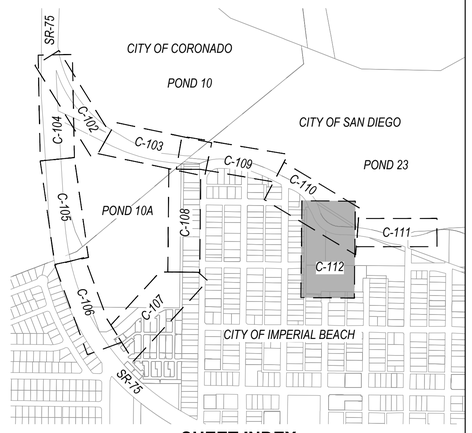


MULTI-PURPOSE DETENTION BASIN PLAN

1" = 40'

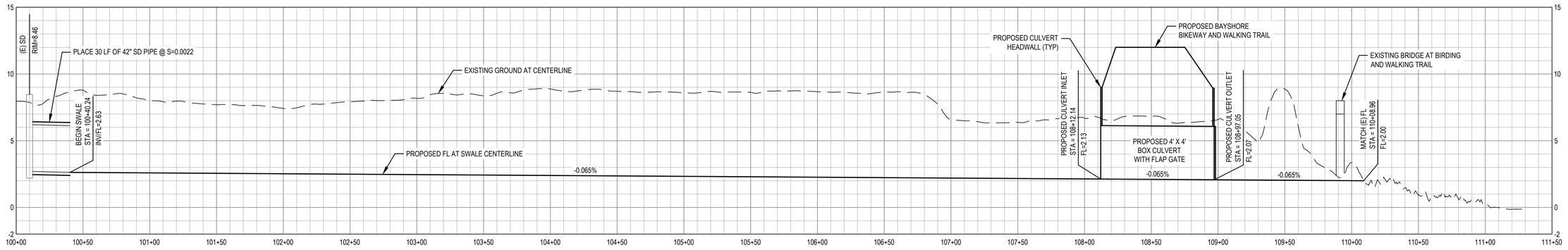
0 20' 40' 80'

N



SHEET INDEX

SCALE: 1" = 700'



MULTI-PURPOSE DETENTION BASIN SWALE PROFILE

1" = 40'

20' 40' 80'

30% PRELIMINARY

No.	Issue	Checked	Approved	Date
Author	XX	Drafting Check	XX	Project Manager B. LESLIE
Designer	P. MCKENNA	Design Check	XX	Project Director XX

Bar is one inch on original size sheet

0 1"

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Client CITY OF IMPERIAL BEACH

Project BAYSHORE BIKEWAY RESILIENCY PROJECT

Project No. 11228822 | Date NOVEMBER 2022 | Scale 1" = 40'

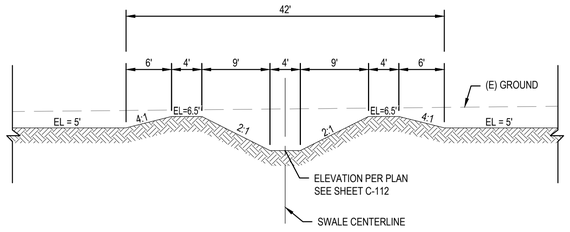
Title MULTI-PURPOSE DETENTION BASIN AND SWALE PROFILE

Size ANSI D

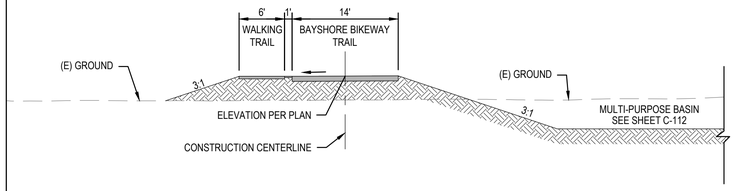
Sheet No. C-112

Sheet 14 of 15

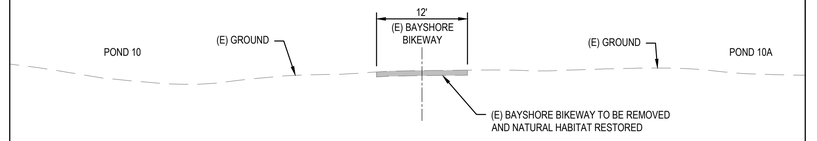
Plot Date: 30 November 2022 - 4:57 PM
Plotted By: Paula McKenna
Filename: \\ghdnet\ghd\US\San Diego\Projects\561\11228822\Digital_Design\ACAD 2017\Sheets\11228822-GHD-0000-DWG-CI-0112.dwg



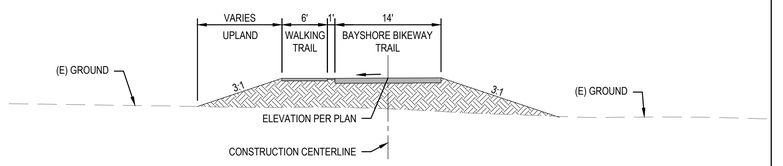
G **SECTION G-G (TYPICAL SWALE SECTION)** SCALE 1" = 10'



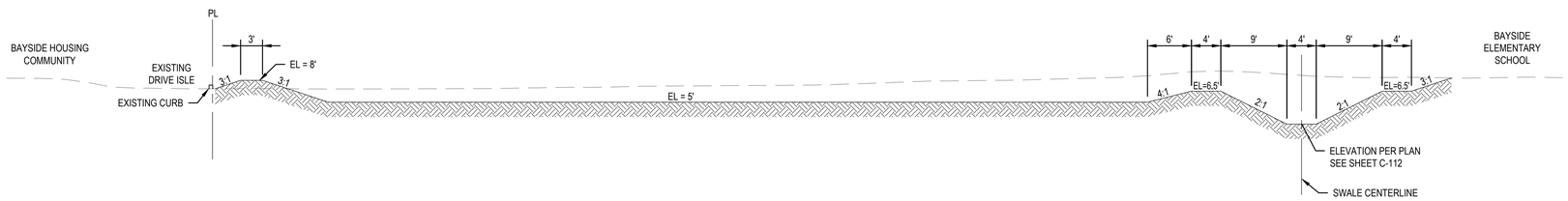
F **SECTION F-F** SCALE 1" = 10'



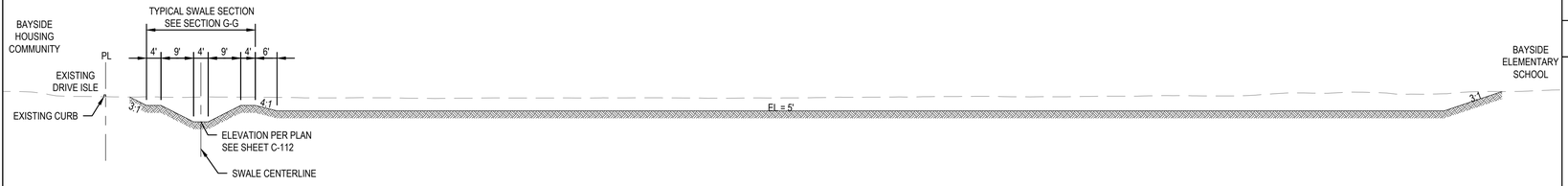
A **SECTION A-A - EXISTING BAYSHORE BIKEWAY** STA: 0+00 - 18+46.20 SCALE 1" = 10'



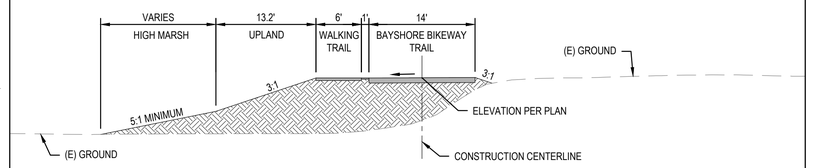
B **SECTION B-B** STA: 0+00-5+00; 15+60-16+00; 23+50-24+40; 26+10-26+60; 27+00-32+70; 34+45-38+20; 46+20-47+10; 47+90-52+10; 59+90-64.35; 65+60-END SCALE 1" = 10'



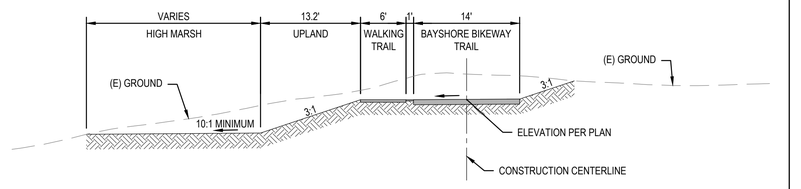
H **SECTION H-H (MULTI-PURPOSE BASIN)** SCALE 1" = 10'



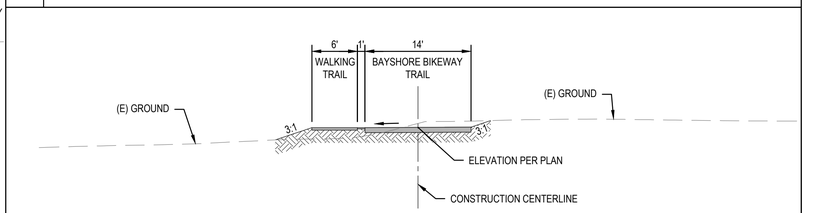
I **SECTION I-I (MULTI-PURPOSE BASIN)** SCALE 1" = 20'



C **SECTION C-C** STA: 5+00-1500; 24+40-26+10; 38+20-46+20; 47+10-47+90; 64+35-65+60 SCALE 1" = 10'



D **SECTION D-D** STA: 16+00-23+50; 32+70-33+46.50 SCALE 1" = 10'



E **SECTION E-E** STA: 15+00-15+60; 26+60-27+00; 33+46.50-34+45; 52+10-59+90 SCALE 1" = 10'

30% PRELIMINARY

No.	Issue	Checked	Approved	Date
Author	XX	Drafting Check	XX	Project Manager	B. LESLIE
Designer	P. MCKENNA	Design Check	XX	Project Director	XX

Bar is one inch on original size sheet
0 1"

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Client **CITY OF IMPERIAL BEACH**

