SECTION 3.8
Hydrology and Water Quality

3.8.1 Introduction

This section evaluates the potential for the proposed program to result in adverse impacts related to hydrology and water quality environmental impacts related to surface water, groundwater, stormwater drainage, and flooding. The following analysis is based on review of available hydrology and water quality reports of the program area and vicinity, relevant statutes and regulations, and a discussion of the methodology and thresholds used to determine whether the proposed program would result in significant impacts. This section identifies the potential for both program-level and cumulative environmental impacts. Potential impacts to biological resources from water quality impacts are discussed in Section 3.3, *Biological Resources*. Potential water quality impacts associated with hazardous materials are discussed in Section 3.7, *Hazards and Hazardous Materials*. Potential impacts relative to water supply are discussed in Section 3.16, *Utilities and Service Systems*.

Data used in this section include information obtained from the State Water Resources Control Board (SWRCB), the California Department of Water Resources (DWR), the Los Angeles Regional Water Quality Control Board (LARWQCB), the Federal Emergency Management Agency (FEMA), and the City of Long Beach. Related plans and policies are discussed, including the *Water Quality Control Plan, Los Angeles Region* (Basin Plan). All information sources used are included as citations within the text; sources are listed in Section 3.8.7, *References*.

3.8.2 Environmental Setting

3.8.2.1 Regional Hydrology

Regional Watershed and Local Water Bodies

The LCW are located in the 640-square-mile San Gabriel River Watershed, which is bounded by the San Gabriel Mountains to the north, most of San Bernardino/Orange County to the east, the division of the Los Angeles River from the San Gabriel River to the west, and the Pacific Ocean to the south. The watershed drains to the San Gabriel River, which is fed by numerous tributaries and storm drains as it passes through 19 cities from its origin in the San Gabriel Mountains to its outlet at the Pacific Ocean.

The site is located near the San Gabriel River's outlet to the Pacific Ocean. The Los Cerritos Channel runs southwest along the northern side of the Synergy Oil Field site and discharges into a portion of Alamitos Bay referred to as the Marine Stadium. Alamitos Bay is connected to the

Pacific Ocean. A tidal channel referred to as Steamshovel Slough is fed by the Los Cerritos Channel and extends across the Northern Synergy Oil Field Site. The Haynes Cooling Channel, a channelized water inlet used for industrial process water cooling is located just south of the San Gabriel River towards the southern boundary of the site and is connected to the Alamitos Bay by 7 culverts.

Regional Groundwater

The site is located within the Coastal Plain of Los Angeles Groundwater Basin, which is further subdivided into subbasins: Santa Monica, West Coast, Central, and Orange County Coastal Plain subbasins. The site straddles the West Coast and Central subbasins and also includes a portion of the Orange County Coastal Plain. The border between the West Coast and Central basins is formed by the Newport Inglewood Fault Zone, as shown on **Figure 3.5-1**, provided in Section 3.5, *Geology, Soils, and Paleontological Resources*, which intersects the site in a northwest-southeast direction. The Central Basin includes the Northern Synergy Oil Field site, Central Bryant site, the Los Alamitos Pump Station and Retarding Basin site, and portions of the Hellman Retained site. The West Coast Basin includes most of the Southern Synergy Oil Field site, the Long Beach City Property site, Pumpkin Patch site, and the South LCWA site is largely within the Orange County Coastal Plain.

Groundwater enters the basins through surface and subsurface flow and by direct percolation of precipitation, stream flow, and applied water. Because of overdrafting (pumping exceeds recharge) of both basins, both basins have been adjudicated and groundwater use within the basins is managed by Watermasters, the Water Replenishment District of Southern California (USBR 2014; WRD 2016 and 2017). When multiple parties withdraw water from the same aquifer, the aquifer may become overdrafted resulting in water supply conflicts among the users. Through adjudication, the courts assign specific water rights to specific water users and compel the cooperation of those who might otherwise refuse to limit their pumping of groundwater. Watermasters are appointed by the court to ensure that pumping conforms to the limits defined by the adjudication.

Seawater Intrusion

Because of seawater intrusion along the coast, the County of Los Angeles Department of Public Works (LADPW) operates the Alamitos Barrier Project, located about 2 miles inland from the terminus of the San Gabriel River and 4,000 feet north, northeast, and east of the Synergy Oil Field site (OCWD 2013; LADPW 2014b). This is a system of injection wells that create a freshwater barrier in subsurface aquifers to prevent seawater from intruding further inland and degrading water quality in inland supply wells. Groundwater levels in the program area are tidally influenced. Previous sampling has indicated that shallow groundwater (as well as surface water) in the Steamshovel Slough in the Northern Synergy Oil Field site and existing wetlands area is saline. Salinity deceases in groundwater further away from the Steamshovel Slough and the wetlands, but is still brackish (ESA 2019). However, the program area is located on the ocean side of the Alamitos Barrier Project which indicates that saline to brackish water quality is present in shallow groundwater beneath the entire site.

Land Use History

Until the late 1800s, the LCW spanned approximately 2,400 acres and consisted of a network of meandering streams, vegetated wetlands, and upland areas. Historically, the program area was almost entirely (88.5 percent) tidal vegetated wetland, with a few natural streams and intertidal flat channels in both the north and the south.

Beginning in the late 1800s, the site began to undergo significant alterations due to agriculture (cattle and beet farming), the demands of a growing population, and oil production. Oil was first discovered at the LCW at the Seal Beach Oil Field in 1926. The development of oil production operations, paired with channelization of the San Gabriel River, resulted in substantial dredge and fill of the LCW. The program area contains oil wells, and network of oil-production tanks and pipes. Today, nearly all of the program area has been converted from its historic wetland habitat, though a few remnant and degraded historic habitats remain. Given the history of the LCW land use, sediment contamination at the site is an important consideration for restoration.

Hazardous Waste and Ecological Criteria Terms

California has established hazardous waste material disposal thresholds, known as Total Threshold Limit Concentrations (TTLC) and Soluble Threshold Limit Concentrations (STLC), that are used to evaluate sediments and soils for hazardous waste criteria that help determine disposal destinations and handling criteria. The TTLC value for each constituent is the upper limit allowed in a solid or powdered waste to possibly be considered non-hazardous; any constituent that exceeds the promulgated TTLC values are considered toxic hazardous waste. Similarly, the STLC value is the maximum concentration of a waste constituent in liquid form to not be considered hazardous. If a solid waste sample falls between the STLC and TTLC value, it is considered non-hazardous if the concentration is less than ten times the STLC value. If the measured concentration exceeds ten times the STLC, it is likely hazardous but the optional "Waste Extraction Test (WET)" can be performed to determine whether the sample is considered hazardous. Hazardous waste material criteria dictate which facility or treatment is required for disposal of hazardous material.

Beneficial reuse criteria for wetland restoration were first developed by the San Francisco Bay Regional Water Quality Control Board (SFBRWQCB) and presented in the Draft Staff Report entitled, *Beneficial Reuse of Dredged Materials: Sediment Screening and Testing Guidelines* dated May 2000. The document was prepared to assist in planning beneficial reuse projects in the Bay Area by establishing general screening guidelines and general sediment testing requirements. The guidelines include specific criteria for reuse of sediments in wetland and upland beneficial uses. The guidelines for the wetland foundation use are based on the ER-M concentrations. These guidelines are typically used in combination with bioassay testing to determine suitability of the materials for use in wetland restoration projects (SFBRWQCB, 2000).

Environmental Screening Levels (ESLs), developed and maintained by the SFBRWQCB, are used by regulatory agencies throughout the State of California. The SFBRWQCB develops separate screening levels for residential and commercial/industrial land uses and construction worker exposure. As the board notes, the residential ESLs are the most stringent thresholds, and

soil "with chemical concentrations below these levels generally would not require remediation and would be suitable for unrestricted uses if disposed offsite" (SFBRWQCB 2010). In addition to ESLs, constituent concentrations were compared to Regional Screening Levels (RSLs), which were previously referred to as Preliminary Remediation Goals (PRG), as promulgated by the United States Environmental Protection Agency (USEPA).

Sediment Quality

Based on the sediment and water quality characterization results to date for the LCW, the program area has been adversely affected from past oil and gas land uses and releases of hazardous materials associated with these operations. Sediment sampling has been conducted at the LCW dating back to the late 1980s. The effects include the presence of petroleum hydrocarbons, PCBs, pesticides, VOCs, SVOCS, and bi-products in sediments and groundwater. Recent (2014) studies show that PAHs have decreased significantly in the Zedler Marsh and State Lands Area since the mid-1990s, potentially attributable to vegetation at the marsh that is enhancing degradation of the PAHs, and do not require remediation prior to the restoration of the site (ESA 2019).

Though a few sediment samples taken to date have exceeded state hazardous waste criteria (TTLC and STLC), the primary concern within LCW is constituents that exceed ecological criteria (ER-L and ER-M)[1] and human health criteria (i.e., Environmental Screening Levels (ESLs)). The sediment studies performed at the site indicate that impacted soils may require management and/or remediation depending on the final placement and associated constituent concentrations and regulatory action levels.

Surface Water Quality

The general surface water quality conditions are identified by water body below:

Los Cerritos Channel

Historically, dry weather flows from the Los Cerritos Channel exceed copper water quality objectives from the State Water Quality Control Board and Regional Basin Plan. Data from wet-weather flows indicated exceedances for copper, lead, and zinc. In response to these exceedances, a Total Maximum Daily Load (TMDL) was developed to address impairments in the water column in Los Cerritos Channel for copper, lead, selenium, and zinc (**Table 3.8-1**, *Los Cerritos Channel TMDL*). The TMDL set numeric targets based on the water quality criteria contained in the California Toxics Rule (CTR). In addition to metals, the Los Cerritos Channel is listed under the Clean Water Act Section 303(d) for ammonia, phthalate, chlordane, metals, coliform bacteria, and trash.

[1] Effect range (ER) values are used in dredged material evaluations for ocean disposal. Effect range low (ER-L) and effect range median (ER-M) are the chemical values for paired data demonstrating benthic impairment and are used as the representative ecological criteria in this analysis.

TABLE 3.8-1
LOS CERRITOS CHANNEL TMDL

Pollutant	Anticipated TMDL Adoption Date
Ammonia	1/1/2019[a]
Bis(2ethylhexyl)phthalate (DEHP)	1/1/2019[a]
Chlordane (sediment)	1/1/2019[a]
Coliform bacteria	1/1/2019[a]
Metals (copper, lead, zinc)	USEPA TMDL Adopted on 3/17/2010
Trash	1/1/2019[a]

[a] No updated TMDLs have been adopted according to the California Waterboard's Website as of May 2019.
SOURCE: Everest 2012 as cited in ESA 2019

San Gabriel River

The San Gabriel River and its associated tributaries exceed water quality objectives (which are based on beneficial uses and CTR values) for a number of constituents. Coyote Creek, which converges with the San Gabriel River just upstream of the program area, is listed under Section 303(d) for diazinon, coliform bacteria, pH, toxicity, copper, lead, and zinc (**Table 3.8-2**, *303(d) Impaired Waters and Pollutants for the Lower San Gabriel River Watershed*). The San Gabriel River Estuary is listed for copper. The Lower San Gabriel River Watershed Management Program (WMP), a multi-jurisdictional planning document, has found that the municipal separate storm sewer systems (MS4s) contributes significantly to the metal loading rates found in the San Gabriel River during dry-weather flow events. This is attributed to high metal concentrations in urban runoff.

Haynes Cooling Channel

The Haynes Cooling Channel provides water for the Haynes Generating Station for cooling. The generating station pulls water from the Alamitos Bay, runs it through the generating station, and discharges to the San Gabriel River adjacent to the generating station. The water quality in the Haynes Cooling Channel is expected to be similar to the water quality in Alamitos Bay which is impaired by bacteria. The Haynes Generating Station is undergoing a modernization project that would eliminate the use of ocean water to cool the plant by 2029; once complete, the Haynes Cooling Channel will be decommissioned. A monitoring report found that concentrations of all priority pollutants in the Haynes Generating Station intake (e.g., water coming from the Haynes Cooling Channel) were low enough to be due to background levels or laboratory testing (City of Los Angeles 2011 as cited in ESA 2019).

TABLE 3.8-2
303(D) IMPAIRED WATERS AND POLLUTANTS FOR THE LOWER SAN GABRIEL RIVER WATERSHED

Water Body	Pollutant and TMDL Adoption Date (or Anticipated Date)
Coyote Creek	Ammonia (Timeline N/A) Cyanide (Timeline N/A) Copper (TMDL completed 3/27/2007) Diazinon (1/1/2019)[a] Coliform Bacteria (1/1/2009)[a] Lead (TMDL completed 3/27/2007) pH (1/1/2019)[a] Toxicity (1/1/2009)[a] Zinc (TMDL completed 3/27/2007)
Coyote Creek, North Fork	Indicator Bacteria (1/1/2012)[a] Selenium (1/1/2021)
San Gabriel River Reach 2	Coliform bacteria (1/1/2011)[a] Cyanide (1/1/2021) Lead (TMDL completed 3/27/2007)
San Gabriel River Reach 1	Ammonia (timeline N/A) Coliform bacteria (1/1/2019)[a] pH (1/1/2019)[a] Copper
San Gabriel River Estuary	Copper (TMDL completed 3/27/2007)

[a] No updated TMDLs on California Waterboard's Website as of May 2019.
SOURCE: Everest 2012, SGR 2015 as cited in ESA 2019

Alamitos Bay

Alamitos Bay is 303(d) listed for indicator bacteria, which is an issue that affects the local beaches as well. No TMDLs have been established for the bay.

The Long Beach Estuary Monitoring Plan (2016) is an Integrated Monitoring Program aimed to assess the effects of MS4s on receiving waters. As part of this plan, the City of Long Beach has set up a monitoring site in the Alamitos Bay (LBR2). Beginning in 2015, three wet-weather and two dry-weather events have been monitored at the Alamitos Bay Partners site. At this time, data is not publicly available.

The County Health and Human Services performs weekly water samples at Long Beach beaches, including those in Alamitos Bay. Los Angeles County provides watch conditions based on the monitoring results. Historical monthly monitoring is available through the County's website (**Table 3.8-3**, *Heal the Bay Water Quality Grades at Alamitos Bay*). According to the Long Beach Estuary Monitoring Plan, beaches in Long Beach (including the beaches at Alamitos Bay) have shown an improvement in bacterial compliance.

TABLE 3.8-3
HEAL THE BAY WATER QUALITY GRADES AT ALAMITOS BAY

Year	Summer Dry	Winter Dry	Annual Wet
2017	A	B	F
2016	B	B	F
2015	A+	A	F
2014	A	A	F
2013	B	A+	F
2012	B	A	F
2011	C	F	F
2010	C	F	F

SOURCE: Heal the Bay (2019) as cited in ESA 2019

Urban Runoff

In addition to the water bodies identified above, urban runoff contributes to water quality of the aforementioned water bodies as receiving waters. The areas of the proposed program that are most affected by urban runoff are the Los Alamitos Retarding Basin site, Gum Grove Park (on the southeastern side of the South LCWA site), and the Long Beach City Property site (ESA 2019). Constituents common to urban runoff include metals, bacteriological indicators, and nutrients. While data on the local stormwater is not available, similar characteristics can be expected from runoff entering the three locations (ESA 2019).

Groundwater Quality

Three groundwater sampling investigations have occurred within the program area dating back to 1988 and are summarized as follows:

1988 Phase I Earth Technology Corporation Site Investigation, Texaco Bryant Lease

Earth Technology Corporation performed a soil and groundwater sampling investigation on the eastern bank of the San Gabriel River within the Texaco-Bryant lease property (the Central LCWA, Isthmus LCWA, Zedler Marsh, and Isthmus Bryant locations). Groundwater sampling evaluated TPHC and BTEX concentrations at three monitoring wells. Floating hydrocarbons (a floating layer of viscous crude oil) of approximately 1/8-inch thickness were found during sampling of monitoring well 1, and a sheen on the groundwater surface was noted during sampling at monitoring well 3.

