Los Peñasquitos Lagoon Restoration – Phase 1

Water Quality and Hydrology Environmental Assessment Report

June 2022

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1.1 Introduction

The Los Peñasquitos Lagoon Restoration Phase 1 Project (Project) is located within the upper portion of Los Peñasquitos Lagoon (Lagoon) and the upstream riparian corridor within Sorrento Valley in the City of San Diego, San Diego County, California. Los Peñasquitos Lagoon is a State Natural Preserve that is part of the Torrey Pines State Natural Reserve (TPSNR) located in coastal north county San Diego, which is owned and managed by State Parks. The Lagoon is a 565-acre coastal estuary that receives drainage from an approximately 59,212-acre watershed comprising three primary sub-drainages: Carmel Valley, Los Peñasquitos Canyon, and Carroll Canyon (Figure 1). The Lagoon lies primarily within the jurisdictional boundary of the City of San Diego, but also includes the City of Del Mar. The City of Poway and the County of San Diego are also included in the Lagoon watershed (Figure 1).

The Project is addressing the targeted compliance goals of the Los Peñasquitos Watershed Management Area (WMA) Sediment Total Maximum Daily Load (Sediment TMDL) that include reductions in sediment loading to the Lagoon to 1973 levels, restoration of historical salt marsh toward 84 acres by 2035, and management of freshwater inputs to the Los Peñasquitos Lagoon (Lagoon). Each of the targets address existing conditions that have resulted in impairment of the Lagoon. The Sediment TMDL that is enforced through the Order No. R9-2013-0001, as amended by Order Nos. R9-2015-0001 and R9-2015-0100, National Pollutant Discharge Elimination System (NPDES) Permit and Waste Discharge Requirements for Discharges from the Municipal Separate Storm Sewer Systems (MS4s) draining the watersheds within the San Diego Region. The City of San Diego, with the other Los Peñasquitos WMA co-permittees and watershed stakeholders worked collaboratively in the development of the Los Peñasquitos WMA Water Quality Improvement Plan (WQIP). The WQIP identifies and prioritizes the water quality conditions and the watershed measures that will be taken to address these priority conditions. During these planning efforts, it was determined that restoration of the Lagoon's historic habitats (e.g., salt marsh) and ecosystem services would serve a primary compliance target, in conjunction with load reductions of sediment and other constituents of concern.

The City is taking a multi-benefit approach to this Project. This includes not only addressing the TMDL compliance goals, but also achieving additional benefits of reducing additional sediment load reductions to the lagoon and freshwater ponding that decreases salinity in existing sediments and promotes establishment of invasive Italian rye grass in historical salt marsh habitats. Ponding also creates favorable mosquito breeding habitat through planned upgrades to existing storm drain outfalls that discharge to the Lagoon. Reductions in trash delivery to the Lagoon are also targeted by the proposed Project through trash exclusion devices at the storm drain outfalls and through the floodplain enhancements. Additional benefits include addressing flood inundation from more frequent storm events in the developed floodways in Sorrento Valley.

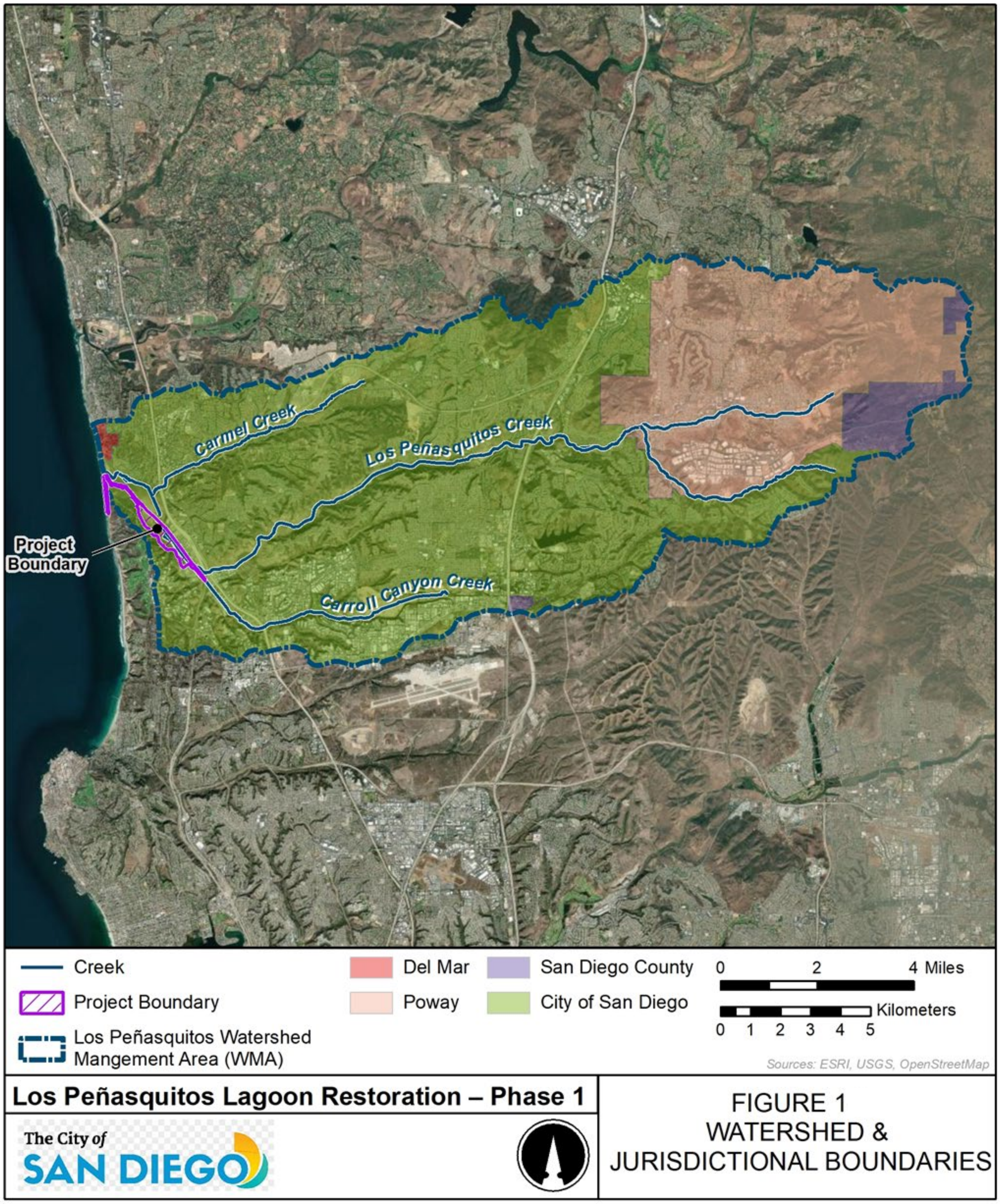

Figure 1: Watershed & Jurisdictional Boundaries

The Project is consistent with the recommended restoration alternative, "Freshwater Management", in the Updated Los Peñasquitos Lagoon Enhancement Plan (LPLF, 2016). The Project is also consistent with the State Park General Plan for Torrey Pines State Beach and State Reserve (California State Parks, 1984) that includes restoration of historical habitat salt marsh function, preservation of listed species, management of sediment entering the Lagoon, addressing water quality to the Lagoon, and providing trailhead improvements.

The Project components are presented in Figure 2. The Project key components include salt marsh restoration, freshwater management, sediment management and habitat restoration, rehabilitation and enhancement of riparian, freshwater and degraded salt marsh wetland habitats, storm drain upgrades, stormwater and dry weather diversions and flood management. The Project has an estimated construction completion timeline of 2024-2028 that will be implemented in three subphases (Phases 1A,1B and 1C) followed by several years of adaptive management and monitoring. The estimated 51-acres of historical salt marsh restoration will be implemented in Phase 1C following the implementation of sediment and freshwater management design features in Phases 1A and 1B that are integral to the success and long-term resiliency of the restoration. The salt marsh restoration is in the downstream western portion of the Project site and includes the construction of new tidal channels, channel benching and site grading to increase tidal inundation extent and frequency to the restored salt marsh. The restoration will remove accumulated sediments and non-native rye grass within the degraded salt marsh limits and revegetate these areas with native salt marsh vegetation.