Project **BAYSHORE BIKEWAY RESILIENCY PROJECT**

Title **TYPICAL SECTIONS**

Size **ANSI D**

Project No.	Date	Scale	Sheet No	Sheet
11228822	NOVEMBER 2022	1" = 40'	C-301	15 of 15

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Appendix C

Multi-Criteria Analysis Results

Bayshore Bikeway
Feasibility Analysis for Imperial Beach Bayshore Bikeway Project Alternatives
Multi Criteria Analysis Weighted Scoring Matrix

Scoring	1	2	3	4	5
	Low		Average		High

Importance	Criteria	Basis of Evaluation	No Project		Alternative 1 Elevate in Place		Alternative 2 Replace with Bridge		Alternative 3 Remove and Reroute		Comments
			Score (out of 5)	Weighted Score	Score (out of 5)	Weighted Score	Score (out of 5)	Weighted Score	Score (out of 5)	Weighted Score	
25%	**Habitat Enhancement**										
25%	**Habitat Enhancement Area**	Does the alt. enhance and diversify habitat types? (1 = little or no enhance/diversification, 5 = maximum enhancement/diversification potential)	1	1%	2	3%	4	5%	5	6%	Alt. 1 provides the smallest area of restored habitat and restored habitat is limited to the ecotone slope. Alt. 2 and 3 both include a habitat restoration area in Pond 10A and restore the tidal prism, which should result in habitat enhancement. Alt. 2 scores lower than Alt. 3 because the area under the bridge is not restored, while Alt. 3 removes the fill and restores the area
25%	**Temp. Habitat Disturbance from Construction**	Does the Project result in disturbance to sensitive habitat? (1 = extensive disturbance, 3=some disturbance, 5 = no impacts or disturbance)	5	6%	4	5%	3	4%	2	3%	Options 2/3 have the highest impact based on levee footprint.
25%	**Pond 10A Hydraulics**	Does the Project enhance or restore the tidal connection, circulation and range in water levels in Pond 10A? (1=little or no change, 5= full tidal connection restored)	1	1%	1	1%	5	6%	5	6%	Option 1 doesn't include new tidal channel. Option 2/3 should both restore full tidal connection
25%	**Ecosystem Resilience (Sustainability)**	Does the alt. provide habitat transgression for resilience to SLR? (1 = little ability to transgress, 5=adequate room to transgress to 3.5' SLR)	1	1%	4	5%	5	6%	5	6%	Each Alt. has room to adapt with 3.5' SLR. But, Alt. 2 and 3 provide the greatest area of transitional habitat (ecotone) which salt marsh could transgress with SLR, so they score higher. Alt 1 scores low because the total area of constructed transitional habitat is minimal
100%		**SUBTOTAL out of 25%**		**10%**		**14%**		**21%**		**21%**	
25%	**Public Access, Safety & Consistency with Community Vision**										
20%	**Public Access**	Coastal access, trail connectivity to neighbourhood (1 = impact to access, 3 = no change, 5 = improvement)	3	3%	4	4%	4	4%	4	4%	The access nodes are the same across each Alt., so each Alt. receives the same score
20%	**User Experience**	Does the project align with the community vision ? (1=little or no change to the existing experience, 5= Project includes elements from public outreach)	1	1%	2	2%	4	4%	4	4%	Criteria needs work. Scoring should be based on the public outreach results - i.e. which is the preferred option?
20%	**Safety**	Balance between pedestrian and cyclists. Will the Project separate user groups to increase safety along the bikeway? (1=little or no change, 5=improved bikeway & pedestrian separation)	1	1%	5	5%	5	5%	5	5%	Criteria needs work. The separation of bike/pedestrians creates a safer experience. Each alternative includes a ped. & bike path, so each alternative should be scored the same.
20%	**Community impacts during construction**	How long will Project construction disturb access/use of the bikeway and community? (1= long construction/disturbance duration along bikeway and neighbourhood , 5=minimal construction/disturbance along bikeway and neighbourhood)	5	5%	4	4%	3	3%	2	2%	Alt. 1 scores the highest because there is the least amount of construction required along the bikeway, and access along the Flamingo Trail is not impacted. Alt. 2/3 both impact the Flamingo Trail, although more construction is required with Alt. 3 so it scores lower
20%	**Aesthetics**	Does the Project enhance the aesthetics or view corridors of the bikeway, corridor and the community? (1 = negative impact, 3 = no change, 5 = improved aesthetics)	3	3%	2	2%	4	4%	5	5%	Alt. 2 scores lower because a bridge doesn't blend well with the surrounding habitat. Alternatives 1 and 3 will blend well with the surround habitat, Alt. 1 scores the highest because there is less alteration to Pond 10A when compared to Alt. 3
100%		**SUBTOTAL out of 25%**		**13%**		**17%**		**20%**		**20%**	
25%	**Coastal Hazards**										
50%	**Coastal Flood Protection**	Does project mitigate overtopping of the bikeway and minimize (tidal) flood hazards for the community? (1 = no improvement in flood reduction, 5 = resilient to extreme water levels+3.5' SLR,)	1	3%	5	13%	5	13%	5	13%	The elevation of the levee will be consistent across each alternative and will provide the same level of flood protection for extreme water levels + SLR. Each alternative scores the same. Scores could be refined by examining areas where additional freeboard and flood protection could be provided.
50%	**Flood protection from extreme rain events**	Does the Project reduce the risk of flooding from extreme precipitation events in combination with SLR in the Project area? (1=no change, 3=mitigates 1-yr storm+3.5' SLR, 5=mitigates 10-yr storm+3.5' SLR)	1	3%	5	13%	5	13%	5	13%	The stormwater detention basin is the same for each alternative and was designed for a 25-year storm, so each alternative scores the same.
100%		**SUBTOTAL out of 25%**		**5%**		**25%**		**25%**		**25%**	
10%	**Regulatory**										
33%	**CEQA/NEPA Process**	Length and complexity of environmental process (e.g. EIR, MND, etc…) (1 = Lengthy EIR process, 3 = streamlined MND or tiered document from Programmatic EIR, 5 = categorical exemption / exclusion or no action needed)	5	3%	2	1%	3	2%	4	3%	Alt. 3 provides the greatest ecosystem benefits (wetland/transitional & restored habitat), so it scores the highest.
33%	**Permitting Process**	Length and complexity of permits (CCC, USACE, RWQCB) (1 = Lengthy process, 3 = standard process, 5 = No permit or streamlined process - e.g. NWP)	5	3%	2	1%	3	2%	3	2%	Each Alt. should require roughly the same level of effort to acquire permits. However, Alt. 1 provides the least amount of ecological benefits.
33%	**USFWS Jurisdictional Impacts**	Does the Project impact USFWS lands/habitat? And to what extent? (1=significant impact, 3=moderate impacts, 5=no impact)	1	1%	2	1%	1	1%	2	1%	Levee footprint - Options 2/3 have the highest impact. To be updated with area (acres) impacted
100%		**SUBTOTAL out of 10%**		**7%**		**4%**		**5%**		**6%**	
15%	**Financial / Economic**										
50%	**Construction Cost**	Initial cost of construction to implement each alternative (1 = high construction costs, 3 = moderate, 5 = low construction costs)	5	8%	4	6%	1	2%	3	5%	The boardwalk element of Alt. 2 will cost the most to construct. Alt. 1 and 3 elements are similar, although Alt 1 has a smaller overall footprint so it will have a lower construction cost than Alt. 3
50%	**Long-term Maintenance & Operation Costs**	Costs to maintain and adaptively manage the Project over period of 20 years? (1 = high maintenance and management costs, 3 = moderate, 5 = low maintenance and management costs)	5	8%	3	5%	2	3%	3	5%	The construction costs for Alt. 1 & 2 are roughly the same and standard over a 20 year time horizon. Alt. 2 scores lower because the lifespan of the bridge may be 20 years and require inspection, repairs, ect…
100%		**SUBTOTAL out of 15%**		**15%**		**11%**		**5%**		**9%**	
		TOTAL out of 100%		**50%**		**70%**		**75%**		**81%**	

Appendix D

Stakeholder and Public Outreach Summary

bayshorebikeway
RESILIENCY PROJECT

CITY OF IMPERIAL BEACH
PUBLIC ENGAGEMENT SUMMARY

Funding provided by:

IMPERIAL BEACH
classic southern california

OCEAN PROTECTION COUNCIL

IBBayshoreBikeway.com

bayshorebikeway
RESILIENCY PROJECT

CITY OF IMPERIAL BEACH
PUBLIC ENGAGEMENT SUMMARY

October 2022

PROJECT SUPPORT FROM:

1. INTRODUCTION

Beginning in 2021, through funding from an Ocean Protection Council Prop 68 grant, the City of Imperial Beach began developing conceptual plans to repurpose a 1.2-mile segment of the Bayshore Bikeway corridor into a multi-benefit coastal resilience corridor. The Bayshore Bikeway Resiliency Project (Project) is intended to:

- Provide enhanced flood protection for the Bayshore Bikeway corridor and the adjacent community that is vulnerable to coastal inundation;
- Improve public access to the San Diego Bay; and
- Strengthen ecosystem resilience by adding transitional habitat areas along the bay's edge.

The Project would serve as a catalyst to activate the Imperial Beach bayfront leading to greater opportunities for sustainable economic development and recreation.

Community outreach and stakeholder engagement (public engagement) is a vital and necessary component of the planning process to ensure the Project is community-driven and meets local, State, and Federal regulations. Between June 2021 and September 2022, the project team, consisting of City of Imperial Beach staff and consultants, obtained feedback from a variety of stakeholders including:

- Imperial Beach staff;
- Federal, State, regional, and local public agencies;
- Regional non-profits;
- Private businesses; and
- The general public.

Numerous opportunities were provided for the Imperial Beach community to follow the progress of this Project and participate in its design and development. The goals, desired outcomes, marketing, summary of events and feedback are further described herewithin.