Two groundwater samples exceeded the human health based groundwater ESL for benzene and ethyl benzene. Based on the elevated concentrations of hydrocarbon in both soil and groundwater found during the 1988 sampling, Earth Technology proposed further groundwater sampling to delineate the extent of contamination at the site.

1989 Engineering Enterprises Environmental Assessment

Engineering Enterprises, Inc. (EEI) performed groundwater sampling at ten different wells between March and April 1989 in the Central LCWA, Isthmus LCWA, Isthmus Bryant, and Zedler Marsh areas. The groundwater investigation yielded sixteen groundwater samples, which were evaluated for SVOCs, total fuel hydrocarbons, and BTEX using EPA Methods 8015 (modified) and 418.1. Six groundwater samples showed elevated concentrations of TPHC (ranging from 3,700 to 32,000 micrograms/liter [µg/L]). Three samples had total fuel hydrocarbons greater than 250 µg/L, with the highest sample showing a concentration of 22,021 µg/L. At least one sample also exceeded ESL standards for BTEX.

The groundwater analysis found slightly elevated levels of TPHC in some of the sample wells. There were no samples with detectable levels of SVOCs. EEI concluded that the eastern portion of the site had elevated total petroleum hydrocarbon concentrations, "of limited lateral and vertical extent." The report further determined that some remediation activity would be necessary, though EEI did not determine the remediation activities or associated costs.

2006 Hellman Ranch (South LCWA) Groundwater Sampling

In 2006, as a follow-up to their 2004 LCWA Phase II Soil and Groundwater Sampling, Anchor collected groundwater samples at seven different monitoring wells located on the Hellman ranch (South LCWA) property. The sampling aimed to characterize the former dump site materials, define the lateral extent of the crude oil plume found in the 2004 monitoring, identify the potential and likely sources of crude oil, characterize the groundwater flow, and analyze the contaminants of concern and their ability of migrating to potential receiving waters.

Anchor determined the approximate extent of the crude oil: a 100-by-500-foot area on the southwestern portion of the property and determined that the likely source was a former 6-inch oil and gas line that ran along the border of the contaminated area.

To assess groundwater quality, samples were tested for volatile organic compounds, polycyclic aromatic hydrocarbons, semi volatile organic compounds, dissolved metals, and common cations and anions and compared to the most stringent California Toxics Rule Standards. In general, the samples were below the Toxic Rule Standards, though there were exceedances for benzene, bromodichloromethane, 1,2,-dichlorethane, chrysene, benzo(a)pyrene, copper, and silver. Additionally, the sampling found crude-oil at one of the monitoring wells.

Given the zone of the approximated crude oil contamination and constituent results, Anchor recommended that "future restoration plans should minimize disturbance of groundwater flow gradients in this area."

Flooding

Flooding can occur when stormwater runoff exceeds the conveyance capacity of the drainage system. Flooding can also occur due to tsunamis, high tides/storm surge, dam or levee failure, sea-level rise, or other causes.

FEMA identifies flood hazard areas on flood insurance rate maps including areas that will be inundated by the flood event having a 1 percent chance of being equaled or exceeded in a given year; 1 percent annual chance flood is also referred to as the 100-year flood. Currently, the extent of the 100-year flood zone in the program area is confined to the existing water bodies and excludes all upland areas.

Sea-Level Rise

Estimates of sea-level rise can be used to evaluate potential future flooding conditions. Projections of global sea-level rise are well-documented and investigated, with recent research projecting sea-level rise on the order of 2 to 10 feet by 2100 in California (e.g., Cayan et al. 2008; Griggs et al. 2017). This research has been used to develop a series of policy guidance documents by the State of California that recommend including a specific amount of sea-level rise in project planning and design, the most recent being the California Ocean Protection Council's (OPC) *State of California Sea-Level Rise Guidance* (OPC 2018). The OPC (2018) Guidance includes tables of projected relative sea-level rise at well-established tide gauges located along the coast of California through 2150 for a range of risk aversion scenarios, including low, medium-high, and extreme (e.g., H++). **Table 3.8-4**, *Projected Sea-Level Rise (in feet) for Los Angeles*, shows the projections for Los Angeles (the closest tide gauge to Seal Beach/Long Beach). These projections were developed and summarized with the intention that local planning and design efforts would have a consistent and accepted basis for addressing future sea-level rise.

The California Coastal Commission (CCC) recently updated their *Sea-Level Rise Policy Guidance* in 2018 (CCC 2018). The CCC (2018) Guidance provides a basis for selecting the time horizon and the risk level of the project, which are used to define the appropriate sea-level rise amounts. The CCC (2018) Guidance recommends that project planning and design consider a range of scenarios in order to bracket the possible timing of a given amount of sea-level rise.

The CCC (2018) Guidance identifies three levels of risk to consider when planning for sea-level rise (blue boxes in Table 3.8-4):

- The low risk aversion scenario is appropriate for adaptive, lower consequence decisions (e.g., unpaved coastal trail), but is not adequate to address high impact, low probability events.
- The medium-high risk aversion scenario is appropriate as a precautionary projection that can be used for less adaptive, more vulnerable projects or populations that will experience medium to high consequences as a result of underestimating sea-level rise (e.g., coastal housing development).
- The extreme risk aversion scenario is appropriate for high consequence projects with little to no adaptive capacity and which could have considerable public health, public safety, or environmental impacts (e.g., coastal power plant, wastewater treatment plant, etc.).

TABLE 3.8-4
PROJECTED SEA-LEVEL RISE (IN FEET) FOR LOS ANGELES

		Probabilistic Projections (in feet) (based on Kopp et al. 2014)						
		Median	Likely Range			1-in-20 Chance	1-in-200 Chance	H++ Scenario (Sweet et al. 2017) *Single Scenario
		50% probability sea-level rise meets or exceeds …	66% probability sea-level rise is between …			5% probability sea-level rise meets or exceeds …	0.5% probability sea-level rise meets or exceeds …	
					Low Risk Aversion		Medium-High Risk Aversion	Extreme Risk Aversion
High emissions	2030	0.3	0.2	–	0.5	0.6	0.7	1.0
	2040	0.5	0.4	–	0.7	0.9	1.2	1.7
	2050	0.7	0.5	–	1.0	1.2	1.8	2.6
Low emissions	2060	0.8	0.5	–	1.1	1.4	2.2	
High emissions	2060	1.0	0.7	–	1.3	1.7	2.5	3.7
Low emissions	2070	0.9	0.6	–	1.3	1.8	2.9	
High emissions	2070	1.2	0.8	–	1.7	2.2	3.3	5.0
Low emissions	2080	1.0	0.6	–	1.6	2.1	3.6	
High emissions	2080	1.5	1.0	–	2.2	2.8	4.3	6.4
Low emissions	2090	1.2	0.7	–	1.8	2.5	4.5	
High emissions	2090	1.8	1.2	–	2.7	3.4	5.3	8.0
Low emissions	2100	1.3	0.7	–	2.1	3.0	5.4	
High emissions	2100	2.2	1.3	–	3.2	4.1	6.7	9.9
Low emissions	2110*	1.4	0.9	–	2.2	3.1	6.0	
High emissions	2110*	2.3	1.6	–	3.3	4.3	7.1	11.5
Low emissions	2120	1.5	0.9	–	2.5	3.6	7.1	
High emissions	2120	2.7	1.8	–	3.8	5.0	8.3	13.8
Low emissions	2130	1.7	0.9	–	2.8	4.0	8.1	
High emissions	2130	3.0	2.0	–	4.3	5.7	9.7	16.1
Low emissions	2140	1.8	0.9	–	3.0	4.5	9.2	
High emissions	2140	3.3	2.2	–	4.9	6.5	11.1	18.7
Low emissions	2150	1.9	0.9	–	3.3	5.1	10.6	
High emissions	2150	3.7	2.4	–	5.4	7.3	12.7	21.5

SOURCE: OPC, 2018

For habitat restoration projects, the CCC (2018) Guidance recommends using multiple time horizons and sea-level rise projections (CCC 2018, pg. 102):

> *Determining an anticipated life for restoration activities or other related projects is somewhat more complex than for typical development projects because these activities are typically meant to exist in perpetuity. As such, assessing sealevel rise impacts may necessitate analyzing multiple different time frames, including the present, near future, and very longterm depending on the overall goals of the project.*

According to a mapping tool created by the USGS based on their Coastal Storm Modeling System (CoSMoS), 6.6 feet of sea-level rise would inundate the majority of the program area. Even 1 foot of sea-level rise would inundate most of the Synergy Oil Field sites.

Sediment Dynamics

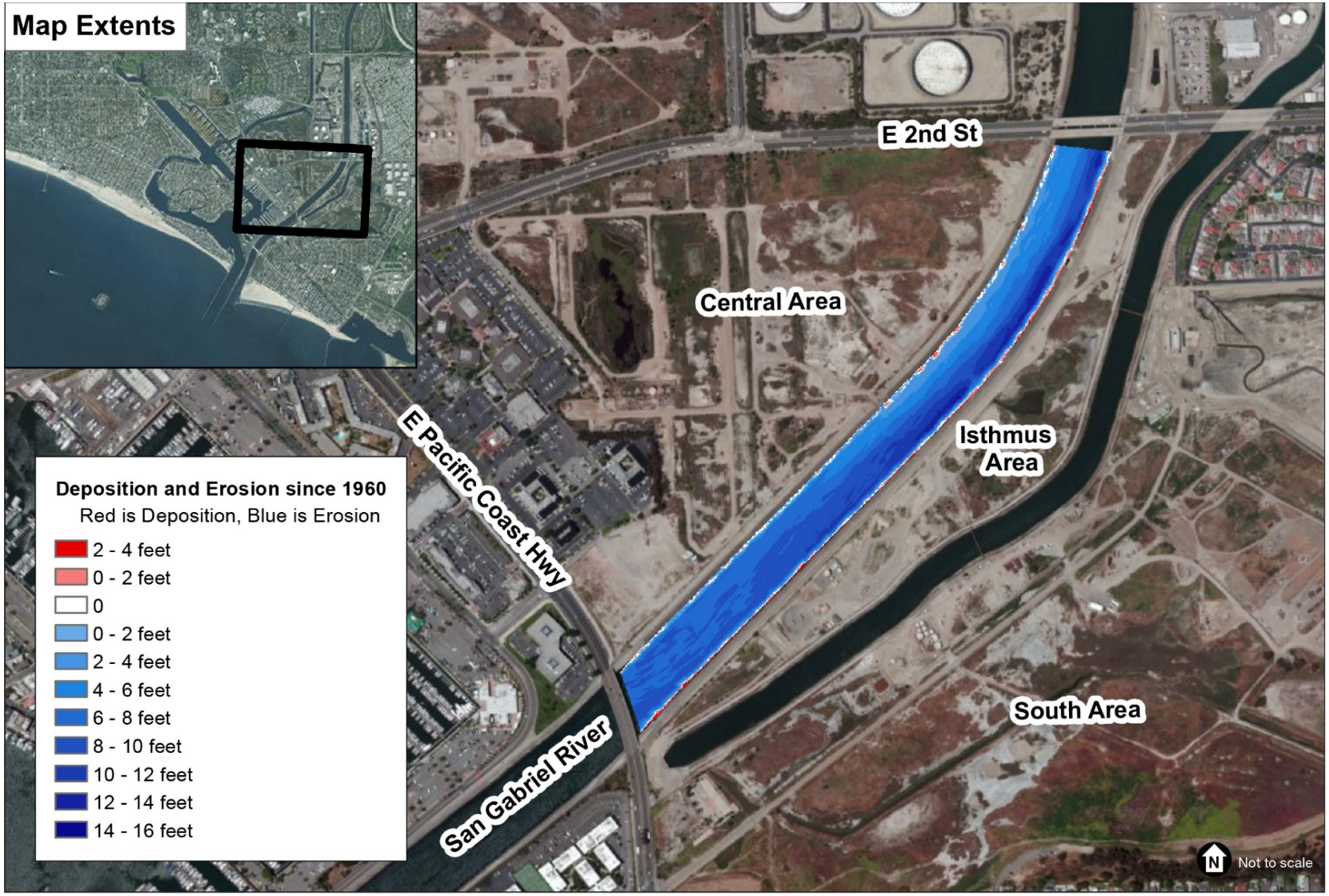
Sediment Dynamics in the San Gabriel River

The San Gabriel River is an intermittently-concrete-lined, flood-control channel in a highly urbanized watershed. These factors limit the supply of sediment to the river, which in turn limits the potential for sedimentation in the channel. The concrete lining also prevents channel erosion, so erosion only occurs in the soft-bottom portion of the channel.

Storm events can mobilize sediment from the watershed or within the San Gabriel River and result in either net deposition or, where the channel has a soft-bottom, net erosion within the channel. Channel profiles from 1960 and 2019 were compared to identify areas of net channel deposition or erosion in feet over time (**Figure 3.8-1**, *San Gabriel River Erosion between 1960 and 2019*). Based on this historic data, the San Gabriel River has generally scoured in the vicinity of the program site, with erosion depths up to 14 feet in some areas. The most significant channel bed scour is on the northeastern side of the channel near 2nd St and along the Isthmus Area. This indicates velocities in the San Gabriel River are higher on the outside of the channel bend, which is typical of natural systems. Additionally, the overall scour indicates that the channel is sediment supply limited rather than transport limited (e.g., there is more erosive power than sediment available to be moved).

Sediment Dynamics along the Coast

In the vicinity of the LCW, the historic longshore transport is generally toward the southeast. The LCW is part of the San Pedro Littoral Cell, which extends from Point Fermin in the northwest to Dana Point at the southeast. The Newport Submarine Canyon is at the southeastern end of the cell and acts as a sediment sink. Historic processes in the littoral cell have been disrupted by the San Pedro-Long Beach port complex, dam construction, channelization of the Los Angeles and San Gabriel Rivers and the construction of a series of coastal structures. Prior to the dam construction, the Santa Ana, San Gabriel, and Los Angeles Rivers often changed course and their watersheds provided abundant sediment to local beaches. Following the extensive construction of dams, pavement, and channelization, the sediment deliveries from the San Gabriel and Los Angeles river basins are now substantially reduced.



SOURCE: ESRI (background imagery)
NOTE: WSE = Water Surface Elevation

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Figure 3.8-1
San Gabriel River Erosion between 1960 and 2019

The San Gabriel River flowed into Alamitos Bay from 1868 until 1933–1935, when its new flood channel outlet was constructed. The new construction included levees and stone jetties at its mouth. The east and west jetties for the new San Gabriel River mouth were completed in 1932 and 1933, respectively. The west jetty was extended in 1940–1941 to slow the shoaling of the outlet. A new bay entrance was dredged in 1945–1946. This separated the Alamitos Bay from the San Gabriel River ocean outlet, resulting in three stone jetties at the bay entrance and its adjacent river mouth outlet.

The Long Beach Detached Breakwater protects most of the coast from ocean waves, resulting in relatively little longshore transport in the vicinity of the site (USACE 1986). However, northwest longshore transport at Seal Beach has led to accumulation of sand at the San Gabriel River mouth east jetty and erosion at the Anaheim Bay west jetty according to Wiegel (2009). Many of the beaches in the San Pedro Littoral Cell are nourished with sands annually to combat erosion (Orme et al 2011). In the vicinity of the program at Belmont Shore Beach and Seal Beach, nourishment began in 1940s, with much of the material coming from Alamitos Bay. A history of dredge events for Alamitos Bay from 1933–2002 is provided in Appendix I.