Phase 1A includes sediment reduction measures in the upstream portion of the Project that are located partially outside of the current stream channels and will use natural floodway processes to slow down storm flows and allow coarser sediments to drop out and be periodically removed. Three floodplain enhancement sediment management measures and enhancement to the drainage ditch along Dunhill Road to increase sediment management are planned. These sediment management measures are integral to the success of the salt marsh restoration to address impacts from sediment accumulation in restored areas. Phase 1A includes a stormwater diversion from Dunhill Ditch to provide additional capacity for sediment management.

Phase 1A of the Project also includes flood management measures in Sorrento Valley that integrate with the three floodplain enhancements and include storm flow diversions, new channels, and backflow control devices. These measures also reduce sediment loading by diverting storm flows to the floodplain enhancements compared to current direct discharges to the creeks and upper Lagoon. Phase 1A includes upgrades to storm drain outfalls at Flintkote Avenue, Tripp Court, and Estuary Way; and upgrades and combines the outfall for Industrial Court, Camel Mountain Road and North Carmel Mountain Road that discharge into the Lagoon. Upgrades to existing storm drains that discharge directly to the Lagoon address freshwater ponding that creates favorable mosquitos breeding habitat, sediment accumulation and trash entering the Lagoon and impacting habitat and water quality.

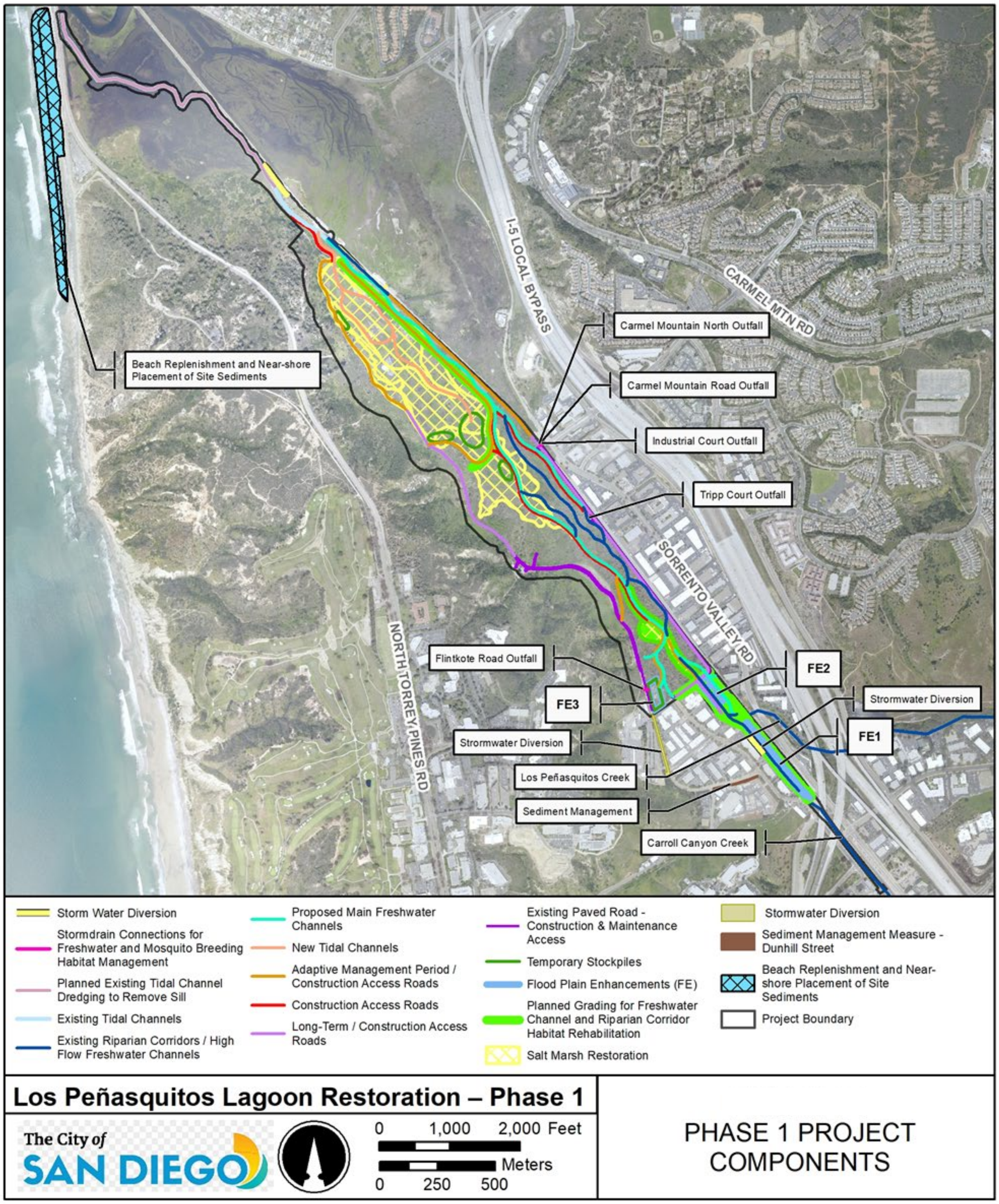

Figure 2: Phase 1 Project Components

Phase 1B components include a new continuous channel that connects upstream creek flows to downstream tidal channels. Secondary channels will also be constructed to reduce the extent and duration of freshwater ponding in historical tidal and nontidal salt marsh habitats. These freshwater management measures are needed to establish a more resilient salt marsh habitat that has been impacted by increased freshwater inputs and inundation. Phase 1C completes the installation of the third floodplain enhancement that is used for material stockpile in the previous phases and the stormwater diversion from the Flintkote Channel to this Floodplain Enhancement.

The report presents an assessment of the effects of the Project on the water quality and hydrology of the site. The design features that contribute to the water quality and flood management are first presented with a summary of the results of the design analysis and assessment. Further detail on the results of the assessment and modeling for water quality and hydrology are presented in the design reports referenced in this report.

1.2 Water Quality Improvements

Figure 3: Coarse Grained Sandy Sediment Deposited in Upper Lagoon

Urbanization of the watershed and loss of historic floodplain has led to increased sediment loading within the Lagoon and lower reaches of riparian corridors that connect the upper Lagoon to its sub-watersheds. Impacts related to increased coarser (sandy) sediment input include increased elevations in the upper Lagoon that impede tidal influence, buried native plants, and reduced salinity of surface soils resulting in degraded and converted habitats. Fine-grained sediment is also deposited in the upper Lagoon when storm flows over top the existing "pilot channel" that ends within the riparian corridor and spreads over the marsh plain throughout the Phase 1 area. Fine-grained sediment, when deposited under more effective storm flow conveyance, may benefit areas of restored salt marsh if also subjected to frequent tidal flow to increase and retain salinity levels in the marsh plain sediments. Increased coarse sediment loading downstream of the confluence of Carroll Canyon and Los Peñasquitos Creeks has degraded the riparian habitat and has accelerated establishment of invasive plant species in the understory and contributed to the density and dominance of willows in the overstory as this species establishes quickly in disturbed soils near waterways.

Load reductions in sediment to the Lagoon are targeted by the Sediment TMDL. These sediment load reduction targets and timelines are further defined in the WQIP prepared for the Los Peñasquitos Watershed. The Project includes measures to reduce sediment loading into the Lagoon from upstream tributaries of Carroll Canyon and Los Peñasquitos Creeks. These measures include the construction of three floodplain enhancements that use restored floodplain processes upstream of the TPSNR using a similar approach to existing permitted sediment measure operating on Los Peñasquitos Creek. Additional measures include enhancement of the Dunhill Ditch for sediment management through planned channel widening and installation of concrete articulated block on the channel bottom. This approach is similar to the three floodplain enhancements in order to facilitate sediment removal and accounting of sediment removal toward the TMDL sediment load reduction that is reported on an annual basis.