CONTENTS

2.
ENGAGEMENT OUTCOMES & GUIDING PRINCIPLES

DESIRED ENGAGEMENT OUTCOMES

Successful public engagement outcomes for this Project included:

1. Participation that is representative of the City of Imperial Beach's and the Bayside neighborhood demographics (e.g., homeowners/renters; race and ethnicity; age; geographic location);
2. Involvement at key stages with agency partners that have jurisdictional or management authority over areas proposed for development;
3. At the end of the planning process, more residents have learned about the City of Imperial Beach's coastal resiliency efforts. Additionally, the engagement process was a valuable and enjoyable experiences that help them to develop a deeper understanding about climate change, coastal flooding, and public engagement;
4. Development of a public engagement process, including messaging and educational materials, that becomes a model for the City of Imperial Beach.

COMMUNITY GUIDING PRINCIPLES

The guiding principles for community engagement included:

1. **Use a flexible and adaptive approach:** The Project team fully appreciates that the COVID-19 pandemic and limits to public gathering will impact the team's ability to engage stakeholders in the near-term, particularly as it relates to in-person meetings and workshops. We understand that stakeholders will want to be engaged in different ways, and we will aim to be flexible and responsive to their needs. In addition, the team will identify barriers to effective engagement early in the process (should they occur) and adapt the engagement process as needed.
2. **Encourage transparency:** The team will conduct stakeholder engagement in an inclusive, open, and transparent way. Transparency is a key component for building trust.
3. **Communicate early and often:** The team will introduce the Project to stakeholders as early as possible to build partnership and collaboration. The team will share regular Project updates and provide opportunities for stakeholder input.
4. **Promote easily accessible information and processes:** For both project information and outreach activities, the team will use a variety of methods to ensure those interested in the project can access information when convenient for them. The team will use up-to-date technical data in the stakeholder engagement process and translate this information into more easily accessible language for a general audience.

3. SUMMARY OF RESPONSES

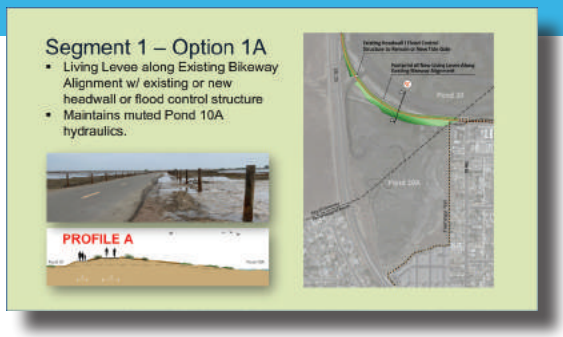
Top Comments

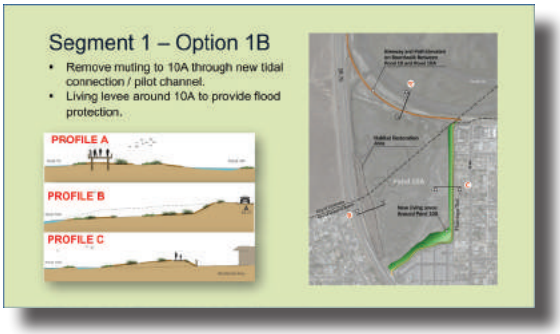
Feedback collected from the community informs the design process of the Bayshore Bikeway Resiliency Project. The following are the most commonly heard comments organized by topic.

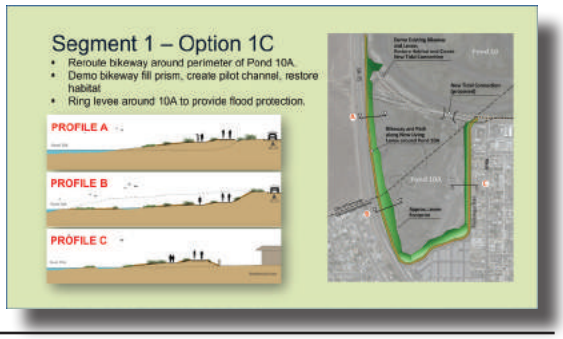
Coastal Resiliency Concepts

Segment 1

- Public and agency stakeholders was for *Option 1C - Remove and Reroute* (68% of respondents) versus *Option 1B - Replace with Bridge* (32% of respondents). 15% of respondents voiced a preference for merging Option 1C and Option 1B.
- The majority of the cycling community preferred *Option 1B - Replace with Bridge* because it maintains the existing pathway, does not require slowing for the turn at the Flamingo Trail, and cyclists deemed it "safer" than turning the corner at the Flamingo Trail.
- Agency stakeholders preferred *Option 1C - Remove and Reroute* because it provides the greatest environmental benefits as removal of the existing dike (between SR75 and 7th Street) allows full tidal flushing of Pond 10A and greater ecosystem enhancement.
- *Option 1C - Remove and Reroute* was also a popular concept because it allows for "greater connection to the ocean" and "brings people into Imperial Beach". Both of these comments support the desire of the City to improve access (e.g., wayfinding and physical improvements) for Bayshore Bikeway users to travel into the City.
- *Option 1B - Replace with Bridge* was supported by respondents because this area is one of the few places where users can "experience standing above/in" the water.

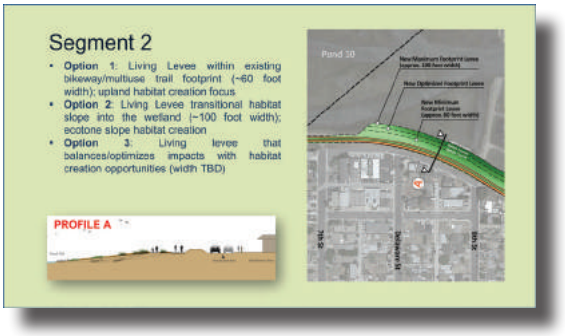






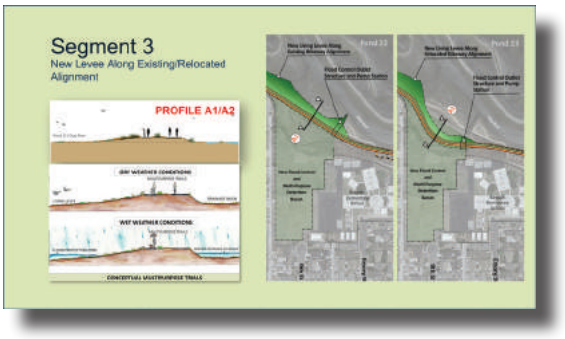
Segment 2

- Segment 2 implements a living levee concept, where the options are differentiated by the degree of the ecotone slope within the water. The agencies commented that the shallower slope (Option 2) provides greater habitat transition; however, it also has the greatest short-term impact during construction.
- The public supports the concept regardless of the slope selected. The preference is for implementation of the concept with the greatest environemental benefits.



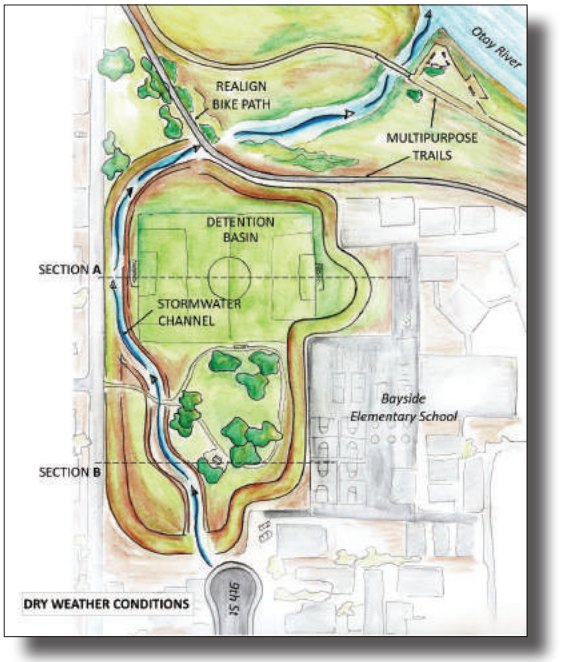
Segment 3

- All respondents supported the realignment of the Bayshore Bikeway as it improves the safety for all users through the removal of an existing blind spot.
- Respondents support the realignment; however, theycommented that they would not want to lose the existing overlook (provided by the United States Fish & Wildlife).
- Agency stakeholders support the realignment because it may reduce scouring from the river channel during high tide or high precipitation events.



Multi-Purpose Detention Basin/Joint Use Park

- Respondents overwhelming support the planning and implementation of a joint use park at the existing Bayside Elementary School. [The recreational area located east of the school facilities would be open to the public during non-school hours.]
- Agency stakeholders support the multi-purpose detention basin because of: 1) The flood reduction benefits through accomodation of tidal flows and onshore precipitation events and 2) The potential improvements in water quality from urban runoff.
- Respondents would like to have access from 9th Street to the park.
- The public expressed concern over public safety and the monitoring of the park.



Public Access Concepts

Access To/From Bayshore Bikeway

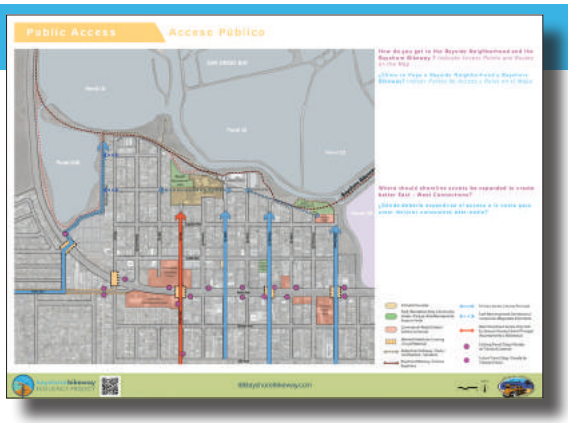
7th Street and 13th Street are the primary access points to the Bayshore Bikeway for Imperial Beach residents. Non-Imperial Beach residents access the Bayshore Bayway from 13th Street (though the majority are passthrough on the bikeway path).