The program site is upstream along the San Gabriel River and, therefore, the sediment dynamics along the coast may not directly affect the sediment dynamics near the site. However, sedimentation at the river mouth could affect the hydrodynamics further up the river and at the site.

3.8.3 Regulatory Framework

3.8.3.1 Federal

Clean Water Act

The Clean Water Act (CWA), also known as the Federal Water Pollution Control Act as amended by the Federal Water Pollution Control Act Amendments of 1972, (33 USC 1251–1376) is the major federal legislation governing water quality. The CWA established the basic structure for regulating discharges of pollutants into the waters of the United States and gave the USEPA the authority to implement pollution control programs, such as setting wastewater standards for industry. The CWA sets water quality standards for all contaminants in surface waters. The statute employs a variety of regulatory and non-regulatory tools to reduce direct pollutant discharges into waterways, finance municipal wastewater treatment facilities, and manage polluted runoff. The United States Army Corps of Engineers (Corps) has jurisdiction over all waters of the United States including, but not limited to, perennial and intermittent streams, lakes, and ponds, as well as wetlands in marshes, wet meadows, and side hill seeps. The CWA states that the discharge of pollutants to waters of the United States from any point source is unlawful, unless the discharge is in compliance with a National Pollutant Discharge Elimination System (NPDES) permit. Amendments to the CWA established a framework for regulating municipal and industrial stormwater discharges under the NPDES program. In addition, the USEPA published final regulations that establish application requirements for stormwater permits in 1990.

The relevant sections of the CWA are summarized below.

Clean Water Act Section 401

Federal CWA Section 401 requires that any person applying for a federal permit or license that may result in the discharges of dredged or fill material or pollutants (including sediment) into waters of the United States must obtain a state water quality standards certification (WQC) that the activity complies with all applicable state water quality standards, limitations, and restrictions. In California, this certification is typically administered ~~in California~~ by the Regional Water Quality Control Boards (RWQCBs). For all applications for WQC received by the Water Boards after May 29, 2020, the State Wetland Definition and Procedures for Discharges of Dredged or Fill Material to Waters of the State must be implemented. For guidance on the application process see: https://www.waterboards.ca.gov/water_issues/programs/cwa401/docs/procedurs_conformed.pdf).~~SWRCB via the local RWQCB.~~ No license or permit may be granted by a federal agency until certification as required by Section 401 has been granted. Further, no license or permit may be issued if certification has been denied. An entity seeking a Section 401 water quality certification typically must obtain a CWA Section 404 permit from USACE. This certification ensures that the proposed activity does not violate state or federal water quality standards. The Los Cerritos Wetlands Restoration Plan area lies on the boundary between two water quality control regions, Santa Ana and Los Angeles, and therefore the State Water Resources Control Board may be designated as the permitting authority for issuance of some or all of the WQCs that may be needed for the projects to be conducted under this PEIR.

Clean Water Act Section 402

CWA Section 402 regulates discharges to surface waters of the United States through the NPDES program. In California, the USEPA authorizes the SWRCB to oversee the NPDES program through the local RWQCB. Stormwater discharges are also regulated under CWA Section 402. Construction activities disturbing 1 acre of land or greater must be covered under the NPDES Construction General Permit, discussed in Section 3.5.3, *Regulatory Framework*, of Section 3.5, *Geology, Soils, and Paleontological Resources*, which requires the preparation and implementation of a Stormwater Pollution Prevention Plan (SWPPP) for construction activities that includes erosion and sediment controls, runoff water quality monitoring, means of waste disposal, implementation of approved local plans, control of post-construction sediment, and maintenance responsibilities.

Clean Water Act Section 303—Water Quality Criteria and Standards

Under federal law, the USEPA has published water quality regulations under 40 CFR. CWA Section 303 requires states to adopt water quality standards for all surface waters of the United States. As defined by the CWA, water quality standards consist of two elements: identified designated beneficial uses of the water body in question and criteria that protect the designated uses. Where multiple uses of a water body exist, water quality standards must protect the most sensitive use. In California, the USEPA has granted SWRCB and its local RWQCBs the authority to identify beneficial uses and adopt applicable water quality objectives.

Clean Water Act Section 303(d)

CWA Section 303(d) requires that each state identify water bodies or segments of water bodies that are "impaired" (i.e., do not meet one or more of the water quality standards established by the

state). These waters are identified in the Section 303(d) list as waters that are polluted and need further attention to support their beneficial uses. Once the water body or segment is listed, the state is required to establish TMDLs for the pollutant.

A TMDL is a pollution budget, includes a calculation of the maximum amount of a pollutant that can occur in a waterbody, and allocates the necessary reductions to one or more pollutant sources. A TMDL serves as a planning tool and potential starting point for restoration or protection activities with the ultimate goal of attaining or maintaining water quality standards. Under CWA Section 303(d), states are required to submit lists of impaired waters. These are waters that are too polluted or otherwise degraded to meet water quality standards. The law requires that the states establish priority rankings for waters on the lists and develop TMDLs for these waters. TMDLs can be narrative actions to reduce loading or numeric goals such as an amount of mercury in fish tissue, concentrations in water, or concentrations in sediment.

As of 2016, the Los Cerritos Channel is listed as a Water Quality Limited Segment for ammonia, bis(2ethylhexyl)phthalate, indicator bacteria (coliform), copper, lead, zinc, trash, and pH (LARWQCB 2016). In addition to narrative actions to reduce the pollutant loading, the LARWQCB has developed and the USEPA has accepted the following numeric TMDLs for the channel (USEPA 2010):

- Copper = 0.0039 mg/L;
- Lead = 0.0151 mg/L; and
- Zinc = 0.386 mg/L.

The San Gabriel River is also listed as an impaired water body for metals and bacteria. Separate numeric targets for metals were developed for dry and wet weather.

- Dry Weather Copper = 3.7 µg/L[2] or 0.0037 mg/L
- Wet Weather Lead = 166 µg/L or 0.166 mg/L

The draft TMDL for bacteria numeric target for the San Gabriel River Estuary and tributaries are provided in **Table 3.8-5**, *Numeric Targets for San Gabriel River Estuary and Tributaries*.

[2] ug/L = micrograms per liter.

TABLE 3.8-5
NUMERIC TARGETS FOR SAN GABRIEL RIVER ESTUARY AND TRIBUTARIES

Numeric Targets (Beneficial Uses)	Estuary (Marine REC-1)	SGR and Tributaries (Freshwater REC-1)
Single Sample		
E. coli	NA	235/100 ml
Fecal coliform	400/100 ml	NA
Enterococcus	104/100 ml	NA
Total coliform*	**10,000/100 ml**	**NA**
Geometric Mean		
E. coli	NA	126/100 ml
Fecal coliform	200/100 ml	NA
Enterococcus	35/100 ml	NA
Total coliform*	**1,000/100 ml**	**NA**

* Total coliform density shall not exceed 1,000/100 ml, if the ratio of fecal-to-total coliform exceeds 0.1.
NA = not applicable
SOURCE: LARWQCB, 2015

Clean Water Act Section 404

CWA Section 404 requires that any person conducting any activity that involves any discharge of dredged or fill material into waters of the United States, including wetlands, obtain a permit. USACE is responsible for issuing permits for the placement of fill or discharge of material into waters of the United States required under CWA Sections 401 and 404. Projects that involve construction in streams or wetlands trigger the need for these permits and related environmental reviews by USACE. Under the CWA, ~~W~~wetlands are *"areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions."* ~~generally considered to be areas that are periodically or permanently inundated by surface water or groundwater, and support vegetation adapted to life in saturated soil~~. Wetlands are recognized as important features on a regional and national level due to their high inherent value to fish and wildlife, use as storage areas for storm and floodwaters, and water recharge, filtration, and purification functions. Technical standards for delineating wetlands have been developed by the USACE, which ~~generally~~ defines wetlands through consideration of three criteria: hydrology, soils and vegetation. Under CWA Section 404, the ACOE is responsible for regulating the discharge of dredged or fill material into waters of the United States. The term "waters of the United States" includes wetlands and non-wetland bodies of water that meet specific criteria as defined in the Code of Federal Regulations.

National Flood Insurance Program

The National Flood Insurance Program was created to reduce the impact of flooding private and public structures by providing affordable property insurance and encouraging communities to implement floodplain management regulations. FEMA implements NFIP and identifies flood hazard areas on flood insurance rate maps. FEMA requires minimum design standards are implemented in flood hazard areas.

33 U.S.C. Section 408: Modifications and Alterations of Corps of Engineers Projects

Section 14 of the Rivers and Harbors Act of 1899 and codified in 33 U.S.C. Section 408 (commonly referred to as "Section 408") authorizes the Secretary of the Army, on the recommendation of the Chief of Engineers of the Corps, to grant permission for the alteration of a Corps' civil works project if the Secretary determines that the activity will not be injurious to the public interest and will not impair the usefulness of the project. Because the San Gabriel River flood control channel is a Corps flood risk management project, a Section 408 permit would be required to remove the levees and reconnect the channel to the floodplain or to install culverts in the levee. The Section 408 permit application would include all project plans and review the proposed hydrologic changes for the Chief of Engineer's consideration on whether these changes would ultimately impair the usefulness of the original project or not.

National Weather Service TsunamiReady Communities

The National Weather Service established guidelines to be followed to ensure an area is prepared in the event of a tsunami. These guidelines are referred to as "TsunamiReady" Guidelines, and include mitigation, preparation, and response guidelines. Examples of mitigation guidelines include designating and mapping tsunami hazard zones and installing signage identifying tsunami hazard zones and instructions to go to higher ground. Preparation guidelines include conducting public education and outreach efforts regarding tsunamis. Response guidelines include addressing tsunami hazards in emergency plans, having a reliable means for a 24-hour warning point to disseminate warnings to the public, and using weather receivers in critical facilities and public venues (NWS 2016). The County of Los Angeles, including the City of Long Beach, is not considered a TsunamiReady community, however, the City Seal Beach is (NWS 2019). Pacific Coast Highway is identified as a primary disaster route and runs adjacent to the western boundary of the South Synergy Oil Field site (LADPW 2013); this roadway is designated for use in the event of an emergency to transport emergency personnel and supplies.

3.8.3.2 State

Porter-Cologne Water Quality Control Act

The Porter-Cologne Water Quality Control Act (California Water Code Sections 13000–16104) (Porter-Cologne Act) provides the basis for water quality regulation within California and defines water quality objectives as the limits or levels of water constituents that are established for reasonable protection of beneficial uses. Porter-Cologne is administered by the State Water Resources Control Board (State Water Board) and nine Regional Water Quality Control Boards (RWQCBs), collectively referred to as the Water Boards ~~The SWRCB administers water rights, water pollution control, and water quality functions throughout the state, while the local water boards (in this case, LARWQCB) conducts planning, permitting, and enforcement activities.~~ The State Water Board sets statewide water quality standards, issues statewide general permits, conducts statewide surface and groundwater monitoring and assessment, administers water rights, regulates drinking water supplies, and issues orders for cleaning up contaminated sites.

The nine semi-autonomous Regional Water Boards are responsible for setting water quality standards and objectives, issuing waste discharge requirements, determining compliance with those requirements, and taking appropriate enforcement actions. Each Water Quality Control Region is regulated through a Water Quality Control Plan, or "Basin Plan," which is updated every three years. The Basin Plans contain the regulations adopted by the Regional Water Boards to control the discharge of waste and other controllable factors affecting the quality or quantity of waters of the state. The Los Cerritos Wetlands Restoration Plan area lies on the boundary of two water quality control regions: Los Angeles and Santa Ana.

The Porter-Cologne Act requires the Los Angeles Regional Water Quality Control Board (LARWQCB) to establish water quality objectives, while acknowledging that water quality may be changed to some degree without unreasonably affecting beneficial uses. Beneficial uses, together with the corresponding water quality objectives, are defined as standards, per federal regulations. Therefore, the regional plans form the regulatory standards for meeting state and federal requirements for water quality control. Changes in water quality are only allowed if the change is consistent with the maximum beneficial use designated by the state, does not unreasonably affect the present or anticipated beneficial uses, and does not result in water quality less than that prescribed in the water quality control plans.

California Coastal Act

The California Coastal Act (CCA) establishes policies with respect to the review of new development projects by both state and local agencies. The CCA policies concerning hydrology and water quality are as follows:

- **Section 30230.** Marine resources shall be maintained, enhanced, and, where feasible, restored. Special protection shall be given to areas and species of special biological or economic significance. Uses of the marine environment shall be carried out in a manner that will sustain the biological productivity of coastal waters and that will maintain healthy populations of all species of marine organisms adequate for long-term commercial, recreational, scientific, and educational purposes.
- **Section 30231.** The biological productivity and the quality of coastal waters, streams, wetlands, estuaries, and lakes appropriate to maintain optimum populations of marine organisms and for the protection of human health shall be maintained and, where feasible, restored through, among other means, minimizing adverse effects of waste water discharges and entrainment, controlling runoff, preventing depletion of ground water supplies and substantial interference with surface water flow, encouraging waste water reclamation, maintaining natural vegetation buffer areas that protect riparian habitats, and minimizing alteration of natural streams.
- **Section 30232.** Protection against the spillage of crude oil, gas, petroleum products, or hazardous substances shall be provided in relation to any development or transportation of such materials. Effective containment and cleanup facilities and procedures shall be provided for accidental spills that do occur.
- **Section 30236.** Channelizations, dams, or other substantial alterations of rivers and streams shall incorporate the best mitigation measures feasible, and be limited to (1) necessary water supply projects, (2) flood control projects where no other method for protecting existing structures in the floodplain is feasible and where such protection is necessary for public

safety or to protect existing development, or (3) developments where the primary function is the improvement of fish and wildlife habitat.

In addition to these CCA policies, the Coastal Commission in August 2015 adopted a Sea-Level Rise Policy Guidance document setting forth the means by which new development that may be subject to sea-level rise should be analyzed (CCC 2015).

Senate Bill 610 (Water Code Sections 10910 et seq.)

Senate Bill 610 of 2001 (Water Code Sections 10910 et seq.) was promulgated to assist water suppliers, cities, and counties in integrating water and land use planning. In particular, the statute requires detailed information regarding water availability to be provided to the city and county decision-makers prior to approval of specified large development projects in the form of a Water Supply Assessment. The statute applies to the following specified large development project types as cited in Water Code Section 10912:

- A proposed residential development of more than 500 dwelling units;
- A proposed shopping center or business establishment employing more than 1,000 persons or having more than 500,000 square feet of floor space;
- A proposed commercial office building employing more than 1,000 persons or having more than 250,000 square feet of floor space;
- A proposed hotel or motel, or both, having more than 500 rooms;
- A proposed industrial, manufacturing, or processing plant, or industrial park planned to house more than 1,000 persons, occupying more than 40 acres of land, or having more than 650,000 square feet of floor area;
- A mixed-use project that includes one or more of the projects specified in this subdivision; and
- A project that would demand an amount of water equivalent to, or greater than, the amount of water required by a 500-dwelling-unit project.

The proposed program does not include development of any of the above categories, nor does the proposed program generate a water demand equal to or greater than the demand generated by a 500-dwelling unit project (i.e., approximately 125 acre-feet per year). Therefore, a water supply assessment is not required for the proposed program.