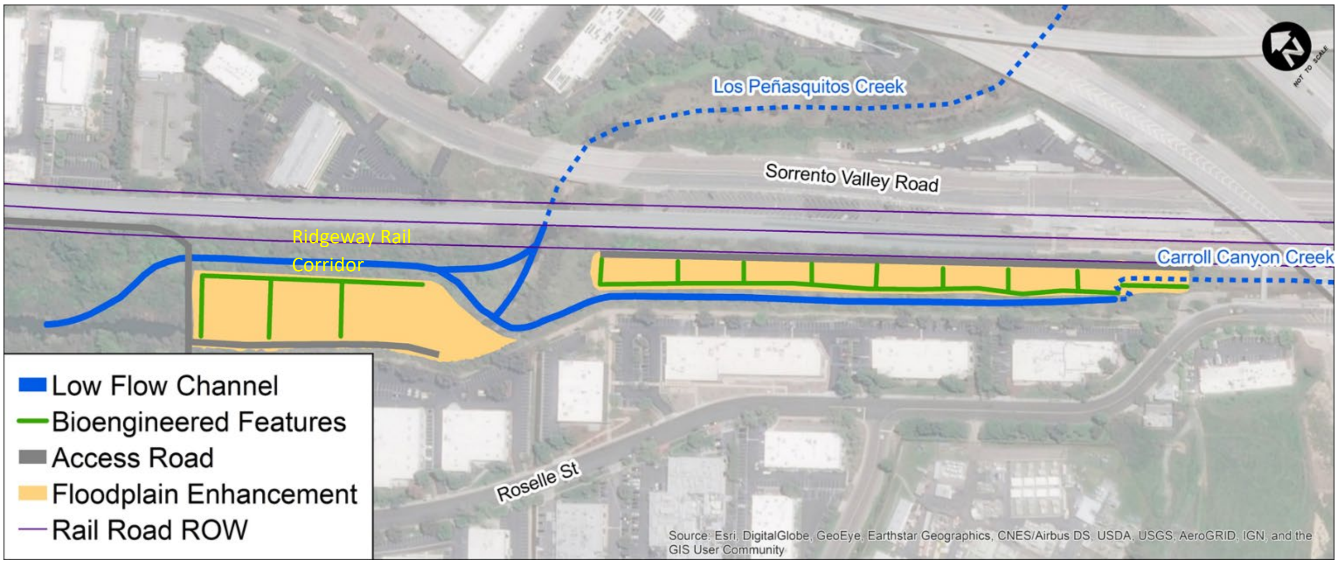

Figure 4: Floodplain Enhancements 1 and 2

Stormwater diversions are planned from Dunhill Ditch to Carrol Canyon Creek to improve sediment storage capacity in the ditch. A stormwater diversion is planned for Flintkote Channel to Floodplain Enhancement 3 that will direct sediment from adjacent drainage areas to this floodplain enhancement reducing sediment loading to the Lagoon. The planned upgrades to storm drain outfalls will include sediment and trash interceptor devices before these enter the Lagoon.

Without the proposed sediment management, freshwater management and riparian enhancement elements of the Project, impacts to water quality and the beneficial uses for not only the Carroll Canyon Creek but to the Los Peñasquitos Lagoon will continue. The success of the planned restoration efforts depends on addressing the sediment loading and accumulation issues and reducing the impact of year-round dry weather flows and longer retention times of stormflows in historical salt marsh habitats. These Project measures are needed for the long-term sustainability of the restoration of the Los Peñasquitos Lagoon.

The sediment load reduction efficiencies of the floodplain enhancements were assessed using sediment transport modeling during the 60% Design with the goal of improving sediment removal in the upstream floodplain enhancements to remove coarse sediments prior to entering and depositing in the downstream riparian and salt marsh restoration areas. Sediment transport modeling was performed using SRH-2D (Sediment & River Hydraulics – Two-Dimensions), Version 3.2 (USBR, 2020). Model construction, including mesh creation, boundary conditions, and results viewing were performed using the SMS (Surface-Water Modeling System) software, Version 13.0.14 (Aquaveo, 2020). SRH-2D is a hydraulic model developed by the U.S. Bureau of Reclamation (USBR) in collaboration with the Federal Highway Administration (FHWA). SRH-2D was chosen because it contains a two-dimensional solution of mobile-bed sediment transport hydraulics, allowing for multi-size and suspended-, bed-, and mixed-load sediment transport simultaneously. The SRH-2D two-dimensional (2-D) sediment transport and hydraulic model was used to compute flood sediment transport through the project reach and the sediment-trapping efficiency of the proposed Floodplain Enhancement 1 and 2.

The results of the sediment transport modeling for the 60% Design indicated a removal efficiency of 21-24% for coarse sandy sediment for floodplain enhancement 1 under more frequent storm events (2-year storm frequency or less). The efficiency of floodplain enhancement 2 is greater at 32% for more frequency storm events. The sediment transport modeling was run for the 2-year, the 10-year, and the 25-year storm events. The 2-year event provides the best correlation to the annual sediment loading, for comparison against the required TMDL reductions. The removal efficiency of the floodplain enhancements decreases with less frequency higher peak flow storm events as sediment is remobilized at these higher velocities. Bioengineered grade control structures have been added to the floodplain enhancements to improve removal efficiencies along with refinement on the configuration of the channels entering the first cells of these design features. The footprints of the floodplain enhancements have also been modified to reduce impacts to sensitive habitat and to provide a wildlife corridor from Los Peñasquitos Creek to the California Coastal Conservancy property. Further detail on the sediment modeling and results are provided in the Los Peñasquitos Lagoon Restoration Hydrologic and Hydraulic Assessment of Restoration and Sediment Transport Modeling Report (Burns & McDonnell, January 2021).

The removal efficiencies of the floodplain enhancements were then used to assess the overall sediment removal on an average basis using watershed models developed a part of the Los Peñasquitos Watershed Master Plan (City of San Diego, 2018). Sediment rating curves derived from the loading simulation program C++ (LSPC) model output were applied to the events simulated in the water quality Storm Water Management Model (SWMM) to generate estimates for sediment transport in storms of various sizes and then apply the removal efficiencies of the floodplain enhancement to estimate the sediment load reductions achieved. The sediment load reductions determined from the watershed modeling for the current 60% Design are comparable to those reported in the Watershed Management Plan of approximately 1200 tons per average year. Additional efficiencies and greater reductions, where feasible, are anticipated through the final design process pending permit negotiations with the resource agencies. The current design is achieving comparable reductions with less impact. For example, the current design has increased the efficiency of floodplain enhancement 2 to achieve comparable sediment load reductions to the original concept even with reductions in the size to minimize impacts to existing sensitive habitat and maintain wildlife corridors.

Load reductions are also achieved through the conveyance of storm flows more efficiently through the Lagoon by the refined design of the freshwater management channel system that transports sediment past the restoration and lower lagoon instead of deposited these sediments on the salt marsh habitat. Fine-grained sediment will still deposit in the salt marsh but at a lower rate. The freshwater management system has also been refined to reduce impacts by re-aligning the channels away from intact riparian habitat and into areas degraded by non-native plant species that will be removed and revegetated with native species.

Excavation of accumulated sediments within Phase 1 as part of the construction of the design features and salt marsh restoration account for approximately 18,000 tons of sediment removal above the sediment load reductions achieved by the floodplain enhancements and stormwater diversion of 1200 tons per year on average toward the Sediment TMDL targets. The Project therefore provides for improvement of water quality and achieves a portion of the Sediment TMDL pollutant load reduction to the Lagoon.