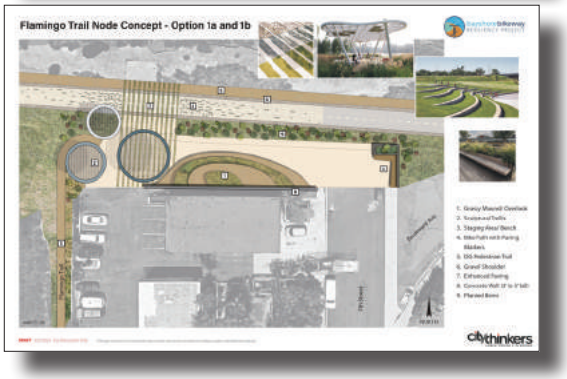
- The number one issue for respondents was the improvement of public safety on the Bikeway. There have been serious accidents between cyclists and other users. A majority of users commenting on public safety expressed concern over the large number of electric bicycles and associated increase in speed. Recommendations to improve public safety included:
  - ◊ Separate cyclists from pedestrians
  - ◊ Widen the bike path
  - ◊ Introduce and enforce speed limits
  - ◊ Introduce areas of slowing or access areas [See Access Nodes below] where users access the bikeway (e.g., access from 13th Street and Bikeway Village is "not well signed", "hidden", "comes up too fast and is abrupt".
  - ◊ Add better areas for staging (where users "don't congregate in the the bikeway right-of-way")
  - ◊ Educate cyclists on riding safety
  - ◊ Ban electric bikes
- 38 respondents requested the addition of lighting.
- Respondents would like to see better access to the Bikeway from 7th Street, including bike lanes from Palm Avenue.
- 13 respondents would like to see public parking near 7th

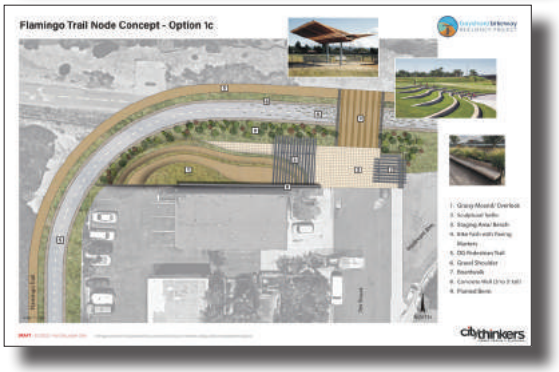
Access Nodes

The concepts illustrated to the right were developed in response to public surveys and respondent recommendations as to how to improve public safety.

- All stakeholders support the concept of public access nodes.
- Add public access nodes at SR75 and the Flamingo Trail, 7th Street, 8th Street, adjacent to the Bayside Elementary School park, 12th Street, and 13th Street.
- City advisory committees and the public support the areas for staging and recommended refinement of the design concepts as to how cyclists would integrate with other users, such as children in the node areas.
- A few residents expressed concern over the incorporation of design elements such as seating that may lead to an increase in the transient population.







Recreational and Commercial Activation

General Comments

- Increase development along a continuum running west to east along the Bikeway. Specifically, more naturalized starting at 7th Street to more developed between 10th Street and Bikeway Village (13th Street).
- Overwhelmingly did not want hotels or large commercial establishments, but supported local coffee shops, brew pubs, and hostels.
- Improve wayfinding and educational signage, and better lighting were common requests.
- Add a park with passive to mild activation, but not overly programmed. Examples of desired uses include play areas, chess/ mahjong tables, and fitness spots.
- Add a kayak or canoe launch from Imperial Beach.

7th Street and Flamingo Trail

- Improve wayfinding, add lighting, and add areas to relax (e.g., seating or park space.)
- Add kayak/canoe launch access at 7th Street.

8th Street/Birding and Walking Trail

- Add lighting and areas to relax (e.g., seating or park space).
- Add kayak/canoe launch access at 8th Street.

Bayside Recreational Area

- Improve wayfinding, add lighting, and add areas to relax (e.g., seating or park space) with ample shade.
- Add fitness areas and play facilities for children to the park.
- Incorporate public bathrooms and water refill stations.
- Potentially allow commercial vendors, small shops, or a cultural center.
- Add programmed events in the park.

Public Works Yard

- Convert into a passive use park (e.g., seating or children play areas) adjacent to small shops or a market, small restaurants or a local brewery.
- Develop a children's oriented museum or cultural center.
- Expand parking would be desired with any development.

Bikeway Village/13th Street

- Support development of restaurants, brewpubs, small hotel and lodging, entertainment ("Rady Shell), and cafes/ coffee shops.
- Add kayak/canoe launch access near 13th Street.
- Add sitting areas near Pond 20 and more trash receptacles.

4.
OUTREACH: MARKETING EFFORTS

The outreach process began with informing interested stakeholders and the public about the Project and keeping them continually updated about the planning process and progress. The Project team used a variety of direct marketing and digital media to reach and inform the local and regional community and agency stakeholders. These materials and approaches included the Project website, social media, news and video, email, and electronic reader boards. The project also utilized traditional print media with business cards, flyers, banners, and door hangers.

Print material was provided in English and Spanish. The website contains pages in English, Spanish, and Tagalog.

Branding the Project

To achieve successful project immersion into the community, the Project team worked with City of Imperial Beach staff to design a logo that would serve as a Project identifier. The central idea was to create an inviting, familiar image that conjures activation, recreation, and is synonymous with the Bayshore Bikeway and coastal setting. The resulting logo utilizes the City of Imperial Beach's citywide color palette, displays a modern font, and expresses the joy and serenity associated with both Imperial Beach and the Bayshore Bikeway.

bayshorebikeway
RESILIENCY PROJECT

Supporting Partners in Outreach

Local and regional agencies and non-profits organizations helped the City of Imperial Beach to spread the word about the Project, including outreach events.

CITY OF CORONADO

PORT of SAN DIEGO
Waterfront of Opportunity

Climate Collaborative
SAN DIEGO REGION

San Diego Foundation

BIKE COALITION
SAN DIEGO COUNTY

SANDAG

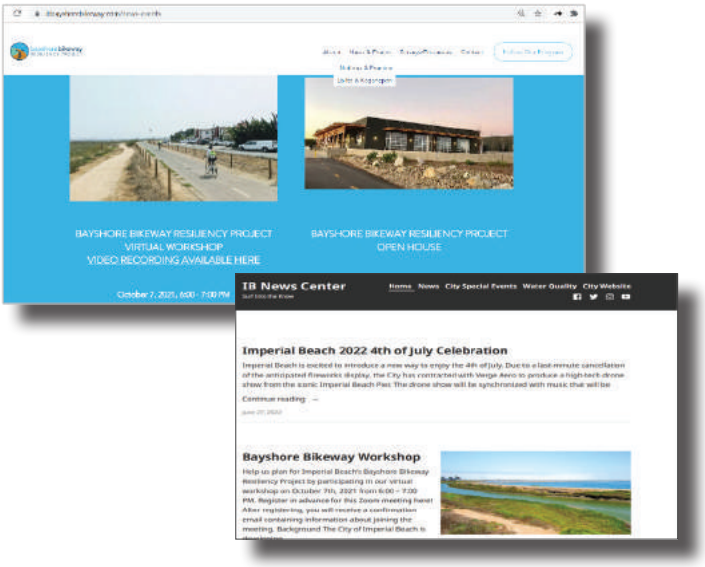
DIGITAL MEDIA

Digital outreach efforts focused on providing static media (e.g. websites) to supply a constant foundation of information, and dynamic, proactive methods (e.g., social media, news and video, and email) to inform the community about events, project progress, and opportunities to provide feedback.

Websites

The Project website provides the public with a one-stop-shop for information on all project components, a schedule of activities, as well as materials, including draft documents, frequently asked questions, and public notices. The website includes presentations, surveys and other exercises from the various meetings for those individuals who are unable to attend in person. A direct email is also provided for residents to submit questions or comments and requests for additional information.

The IB News Center provides up-to-date information on the project's progress and links directly to the Project website.



Social Media

Social media including Facebook, Nextdoor, and LinkedIn were used to share information with the public. In collaboration with the supporting partners in outreach, information was reshared through their member listservs.

News and Video

In partnership with the Ocean Protection Council, the City created a video providing an overview of the Project. Univision documented the Project in a segment covering climate change and sea level rise.

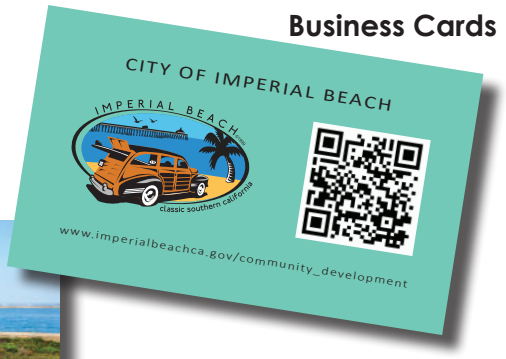
Collaborating Partners Eblasts

Eblasts are sent out via email to the entire contact database to inform community members of the open houses, surveys, and other events as scheduled. These are distributed through email communications to be both efficient and broad reaching. The City of Imperial Beach and collaborating partners distributed e-blasts as needed (e.g. in advance of all planning events) to promote event attendance and increase awareness of the planning process.

PRINT MEDIA

Flyers, door hangers, and project cards are used to inform community members of the planning process, meetings, surveys, and other events. Not every resident has access to or uses social media and email regularly. Flyers and door hangers help to bridge the digital divide. Flyers were distributed before community meetings in locations near the meeting site. All meeting flyers are produced in English and Spanish. Additional languages were included based on demographics. Project cards are available at events throughout the planning process. The project cards contain a QR Code that links directly to the Project website: IBBayshoreBikeway.com.