Sustainable Groundwater Management Act

The Sustainable Groundwater Management Act (SGMA) of 2014, effective January 1, 2015, gives local agencies the authority to manage groundwater in a sustainable manner and allows for limited state intervention when necessary to protect groundwater resources. The SGMA establishes a definition of sustainable groundwater management, establishes a framework for local agencies to develop plans and implement strategies to sustainably manage groundwater resources, prioritizes basins with the greatest problems (ranked as high- and medium-priority) and sets a 20-year timeline for implementation. The initial basin prioritization under SGMA uses the prioritization conducted by the California Department of Water Resources (DWR) in 2014 under the California Statewide Groundwater Elevation Monitoring program. As previously noted, the

Central Subbasin is ranked as high priority. SGMA requires the creation of a Groundwater Sustainability Agency that would develop and implement a Groundwater Sustainability Plan that would manage and use groundwater in a manner that can be maintained during the planning and implementation horizon without causing undesirable results, defined as follows:

1. Chronic lowering of groundwater levels indicating a significant and unreasonable depletion of supply;
2. Significant and unreasonable reduction of groundwater storage;
3. Significant and unreasonable seawater intrusion;
4. Significant and unreasonable degraded water quality, including the migration of contaminant plumes that impair water supplies;
5. Significant and unreasonable land subsidence that substantially interferes with surface land uses; or
6. Depletions of interconnected surface water that have significant and unreasonable adverse impacts on beneficial uses of the surface water.

NPDES Construction General Permit

Construction associated with the proposed program would disturb more than 1 acre of land surface affecting the quality of stormwater discharges into waters of the United States. The proposed program would, therefore, be subject to the *NPDES General Permit for Stormwater Discharges Associated with Construction and Land Disturbance Activities* (Order 2009-0009-DWQ, NPDES No. CAS000002; as amended by Orders 2010-0014-DWQ and 2012-006-DWQ). The Construction General Permit, discussed in Section 3.5.3, *Regulatory Framework*, of Section 3.5, *Geology, Soils, and Paleontological Resources*, requires the preparation and implementation of a SSWPPP for construction activities that includes erosion and sediment controls, runoff water quality monitoring, means of waste disposal, implementation of approved local plans, control of post-construction sediment, and maintenance responsibilities.

Municipal Stormwater Permitting (MS4)

The state's Municipal Stormwater Permitting Program regulates stormwater discharges from Municipal Separate Storm Sewer Systems (MS4s). MS4 Permits were issued in two phases. Phase I was initiated in 1990, under which the RWQCBs adopted NPDES stormwater permits for medium (serving between 100,000 and 250,000 people) and large (serving more than 250,000 people) municipalities. The regional water quality control boards, including LARWQCB, have adopted an MS4 Permit specific to their region. As part of the Phase II of the MS4 Permit, the SWRCB adopted a General Permit for small MS4s (serving less than 100,000 people) and non-traditional small MS4s including governmental facilities such as military bases, public campuses, and hospital complexes. The Long Beach MS4 Permit is noted below but discussed in detail in Section 3.5.3, *Regulatory Framework*, of Section 3.5, *Geology, Soils, and Paleontological Resources*.

3.8.3.3 Local

Water Quality Control Plan for the Los Angeles Region (Basin Plan)

The Water Quality Control Plan for the Los Angeles Region (Basin Plan) is designed to preserve and enhance water quality and protect the beneficial uses of waters within the region. The Basin Plan (i) designates beneficial uses for surface and groundwater, (ii) sets narrative and numerical objectives that must be attained or maintained to protect the designated beneficial uses and conform to the state's antidegradation policy, and (iii) describes implementation programs to protect all waters in the region. The Basin Plan incorporates pertinent water quality policies and regulations including applicable State and Regional Board plans and policies. The Basin Plan is a resource for the LARWQCB and others who use water and/or discharge wastewater in the Los Angeles Region. Other agencies and organizations involved in environmental permitting and resource management activities also use the Basin Plan. Finally, the Basin Plan provides valuable information to the public about local water quality issues. The Basin Plan is reviewed and updated as necessary. For the Los Cerritos Channel Watershed, the beneficial uses identified in the Basin Plan are listed below:

- Wetland Habitat (WET);
- Navigation (NAV);
- Commercial and Sport Fishing (COMM);
- Estuarine Habitat (EST);
- Wildlife Habitat (WILD);
- Rare, Threatened, or Endangered Species (RARE);
- Migration of Aquatic Organisms (MIGR);
- Shellfish Harvesting (SHELL);
- Water Contact Recreation (REC-1); and
- Non-contact Water Recreation (REC-2).

For the San Gabriel River, the beneficial uses are as follows:

- Wildlife Habitat (WILD);
- Warm water habitat (WARM);
- Cold water habitat (COLD);
- Rare, Threatened, or Endangered Species (RARE);
- Estuarine Habitat (EST);
- Marine habitat (MAR);
- Migration of Aquatic Organisms (MIGR);
- Spawning, Reproduction, and or Early Development (SPWN);
- Wetland Habitat (WET);

- Municipal water supply (MUN);
- Industrial service supply (IND);
- Agricultural Supply (AGR);
- Groundwater Recharge (GWR); and
- Industrial process supply (PROC).

Wetland Beneficial Use Guidelines

Criteria for assessing sediment for wetland surface and foundation beneficial uses were first developed by the San Francisco Bay Regional Water Quality Control Board in the Draft Staff Report entitled *Beneficial Reuse of Dredged Materials: Sediment Screening and Testing Guidelines*, dated May 2000. The document was prepared to assist in planning beneficial reuse projects in the San Francisco Bay Area by establishing general screening guidelines and general sediment testing requirements, and included specific criteria for reuse of sediments in wetland and upland beneficial uses. Subsequent additional ambient sediment chemical and toxicity testing was performed along with a statistical analysis of the historical and more recent analytical data to develop a statically derived set of recommended sediment chemistry screening guidelines for beneficial reuse, as documented in *An Evaluation of Existing Sediment Screening Guidelines for Wetland Creation/Beneficial Reuse of Dredged Material in the San Francisco Bay Area along with a Proposed Approach for Alternative Guideline Development* prepared by Germano & Associates in 2004 and funded by the California State Coastal Conservancy. The subsequent recommended guidelines are based on predicting acute amphipod toxicity and, therefore, can be applied to sites outside of the San Francisco Bay area, as they are based on toxicity testing results rather than ambient concentrations in the Bay. The guidelines were applied to a restoration project at the Ballona Wetlands, located in a similar setting just north of Los Angeles International Airport (ESA 2015).

Long Beach MS4 Permit

The City of Long Beach is covered under the Long Beach MS4 Permit: Waste Discharge Requirements for Municipal Separate Storm Sewer System Discharges from the City of Long Beach; Order No. R4-2014-0024 (LARWQCB 2014). The Long Beach MS4 Permit is discussed in detail in Section 3.5, *Geology, Soils, and Paleontological Resources*. The MS4 Permit includes regulations that would apply to maintaining water quality.

Long Beach Storm Water Management Program

The City of Long Beach prepared and implemented a Storm Water Management Program, as required by the above-cited MS4 Permit. The Long Beach Storm Water Management Program is discussed in detail in in Section 3.5, *Geology, Soils, and Paleontological Resources*. The Storm Water Management Program includes regulations that would apply to maintaining water quality.

Long Beach Low-Impact Development Manual

The City of Long Beach adopted low-impact development (LID) regulations for the purpose of encouraging the beneficial use of rainwater and urban runoff; reducing stormwater/urban runoff

while improving water quality; reducing off-site runoff and providing increased groundwater recharge; reducing erosion and hydrologic impacts downstream; and enhancing the recreational and aesthetic values in our communities. The LID Manual is discussed in in Section 3.5, *Geology, Soils, and Paleontological Resources*. The above-described Long Beach Storm Water Management Program requires that each project prepare and implement a project-specific LID Plan.

Long Beach Municipal Code

The relevant portions of the Long Beach Municipal Code include Chapter 8.96, Stormwater and Runoff Pollution Control, which reinforces the requirements of the CWA and the Porter-Cologne Act (including Construction General Permit requirements) within the City.

Southeast Area Development and Improvement Plan and Draft Southeast Area Specific Plan

Approved in 1977, the Southeast Area Development and Improvement Plan (SEADIP) was the first Planned Development district in the City of Long Beach. The SEADIP document was intended to guide land use and development in area that was experiencing a period of rapid growth and is identified as the zoning for the program area. The 1977 SEADIP included the following planning goals and objectives relevant to hydrology and water quality:

> **Goal 2. c):** Preservation, revitalization, and, if feasible, enlargement of the Cerritos [sic] Wetlands as a wildlife reserve park.
>
> > **Environmental Objective: 3. b)** Enhance the natural environment, improving features that are renewable and preserving those that are unique.

The 1977 SEADIP also provided the following narrative environmental consideration:

> *"Protection of the Cerritos Wetlands was of primary consideration during the project planning. Area 33, which contains the marsh, is to be improved and enhanced so that it can serve its natural function and still serve the community by providing open space, visual quality, and peripheral trails. New wildlife habitats may also be established as a result of the projected improvement. In addition, protection of an endangered bird, the least tern, can result from these improvements."*

Subsequent revisions to SEADIP are provided in the SEADIP PD-1, which includes updates, revisions, and additions of the ordinance history through 2006. The additions through 2006 include narrative discussion of "The Wetlands" and "The Buffers," which would include the restoration area. Relative to hydrology and water quality, the narrative is largely permit-, process-, phasing-, and financially-oriented.

In July 2016, the City of Long Beach circulated a draft of the Southeast Area Specific Plan (SEASP) 2060, which is intended to replace SEADIP as the applicable planning document for the program area, including re-designating land uses for the program area. Although the proposed SEASP 2060 was adopted by the City Council on September 19, 2017,the SEASP 2060 has not been certified by the CCC, it is anticipated that the SEASP 2060 will be completed and issued in its final form within the lifetime of the proposed program and is discussed here for informational

purposes. Portions of SEASP 2060 relevant to the proposed program are provided in Section 3.5.3, *Regulatory Framework*, in Section 3.5, *Geology, Soils, and Paleontological Resources*, of this PEIR, and include development standards for wetland buffers and storm drains that are also relevant to hydrology and water quality. In addition, the following objectives apply to sea-level rise:

- Project the range of sea-level rise for the proposed program.
- Determine how impacts from sea-level rise may constrain the program area.
- Determine how the proposed program may impact coastal resources, considering the influence of future sea-level rise on the landscape.

Seal Beach General Plan – Safety Element

The Safety Element of the General Plan dated December 2003 includes the following policies that would relate to the proposed program:

5D. Plan capacity for the 100-year flood and provide short term reasonable protection for locations that would benefit from 10-, 25- or 50-year storm drainage facilities.

5F. Pursue a regional approach to watershed management, particularly in regards to the San Gabriel River, and coordinate improvement plans with local, state, federal, and community-based organizations and agencies, including all of the jurisdictions located upstream on the San Gabriel River.

3.8.4 Significance Thresholds and Methodology

3.8.4.1 Significance Thresholds

For the purposes of this Program Environmental Impact Report (PEIR) and consistency with Appendix G of the CEQA Guidelines, the proposed program would have a significant impact on hydrology and water quality if it would:

a. Violate any water quality standards or waste discharge requirements or otherwise substantially degrade surface or ground water quality;

b. Substantially decrease groundwater supplies or interfere substantially with groundwater recharge such that the project may impede sustainable groundwater management of the basin;

c. Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river or through the addition of impervious surfaces, in a manner which would:

   i. result in substantial erosion or siltation on- or off-site;

   ii. substantially increase the rate or amount of surface runoff in a manner which would result in flooding on- or off-site; or

   iii. create or contribute runoff water that would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff.

   iv. impede or redirect flood flows?

d. In flood hazard, tsunami, or seiche zones, risk or release of pollutants due to project inundation; or

e. Conflict with or obstruct implementation of a water quality control plan or sustainable groundwater management plan.

3.8.4.2 Methodology

Hydrodynamic Modeling

The following analysis to assess potential impacts related to hydrology and water quality is based on the potential for elements of the proposed program to result in adverse impacts, using existing site conditions, as currently understood from investigations conducted to date, as a baseline for comparison. The existing regulatory requirements of proposed elements of the proposed program are also considered and assessed in the realm of applicable regulations to proposed activities. Hydrodynamic modeling is a primary tool to evaluate hydrologic changes that would occur with changes such as removal of berms or culverts and grading changes that provide hydraulic connections that currently do not exist or limit connections that do currently exist. Hydrodynamic modeling can be used to predict through computer simulations how water flows could change existing flooding, erosion, and sediment deposition regimes. This section describes the hydrodynamic model and how it was used to simulate the surface water response to the proposed program during storm events. The results of the hydrodynamic modeling are presented in Hydrodynamic Modeling Technical Report prepared by ESA for the proposed program in January 2020 (Appendix H).

Hydrodynamic models are computer simulations that represent water flow in the environment using mathematical equations. By mathematically representing a simplified version of a surface water system, reasonable scenarios can be predicted, tested, and compared. The applicability or usefulness of a model depends on how closely the mathematical equations approximate the physical system being modeled.

Setting up a standard hydrodynamic model involves establishing the model domain, which is the area within which the model stimulates surface water conditions. In a two-dimensional model, as used in Appendix H, the model domain is defined by a horizontal grid. The grid divides the two-dimensional space into cells that resemble rectangular boxes, typically numbering in the tens of thousands. Each cell can have a different roughness to represent flow resistance under different flow conditions.

Boundary conditions are applied to the model to simulate the water conditions at the upstream and downstream ends of the domain and to provide a starting place for computations. In an unsteady model, as used in Appendix H, the boundary conditions are represented by a time series (e.g., one week of tides, an entire storm event).

Features such as culverts and bridges can be added to the model domain, as well, to represent the system. Model inputs to represent these features include dimensions, roughness, and energy losses caused by the feature.

After the model has been set up for existing conditions as described in Section 3.8.2, *Environmental Setting*, it then is verified against known information. Simulations are run for measured flow rates, and model results are compared to observed/measured water elevations or

velocities. The various input parameters then are adjusted to better simulate observed conditions. When measured flow data are not available, model parameters are selected based on available information and professional judgment.

Model results for existing conditions then are used as a baseline for evaluating the potential hydrodynamic impacts of proposed changes, such as expansion of a floodplain, construction of a bridge, or enlargement of culverts. For this analysis, each alternative was modeled and the results were compared to existing conditions model results to identify potential impacts.

Hydrodynamic Model Terminology

Certain terminology is used in hydrodynamic modeling to describe and illustrate the nature, extent, and movement of surface water and the responses to changes. Key terms are presented below.

- *100-Year Flow/Flood/Storm/Event*—a storm/flood/event expected to occur once every 100 years or with an annual probability of occurring of 1 percent. Any X-year event is expected to occur once every X years or with a 100/X percent chance of annual occurrence.
- *Freeboard*—the distance between the water surface and the lowest possible entry point along a levee or berm during flooding or large waves
- *MLLW*—mean lower low water, average height of the lowest tide each day
- *MHHW*—mean higher high water, average height of the highest tide each day
- *NAVD*— North American vertical datum. A plane that elevations are measured from for consistency across North America
- *Unsteady Model*—unsteady models represent a time series
- *Tidal Prism*—the volume of water that is exchanged in a given tidal area between MLLW and MHHW

Limitations of Hydrodynamic Models

Hydrodynamic models use simplified mathematical equations to represent extremely complex natural systems. Therefore, significant uncertainty is inherent in model results, even when parameters have been calibrated to measured data. Nonetheless, hydrodynamic modeling is a standard tool for project planning, design, and impact analysis, and the results provide a basis for comparing the hydraulic performance of different scenarios relative to a baseline.

Hydrodynamic Model Used for Project Analysis

An unsteady state, two-dimensional HEC-RAS hydrodynamic model was the primary analytical tool used to evaluate project impacts on flooding. HEC-RAS is a public domain hydrodynamic modeling program that was developed by the Corps' Hydrologic Engineering Center and is used extensively in flood and sediment transport analysis applications.