1.3 Flood Management

The floodplain enhancements 1 & 2 along Carroll Canyon and Los Peñasquitos Creeks are designed primarily for sediment capture and periodic removal before the storm season and after larger storm events to achieve sediment load reductions under the Sediment TMDL and to reduce coarse sediment from depositing in the salt marsh restoration area. Floodplain enhancements 1 & 2 also provide additional storm flow capacity by increasing the available cross-sectional area adjacent to the existing low flow creek channels. Grade control structures within the floodplain enhancements limit this capacity by slowing of storm flows to allow coarser sediments to dop out. Floodplain enhancement 1 opens up the transition from the concrete channel to the earthen channel that had been a restriction to storm flows that added to flood levels in the Carroll Canyon Creek channel along Roselle Street. Hydraulic modeling for the Phase 1 design has indicated a reduction in storm flow levels during the more frequent storm events. The result of this analysis is summarized below.

In addition to the flood management improvements from floodplain enhancements 1 & 2, stormwater from adjacent drainage areas that currently flow into storm drain channels within the business park and into Carroll Canyon Creek will be captured and diverted. These three stormwater diversions are located at Flintkote Avenue/Roselle Street, Roselle Street/Estuary Way and the Dunhill Street Ditch (see Figure 2). These three stormwater diversions divert a combine drainage area of 262 acres. These diversions also reduce sediment loading to the Lagoon. These three diversions for sediment and flood management include (See Figure 2):

- **Flintkote Avenue/Roselle Street Stormwater Diversion**: The existing 30-inch RCP discharges to a concrete-lined ditch that cuts directly through the business park with a culvert crossing at Roselle Street, before reaching the ultimate outfall location at Carroll Canyon Creek. Under existing conditions, flooding frequently occurs due to existing flood conveyance capacity and sediment accumulation, as well as backflow from Carroll Canyon Creek at the outfall location. A diversion is planned at Flintkote Avenue to outfall to the southern third of Floodplain Enhancement 3 along Estuary Way to reduce sediment loading to the Lagoon and to reduce flooding during more frequent events. Floodplain enhancement 3 drains to a new freshwater management channel that connects the existing pilot channel to the downstream tidal.

- **Roselle Steet/Estuary Way**: The Roselle Street and Estuary Way intersection is one of three low points in the business park area. An existing dual 18-inch asbestos cement pipe (ACP) serves to convey approximately 11 acres of local business park drainage from Roselle Street and Estuary Way to Los Peñasquitos Creek. However, backflow from the creek typically occurs and floods at the sump location. Street improvements and a transition structure will be made along the northern curb to provide a connection to a low-flow connector channel to the Lagoon. The low-flow connector channel will converge with the channel from the outfall of Floodplain Enhancement 3 before connecting to the main channel enhancement area.
- **Dunhill Ditch Stormwater Diversion**: The planned diversion will move the existing 54-inch RCP that receives storm flow from the Dunhill ditch to farther down Carroll Canyon Creek. This farther downstream outfall has a lower water elevation allowing for greater capacity for sediment and stormwater management in the Dunhill ditch. The relocated underground culvert will run along the existing maintenance road adjacent to the low flow channel (Carroll Canyon Creek).

These stormwater diversions along with the installation of flap gates at the outfalls of the existing channels within the business park that currently backup during storm events due to water levels in Carroll Canyon Creek will provide additional storm flow capacity to Carroll Canyon Creek channel and the channels within the business park. The addition of stormwater diversions and flap gates to storm drain outfalls will improve overall flood management during more frequency events. The effects of these design features on flood levels were assessed as part of the 30% design and summarized below.

Hydraulic modeling was performed using HEC-RAS (River Analysis System), Version 5.0.7 (HEC, 2019) to assess the design features. A two-dimensional (2-D) hydraulic model was used to compute flood elevations and depths, flow velocities, shear stress, and floodplain boundaries for the 2-, 5- and 100-year return period events. Existing conditions were compared to post-construction flood elevations within the Carroll Canyon Creek flood management channel just upstream of the Project and within the business park. Preliminary watershed hydraulic results indicate that sea level rise and railroad berm removal have no impact on flood elevations within the Floodplain Enhancement areas and Business Park. The proposed improvements, including floodplain enhancements and the freshwater channels, are effective in reducing flood elevations in the business park. The Flintkote Avenue/Roselle Street Storm Drain Diversion with the added diversion from Tower Road appears to provide significant reduction in flooding within the business park for more frequent events. Preliminary sediment analysis results show that floodplain enhancements with bioengineered grade control structures provide for larger deposition zones for sand and gravel. Lastly, the proposed bioengineered grade control structures do not cause a significant increase in flood elevation or velocity with the main channel. Table 1 presents the results of the hydraulic analysis of the flood depths in Carroll Canyon Creek flood channel for the 2- and 5-year storm events. These results indicate a lowering of the flood depth and therefore an improvement of flood management for the Project. No significant effect is indicated for larger storm events (50- and 100-year frequency events).

Table 1: Results of Hydraulic Analysis of Project- Effect on Flood Level in Carroll Canyon Creek Flood Channel

Model Run	2-Year		5-Year	
	Flood Depth (ft)	Change vs. Existing	Flood Depth (ft)	Change vs. Existing
Existing Conditions	1.9	n/a	2.8	n/a
Proposed Conditions No Diversions	0.7	Lowered by 1.2 ft	1.7	Lowered by 1.1 ft
Proposed Conditions including Flintkote/Roselle Storm Drain Diversion	0.7	Lowered by 1.2 ft	1.7	Lowered by 1.1 ft
Proposed Conditions including Flintkote/Roselle Storm Drain Diversion *plus* Dunhill Ditch Enhancements and Stormwater Diversion	0.0	Lowered by 1.9 ft	1.4	Lowered by 1.4 ft

The findings and results of the hydrology modeling presented in Table 1 are based on the 30% design of the project. Design refinements completed for the Permit Level (60% Design) Design provide similar reductions in flood-levels. Figures 5 and 6 presents the results of the hydraulic modeling on the effect of the design features on flood elevations within the business park. Figure 5 presents the existing conditions and post-construction for the 10-year storm event and the effect on flood depths within the business park with the completion of the floodplain enhancements, new freshwater channels, flap gates and the stormwater diversions at located at Flintkote Avenue and Roselle Street and from the outlet of Dunhill Ditch to the relocated outlet farther downstream in Carrol Canyon Creek. Figure 6 presents the results for the 25-year storm event. For larger less frequent storm events the effect of the project is not significant due to the design capacity of the Carroll Canyon Creek flood channel. Flood inundation is limited to outside the flood walls (shown in red).

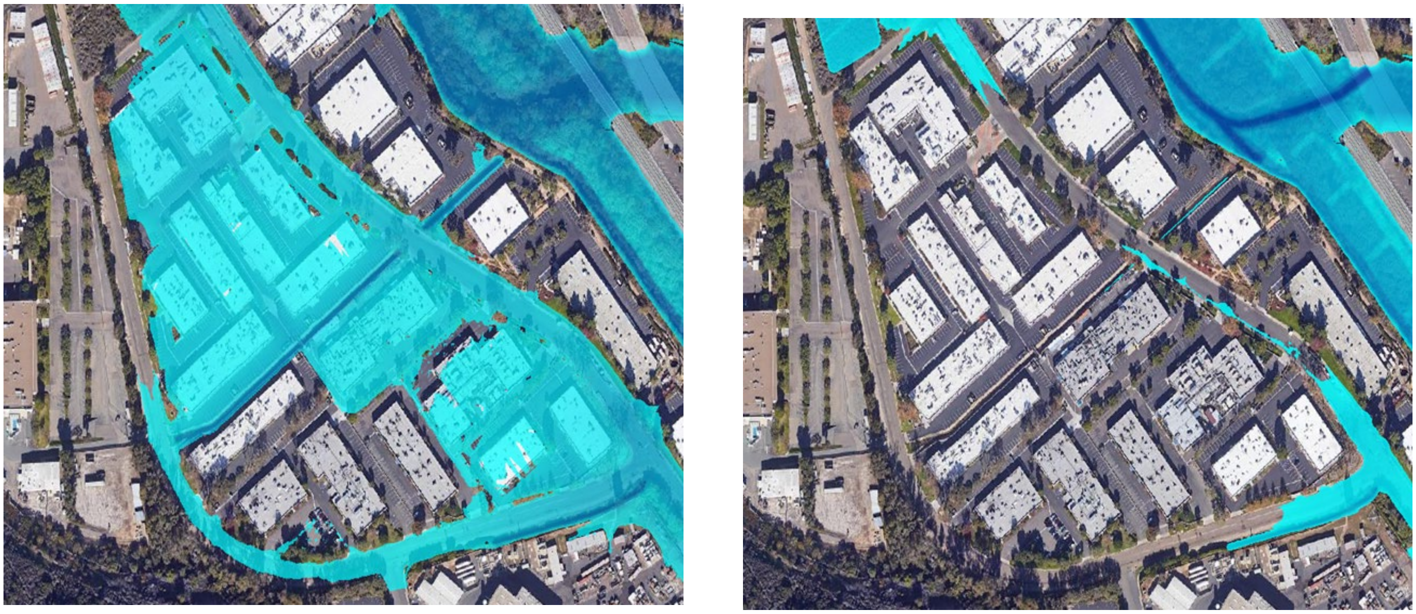

Figure 5: Existing Condition and Post-Construction with Effects of Project Design Features on Flood Depths - 10-Year Storm Event