Business Cards



Flyers

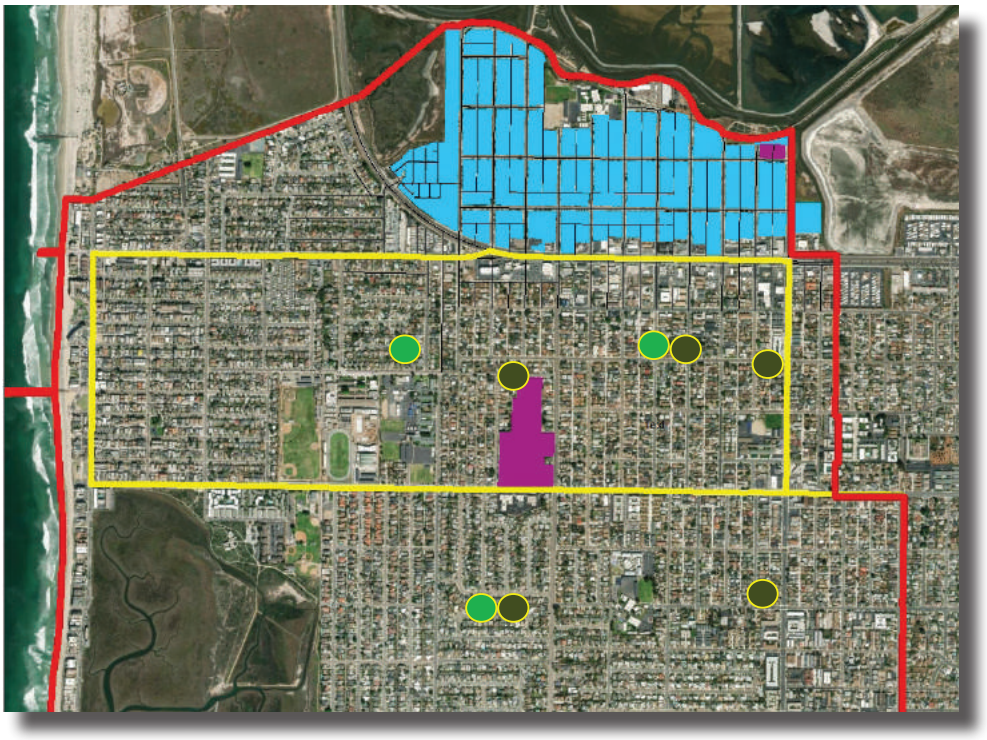
Door Hangers

Banners

GEOGRAPHY OF ENGAGEMENT

Engagement and marketing activities occured at three geographic scales to reach a diverse range of the local and regional communities:

1. Regional: Websites, Email blasts, Online Surveys, Social Media (Facebook, LinkedIn), Television, Video (YouTube);
2. City: Community-based organizations, Social Media (NextDoor), Newpaper advertising (Eagle & Times), Commercial Businesses, Digital Message Board and Banners at major streets; and
3. Neighborhood: Door hangers, Flyers, Workshops, Intercept Surveys



Full City: Project website, Nextdoor, Facebook, City website, Email Blasts, CBOs, Churches

Major Streets: Flyers at Commercial Businesses, Banners, Digital Message Boards

Bayside Neighborhood: Door Hangers, Intercept Surveys, HOA flyers, Commercial Business flyers

Event Focus Areas: Bikeway Village, Library, Veteran's Park

Banners

Digital Message Boards

Banner at Teeple Park in the Bayside Neighborhood, March 3rd, 2022

5.
ENGAGEMENT TYPES

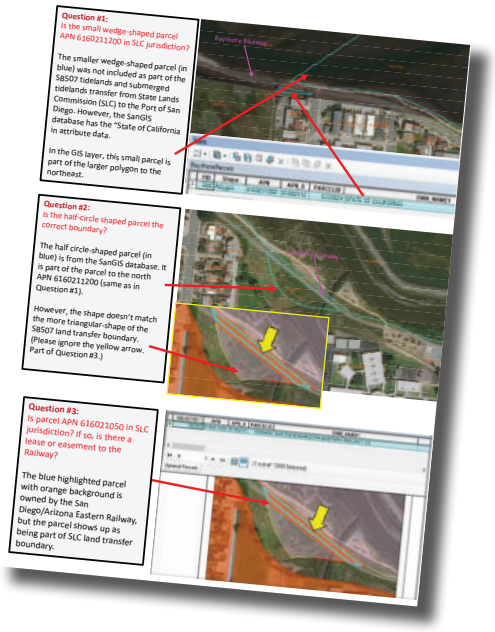
Engagement activities consisted of the following:

1. **Agency Coordination:** Faciliated agency stakeholder meetings on relevant interests;
2. **Workshops:** Planned and facilitated in-person workshops at diverse locations and times;
3. **Pop-up Events:** Staffed booths at local and regional recreational and community events; and
4. **Online Surveys:** Performed in-person, intercept surveys at locations near the Project site and provided on-line surveys accessed directly through the project website.

1. AGENCY COORDINATION

The Project team made multiple presentations and had collaborative meetings with local, regional, State, and Federal agencies and stakeholder. These meetings began in May of 2021 and continued until September of 2022. The meetings covered diverse topices such as jurisdictional authority, current and planned Projects, funding, environmental issues, opportunities and constraints, and permitting.

- United States Fish & Wildlife
- United States Department of Navy
- San Diego Unified Port District
- California Coastal Commission
- California Department of Transportation
- Caifornia State Lands Commission
- California Ocean Protection Council
- City of Imperial Beach City Council
- City of Imperial Beach Tidelands Advisory Committee
- City of Imperial Beach Design Review Board
- City of Coronado Planning Department
- City of Coronado Mobility Commission
- City of San Diego Planning Department
- San Diego Association of Governments
- Metropolitan Transit District
- San Diego Regional Bicycle Coalition
- San Diego Regional Climate Collaborative
- San Diego State University
- The San Diego Foundation
- Silver Strand Beautification Project



2. WORKSHOPS

The public were given multiple opportunities to provide feedback on the proposed Project through in-person and virtual workshops. Participants were given presentations on design concepts related to coastal resiliency and enhancing public access then had the opportunity to talk with the Project team one-on-one and provide feedback verbally or through written comment placed directly on mounted boards illustrating the design concepts.

Workshops were held both in-person at the Imperial Beach Public Library and outside at Bikeway Village adjacent to the Bayshore Bikeway. Virtual workshops were held via Zoom to provide the opportunity to participate for those with constraints to access or because of public health concerns related to Covid-19. In-person and virtual workshops were offered in English and Spanish with virtual workshops used breakout rooms.

In-Person Workshops (57 total participants)

- Saturday, October 9th, 2021 - Bikeway Village (on the Bayshore Bikeway)
- Tuesday, March 15th, 2022 - Imperial Beach Public Library
- Saturday, March 19th, 2022 - Bikeway Village (on the Bayshore Bikeway)

Virtual Workshops (12 total participants)

- Thursday, October 7th, 2021
- Tuesday, May 24th, 2022
- Tuesday, May 31th, 2022
- Tuesday, June 7th, 2022

Imperial Beach Public Library, March 15th, 2022

Bikeway Village, March 19th, 2022

Imperial Beach Public Library, March 15th, 2022

3. POP-UP EVENTS

Pop-up events were integrated with planned local and regional recreational and community events. The Project team set up booths with snacks, water, and coloring books for kids to entice participants to engage with the team and provide feedback on the Project.

Pop-Up Events (Approximately 200 total participants)

- 2021 Bike the Bay: October 9th, 2021 - Bikeway Village
- 2022 National Night Out: August 2nd, 2022 - Veterans Park
- 2022 Bike the Bay: August 28th, 2022 - Bikeway Village

Bike the Bay

This annual event is a 25-mile, non-timed and non-competitive, ride that starts and finishes at Embarcadero Marina Park South, located on San Diego Bay via the Bayshore Bikeway. An estimated 15,000 rider travel through the surrounding cities of Coronado, Imperial Beach, Chula Vista, and National City.

The Project team staffed a booth at Bikeway Village, providing snacks and water for cyclists, affording them the opportunity to provide comment on the conceptual designs while they took a break.

Bike the Bay, Bikeway Village, August 28th, 2022

National Night Out, Veterans Park, August 2nd, 2022

National Night Out

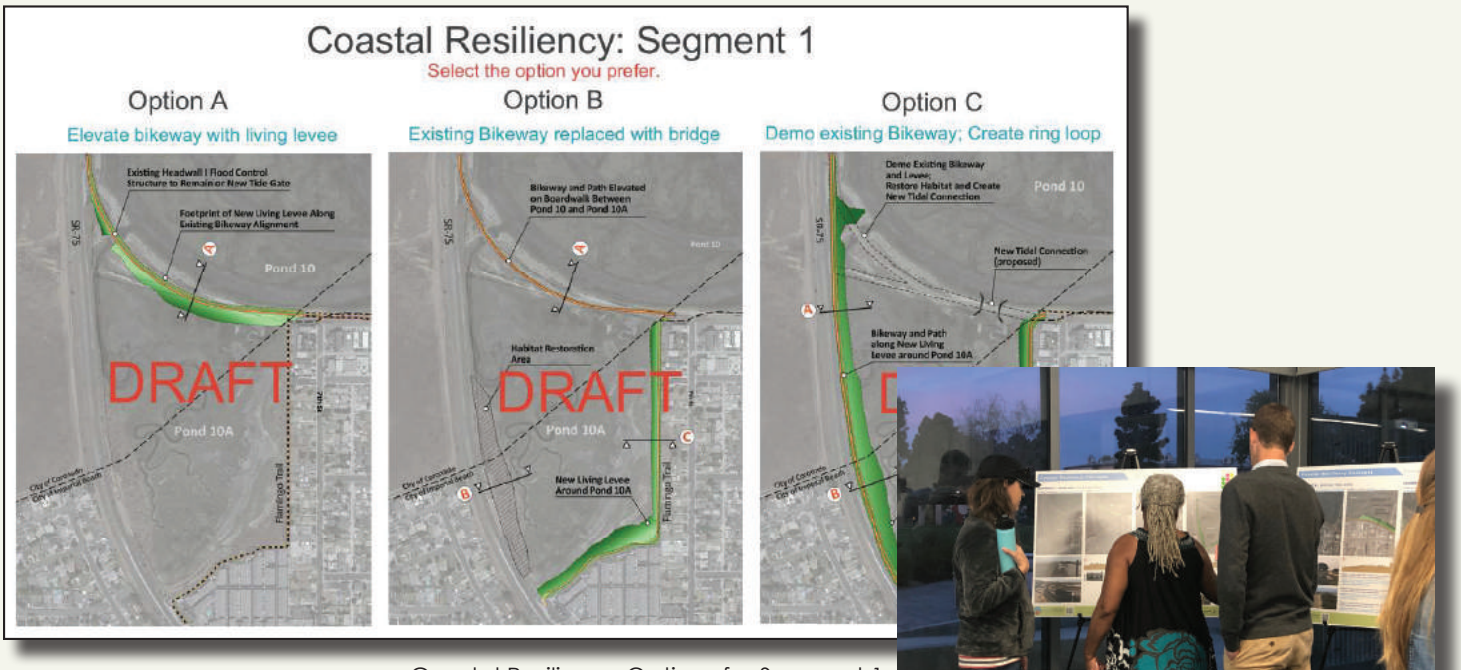
National Night Out is annual community-building campaign that promotes police-community partnerships and neighborhood camaraderie.