Model set-ups were built for baseline conditions (no project), South Area, near-term conditions, and full breach conditions (South Area mid-term restoration, Isthmus mid-term restoration) and Central Area long-term restoration). Both phases of the South Area were modeled to assess potential interim impacts following near-term restoration. The model boundary includes the

Central Area, the San Gabriel River, the Isthmus Area, the Haynes Cooling Channel, and the South Area, as well as a small portion of Alamitos Bay Marina, where the Haynes Cooling Channel culverts connect to the bay. The models include the following bridges: 2nd Street over the San Gabriel River, 2nd Street over the Haynes Cooling Channel, the Pacific Coast Highway, and Marina Drive. Appendix H provides the detailed model set-up.

HEC-RAS computes water surface elevations for each cross section working upstream from a known water surface elevation. The downstream boundary condition (water level) is therefore an important input to the model. For this study, the downstream boundaries of the HEC-RAS model were where the San Gabriel River discharges to the Pacific Ocean and where the Haynes Cooling Channel connects to the Alamitos Bay Marina.

To evaluate flood risk, a conservative tidal boundary condition of the annual high tide was chosen. A representative two-week tide cycle from September 5 to 18, 2018, was used for the typical tides scenario. Verification time series of observed water level data provided by Moffatt and Nichol for the Hellman Channel and collected by ESA in the San Gabriel River were used in unsteady flow analyses. HEC-RAS model results were similar to recorded water surface elevations at the location of the tide gauges.

For storm conditions, a 100-year storm flow rate of 55,900 cfs was applied at the upstream boundary of the model.

Sea-Level Rise Scenarios

To assess the potential flood impacts and to inform the habitat design for the LCW, two sea-level rise amounts were selected to bracket the range of potential projections: 1.7 and 3.3 feet. According to OPC 2018, there is a 66 percent chance that sea-level rise will be between 1.7 and 3.3 feet of sea-level rise by 2110. There is a 0.5 percent chance that sea-level rise will reach or exceed 3.3 feet as soon as 2070.

To analyze potential flood impacts along the San Gabriel River, the medium-high risk aversion scenario is recommended per the OPC Guidance, since homes and other development in the area are at risk for flooding. **Table 3.8-6**, *Los Cerritos Wetlands Sea-Level Rise Projections (in feet)*, shows the model scenarios and the corresponding time frames (the first year in the range) under the medium-high risk aversion projection. To analyze habitat elevations, the likely range of sea-level rise (the second column in Table 3.8-6) can be used to understand the likely habitat acreages that will develop over time. Since habitat restoration requires a balance of creating wetland habitat today and providing space for wetland habitat tomorrow, the likely range of sea-level rise can be considered to understand the expected amount of sea-level rise (rather than a worst-case scenario). The model scenarios and the corresponding time frames under the likely range (the second year in the range) are shown in Table 3.8-6.

TABLE 3.8-6
LOS CERRITOS WETLANDS SEA-LEVEL RISE PROJECTIONS (IN FEET)

	~2040–2070	~2070–2110
Amounts of sea-level rise	1.7	3.3

Model Runs

The HEC-RAS model was run with a range of tidal conditions and storm flow combinations. **Table 3.8-7**, *Model Scenarios*, presents the different scenarios.

TABLE 3.8-7
MODEL SCENARIOS

	Run	Scenario/ Geometry	Hydrology	Downstream Boundary Conditions	Sea-Level Rise
Typical Tides	Calibration	Existing	Power plant inflow	Two weeks tides from gage data	—
	1	Existing	Power plant inflow	Two weeks typical tides, w/ annual high tide	—
	2	Existing	No flow	Two weeks typical tides, w/ annual high tide	—
	3	South Area, Near-Term	Power plant inflow	Two weeks typical tides, w/ annual high tide	—
	4	South Area, Near-Term	No flow	Two weeks typical tides, w/ annual high tide	—
	5	Full Breach	No flow	Two weeks typical tides, w/ annual high tide	—
Flood Conditions	6	Existing	100-year event	Two days, w/ annual high tide	—
	7	South Area, Near-Term	100-year event	Two days, w/ annual high tide	—
	8	Full Breach	100-year event	Two days, w/ annual high tide	—
Sea-Level Rise	9	Existing	No flow	Two weeks typical tides, w/ annual high tide	1.7 ft
	10	Full Breach	No flow	Two weeks typical tides, w/ annual high tide	1.7 ft
	11	Existing	No flow	Two weeks typical tides, w/ annual high tide	3.3 ft
	12	Full Breach	No flow	Two weeks typical tides, w/ annual high tide	3.3 ft

Sediment Dynamics Analysis

Sedimentation and erosion in a stream channel can impact the flood conveyance capacity of the channel. Sediment analyses were used to evaluate the potential impact of sedimentation and/or erosion on flooding under the proposed program. This section describes the sediment dynamics analysis, including geomorphic analyses. The results of these analyses are presented in the Sediment Dynamics Analysis prepared for the program by ESA in January 2020 and in Appendix I. This analysis focuses on the Central Area, which due to its potential future connection to the San Gabriel River, is most at risk for scour and deposition. The culvert connections to Callaway Marsh, Zedler Marsh, and the South Area protect these habitats from any tidal scour by muting the tides, which limits tidal velocities. Similarly, the culverts limit how much sediment can enter the wetlands, so deposition is limited.

Sediment Dynamics Terminology

Certain terminology is used in sediment dynamics analyses to describe and illustrate the nature, extent, and movement of sediment. Key terms are presented below.

- *Shear stress*—the force that causes materials (such as water and sediment) to slide upon each other in opposite directions.

Geomorphic Analyses

A geomorphic analysis was performed to assess how the site would develop and evolve over time in response to the proposed program and physical processes. Flood events, tidal action, and coastal sediment transport processes were examined as part of this analysis.

Flood Events

The HEC RAS 2D modeling described above evaluated the potential for erosion and deposition within the San Gabriel River channel, as well as scour and deposition on the marsh. Maps of hydraulic shear stress during the peak of the 100-year storm event were exported from HEC RAS to analyze potential marshplain erosion. Mathematical equations relating shear stress to erosion were used to develop a map of potential erosion during the 100-year storm event and to estimate erosion volumes. The inputs to the equations, including critical shear stress, were chosen based on the most conservative values (the values resulting in the highest erosion) found in the literature, in order to evaluate the greatest possible impacts of the proposed program. For this reason, the marsh erosion volumes are likely a conservative overestimate.

To analyze deposition in the marsh, it was assumed that most of the sediment that enters the wetland system would be brought in during storm events, and in areas experiencing velocities slower than the settling velocity of the sediment, the sediment is expected to drop out of solution and settle or deposit onto the marsh. Cahoon et al. (1996) estimated that 0.64 percent of sediment yield was deposited on the marsh during storm events for creek mouth tidal wetlands. To roughly approximate the amount of sediment being deposited at different locations in the Central Area, the estimate of 0.64 percent was applied to the total sediment load (from the sediment transport model) to estimate the volume of deposition. The total was then divided among the different slow-flowing marsh areas. This is likely a low estimate of marsh accretion, but was used to conservatively estimate the amount of sediment leaving the system with the Project.

Tidal Action

Tidal channels deposit or scour in response to the size of the tidal prism that the channels convey. Tidal hydraulic geometry relationships can provide an estimate of the equilibrium channel size (cross-section dimensions) in relationship to the tidal prism (the volume of water between MLLW and MHHW) or marsh area. These relationships were used to predict the equilibrium channel size under existing conditions and with the proposed program.

Coastal Sediment Transport

Analysis of the coastal sediment transport was conducted through literature review. The Long Beach Detached Breakwater protects most of the coast from ocean waves, resulting in relatively little longshore transport in the vicinity of the site (USACE 1986). Due to jetties at the mouth of

the San Gabriel River and the program site's inland location, coastal sediment transport is not expected to have a substantial impact on the sediment dynamics at the LCW.

As stated in Chapter 1, *Introduction*, on March 8, 2019, the Los Cerritos Wetlands Authority sent a Notice of Preparation to responsible, trustee, and federal agencies, as well as to organizations, and individuals potentially interested in the proposed program to identify the relevant environmental issues that should be addressed in the PEIR. Issues related to hydrology and water quality were identified.

3.8.5 Program Impacts and Mitigation Measures

Impact HYD-1: The proposed program would result in a significant impact if the proposed program would violate any water quality standards or waste discharge requirements or otherwise substantially degrade surface or ground water quality.

Construction

The proposed program would require ground disturbance, vegetation removal and/or grading to restore and enhance the wetlands, levee modifications, public access facilities, and infrastructure and utility modifications. Exposure and removal of topsoil and the underlying sub-soils during construction could generate sediment that, if mobilized by stormwater runoff or runoff from applied water during construction, could expose sediments to erosion and could potentially mobilize contaminated sediments that adversely affects water quality of receiving waters.

The construction activities for the proposed restoration activities would be required to comply with the Construction General Permit for the state and the County MS4 Permit required as part of the permitting process. The proposed program would be required to comply with the General Construction and MS4 Permits because greater than 1 acre of ground would be disturbed. For work in the channel, the proposed program also would be required to comply with a Section 401Water Quality Certification. Excavation of the channels in the Central and South Areas may extend below the water table and could require temporary dewatering. All excavation dewatering would be conducted in accordance with the General Construction Permit and Regional Water Board Order No. R8 2015-004, General Waste Discharge Requirements for Discharges to Surface Waters that Pose an Insignificant (De Minimis) Threat to Water Quality, which ensures discharge water would not be discharged in such a way as to result in direct or indirect degradation of surface water in the San Gabriel River, Los Cerritos Channel, or Alamitos Bay. Compliance with the General Construction Permit, MS4 Permit, and 401 Certification would ensure that the proposed activities would include adequate stormwater protection through BMPs and monitoring, to limit increased turbidity and decreased water quality from sediment and other pollutants leaving the construction site. As a result, impacts during construction would be less than significant.

Contaminated Water and Sediment from Upstream Sources Impacting the Existing Wetlands

No changes are proposed to the source of flows to the Isthmus Area, so no water quality impacts are expected in these habitats due to the proposed program. In the South Area, the proposed program would reconnect the marsh floodplain to the Haynes Cooling Channel, which would

improve water quality at the site by increasing tidal flushing and bringing in a cleaner source of water, when compared to the San Gabriel River. Historical and current water quality data indicates that flows from the Los Cerritos Channel and the San Gabriel River exceed water quality objectives. Since the proposed program will reconnect existing habitats in the North and Central Area to the flows in the Los Cerritos Channel and the San Gabriel River respectively, there is a potential for water quality impacts to the existing habitat in these areas.

However, work is being done in the watershed, outside of the proposed program, to improve the water quality in the Los Cerritos Channel and the San Gabriel River. TMDLs have been developed or are anticipated for the different constituents listed for these waterbodies. The LARWQCB has incorporated the TMDL waste load allocations and timelines into the reissued municipal separate storm sewer system (MS4) permit. Both Alamitos Bay and Los Cerritos Channel and the Lower San Gabriel River have Watershed Management Programs (WMP) which have identified watershed control measures (WCMs). The WCMs will help jurisdictions meet the MS4 permit requirements and improve water and sediment quality in the rivers and channels. The concentration and loading of the water quality constituents from the watershed will be reduced through compliance with the reissued MS4 Permit, TMDLs, and the WMPs. The potential for significant adverse impacts to the proposed program would, therefore, be significantly reduced.

In addition, the proposed program design allows for full tidal flows into the North and Central Area wetlands. Full tidal exchange creates favorable water quality conditions by limiting retention times of potentially impacted stormwater and non-storm flows and enhancing flushing of the wetlands with much higher quality ocean water.

Contaminated Water and Sediment from the Site Impacting the Local Water Bodies

The proposed program would further connect the Los Cerritos Channel and Steam Shovel Slough to the North Area, reconnect the San Gabriel River to the Central Area, connect the Haynes Cooling Channel to the South Area, and open up the North, Central, and South Areas to full tidal connections. Reconnection of the creek or channel to the floodplain and removal of the berms in the North Area and levees in the Central Area could cause erosion of the marsh during a large storm event, which could deliver sediment-laden runoff and associated constituents to the Los Cerritos Channel and San Gabriel River, respectively. (Storm erosion is not expected along the Haynes Cooling Channel due to the small watershed and storm flows.) Constituents associated with these sediments could then settle out into the channels at concentrations that may result in impairment for biological resources/beneficial uses. If this occurs, it would be a significant adverse impact.

Under tidal conditions, the program area is not expected to experience substantial erosion. In a stable estuary, mature marshes remain in a dynamic equilibrium between erosional and depositional processes. The marsh vegetation and its root structures help hold sediments in place. The appropriate sizing of tidal channels, as well as naturally recruited or planted vegetation, is expected to keep the marsh in a dynamic equilibrium, where any erosion during typical tides would be minor.

Under existing conditions, the existing marsh is not fully connected to the River, and sediment export from the marsh to the River during storm events is likely minimal. For storms less than the 10-year event (10 percent or greater chance of occurrence annually), no export from the marsh is expected. The sediment dynamics analysis showed that under full breach conditions, the 100-year event could export up to 10,000 cy of sediment (Appendix I). However, these events would occur infrequently with less than a 1 percent chance of occurrence every year. While the erosion could result in an increase in turbidity during storm events, it would be an infrequent, temporary impact, and one which is typical of natural systems and already occurs at the site. As a result, erosion could result in an infrequent, temporary impact relating to the contribution of constituents to the San Gabriel River; these inputs would not have a substantial impact on the beneficial uses of the system. Additionally, **Mitigation Measure HYD-1** has been developed to ensure monitoring and adaptive management is conducted to recognize and address any erosion, deposition, or sediment quality issues.

Groundwater Quality

The groundwater sampling conducted to date indicates that groundwater at the site has already been impacted by the historic site land uses. It is likely that sediment in certain areas of the site will require remediation before restoration, which would improve conditions and be a benefit to groundwater quality.

The shallow water table is under tidal influence meaning that groundwater elevations fluctuate in response to tidal cycles in the Los Cerritos Channel, the San Gabriel River, and the Haynes Cooling Channel. Generally, freshwater from the inland water table flows toward the coast and mixes with salty groundwater making groundwater that is brackish (a mixture of salty and fresh water); however, the program area is on the ocean side of the previously discussed Alamitos Barrier Project, a seawater intrusion barrier system located north, northeast, and east of the program area. Consequently, shallow groundwater beneath the site will remain saline to brackish. As all of the local groundwater is non-potable, there are no wells in the vicinity of the program area that draw groundwater from the shallow water table for domestic or municipal use. Although the proposed program would increase tidal inundation through the restored marsh and possibly result in some localized increase in salinity within the restoration area, the change to water quality would not be considered to have an adverse impact on water resources because the groundwater in this area is all brackish to saline and is not used for domestic or municipal supply. Furthermore, the groundwater elevations below the site correspond to the tidally influenced river and channel elevations and, therefore, are also likely tidally influenced. It is not likely the site's groundwater will be used for direct potable use due to the tidal connection and salt water intrusion. Impacts would be less than significant.

Ocean Water Quality

The proposed program would excavate sediments in certain areas to reach marshplain elevations. Excavated sediment would be used on site to the extent feasible, but any remaining sediment may be designated for placement in an off-site landfill or in ocean disposal sites at either the Los Angeles (LA-2) or Newport Bay (LA-3) sites. The suitability of on-site excavated sediment for placement at a designated ocean dredged material disposal site would require a Tier III evaluation

in accordance with Evaluation of Dredged Material Proposed for Ocean Disposal – Testing Manual (OTM; USEPA/USACE 1991). The testing results to date do not preclude this alternative, but require further biological testing to meet the applicable guidelines. The Tier III evaluation contains sediment quality standards which are set based on water quality criteria and protection of water quality. Sediment would be placed in an ocean disposal site only if it met the standards of the OTM, therefore, there would be no adverse impact as a result of ocean disposal. If the material is determined to be suitable for this placement alternative, specific permitting for ocean disposal or open-water placement would be required for the designated site. Impacts would be less than significant.