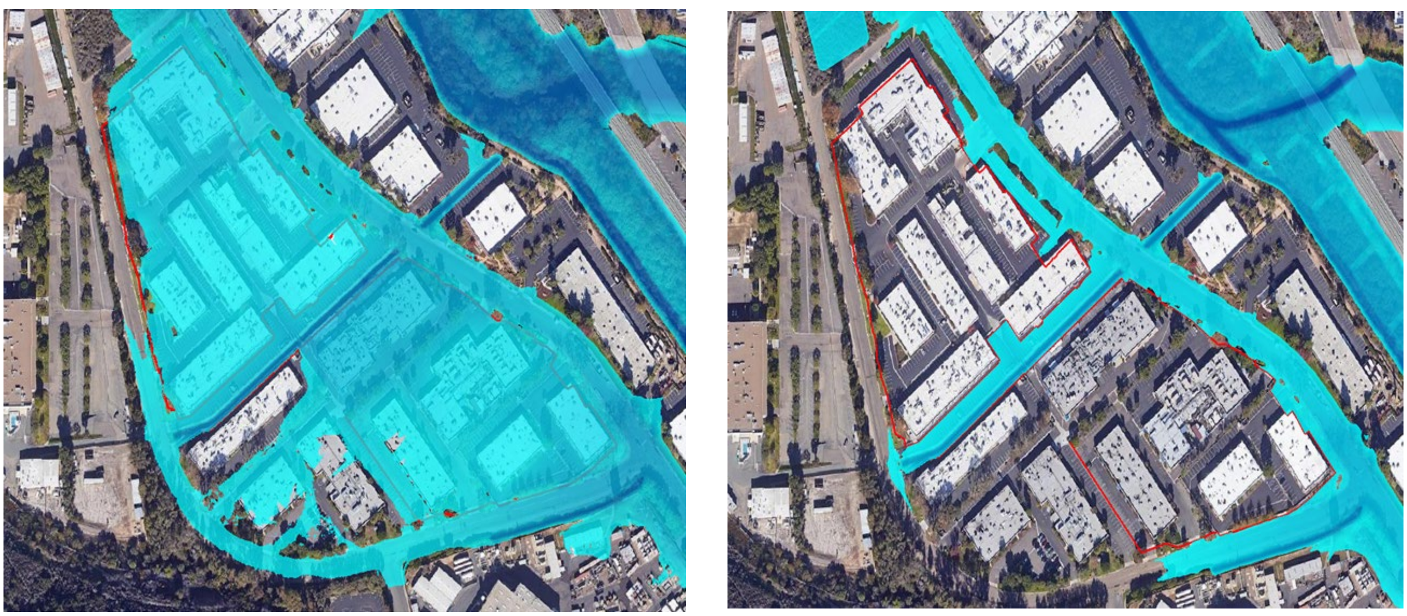

Figure 6: Existing Condition (Left Side) and Post Construction (right side) with Effects of Project Design Features on Flood Depths - 25-Year Storm Event

1.4 Sediment and Erosion Control

Increased sediment loading from the watershed has increased elevations and added coarse-grained sediment in the upper lagoon that has resulted in conversion of historical salt marsh to freshwater marsh and riparian habitat. These higher elevations and sandy material have reduced the tidal influence and salinity of surface soils in the downstream area of Phase 1 that was historical salt marsh. The three floodplain enhancements are designed to capture sediment prior to the approximate 62-acres salt marsh restoration area. The floodplain enhancements are proposed to manage sediment prior to reaching the lagoon and improve storm flow conveyance, improve channel capacity for floodwaters and reduced sediment transport to rates that allow coarse sediment to drop out prior to entering the lagoon downstream. An increase in maintained channel width and the inclusion of vegetated and non-vegetated grade control structures are part of the floodplain enhancement design to reduce water surface elevations and velocities to allow for sediment capture. Bioengineered grade-control structures and open cell articulated concrete blocks are design features for each floodplain enhancement to promote sediment capture, reduced velocities, increased channel conveyance, and operation and maintenance access. The low flow channels that are adjacent to the floodplain enhancement 1 & 2 and a continuation of Carroll Canyon and Los Peñasquitos Creeks, will be regraded with more gentle bank slopes on the side of the floodplain enhancements and both banks stabilized with native vegetation for greater erosion protection.

Existing storm drain outfalls that drain directly to the Los Peñasquitos Lagoon have accumulated significant amounts of sediment at their outfall locations. Sediment buildup has caused ponded water that results in vector control issues and flooding upstream of the storm conveyance system. Storm drain outfalls identified in Figure 2 will be upgraded to include erosion protection at the outfall locations to address scoring and ponding. Permanent access to these outfalls will also provide for periodic maintenance to remove accumulated sediment and address localized scouring and erosion.

The new freshwater channels that connect the pilot channel to the downstream tidal channel have been designed to address both sediment accumulation under low storm flow velocity conditions and channel erosion under higher storm flow velocities. Figure 7 presents the low velocity conditions for the 85th percentile and 2-year events (channel design capacity) that would result in sediment accumulation in the channel. The channel segments that were identified with velocities below the threshold were then modified. Figure 8 presents the higher flow conditions within the channel for the same storm events and the segments above the threshold that would result in channel erosion. The segments that were above the threshold were then designed with stabilization or modified to address potential erosion. The bottom of the freshwater management channels will be lined with natural cobble to provide both erosion control and to control accelerated establishment of woody vegetation that will impact the conveyance capacity of the channel for dry weather and more frequent flow storm flows. The banks of the freshwater management channels will also be revegetated with native plants for erosion protection. Where high velocities above the thresholds are identified additional stabilization using bioengineered techniques will be used to control erosion.