The Project team partnered with the Imperial Beach Parks and Recreation Department to engage with community members and gain

To faciliate engagement, educate participants, and offering creativity for kids, the Project team developed coloring books and provided crayons so everyone could learn about the ecosystem adjacent to the Project site while having fun!

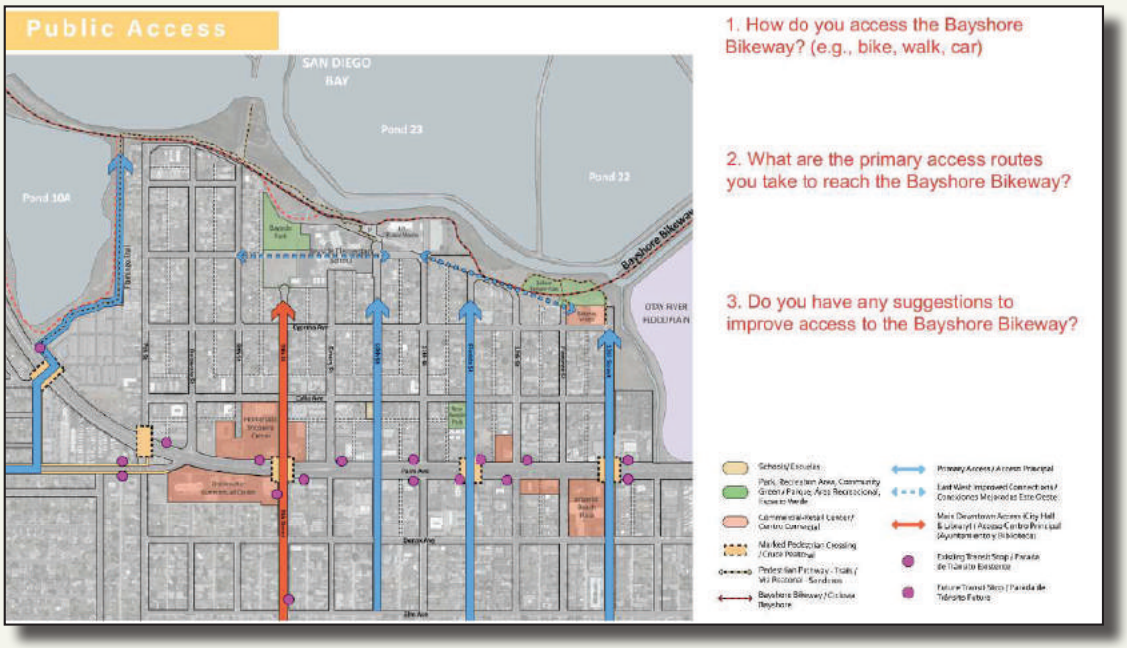
WORKSHOP MATERIALS

Workshops (in-person and virtual) and Pop-Up events utilize Project conceptual designs and maps on 36X48 boards to provide the public opportunities to select specific options and directly identify areas of concern and opportunity. The virtual workshops used Jamboard via Zoom where participants could select options and scenarios to inform future development. The following images represent examples of the coastal resiliency options, public access enhancements, and potential for activation adjacent to the project developed based on community feedback.



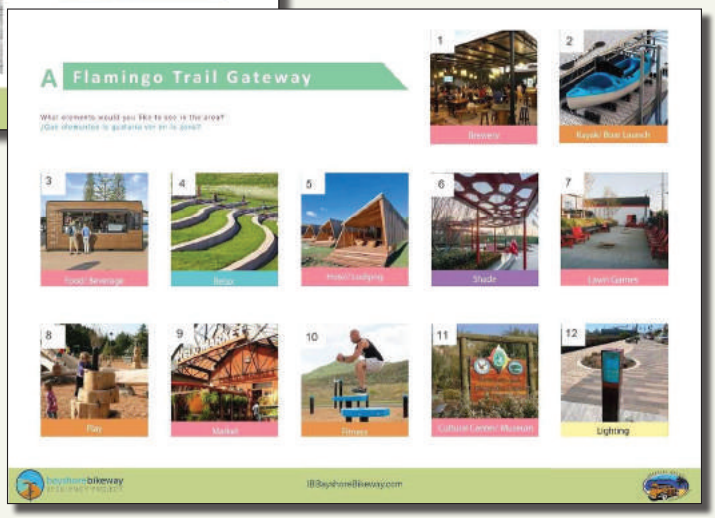
Coastal Resiliency Options for Segment 1

Public providing feedback on concepts



Opportunities for Public Access Enhancements

Opportunities for Recreational and Commercial Activation

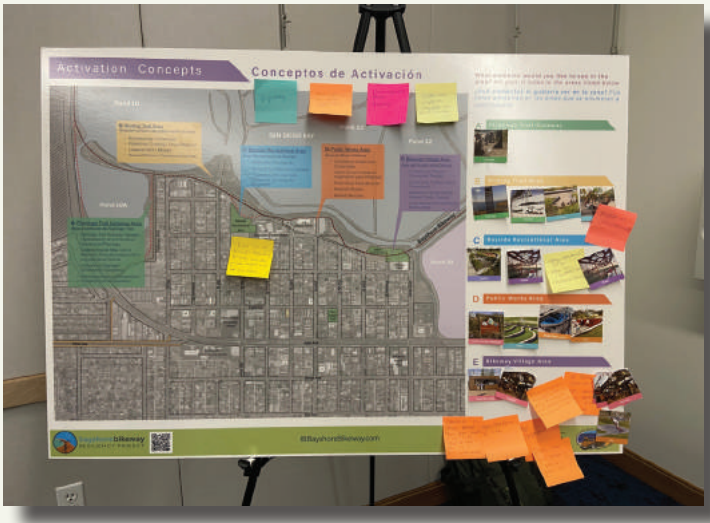


Recreational and Commercial Activation Images

Workshop and Pop-Up event participants were asked to pin (e.g., push pins) the supplied pre-made images (see figure to the right) or write their comments on Post-It notes and place on the board in the locations where they support a concept, would like to see a public access enhancement, or want commercial and recreational activation.

Virtual workshops used Google Jamboard so the public could interact with virtual boards and provide comment. Spanish translators were available for all virtual workshops.

Public providing feedback on concepts



Concept board with public feedback notes and images

4. SURVEYS

Surveys where designed and implemented to gain feedback from the community. Two survey types were used:

- **Online surveys** are structured questionnaires that respondents completed by responding to questions about concerns, constraints, and opportunities related to Project planning and design. These surveys were online-only and allowed for participants to complete them at their leisure.
- **Intercept surveys** were used to collect feedback from respondents during an experience. The Project team directly asked participants questions "live" during events, such as Bike the Bay or National Night Out.

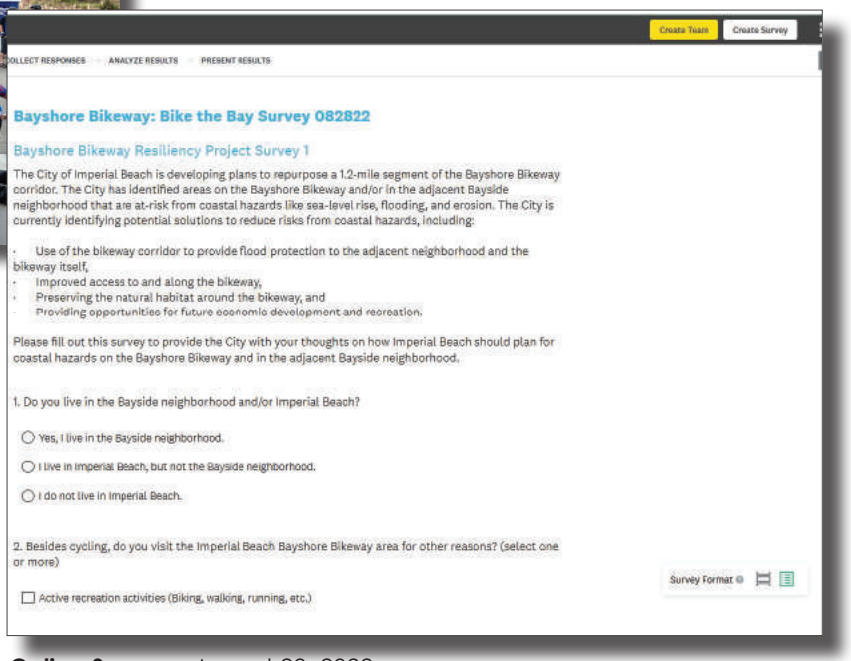
Online Surveys (Date Range,Topic): (112 Surveys completed)

- September 27th - October 15th, 2021 - Opportunities and Constraints
- March 7th - March 25th, 2022 - Concepual Designs (Resiliency Only)

Intercept Surveys (Event, Date, Location, Topic): (168 surveys completed)

- 2021 Bike the Bay: October 9th, 2021, Bikeway Village - Opportunities and Constraints
- 2022 Bike the Bay: August 28th, 2022 - Bikeway Village - Conceptual Designs (Public Access and Resiliency)

Intercept Surveys
Bike the Bay, August 28, 2022



Online Surveys, August 28, 2022

6.
SURVEYS

The following section contains the online surveys and intercept surveys used in this project. Surveys were provided to respondents in English, Spanish, and Tagalog.

The full array of languages are provided for Survey #1. Only the English version is provided for Survey #2.

Survey #1. English - Page 1

bayshorebikeway
RESILIENCY PROJECT

Bayshore Bikeway Resiliency Project Survey #1

Bayshore Bikeway Resiliency Project Survey 1

The City of Imperial Beach is developing plans to repurpose a 1.2-mile segment of the Bayshore Bikeway corridor. The City has identified areas on the Bayshore Bikeway and/or in the adjacent Bayside neighborhood that are at-risk from coastal hazards like sea-level rise, flooding, and erosion. The City is currently identifying potential solutions to reduce risks from coastal hazards, including:

- **Use of the bikeway corridor to provide flood protection to the adjacent neighborhood and the bikeway itself,**
- **Improved access to and along the bikeway,**
- **Preserving the natural habitat around the bikeway, and**
- **Providing opportunities for future economic development and recreation.**

Please fill out this survey to provide the City with your thoughts on how Imperial Beach should plan for coastal hazards on the Bayshore Bikeway and in the adjacent Bayside neighborhood.