Mitigation Measure

Mitigation Measure HYD-1: A Monitoring and Adaptive Management Plan (MAMP) shall be prepared and implemented prior to commencement of construction or restoration activities. The MAMP shall provide a framework for monitoring site conditions in response to the program implementation. The monitoring shall focus on sediment quality in areas subject to the greatest deposition from storm events and that are also not subject to regular tidal flushing, (e.g., the southwestern corner of the Long Beach City Property site). The sediment quality monitoring shall be performed at a frequency that would capture the potential build-up of contaminants in the deposited sediment before concentration are reached that would impact benthic macro-invertebrates and other sensitive species. The findings of the monitoring efforts shall be used to identify any source of impairment, and if discovered, provide measures for remediation of the sediment source area(s).

The MAMP shall be submitted for review and approval to permitting agencies prior to commencement of construction or restoration activities.

Significance after Mitigation

Less than Significant with Mitigation

Impact HYD-2: The proposed program would result in a significant impact if the proposed program would substantially decrease groundwater supplies or interfere substantially with groundwater recharge such that the proposed program may impede sustainable groundwater management of the basin.

Construction of the proposed program facilities could involve activities that require the use of water, such as concrete mixing and dust control during earthwork activities. The local water supply is served by the City of Seal Beach and the Long Beach Water District (LBWD), which both receive a mix of groundwater, imported water, and recycled water (LBWD only) (see Section 3.16, *Utilities and Service Systems*, of this PEIR, for more details on program area water supply and program demand). Therefore, construction water demand could include use of groundwater supplies, however, construction water supply needs would be temporary and are unlikely to be substantial. In addition, as discussed in Section 3.16, *Utilities and Service Systems*, of this PEIR, the City of Seal Beach and LBWD water supplies are projected to exceed demand

through 2040, even in dry years. Therefore, construction associated with program activities would not adversely affect groundwater supplies or sustainable groundwater management of the basin.

During operation of the proposed program, water supply needs would be necessary for elements including Visitor Centers or other public access amenities, and potentially some maintenance activities. As noted above, both the City of Seal Beach and LBWD water supplies exceed projected demand through 2040 even in future dry years. Therefore, considering the different sources of water supply and the projected demands, the proposed program would not substantially decrease groundwater supplies or impede sustainable groundwater management of the basin.

Some elements of the proposed program could also potentially increase impervious surfaces such as public access elements, Visitor Centers, and parking areas. However, as noted above, shallow groundwater beneath the study area is brackish and not a source of public water supply. In addition, the proposed program would largely remain pervious with restoration and provide large areas of groundwater recharge. Other than the public access elements, Visitor Center, and parking area, the restoration would not increase or decrease recharge to the groundwater basin because no substantial areas of pervious surface are being added or removed. Therefore, the proposed program would not interfere with groundwater recharge such that it would interfere with sustainable management of the basin.

Mitigation Measure

No mitigation is required.

Significance after Mitigation

Less than Significant

Impact HYD-3a: The proposed program would result in a significant impact if the proposed program would substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river or through the addition of impervious surfaces, in a manner which would result in substantial erosion or siltation on- or off-site.

Construction

The proposed program would require ground disturbance, vegetation removal, and/or grading to restore and enhance the wetlands, and build levees and berms around the Central and South Areas. Exposure and removal of topsoil and the underlying sub-soils during construction could generate sediment that, if mobilized by stormwater runoff or runoff from applied water during construction, could deliver sediment-laden runoff to the San Gabriel River or adjacent sites, including the beach, which could result in localized and downstream siltation.

The construction activities for the proposed restoration would be required to comply with the Construction General Permit for the state and the County MS4 Permit required as part of the permitting process. The proposed program would be required to comply with the General Construction and MS4 Permits, because more than 1 acre of ground would be disturbed. For work

in the San Gabriel River, the proposed program would be required to comply with a Section 401 Water Quality Certification. Breaching and lowering of the levee may extend below the water table and could require temporary dewatering. All excavation dewatering would be conducted in accordance with the General Construction Permit, which ensures discharge water would not be discharged in such a way as to result in direct or indirect degradation of surface water in the San Gabriel River or Alamitos Bay. Compliance with the General Construction Permit, MS4 Permit, and 401 Certification would ensure that the proposed activities would include adequate stormwater protection through BMPs and monitoring, to limit increased turbidity and decreased water quality from sediment and other pollutants leaving the construction site.

Operation

Post-construction, the proposed program would reconnect the San Gabriel River to the Central Area and open up the Central Area to full tidal connection with the river. Reconnection of the river to the floodplain and removal of the levees could cause erosion of the marsh during a large storm event, which could deliver sediment-laden runoff further down the river or to the ocean. If this sediment deposited in the San Gabriel River or the entrance of Alamitos Bay, it could impact flood management or navigation.

As discussed above for Impact HYD-1, under tidal conditions, the Central Area is not expected to experience substantial erosion. The appropriate sizing of the channels, as well as naturally recruited or planted vegetation, is expected to keep the marsh in a dynamic equilibrium, where any erosion during typical tides would be minor.

The volume of sediment transported through the system may still increase as a result of the proposed program, but, as discussed for Impact HYD-1 above, the volumes of additional sediment is typical for this type of system. However, the additional sediment could increase flooding if it deposited downstream and reduced drainage capacity. During a storm event, velocities in the river channel increase and would erode any temporarily deposited material. Additionally, the amount of sediment that could potential erode from the marsh (10,000 cy) is an order of magnitude less than the amount of sediment coming from the watershed (Appendix I).

The increased volume of sediment transported through the system also could increase the amount of sedimentation at the entrance to Alamitos Bay. However, the existing jetties at the entrance, are expected to limit sediment transported from the San Gabriel River from settling in the marina entrance.

During large storm events, the increased export from the San Gabriel River could increase the deposition of fine sediments on the beach. However, this would be considered merely a temporary nuisance condition and wave action would wash fines out to the ocean.

The proposed program design may also include armoring which would decrease channel bank erosion. Additionally, Mitigation Measure HYD-1 would ensure monitoring and adaptive management is conducted to recognize and address any erosion or sediment quality issues. The MAMP will include sediment erosion and deposition monitoring post large storm events to evaluate whether erosion from the marsh is depositing in the San Gabriel River and increasing the

flood risk. The monitoring will also determine if the marsh habitats are being impacted by erosion and provide measures for addressing the impacts.

Mitigation Measure

Mitigation Measure HYD-1.

Significance after Mitigation

Less than Significant

Impact HYD-3b: The proposed program would result in a significant impact if the proposed program would substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river or through the addition of impervious surfaces, in a manner which would substantially increase the rate or amount of surface runoff in a manner which would result in flooding on- or off-site.

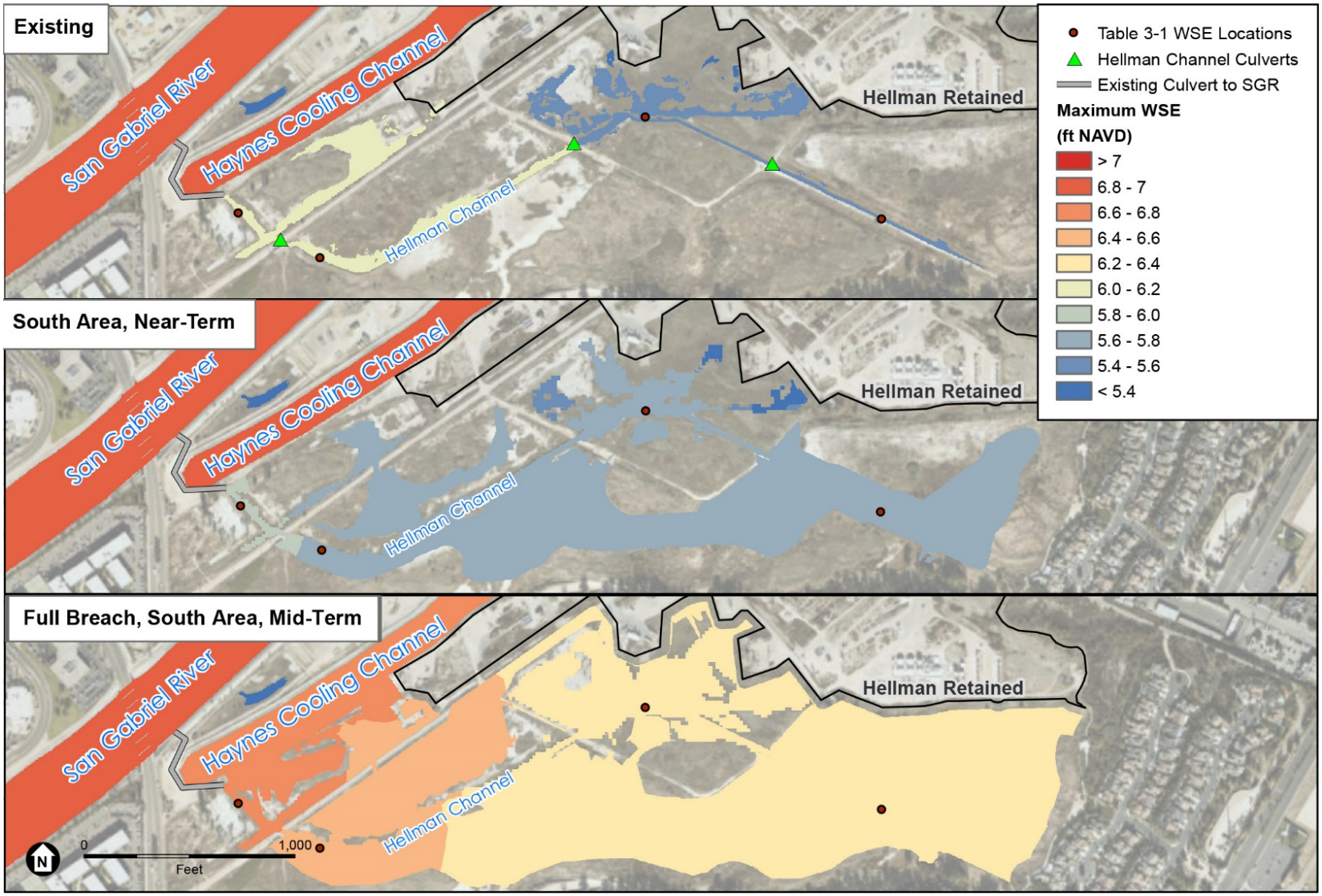
The proposed program would involve altered drainage patterns compared with the existing sites in order to improve drainage to support tidal wetlands on the Project Site. This would include levees around the Central Area, which would reduce the stormwater retention volume available for surrounding areas. As discussed above for Impact HYD-1, stormwater drainage control requirements would require operational BMPs in accordance with the reissued MS4 Permit, TMDLs, and the WMPs, including bioswales along the edge of the Central Area. Through the retention and infiltration of stormwater runoff, the bioswales would accommodate the stormwater from Shopkeeper Road and 2nd Street and would result in a less-than-significant impact.

South Area

In the South Area, the proposed program would open or remove the gate on the culvert from the San Gabriel River to the Hellman Channel in the near-term, which could increase flooding at the site. In the mid-term, the South Area would be connected to the Haynes Cooling Channel, which could also increase flooding at the site.

Under the proposed program, the model results showed that water levels would decrease within the South Area by 0 to 0.8 feet during the 100-year riverine flood event in the near-term (**Figure 3.8-2**, *Modeled Water Levels during a 100-Year Event in the South Area*). This is because the grading of the site under the near-term restoration creates a much larger space for water to flow, but the culvert to the San Gabriel River still limits the amount of water that can enter the site. With the removal of the culverts within the middle of the marsh, the available water spreads more evenly across the site and water levels at the back of the site are higher than existing conditions, but the water levels near the mouth of the Hellman Channel are lower.

In the mid-term, the South Area would be connected to the Haynes Cooling Channel. Because of the Haynes Cooling Channel's small watershed, water levels in the channel are not expected to increase substantially during a 100-year rainfall event. The model results show that the water levels at the mouth of Hellman Channel reach an elevation of 6.8 feet NAVD, 0.5 feet lower than under existing conditions, which is due to the volume of water that leaves the marsh from the connection to the Haynes Cooling Channel.



SOURCE: ESRI, LCWA

NOTE: WSE = Water Surface Elevation

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Figure 3.8-2
Modeled Water Levels during a 100-Year Riverine Event in the South Area

Additionally, the proposed program would construct a berm along the Hellman Property site, resulting in a freeboard of 3.5 feet between the mid-term, 100-year riverine water levels and the top of the berm. Under existing conditions, the model results showed that water levels from the South LCWA site extend onto the Hellman Property site, so since flood protection for the Hellman Property site would increase with the proposed program, this would be a beneficial effect.

The model results showed that the South Area is driven more by coastal water levels rather than the San Gabriel River water levels. Under a coastal 100-year event (i.e., 100-year high tide), the model showed the program would increase water levels in the South Area compared to existing conditions, but that the berm would have over a foot of freeboard under program conditions.

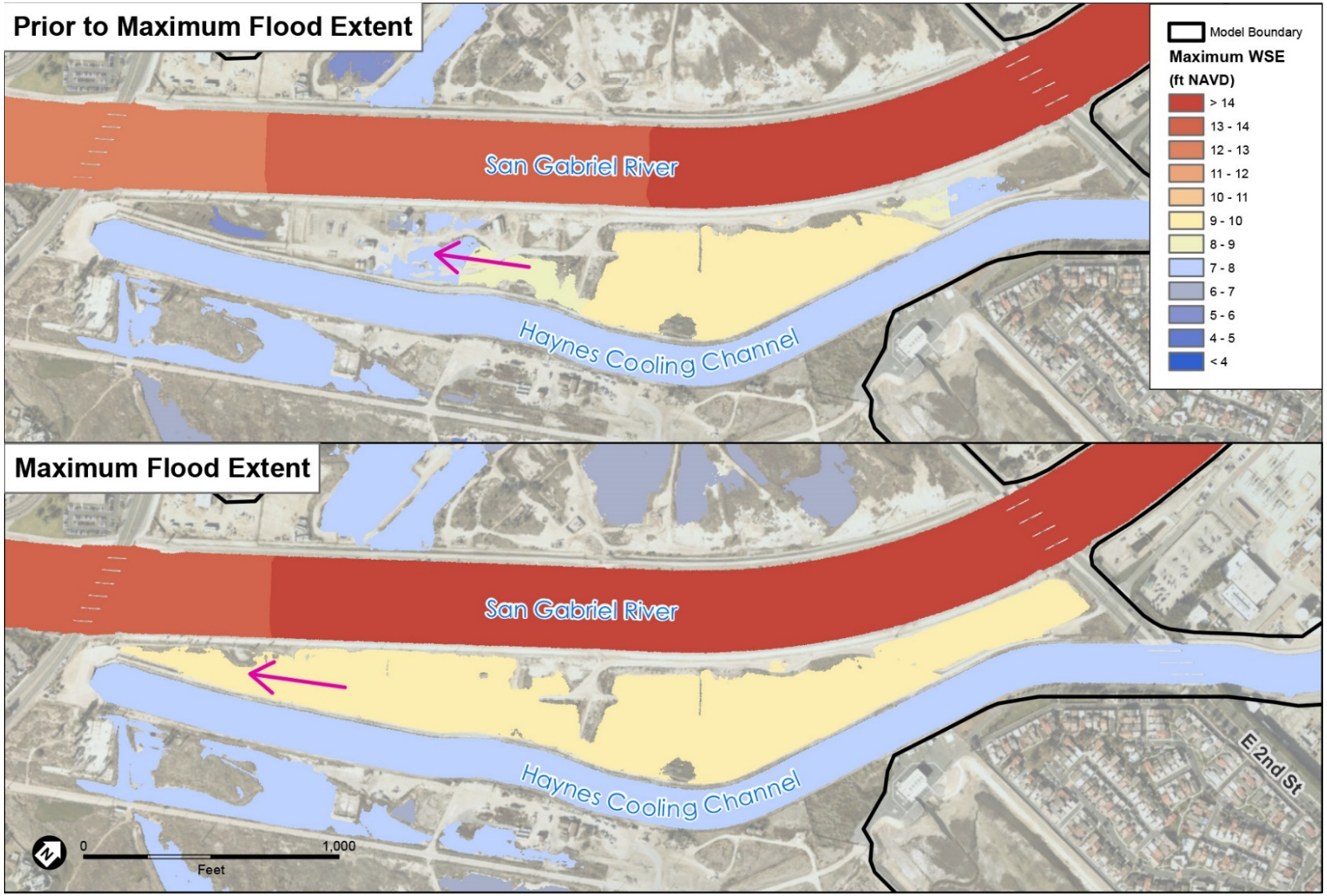
Isthmus Area

In the Isthmus Area, the proposed program would improve the culvert connection between Zedler Marsh and the Isthmus Bryant site in the near-term, which could increase flooding in the site during a storm event. The results of the hydrodynamic modeling for existing conditions showed that during the 100-year storm, the entire Isthmus Area is inundated to similar elevations. Since the culvert connection improvements under restoration would just improve the connection from Zedler Marsh to the Isthmus Bryant site, and both sites already flood during existing conditions, the proposed program is not expected to increase flooding at Zedler Marsh or the Isthmus Bryant site.