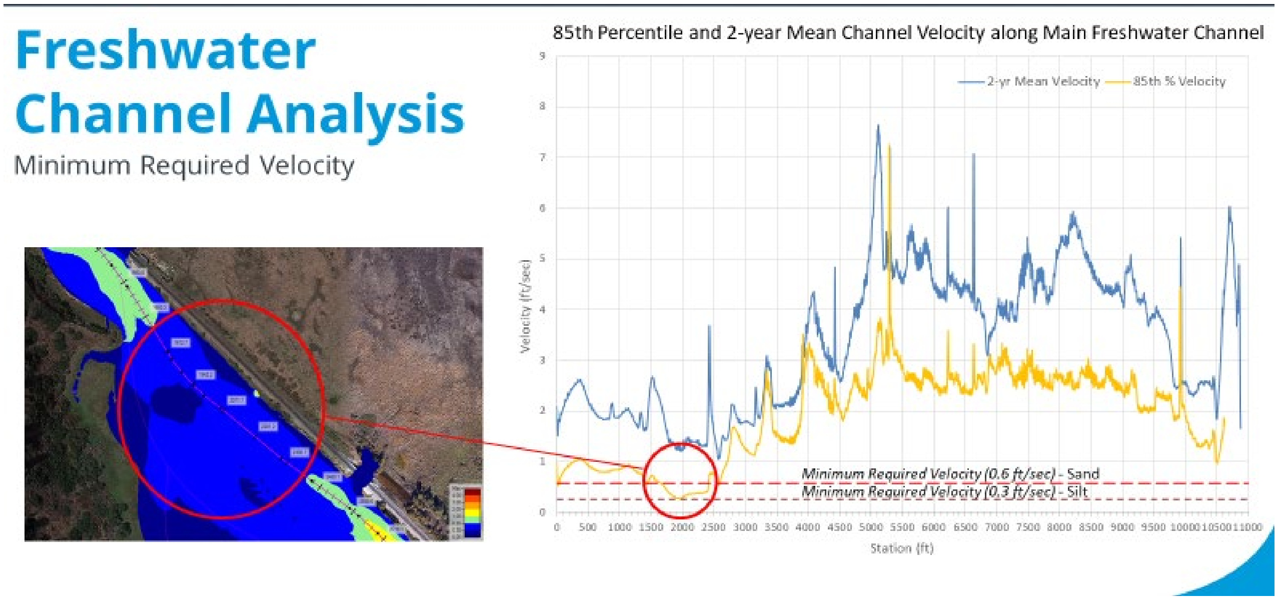

Figure 7: Freshwater Management Channels Analysis - Low Velocity and Sediment Accumulation Analysis

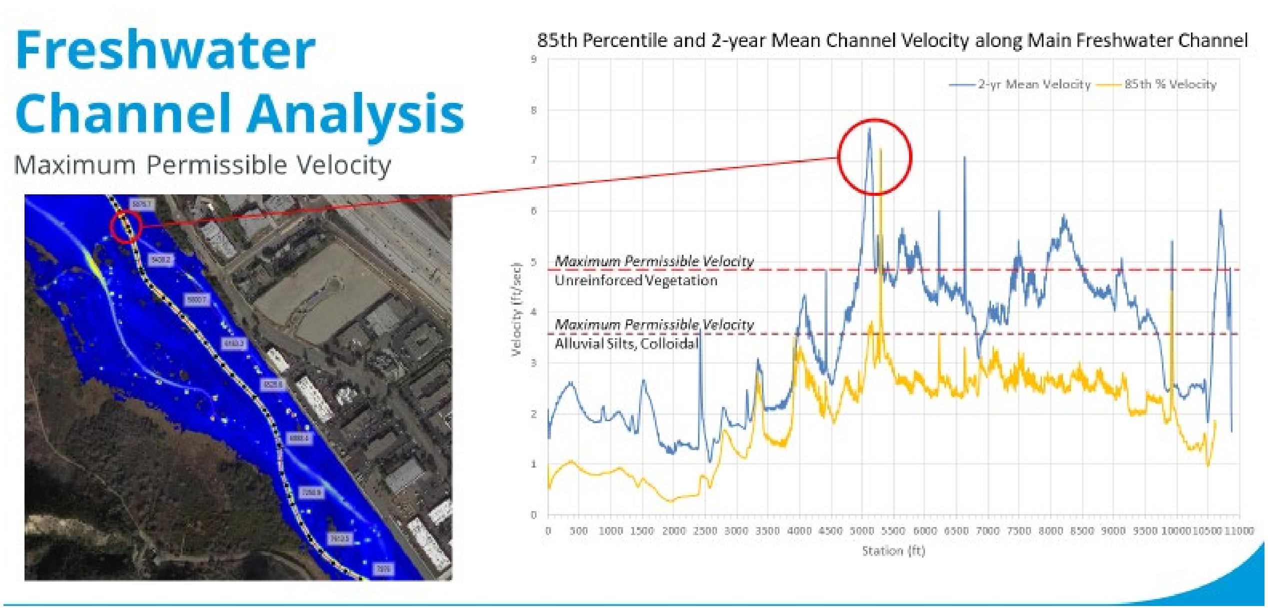

Figure 8: Freshwater Management Channels Analysis: High Velocity and Erison Analysis

During Phase 1 of construction, completion of the freshwater management channels will be sequenced to control sediment from entering downstream tidal channels. Within areas of excavation and grading, erosion and sediment control measures will be implemented in accordance with the stormwater pollution prevention plan (SWPPP) and the Storm Water Quality Management Plan (SWQMP). The SWPPP and SWQMP include the specific methods, phasing, and measures to control erosion and the migration of sediments into the Project waterways. These measures include project sequencing of work from upstream to downstream, placement of temporary check dams in channels, installation of erosion control devices and stabilization of graded area with hydroseed, The SWPPP and SWQMP provide greater detail and are part of the 60% Design.

1.5 Groundwater Conditions

Groundwater investigations conducted in 2020 and 2016 within the Project included the installation of temporary piezometers along access roads and within the areas of planned new freshwater management and tidal channels. Twenty-three temporary piezometers were installed during these investigations both in the Project and along Old Sorrento Valley Road (Phase 2 project). The location map for these piezometers is included in the Report of Geotechnical Services for the Los Peñasquitos Lagoon Restoration Project by Allied Geotechnical (Allied, 2020, revised June 2022). The temporary piezometers were used to obtain groundwater elevations and salinities and to develop the groundwater contour map (Allied, 2020). Results from groundwater investigations showed that groundwater levels in the lagoon range from 2 to 22 ft NAVD and from 3 to 10 feet below ground surface. Groundwater elevations decrease to 2 ft NAVD toward the lower (downstream) end of the project that is also within tidal influence. Salinity was measured during these investigations and results indicated groundwater salinity varied from 0.4 to 15.6 ppt, with higher salinities towards the interior of the lagoon. The lowest salinities were found farthest up into the project above historical and current tidal influence. The average salinity in the Phase 1 area was 6.2 ppt, indicating that the groundwater is brackish and experiences at least some estuarine influence. The groundwater freshwater/brackish boundary in marshes can vary monthly and is not well correlated to rainfall or tidal cycles (Carter, White, and Wilson 2007).

The proposed channel grading was compared to the groundwater elevations to evaluate how the channels would impact groundwater levels in the project area. The temporary piezometer locations included several within the marsh plain where the new freshwater management channels and tidal channels are planned. The new freshwater channels are within the groundwater contours of 8-22 ft Mean Sea Level (MSL). The depth of the freshwater channel varies from 9 to 11 ft. MSL above where tidal inundation is anticipated. Within this area between the tidal inundation and the upstream portion of the project where groundwater depth increases, the groundwater contours are between 8 to 10 ft. MSL. Comparing the depth of the freshwater management channel depths and the groundwater elevations, the channels may intercept groundwater to a depth of one foot or less. This depth will have no significant impact to groundwater levels throughout the project and any potential drawdown effect would be off-set by re-saturation from persistent dry weather flow and storm events. The freshwater management channels will convey continuous dry weather flows from the watershed and storm flows. Storm flows for events greater than the 1-year event will inundate the marsh plain, saturating soils across the wetland and infiltrate and recharge the groundwater. Therefore, no significant impact on groundwater is expected for the project.

Groundwater may be used for temporary irrigation within the salt marsh restoration areas that include non-tidal salt marsh habitat. Based on the groundwater investigation, groundwater salinity increases within the planned salt marsh restoration providing potential brackish water to support the establishment of salt marsh vegetation. Wells to be used for temporary irrigation during the construction and plant establishment period (5 years) and then closed. A geotechnical investigation is planned as part of the design to include slug tests to estimate recovery and drawdown rates. The temporary irrigation wells will be designed to not impact site groundwater. Drawdown radii are anticipated to be close to the wells and not impact groundwater levels across the site. In addition, the irrigation waters from the wells will be re-introduced on the site and thereby recharge the groundwater.

2.0 ENVIRONMENTAL EVALUATION

a) Violate any water quality standards or waste discharge requirements?