1. What interest do you have in the City of Imperial Beach's portion of the Bayshore Bikeway and/or the adjacent Bayside neighborhood?

- ◯ I live and/or own property in (or near) the Bayshore Bikeway and/or Bayside neighborhood.
- ◯ I own a business in (or near) the Bayshore Bikeway and/or Bayside neighborhood.
- ◯ I live in Imperial Beach and visit the Bayshore Bikeway and make use of coastal amenities.
- ◯ I do not live in Imperial Beach, but I visit the Bayshore Bikeway and make use of coastal amenities.
- ◯ I'm interested/involved in the regional dialogue on sea level rise and coastal hazard adaptation.

2. How frequently do you visit the Imperial Beach Bayshore Bikeway area? (select one)

- ◯ 1 – 2 times per week
- ◯ 1 – 2 times per month
- ◯ 2 or more times per year
- ◯ Less than 1 time per year

Survey #1. English - Page 2

3. Which of the following best describes how you most frequently enjoy the Imperial Beach Bayshore Bikeway area? (select one or more)

- [ ] Active recreation activities (Biking, walking, running, etc.)
- [ ] Transit / Commuting
- [ ] Passive recreation activities (Birdwatching, coastal view/overlooks, social activities, etc.)
- [ ] Commercial use (retail, restaurant)
- [ ] Other

4. Have you seen/experienced changes (flooding, erosion, limited access) on the Bayshore Bikeway?

- ○ No, these areas appear the same to me as they did when I first saw them.
- ○ Yes, I've seen minor changes in these areas.
- ○ Yes, I've seen major changes in these areas.
- ○ I don't know. I haven't been here long enough.

5. Have you seen/experienced changes (flooding, limited access) in the Bayside neighborhood?

- ○ No, these areas appear the same to me as they did when I first saw them.
- ○ Yes, I've seen minor changes in these areas.
- ○ Yes, I've seen major changes in these areas.
- ○ I don't know. I haven't been here long enough.

6. Priorities - Sea-level rise will increase the frequency and severity of flood events already occurring in the Bayside neighborhood. Rank (1 - 3) the following issues in importance, starting with the most pressing issue at the top.

≡ Flooding-induced street closures

≡ Flooding resulting in damage to bayfront homes

≡ Flooding resulting in loss of recreational areas and uses

7. Key Considerations - Are there other considerations not already listed in question 6 that the City should use in choosing adaptation strategies?

Survey #1. English - Page 3

8. Coastal Assets - The following are coastal assets the City could choose to protect and enhance. Rank (1 - 5) the following assets from most important to least important.

- Bikeway
- Public amenities (parks, scenic areas, public parking areas)
- Natural habitat areas (such as the Bay and coastal watersheds)
- Commercial goods and services (restaurants, retail, etc.)
- Residential private property

9. Coastal Opportunities – As part of this planning process, there are opportunities to add or improve features to the Bayshore Bikeway. Rank (1 - 5) the following opportunities from most important to least important.

- Increased access to the Bayshore Bikeway (including wayfinding and signage for orientation and education)
- Pedestrian only walkways adjacent to the bikeway
- Additional public amenities (parks, restrooms, public parking)
- Designated scenic overlooks and natural habitat interpretive areas (educational signage)
- Additional commercial goods and services (restaurants, retail, etc.)

10. Bayside Neighborhood Opportunities – As part of this planning process, there are opportunities to add or improve features to the Bayside neighborhood. Rank (1- 5) the following opportunities from most important to least important.

- Pedestrian improvements and access to the Bayshore Bikeway (Improved wayfinding and signage for orientation and direction)
- Addition of landscaped features
- Improved drainage infrastructure
- Additional commercial goods and services (restaurants, retail, etc.)
- More public parking

Survey #1. Espanol - Page 1

bayshorebikeway
RESILIENCY PROJECT

Bayshore Bikeway Resiliency Project Encuesta #1 - Espanol

Bayshore Bikeway Resiliency Project Encuesta 1 - Espanol

La ciudad de Imperial Beach está desarrollando planes para reutilizar un segmento de 1.2 millas del corredor bayshore bikeway. La Ciudad ha identificado áreas en el Bayshore Bikeway y/o en el vecindario adyacente de Bayside que están en riesgo de peligros costeros como el aumento del nivel del mar, las inundaciones y la erosión. Actualmente, la Ciudad está identificando posibles soluciones para reducir los riesgos de los peligros costeros, incluyendo:

• Uso del corredor de la ciclovía para proporcionar protección contra inundaciones al vecindario adyacente y la ciclovía en sí,
• Mejora del acceso a y a lo largo de la ciclovía,
• Preservar el hábitat natural alrededor de la ciclovía, y
• Proporcionar oportunidades para el desarrollo económico y la recreación en el futuro.

Por favor llene esta encuesta para proporcionar a la Ciudad sus pensamientos sobre cómo Imperial Beach debe planificar los peligros costeros en bayshore Bikeway y en el vecindario adyacente de Bayside.

1. ¿Qué interés tiene en la parte de la ciudad de Imperial Beach de Bayshore Bikeway y / o el vecindario adyacente de Bayside?

- ◯ Vivo y/o propiedad propia en (o cerca de) el Bayshore Bikeway y/o Bayside vecindario.
- ◯ Soy dueño de un negocio en (o cerca de) el Bayshore Bikeway y/ o Bayside vecindario.
- ◯ Vivo en Imperial Beach y visito bayshore bikeway y hago uso de las comodidades costeras.
- ◯ No vivo en Imperial Beach, pero visito bayshore bikeway y hago uso de las comodidades costeras.
- ◯ Estoy interesado/involucrado en el diálogo regional sobre el aumento del nivel del mar y la adaptación a los peligros costeros.

2. ¿Con qué frecuencia visita el área de Imperial Beach Bayshore Bikeway? (seleccione uno)

- ◯ 1 – 2 veces por semana
- ◯ 1 – 2 veces al mes
- ◯ 2 o más veces al año
- ◯ Menos de 1 vez al año

Survey #1. Espanol - Page 2

3. ¿Cuál de los siguientes describe mejor cómo disfrutar con mayor frecuencia del área de Imperial Beach Bayshore Bikeway? (seleccione uno o más)

- [ ] Actividades recreativas activas (andar en bicicleta, caminar, correr, etc.)
- [ ] Tránsito / Conmutación
- [ ] Actividades recreativas pasivas (observación de aves, vistas costeras/ miradores, actividades sociales, etc.)
- [ ] Uso comercial (venta al por menor, restaurante)
- [ ] Otro

4. ¿Ha visto / experimentado cambios (inundaciones, erosión, acceso limitado) en Bayshore Bikeway?

- ( ) No, estas áreas me parecen las mismas que cuando las vi por primera vez.
- ( ) Sí, he visto cambios menores en estas áreas.
- ( ) Sí, he visto cambios importantes en estas áreas.
- ( ) No lo sé. No he estado aquí el tiempo suficiente.

5. ¿Has visto/ experimentado cambios (inundaciones, acceso limitado) en el vecindario de Bayside?

- ( ) No, estas áreas me parecen las mismas que cuando las vi por primera vez.
- ( ) Sí, he visto cambios menores en estas áreas.
- ( ) Sí, he visto cambios importantes en estas áreas.
- ( ) No lo sé. No he estado aquí el tiempo suficiente.

6. Prioridades - El aumento del nivel del mar aumentará la frecuencia y la gravedad de los eventos de inundación que ya ocurren en el vecindario de Bayside. Clasifique los siguientes temas en importancia, comenzando con el problema más apremiante en la parte superior.

- Cierres de calles provocados por inundaciones
- Inundaciones que resultan en daños a las casas frente a la bahía
- Inundaciones que dan lugar a la pérdida de zonas recreativas y usos

7. Consideraciones clave - ¿Hay otras consideraciones que aún no se enumeran en la pregunta 6 que la Ciudad debería usar para elegir estrategias de adaptación?

Survey #1. Espanol - Page 3

8. Activos costeros - Los siguientes son activos costeros que la Ciudad podría elegir proteger y mejorar. Clasifique los siguientes activos de más importante a menos importante.

- Ciclovía
- Servicios públicos (parques, áreas escénicas, áreas de estacionamiento público)
- Áreas de hábitat natural (como la bahía y las cuencas costeras)
- Bienes y servicios comerciales (restaurantes, venta al por menor, etc.)
- Propiedad privada

9. Oportunidades costeras : como parte de este proceso de planificación, hay oportunidades para agregar o mejorar las características de Bayshore Bikeway. Clasifique las siguientes oportunidades de más importante a menos importante.

- Mayor acceso a la ruta para bicicletas Bayshore (mejora de la orientación y señalización)
- Pasarelas peatonales adyacentes a la ciclovía
- Servicios públicos adicionales (parques, baños, estacionamiento)
- Miradores escénicos designados y áreas interpretativas de hábitat natural (señalización educativa)
- Bienes y servicios comerciales adicionales (restaurantes, venta al por menor, etc.)

10. Oportunidades del vecindario de Bayside: como parte de este proceso de planificación, hay oportunidades para agregar o mejorar características al vecindario de Bayside. Clasifique las siguientes oportunidades de más importante a menos importante.