The proposed program would open or remove the gate on the culvert from the San Gabriel River to Callaway Marsh in the mid-term, which could increase flooding at the site. The hydrodynamic modeling results for existing conditions showed that flooding during the 100-year event occurs through the culvert to Zedler Marsh, and waters flow both northeast and southwest to inundate the Isthmus Area (**Figure 3.8-3**, *Modeled Water Levels during a 100-Year Event in the Isthmus Area, Existing Conditions*). Flooding from the Callaway Marsh under existing conditions is minimal, based on the model results. However, when the gate on the culvert is removed as part of the mid-term restoration, the model results shows water from the Callaway Marsh culvert would flow northeast onto the Isthmus LCWA site before waters from the Zedler Marsh culvert reach the far side of the site. This indicates that removing the gate increases flooding of the Isthmus LCWA site.

Central Area and San Gabriel River

The proposed program would reconnect the San Gabriel River to the restored wetland floodplain by grading the Central Area to marshplain elevations and removing the levees along the river. The expansion of the floodplain could increase water levels upstream, downstream, and at the site during storm events, thereby increasing off-site flooding.



SOURCE: ESRI, LCWA
NOTE: WSE = Water Surface Elevation

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Figure 3.8-3
Modeled Water Levels during a 100-Year Event in the Isthmus Area, Existing Conditions

As described in Section 3.8.4.2, *Methodology*, above, hydraulic modeling evaluated any changes to flood water elevations that would result due to the proposed program. Modeling was conducted for both existing and program conditions (full breach model scenario). Under existing conditions, model results indicate that the 100-year storm flow is contained within the San Gabriel River channel with 2 to 3 feet of freeboard to the top of the levees. Within the proposed program, the expansion of flow into the Central Area and South Area provides additional flood storage, which reduces water levels upstream as much as 0.3 feet compared to existing conditions (**Figure 3.8-4**, *Modeled Water Levels during a 100-Year Event along the San Gabriel River*). In the vicinity of the Central Area, the model shows that water levels are reduced by 0.3 feet compared to existing conditions. Additionally, the proposed program would construct new levees up to an elevation of 24 feet NAVD in the Central Area, which would result in a levee freeboard of 9.4 feet, an increase of 6 to 7 feet from existing conditions. Below the Central and South Areas, the water levels in the channel are reduced by up to 0.1 feet compared to existing conditions. The model results indicate that the proposed program actually decreases flood water levels in the San Gabriel River, which would be a beneficial effect.

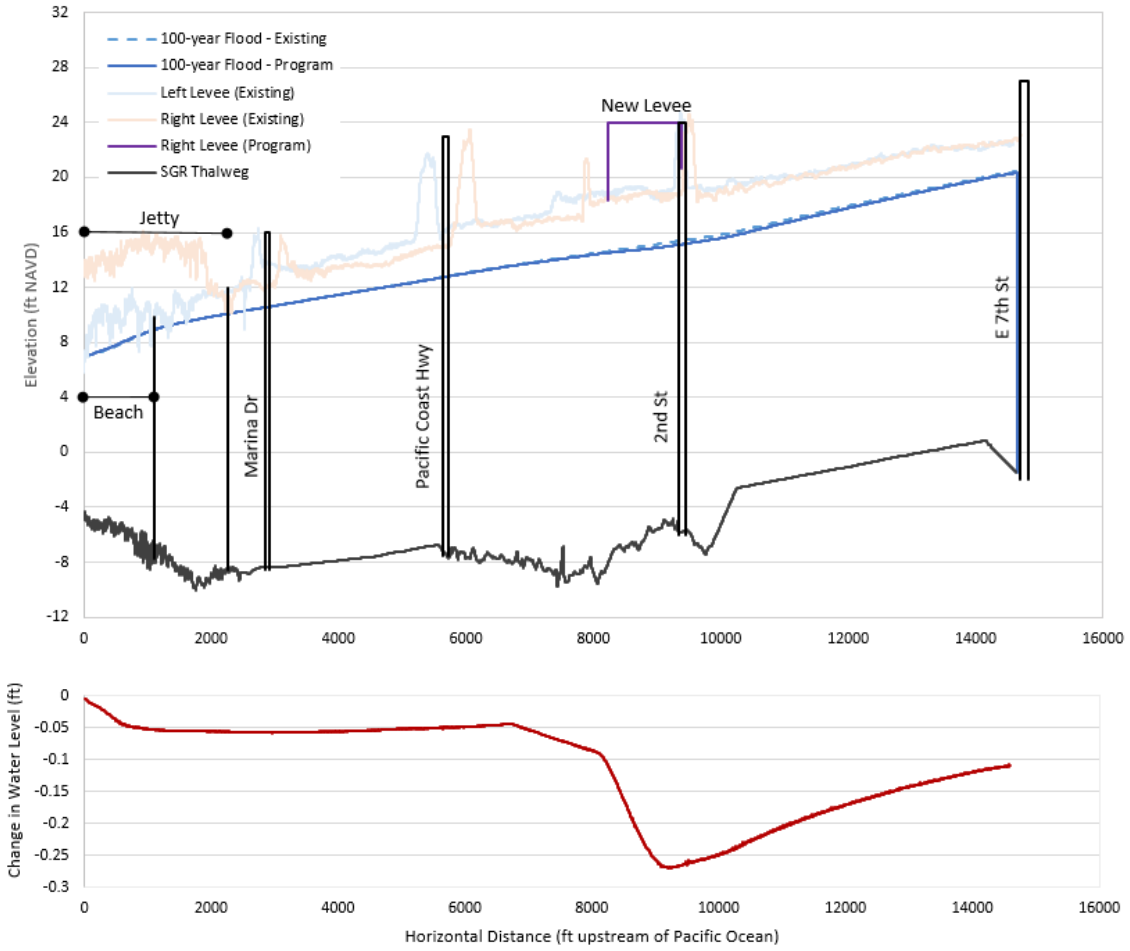
Under the proposed program, the model results show that water levels would increase within the Central Area by up to 7.1 feet during the 100-year event. Because the proposed program allows flows to expand over the floodplain in the Central Area through a levee breach rather than the existing perched culvert, water levels increase as designed (**Figure 3.8-5**, *Modeled Water Levels during a 100-Year Event in the Central Area*). Additionally, the proposed program would increase levee elevations compared to existing conditions, resulting in a freeboard of 9.4 feet. **Table 3.8-8**, *Levee Freeboard during the 100-Year Storm Event*, shows the freeboards under existing conditions and the proposed program. Since freeboard would increase with the program, this would be a beneficial effect.

TABLE 3.8-8
LEVEE FREEBOARD DURING THE 100-YEAR STORM EVENT

	Levee Freeboard in the Vicinity of the Central Area (feet)
Existing Conditions[a]	2–3
Program[b]	~9

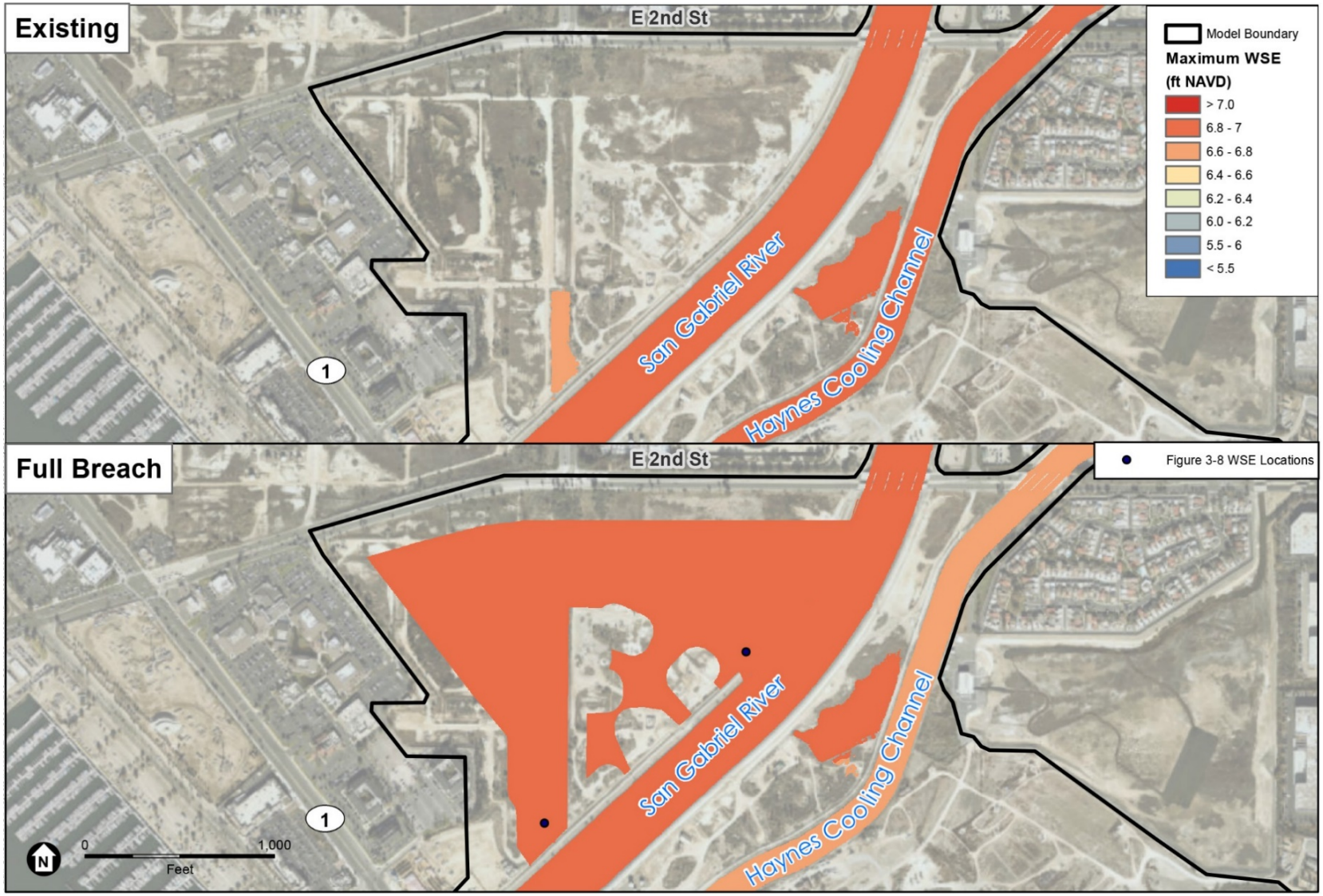
[a] Freeboard to existing levee
[b] Freeboard to proposed Perimeter Levee

Additionally, further modeling is required to receive a 408 permit and that modeling will determine the elevation of the levee that is required to maintain the existing level of flood protection as part of the next phase of design. Since the proposed program would raise the existing levee if that future modeling for the 408 permit determines the proposed program is raising flood levels at the site, there would be no increased flood risk at the site.



SOURCE: ESA, 2019 Los Cerritos Wetlands Restoration Plan Draft Program EIR
NOTE: SGR = San Gabriel River

Revised Figure 3.8-4
Modeled Water Levels during a 100-Year Storm Event along the San Gabriel River



SOURCE: ESRI, LCWA
NOTE: WSE = Water Surface Elevation

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Figure 3.8-5
Modeled Water Levels during a 100-Year Event in the Central Area

Flooding from Sea-Level Rise

The proposed program would reconnect the San Gabriel River to the restored wetland floodplain by grading the Central Area to marshplain elevations and removing the levees along the river. Additionally, the proposed program would connect the South Area to the Haynes Cooling Channel in the mid-term. These program features could result in an increase of flooding under sea-level rise conditions compared to no project conditions.

Under 1.7 feet of sea-level rise, the model results show that tidal water levels in the South Area would be 1.6 to 2.2 feet higher than under no project conditions. However, there would still be 1.8 feet of freeboard along the berm. This would increase flood protection for the Hellman Property site, which would be a beneficial effect.