No Impact. The proposed project will improve water quality through reduction of sediment loading to the Lagoon. This improvement of water quality is achieved through implementation of three floodplain enhancements and two stormwater diversions as part of the design features of the project. These design features are needed to provide for the success and sustainability of the salt marsh restoration through the reduction of sediment loading to the restoration area. Floodplain enhancements located on Carroll Canyon Creek and the confluence of Carroll Canyon Creek and Los Peñasquitos Creek will reduce sediment loading from these tributaries through a series of bioengineered grade-control structures. The floodplain enhancement 3 will reduce sediment loading from adjacent drainage areas through the diversion of these storm flows into the floodplain enhancement, which also contains bioengineered grade-control structures that allow storm flows to slow down and capture the sediment. Improvements to the drainage ditch along Dunhill Street (“Dunhill Ditch”) will improve sediment management from the over 100 acres drainage area that drains into this feature. Sediment management includes increasing the capacity of the drainage ditch and installation of articulate concrete block on the ditch bottom to facilitate periodic sediment removal. The current outfall of the ditch will be relocated farther downstream to where the water elevation will be lower providing greater sediment storage and stormwater conveyance capacity in the ditch. Current capacity is limited by backflow into the ditch from the outfall during storm events. The project would result in improvement in water quality within the Lagoon and would not violate any water quality standards or waste discharge requirements. As part of Lagoon enhancement, materials disposal from sediment excavation may result in sand placement on the beach or in the nearshore. Sand or materials added to the littoral system will have to comply with existing regulations that include the EPA's Inland Testing Manual. Therefore, the proposed project would result in no impact related to water quality standards and waste discharge requirements.

b) Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level (e.g., the production rate of pre-existing nearby wells would drop to a level which would not support existing land uses or planned uses for which permits have been granted)?

No Impact. Construction and operational activities would not require the direct use of groundwater supplies with the exception of the potential use of brackish on-site groundwater for temporary irrigation of the salt marsh restoration area. Temporary irrigation of the other restoration areas will be provided from hookups to the City water system. Based on the groundwater investigation, groundwater salinity increases within the planned salt marsh restoration providing potential brackish water to support the establishment of salt marsh vegetation. Wells to be used for temporary irrigation during the construction and plant establishment period (5 years) and then closed. A geotechnical investigation is planned as part of the design to include slug tests to estimate recovery and drawdown rates. The temporary irrigation wells will be designed to not impact site groundwater. Drawdown radii are anticipated to be close to the wells and not impact groundwater levels across the site. In addition, the irrigation waters from the wells will be re-introduced on the site and thereby recharge the groundwater.

New freshwater management channels will be limited to a depth that does not result in impacts to the local groundwater. Groundwater investigations conducted in 2016 and 2020 obtained groundwater elevations and salinities for the Project. The results from these investigations were compared to the proposed channel grading and new freshwater channels. Comparing the depth of the freshwater management channel depths and the groundwater elevations, the channels may intercept groundwater to a depth of one foot or less. This depth will have no significant impact to groundwater levels throughout the project and any potential drawdown effect would be off-set by re-saturation from persistent dry weather flow and storm events. Storm flows for events greater than the 1-year event will inundate the marsh plain, saturated soils across the wetland and infiltrate and recharge the groundwater. Therefore, no significant impact on groundwater is expected for the project.

c) Substantially alter the existing drainage pattern of area, including through the alteration of the course of a stream or river, in a manner which would result in substantial erosion or siltation on- or off-site?

Less than Significant Impact. Proposed project includes construction of floodplain enhancements for sediment management and new channels for freshwater management. The floodplain enhancements are designed to capture and collect sediment for the purpose of reducing sediment loading to the restoration for its success and sustainability. The new freshwater management channels are designed to control erosion using vegetated banks and, where needed, vegetated soil lifts. These bioengineered structures will be used where the velocity, based on modeling, indicates potential for erosion. The freshwater management channels will also be lined with natural cobble to control erosion and the establishment of woody vegetation that would limit the capacity of the channel to convey dry-weather flows through the Lagoon. The hydraulic analyses of the proposed project features indicate planned erosion control measures provide sufficient stabilization to address the anticipated design storm peak velocities and associated erosive stresses. The design analysis also has identified segment of potential siltation and have been modified. Therefore, the proposed project would result in less than significant impacts related to the alteration of the existing drainage channel and causing erosion and siltation.

This is conclusion is consistent with the Final Program Environmental Impact Report (PEIR) for the Los Peñasquitos Lagoon Enhancement Plan (State Parks, August 2021) that states the Lagoon enhancement and restoration would actively enhance the fluvial and tidal efficiency of the Lagoon by creating channels to convey flows, thereby reducing impoundment of dry weather freshwater inflows to the Lagoon from urban areas, attenuation of flood waters from storm runoff, and increasing tidal extent from the ocean into the interior of the Lagoon. Localized sediment management facilities and protection to stabilize areas that could be subject to erosion (*e.g.,* rock slope protection) would not be substantial and would not result in a substantial increase in impervious surfaces within the Lagoon. The proposed project would not result in a substantial increase in impervious surfaces or associated increased runoff.

The Project includes the placement of sediment in the nearshore from the excavation of sediment for the implementation of the salt marsh restoration and floodplain enhancement. Consistent with the PEIR, materials disposal from sediment excavation may result in sand placement on the beach or in the nearshore. Adding sand to the system and/or creating a nearshore structure to reduce wave action on the beach/shoreline would reduce storm surge inundation and wave uprush and would provide some temporary additional protections against the effects of sea level rise on adjacent roadways/parking facilities.

d) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner which would result in flooding on- or off-site?

Less than Significant Impact. Proposed project does not include any new impervious surfaces. The floodplain enhancements will be lined articulated block that will allow for infiltration and native grasses to establish. As discussed previously, the floodplain enhancements reduce flood levels in the flood channel and adjacent developed areas. New permanent access roads will be constructed using geotextile for subbase stability and aggregate that will allow for infiltration. These design features will also reduce peak flows for more frequent storm events by increasing the overall channel capacity. The implementation of the freshwater management channels and the bioengineered grade-control structures located on the upstream limits of the salt marsh restoration will reduce the retention times for larger storm events to accumulate in the Lagoon while still allowing for inundation of the marsh plain. As a result, the implementation of the proposed project would result in less than significant impacts related to increases in surface water rates or flow that could cause flooding.

This is consistent with the PEIR, the states that drainage patterns within the Lagoon would be intentionally modified with the construction of new tidal and freshwater management channels, to increase hydrologic connectivity with the ocean. The PEIR further states that while the drainage patterns of the Lagoon would be altered by the proposed Project, the resulting changes to flow rates or volumes would not cause hydrologic impacts; rather, these changes would serve to improve hydrologic efficiency of the Lagoon. No additional runoff would be added to the system by these changes. The Project also includes localized protection against scour or erosion to avoid slope or structure instability, as required in Project Design Features (PDF #1) in the PEIR. Consistent with the PEIR, implementation of the proposed Project would not lead to substantial alteration to on-and off-site drainage patterns due to changes in runoff flow rates or volumes or cause substantial alteration of the existing drainage pattern of the site in a manner that could cause instability of slopes, river control berms, adjoining roadway or railway embankments, or bridge abutments. It is recommended to implement the PDF #1 per the PEIR:

PDF #1 - Manufactured slopes would be planted with appropriate native vegetation and maintained, and drainage would be installed in order to reduce erosion. Slope irrigation would be limited to the amount required to support vegetation cover and would only be required until vegetation is established.

e) Create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff?

Less than Significant Impact. The proposed project includes design features that will augment the existing capacity of the flood management channel in Sorrento Valley. The results of the hydraulic analysis indicate a reduction in flood levels for more frequent storm events within the channel and adjacent developed areas. The design features included three stormwater diversions that further augment the capacity of existing drainage channels that flow into the flood management channel that conveys flow from the Carroll Canyon Creek and Los Peñasquitos Creek. As a result, the proposed project would result in a less than significant impact related to the existing capacity of the existing stream's stormwater conveyance system. The Project also dos does not add to sources of polluted runoff.

f) Otherwise substantially degrade water quality?