- Mejoras peatonales y acceso a la ruta ciclista de Bayshore (mejora de la orientación y señalización para la orientación)
- Adición de entidades ajardinadas
- Mejora de la infraestructura de drenaje
- Bienes y servicios comerciales adicionales (restaurantes, venta al por menor, etc.)
- Más aparcamiento público

Survey #1. Tagalog - Page 1

bayshorebikeway
RESILIENCY PROJECT

Bayshore Bikeway Resiliency Project Survey #1 - Tagalog

Bayshore Bikeway Resiliency Project Survey 1

Ang Lungsod ng Imperial Beach ay pagbuo ng mga plano upang mabayaran ang isang 1.2-milyang segment ng Bayshore Bikeway corridor. Tinukoy ng Lunsod ang mga lugar sa Bayshore Bikeway at /o sa katabing Bayside kapitbahayan na nasa panganib mula sa baybayin panganib tulad ng dagat-level rise, pagbaha, at pag-aalinlangan. Ang Lungsod ay kasalukuyang tumutukoy sa mga potensyal na solusyon upang mabawasan ang mga panganib mula sa baybayin hazards, kabilang ang:

• Paggamit ng kritiko sa bisikleta para magbigay ng proteksyon ng baha sa katabing kapitbahayan at bisikleta mismo,
• Pinahusay na access sa at kasama ang bisikleta,
• Pagpepreserba ng natural na gawi sa paligid ng bisikleta, at
• Pagbibigay ng mga pagkakataon para sa pag-unlad at paglilibang sa hinaharap.

Mangyaring punan ang survey na ito upang magbigay ng Lungsod sa iyong mga saloobin sa kung paano Imperial Beach ay dapat magplano para sa mga baybayin hazards sa Bayshore Bikeway at sa katabing Bayside kapitbahayan.

1. Ano ang interes mo sa lungsod ng Imperial Beach ng bahagi ng Bayshore Bikeway at /o ang katabing Bayside kapitbahayan?

- ◯ Nakatira ako at /o may sariling ari-arian sa (o malapit) ang Bayshore Bikeway at /o Bayside kapitbahayan.
- ◯ May sarili akong negosyo sa (o malapit) ang Bayshore Bikeway at /o Bayside kapitbahayan.
- ◯ Nakatira ako sa Imperial Beach at bumisita sa Bayshore Bikeway at gumagamit ng mga baybayin amenities.
- ◯ Hindi ako nakatira sa Imperial Beach, pero binisita ko ang Bayshore Bikeway at gumagamit ng mga baybayin amenities.
- ◯ Interesado ako / kasangkot sa panrehiyong dialogue sa dagat tumaas at baybayin hazard pag-aangkop.

2. Gaano kadalas mo bisitahin ang Imperial Beach Bayshore Bikeway area? (pumili ng isa)

- ◯ 1 – 2 beses kada linggo
- ◯ 1 – 2 beses kada buwan
- ◯ 2 o higit pang mga beses kada taon
- ◯ Wala pang 1 beses kada taon

Survey #1. Tagalog - Page 2

3. Alin sa mga sumusunod ang pinakamainam na naglalarawan kung paano mo madalas tamasahin ang Imperial Beach Bayshore Bikeway area? (pumili ng isa o higit pa)

- [ ] Aktibong mga aktibidad sa pagbibisikleta (Biking, paglalakad, tumatakbo, atbp.)
- [ ] Paglipat / Pag-uulit
- [ ] Passive recreation activity (Birdwatching, baybayin view/overlooks, social activity, atbp.)
- [ ] Komersyal na paggamit (tingian, restaurant)
- [ ] Iba pang mga

4. Nakakita ka na ba ng mga pagbabago (pagbaha, pagkakamali, limitadong access) sa Bayshore Bikeway?

- ◯ Hindi, ang mga lugar na ito ay nagpakita rin sa akin tulad ng ginawa nila nang una kong makita ang mga ito.
- ◯ Oo, nakakita ako ng maliliit na pagbabago sa mga lugar na ito.
- ◯ Oo, nakakita ako ng malalaking pagbabago sa mga lugar na ito.
- ◯ Hindi ko alam. Hindi pa sapat ang tagal ko nang naririto.

5. Nakakita ka na ba ng /nakaranas ng mga pagbabago (pagbaha, limitadong access) sa kapitbahayan ng Bayside?

- ◯ Hindi, ang mga lugar na ito ay nagpakita rin sa akin tulad ng ginawa nila nang una kong makita ang mga ito.
- ◯ Oo, nakakita ako ng maliliit na pagbabago sa mga lugar na ito.
- ◯ Oo, nakakita ako ng malalaking pagbabago sa mga lugar na ito.
- ◯ Hindi ko alam. Hindi pa sapat ang tagal ko nang naririto.

6. Mga priyoridad - Dagat-antas tumaas ay dagdagan ang dalas at kalubhaan ng baha kaganapan na nangyayari sa Bayside kapitbahayan. Ranggo ang mga sumusunod na isyu sa kahalagahan, simula sa pinaka-pagpindot sa isyu sa itaas.

≡ ▲▼ Pagbaha-induced kalye closures

≡ ▲▼ Pagbaha na nagreresulta sa pinsala sa bayfront bahay

≡ ▲▼ Pagbaha na nagreresulta sa pagkawala ng mga libangan lugar at gumagamit ng

7. Key Pagsasaalang-alang - Mayroon bang iba pang mga pagsasaalang-alang hindi na nakalista sa tanong 6 na ang Lungsod ay dapat gamitin sa pagpili ng mga istratehiya sa pag-aangkop?

Survey #1. Tagalog - Page 3

8. Baybayin Asset - Ang mga sumusunod ay baybayin ari-arian ng Lunsod ay maaaring pumili upang protektahan at mapahusay. Ranggo ang mga sumusunod na asset mula sa pinakamahalaga sa pinakamahalaga.

- Bisikleta
- Pampublikong amenities (parke, magandang lugar, pampublikong parking area)
- Natural ugali lugar (tulad ng Bay at baybayin watersheds)
- Commercial kalakal at serbisyo (restawran, tingian, atbp.)
- Pribadong ari-arian

9. Coastal Pagkakataon – Bilang bahagi ng proseso ng pagpaplano, may mga pagkakataong magdagdag o mapabuti ang mga tampok sa Bayshore Bikeway. Ranggo ang sumusunod na mga pagkakataon mula sa pinakamahalaga sa pinakamahalaga.

- Nadagdagan ang access sa Bayshore Bikeway (Pinabuting paggasta at paglagda para sa orientation)
- Pedestrian lamang lakad katabi ng bisikleta
- Karagdagang pampublikong amenities (parke, banyo, parking)
- Itinalagang mga pananaw at natural na gawi interpretasyon (edukasyonal na signage)
- Karagdagang komersyal na mga kalakal at serbisyo (restawran, tingian, atbp.)

10. Bayside Kapitbahayan Pagkakataon – Bilang bahagi ng proseso ng pagpaplano, may mga pagkakataon upang magdagdag o mapabuti ang mga tampok sa Bayside kapitbahayan. Ranggo ang sumusunod na mga pagkakataon mula sa pinakamahalaga sa pinakamahalaga.

- Pedestrian pagpapabuti at access sa Bayshore Bikeway (Pinabuting paghahanap at signage para sa orientation)
- Karagdagan ng landscaped tampok
- Pinabuting imprastraktura ng imprastraktura
- Karagdagang komersyal na mga kalakal at serbisyo (restawran, tingian, atbp.)
- Higit pang mga pampublikong parking

bayshorebikeway
RESILIENCY PROJECT

Bayshore Bikeway: Bike the Bay Survey 082822

Bayshore Bikeway Resiliency Project Survey 2

The City of Imperial Beach is developing plans to repurpose a 1.2-mile segment of the Bayshore Bikeway corridor. The City has identified areas on the Bayshore Bikeway and/or in the adjacent Bayside neighborhood that are at-risk from coastal hazards like sea-level rise, flooding, and erosion. The City is currently identifying potential solutions to reduce risks from coastal hazards, including:

- **Use of the bikeway corridor to provide flood protection to the adjacent neighborhood and the bikeway itself,**
- **Improved access to and along the bikeway,**
- **Preserving the natural habitat around the bikeway, and**
- **Providing opportunities for future economic development and recreation.**

Please fill out this survey to provide the City with your thoughts on how Imperial Beach should plan for coastal hazards on the Bayshore Bikeway and in the adjacent Bayside neighborhood.

1. Do you live in the Bayside neighborhood and/or Imperial Beach?

- ◯ Yes, I live in the Bayside neighborhood.
- ◯ I live in Imperial Beach, but not the Bayside neighborhood.
- ◯ I do not live in Imperial Beach.

2. Besides cycling, do you visit the Imperial Beach Bayshore Bikeway area for other reasons? (select one or more)

- ☐ Active recreation activities (Biking, walking, running, etc.)
- ☐ Transit / Commuting
- ☐ Passive recreation activities (Birdwatching, coastal view/overlooks, social activities, etc.)
- ☐ Commercial use (retail, restaurant)
- ☐ Other

Survey #2. English - Page 2

3. There are opportunities to add or improve features to the Bayshore Bikeway. Which of the following should be priorities?

- [ ] Improved wayfinding and signage for orientation and education
- [ ] Pedestrian only walkways adjacent to the bikeway
- [ ] Restrooms
- [ ] Designated scenic overlooks
- [ ] Additional commercial goods and services (restaurants, retail, etc.)

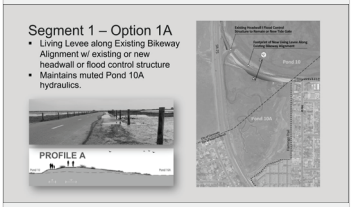
4. Pedestrian intersections may be designed to improve safety for all user on the Bikeway. Would you support these designs even if it meant limiting speeds at these locations?

- ◯ Yes
- ◯ No

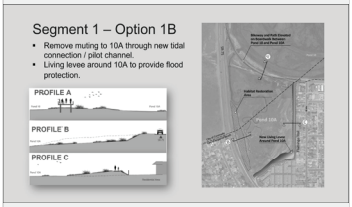
5. Strategies to address sea level rise must balance the needs of users and the environment. On a scale of 1 - 10, with 10 the highest, how willing are you to take a longer route to improve conditions for the environment?

0 10

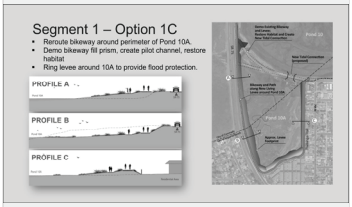
6. Which coastal resiliency option do you prefer for Segment 1?



1A: Elevate Existing Levee



1B: Replace Levee with Boardwalk



1C: Remove Levee, New Ring Levee

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