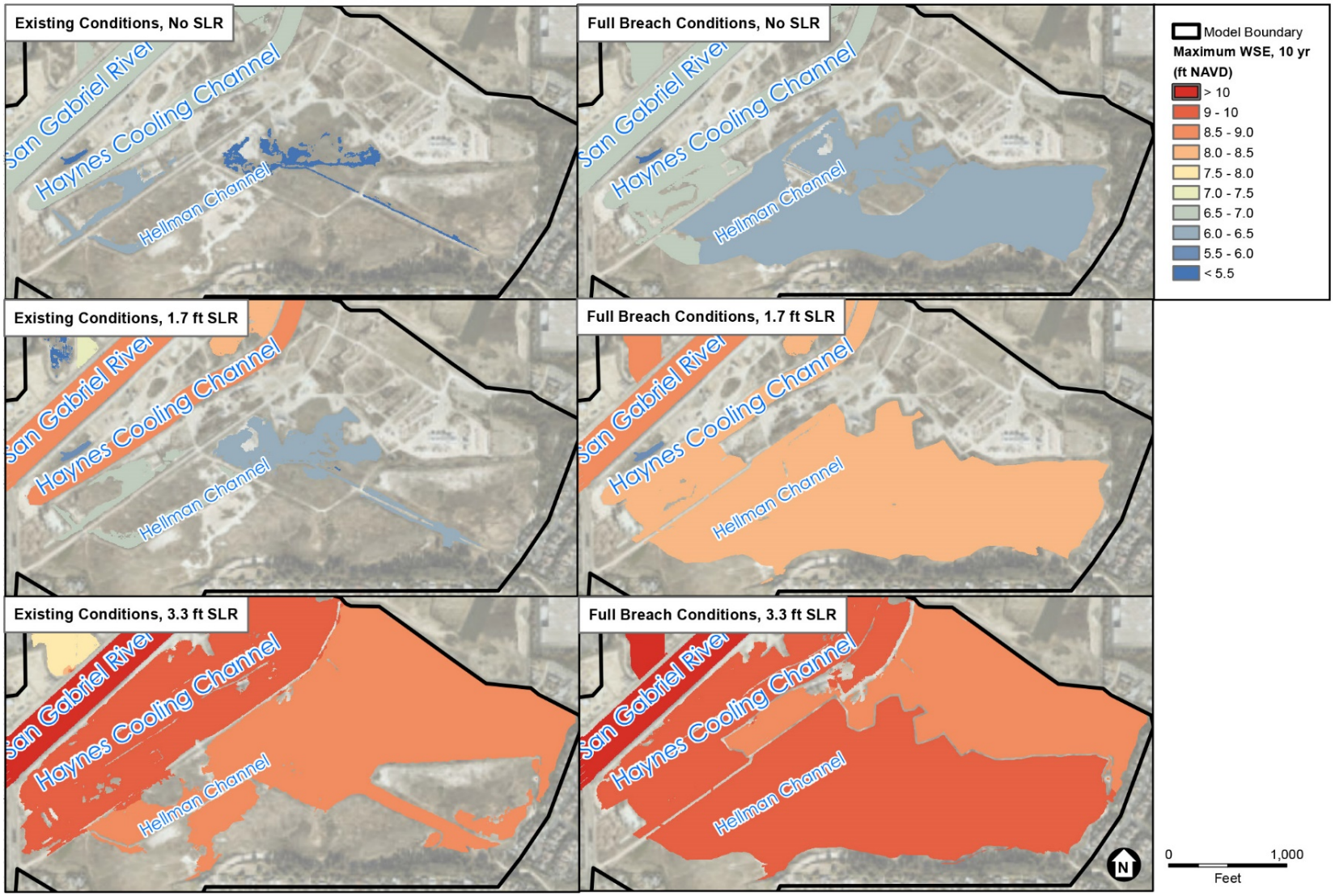
Under 3.3 feet of sea-level rise, the model results show that tidal water levels in the South Area would be 0.1 to 0.8 feet higher than no project conditions. With 3.3 feet of sea-level rise, the annual high tide will overtop the berm along the Haynes Cooling Channel and flood both the South LCWA site and the Hellman Property site, even without the proposed program (**Figure 3.8-6**, *Modeled Extent of Inundation during an Annual High Tide in the South Area, with Sea-Level Rise*). However, there would still be 0.4 feet of freeboard along the berm.

In the Central Area under no project conditions, the model results show that the tidal water levels in the site increase as the water levels in the San Gabriel River rise, because the perched culvert becomes less perched, and water can flow into the site more frequently and for longer portions of the tidal cycle (**Figure 3.8-7**, Modeled Extent of Inundation during an Annual High Tide in the Central Area, with Sea-Level Rise). With 3.3 feet of sea-level rise, the annual high tide water level is less than 2 feet below 2nd Street at the Studebaker Road intersection.

In the Central Area under long-term restoration with 1.7 feet of sea-level rise, the model results show that the tidal water levels in the site are 1.2 feet higher than no project conditions. With 3.3 feet of sea-level rise, the proposed program water levels would be 2.4 feet higher than no project conditions. However, construction of the Perimeter Levee around the site would provide increased flood protection, with up to 14 feet of freeboard.

Mitigation Measure

No mitigation is required.

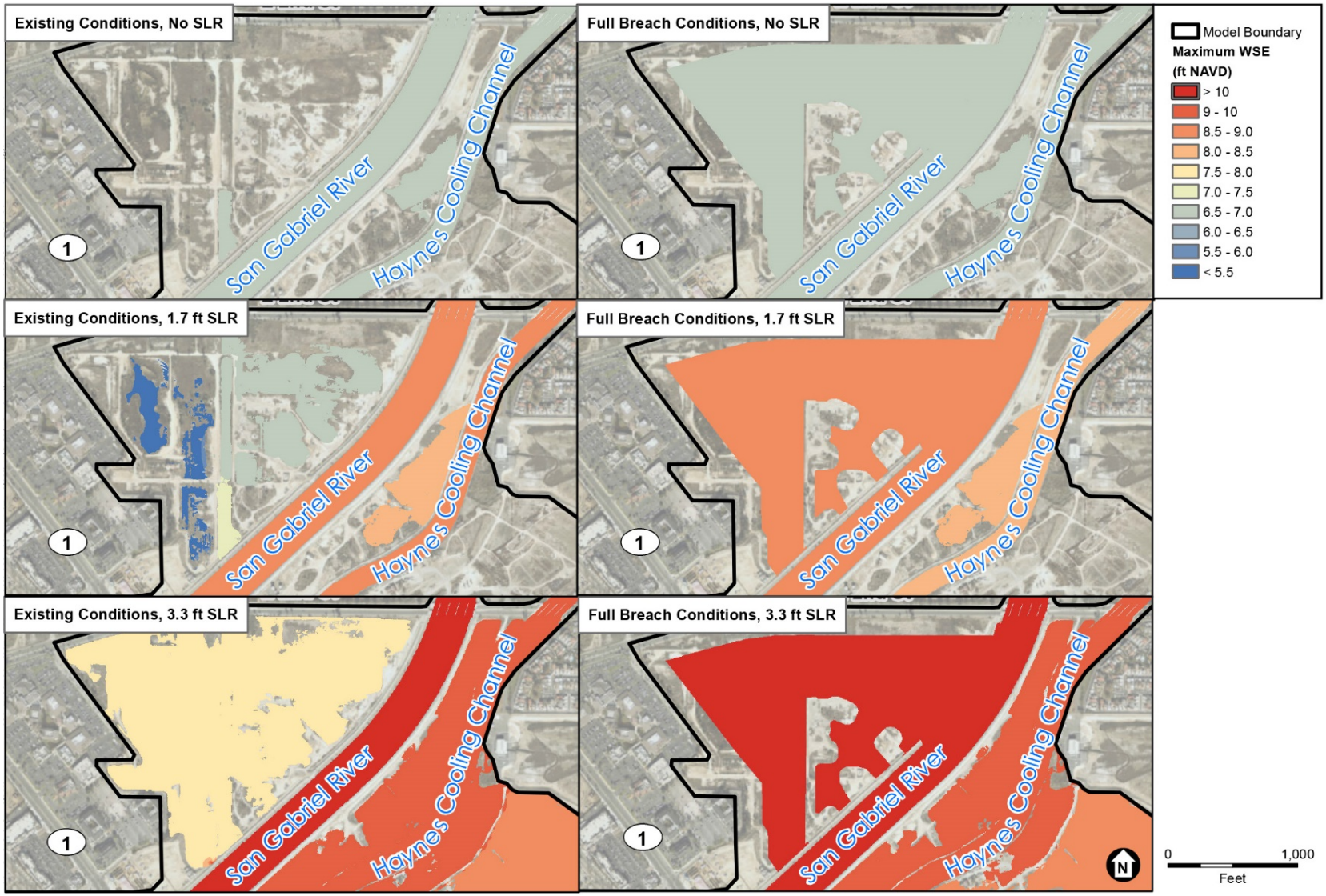


SOURCE: ESRI, LCWA

Los Cerritos Wetlands Restoration Plan Draft Program EIR

NOTES: WSE = Water Surface Elevation; SLR = Sea-Level Rise

Figure 3.8-6
Modeled Extent of Inundation during an Annual High Tide in the South Area, with Sea-Level Rise



SOURCE: ESRI, LCWA

Los Cerritos Wetlands Restoration Plan Draft Program EIR

NOTE: WSE = Water Surface Elevation

Figure 3.8-7
Modeled Extent of Inundation during a 10-Year High Tide in the Central Area, with Sea-Level Rise

Significance after Mitigation

Less than Significant

Impact HYD-3c: The proposed program would result in a significant impact if the proposed program would substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river or through the addition of impervious surfaces, in a manner which would create or contribute runoff water that would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff.

Replacement stormwater storage volume would be provided by creating low areas (e.g., basins or swales) between the roads and the proposed levee in the Central Area. These infiltration basins or bioswales would be sized to accommodate the local area drainage. These basins would also function as water quality treatment measures for a portion of the runoff from the existing paved areas. All drainage features throughout the program area would be designed in accordance with NPDES MS4 permit requirements. The potential impacts would be less than significant.

Mitigation Measure

No mitigation is required.

Significance after Mitigation

Less than Significant

Impact HYD-3d: The proposed program would result in a significant impact if the proposed program would substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river or through the addition of impervious surfaces, in a manner which would impede or redirect flood flows.

As noted above, by design, the proposed program would alter existing drainage patterns of the site to allow for increased flooding within the targeted restoration areas in pursuit of mimicking pre-development conditions, while also providing flood protection of off-site properties through the construction of levees, berms, or flood walls. The levees, berms, or flood walls would be constructed in accordance with 33 U.S.C. Section 408 permit requirements. Above ground structures including the Visitor Centers and other above ground improvements would be constructed in accordance with flood control requirements and with the expanded floodplain habitat created by the proposed program, they would not impede or redirect flood flows. Therefore, the proposed program would alter drainage patterns and areas that would be susceptible to flooding but would not impede or redirect flood flows to off-site areas. As a result, the potential impact related to altered drainage patterns and flood flows would be less than significant.

Mitigation Measure

No mitigation is required.

Significance after Mitigation

Less than Significant

Impact HYD-4: The proposed program would result in a significant impact if the proposed program would be in a flood hazard, tsunami, or seiche zone, and risk release of pollutants due to program inundation.

The entire program area is located in a tsunami inundation zone. Over the course of the proposed program, existing industrial facilities would be removed and replaced with largely restored native habitat areas. Improvements associated with the proposed program would include public access features, such as access roads and visitor centers, but with the removal of existing industrial activities and operations as well as the completion of any remediation of existing contamination, the proposed program would reduce the potential for release of pollutants presently on site.

In addition, the County of Los Angeles is working on becoming a Tsunami Ready community that would implement measures to avoid or lessen potential tsunami impacts to structures and persons. The Pacific Coast Highway could be used to bring in emergency personnel and supplies to the program area in the event of a tsunami. Further, the proposed program would restore areas to wetland habitat. Wetlands provide protection from tsunamis and tidal surges and would thus help mitigate potential damage from a tsunami event.

As discussed above, the proposed program would include flood protection measures that would be designed to limit flooding to the intended habitat areas consistent with pre-development conditions and provide sufficient protection to off-site areas. The berms or flood walls would be constructed in accordance with 33 U.S.C. Section 408 permit requirements which would minimize the potential for activities associated with the proposed program to cause flooding off site or release pollutants from inundation. In addition, there would not be any storage of substantive quantities of hazardous materials anywhere within the program area such that there would be risk of release from program inundation.

Otherwise, the program area is not located adjacent to an enclosed or semi-enclosed water body such that there would be no risk of seiche waves that could affect the site.

Impacts would be less than significant.

Mitigation Measure

No mitigation is required.

Significance after Mitigation

Less than Significant

Impact HYD-5: The proposed program would result in a significant impact if the proposed program would conflict with or obstruct implementation of a water quality control plan or sustainable groundwater management plan.

The Los Cerritos Channel and San Gabriel River are both listed as impaired waterbodies for a number of constituents through the 303(d) and TMDL programs as identified in the Basin Plan. The main constituents of concern for the two primary channels are metals (copper, lead, zinc, mercury, nickel), diazinon, coliform bacteria, pH, toxicity, bis(2ethylhexyl)phthalate, and trash. Water quality concerns within the San Gabriel River and Alamitos Bay/Los Cerritos Channel are being addressed through the watershed management plans (WMPs) and TMDLs. The WMPs contain specific numeric goals and watershed control measures (WCMs) that will improve water quality within the drainage areas. Los Cerritos Channel and Alamitos Bay is also part of the Long Beach Estuary Monitoring Plan which will provide more specific monitoring data and allow for appropriate WCMs.

Implementation of the proposed program would allow for tidal flows into the program area, creating favorable water quality conditions by limiting retention time and enhancing tidal exchange. This flushing would also minimize the impacts of sediment accumulation with high levels of constituents deposited on the restored program area during high storm flow events. As a result, the proposed program would not conflict or obstruct implementation of the water quality control plan but would actually be a benefit to the plan.

The Water Replenishment District of Southern California (WRD), in coordination with other basin stakeholders, has developed a Groundwater Basins Master Plan (GBMP) to manage the West Coast and Central groundwater basins (WRD 2016). The intent of the plan is to provide a single reference document for parties operating within and maintaining the West Coast and Central groundwater basins. This plan is intended to help guide the stakeholders develop and assess initial concepts for additional recharge and pumping from these basins to utilize the basins fully and reduce dependence on imported water. Some proposals to meet the plan goals include increasing groundwater pumping up to the allowed limits, use of additional stormwater and recycled water, expansion of the Edward C. Little Water Reclamation Facility, and various recharge programs. Implementation of the proposed program, would require water supplies for proposed program elements such as visitor centers, but otherwise would have relatively low water supply needs and would not otherwise interfere with the aforementioned goals of the WRD GBMP.

Therefore, the proposed program would have a less than significant impact related to water quality control plans or sustainable groundwater management plans.

Mitigation Measure

No mitigation is required.

Significance after Mitigation

Less than Significant

3.8.6 Cumulative Impacts

The geographical context for evaluating cumulative impacts is the San Gabriel River watershed. Cumulative impacts could occur during and following restoration under the proposed program if the effects of the proposed program were to combine with past, present, or foreseeable future projects within the watershed to become cumulatively considerable. The greatest potential for cumulative impacts with respect to water quality would occur if land disturbing activities either during restoration or post-restoration (long-term) of cumulative projects were to happen concurrently. However, the operation and maintenance phases of potential cumulative projects also are included in the temporal scope of cumulative impacts because minor alterations in topography and the addition/reduction of impervious surfaces could combine with the incremental restoration and post-restoration impacts of the proposed program to produce cumulative impacts related to erosion and sedimentation.

The existing conditions described in the setting above, reflect the effects, including water quality impairments, of past and existing land uses. It is within the context of these conditions that potential cumulative impacts to water resources are considered.

During construction and operation of the cumulative projects, it is anticipated that fuels, antifreeze, paints, oils, greases, and other lubricants, and various other potential water quality pollutants, similar to those discussed for proposed program impacts, would be stored or utilized on each site, in support of construction and operation period activities. Handling of such materials for all cumulative projects would be regulated under applicable federal, state, and local requirements, as discussed for the proposed program above. Adherence to these requirements, including SWPPPs and/or BMP Plans and erosion control practices, would ensure that water quality impacts of accidental releases of hazardous chemicals would be minimized. Minimal residual impacts on water quality could occur; however, they would be expected to be discrete in nature, associated with isolated incidents (e.g., accidental spills), and generally of low occurrence due to the nature of projects anticipated, and therefore, do not represent major hazardous materials users or manufacturers. Therefore, the proposed program's incremental impacts would not combine to cause or contribute to a significant cumulative impact.

As also discussed above, the impaired water bodies within the San Gabriel River watershed are being addressed through adherence to the Clean Water Act and the TMDLs that have been developed for the watershed. While the timing of completion for these TMDLs and WLAs can only be estimated at this time, they are anticipated to be completed at some time in the future. In addition, the proposed program would be associated with a change in land uses and required remediation of contaminated areas such that environmental conditions of water quality would be anticipated to be improved with time. As a result, implementation of the proposed program would not contribute to cumulatively considerable impacts related to hydrology and water quality.

Mitigation Measure

No mitigation is required.

Significance after Mitigation

Less than Significant

3.8.7 References

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