No Impact. Construction activities associated with vegetation and sediment excavation and/or materials disposal, as well as access road or staging area grading, have the potential to impact lagoon water quality through the release of pollutants such as sediment, oils and grease, and trash and debris. Construction in wetland areas could result in temporary increased turbidity and sedimentation or excess vegetative material in the water column. Upland soil disturbance from access roads or staging areas would expose soils and make them susceptible to erosion and sedimentation into surface waters. While some sedimentation could occur during construction activities and until lagoon soils stabilize post-construction, the proposed project will be required to comply with existing applicable regulations (*e.g.,* Municipal Permit, Construction General Permit) to minimize pollutant transport during construction activities. During Phase 1 of construction, completion of the freshwater management channels will be sequenced to control sediment from entering downstream tidal channels. Within areas of excavation and grading, erosion and sediment control measures will be implemented in accordance with the SWPPP and the SWQMP. The SWPPP and SWQMP include the specific methods, phasing, and measures to control erosion and the migration of sediments into the Project waterways.

The SWPPP and SWQMP include Standard Construction Practices that are consistent with the PEIR. Within these documents, BMPs have identified to protect water quality, minimize erosion, prevent pollutant discharge, and minimize sediment transport during construction. Implementation of the identified BMPs presented in the SWPPP and SWQMP will minimize the effects of sedimentation on adjacent and downstream areas consistent with stormwater regulations.

In addition to the BMPs identified in the SWPPP and SWQMP, the following Project Design Features (PDFs) are recommended and will be followed as part of the proposed project to ensure slopes and exposed soils are planted and maintained to reduce erosion potential, including adequate drainage and erosion-control treatments such as jute mesh fiber rolls (PDFs #1, #2, and #3).

- PDF #1 - Manufactured slopes would be planted with appropriate native vegetation and maintained, and drainage would be installed in order to reduce erosion. Slope irrigation would be limited to the amount required to support vegetation cover and would only be required until vegetation is established.
- PDF#2 - Until adequate erosion-control native vegetation is established on exposed soils. Erosion and sediment control devices used for the project, including fiber rolls and bonded fiber matrix, would be made from biodegradable materials such as jute, with no plastic mesh, to avoid creating a wildlife entanglement hazard.
- PDF#3 - Exposed soil at the disposal site would be hydroseeded and/or planted with appropriate native vegetation once the material is placed and appropriately compacted.
- PDF#4 - Recommendations of the geotechnical reports for the project would be incorporated into the design of manufactured slopes, berms, or other features.

Although increased turbidity within the Lagoon would be expected during active construction within hydraulically connected wetland areas (*e.g.,* during earthwork or dredging), the generation of turbidity would be minimized through implementation of BMPs in accordance with existing regulations. Nutrients could potentially become suspended within these areas of localized turbidity, temporarily increasing the potential for eutrophic conditions to develop within the Lagoon. Outside of the lagoon inlet, the nearshore area is shallow and naturally turbid due to wave and wind action; turbidity would dissipate quickly from mixing and dilution. Temporary increases in turbidity may result in temporary impacts to water quality and will require mitigation measures to reduce these potential impacts to less than significant consistent with the PEIR.

The PDFs listed are recommended to minimize erosion and the release of pollutants into the environment (*e.g.,* planting manufactured slopes, stabilizing slopes, requiring preparation of a SWPPP). Consistent with the PEIR, the following mitigation measures are recommended to address the potential for temporary impacts from turbidity during the construction that includes excavation and dredging for the implementation of the salt marsh restoration, habitat enhancement, and freshwater and sediment management components.

- **Water Quality-1:** Compliance with regulatory requirements intended to address turbidity impacts (*e.g.*, Construction General Permit, Municipal Permit) shall be implemented to ensure impacts would be reduced to a less than significant level. Compliance with those permit conditions shall be monitored through the construction monitoring program and the contractor shall certify to the engineer of record that they have been completed.

Load reductions in sediment to the Lagoon are targeted by the Sediment TMDL. The Project includes measures to reduce sediment loading into the Lagoon from upstream tributaries of Carroll Canyon and Los Peñasquitos Creeks. These measures include the construction of three floodplain enhancements that use restored floodplain processes upstream of the Lagoon using a similar approach to existing permitted sediment measure operating on Los Peñasquitos Creek. Additional measures include stormwater diversions, upgrade to the Dunhill Ditch and upgrades to storm drain outfalls that include sediment and trash interceptor devices before these enter the Lagoon. Without the proposed sediment management and riparian enhancement elements of the Project, impacts to water quality and the beneficial uses for not only the Carroll Canyon Creek but to the Los Peñasquitos Lagoon will continue.

g) Place housing within a 100-year flood hazard area as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map?

No Impact. The project site does not contain housing units. There is no residential housing adjacent to the project. There is commercial and industrial development that is located adjacent to the project in the upper portion of the project along the flood management channel that conveys flows from Carroll Canyon and Los Peñasquitos Creeks. These areas that are located adjacent to the upper project in Sorrento Valley are within the 100-year flood plain. The project will provide for reduction in flood levels for more frequent storm events and will not increase flood levels for the 100-year flood event.

h) Place within a 100-year flood hazard area structures which would impede or redirect flood flows?

No Impact. The proposed project does not include the addition of structures on the project site. The construction of the floodplain enhancements to provide for sediment load reduction for the success of the restoration will augment the flood capacity of the upstream and adjacent flood management channel for more frequent flood events. The construction of new freshwater management channels will direct flood flows, including the one-hundred-year flood, through the Phase 1 area of the Lagoon and connect it to the downstream tidal channel. The one-hundred-year flood flows will fully inundate the marsh plain similar to current conditions, which have adapted to temporary flood inundation followed by periods of evaporation and tidal inundation within the planned salt marsh restoration. The bioengineered grade control structure located on the upstream portion of the salt marsh restoration area will direct storm flows below the 25-year storm event into the freshwater management channel. At the downstream end of the grade control structure, storm flows will still inundate the salt marsh restoration area during these more frequent storm events. However, the duration of the time these events inundate the salt marsh restoration will be reduced. For the 100-year flood flow, this grade control structure will be fully inundated and not impede the flows during this larger storm event. This design feature will also have no effect on upstream flooding conditions in Sorrento Valley. Therefore, the proposed project would result in no impact on existing flood flows.

i) Expose people or structures to a significant risk of loss, injury or death involving flooding, including flooding as a result of the failure of a levee or dam?

Less than Significant Impact. Implementation of the proposed project does not include the placement of structures on the project site. The project does not anticipate an impact on downstream flooding. The project conveys flood flow through existing flood control channels and to the new freshwater management channels that connects to the downstream tidal channel. Flood flows that exceed the capacity of these channels will inundate the marsh plain similar to current conditions. The downstream tidal channel capacity will be increased through planned dredging and will provide for additional flood flow capacity for more frequent storm events depending on tidal and inlet conditions. Downstream flooding conditions are dependent on tidal conditions and inlet conditions and maintenance. These inlet and tidal conditions have been considered and modeled as part of the project design. As a result, the project would result in a less than significant impact related to the exposure of people or structures to flood risks associated with a levee failure.

j) Expose people or structures to a significant risk of loss, injury or death involving inundation by seiche, tsunami, or mudflow?

No Impact. A seiche is an oscillation in the water level of an enclosed water body. There are no reservoirs in either drainage area for the project that would be affected by the project. Because the proposed project would not include structures and would retain the existing public trail (Marsh Trail) on the project site, the proposed project would not increase the potential for seiche impacts onto the project site. Therefore, the proposed project would result in no impacts related to seiche.

The project does not include any new structures, residential units, or new development that would increase the risk from tsunamis that already exist from the location of the project within the coastal zone. Therefore, implementation of the proposed project would not result in any tsunami inundation impacts.

Because the proposed project would not include structures, would retain the existing public trail (Marsh Trail) on the project site, and would not alter the terrain directly adjacent to the existing slopes, the project would not increase the potential for mudflows onto the project site. Therefore, the project would result in no impacts related to mudflow.

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