SECTION VI
COASTAL HAZARDS

I. INTRODUCTION

This section documents coastal hazards present in Manhattan Beach, including flooding and shoreline hazards. It establishes policies that address the safety of community members and mitigate potential impacts from natural and man-made hazards. In addition, this chapter discusses the types of shoreline protective devices currently in place within the coastal zone and policies for maintaining, rebuilding, or installing new devices.

Manhattan Beach has experienced numerous coastal storm events over the past few decades that caused flooding and erosion damage. In the late fall and winter of 1982/1983, California experienced an El Niño[1] that produced significant precipitation, strong winds, and high surf along southern California. The storms damaged coastal structures and eroded beaches. Waves reached the Pier deck and damaged the iconic Pier. The Pier deck, Roundhouse Aquarium, and lifeguard station at the beginning of the Pier were completely replaced[2]. Other notable El Nino seasons occurred in 1998 and 2010. In 2017, surf reached 15 feet at El Porto Beach in North Manhattan Beach[3].

II. SETTING

TIDAL INUNDATION AND COASTAL STORM FLOODING HAZARDS

Flooding is inundation of normally dry land as a result of a rise in the level of surface waters or rapid accumulation of stormwater runoff. The Federal Emergency Management Agency (FEMA), through its Flood Insurance Rate Mapping (FIRM) program, designates areas where urban flooding could occur during 100-year and 500-year flood events (1 percent and 0.2 percent annual probability of occurrence, respectively). FEMA categorizes flood-prone areas as follows: Coastal Flooding; River Flooding; and Creek Flooding. Flood zones in the coastal zone are concentrated along the coastline. FEMA mapping shows that the entire sandy beach coastline is within the 1% annual chance flood zone, and anticipated flood water elevations during the 1% flood event in Manhattan Beach range from 16 feet to 20 feet NAVD88[4].

Future sea level rise is expected to create a permanent rise in ocean water levels that would shift the water's edge landward. If no action is taken, higher water levels would increase erosion of the beach, cause a loss of sand, and result in a narrower beach. Additionally, the combination of higher ocean water levels and beach erosion would result in greater flooding and damage during coastal storms and high tide events. The City of Manhattan Beach Sea Level Rise Risk, Hazards, and Vulnerability Assessment[5] (Sea Level Rise Vulnerability Assessment) and associated mapping identifies the progression of coastal erosion under different sea level rise scenarios.

To assess vulnerabilities for the City of Manhattan Beach, five sea level rise scenarios, in addition to existing conditions, were mapped: 0, 2.5, 4.1, 5.7, 6.6, and 9.8 feet (0, 0.75, 1.25, 1.75, 2.0, and 3.0 meters). The scenarios were chosen based on State

[1] El Niño is the warm phase of the El Niño-Southern Oscillation and is associated with a band of warm ocean water that develops in the central and east-central equatorial Pacific. The warmer waters cause the Pacific jet stream to move south often resulting in wetter winters and increased flooding in the southern United States.

[2] Manhattan Beach Historical Society. 2021. https://manhattanbeachhistorical.org/pier/ Accessed August 2021.

[3] Barnes, M. 2017. Daily Breeze. January 22, 2017. https://www.dailybreeze.com/2017/01/22/storm-slams-south-bay-more-than-3-inches-of-rain-causes-widespread-flooding/. Accessed August 2021.

[4] North American Vertical Datum of 1988.

[5] ESA. 2021a. City of Manhattan Beach Sea Level Rise Risk, Hazards, and Vulnerability Assessment. Prepared for the City of Manhattan Beach. May 2021.

guidance using the Ocean Protection Council[6] (OPC) projections and available model runs from the Coastal Storm Modeling System (CoSMoS) developed by the United States Geologic Survey.

With future climate change and sea level rise, the city of Manhattan Beach's current vulnerabilities are projected to increase in both frequency and intensity. However, it's notable that the City's vulnerabilities are relatively limited, compared to other jurisdictions statewide, and centered around public assets and not private development. The following are the public assets most vulnerable to sea level rise hazards based on the Sea Level Rise Vulnerability Assessment:

- Marvin Braude bike trail: expected to be vulnerable to wave runup during a 100-year storm event with 4.9 feet of sea level rise.
- Public restrooms at El Porto Beach: not expected to be vulnerable to wave runup until 4.9 feet of sea level rise but could experience storm inundation with 4.9 feet of sea level rise; not expected to experience daily tidal inundation with up to 9.8 feet of sea level rise (the highest amount of sea level rise analyzed in the Sea Level Rise Vulnerability Assessment).
- Public restroom and maintenance building at Rosecrans Avenue: already vulnerable to wave runup during a 100-year storm event and could be exposed to more extensive storm inundation with 3.3 feet of sea level rise, and daily tidal inundation between 6.6 and 9.8 feet of sea level rise.
- Public restrooms at the Pier: not expected to be vulnerable to wave runup until 1.6 feet of sea level rise but could experience storm inundation with 3.3 feet of sea level rise; not expected to experience daily tidal inundation with up to 9.8 feet of sea level rise (the highest amount of sea level rise analyzed in the Sea Level Rise Vulnerability Assessment).
- Food stand and beach rental building at El Porto Beach: already vulnerable to wave runup during a 100-year storm event; could be exposed to more extensive storm inundation with 3.3 feet of sea level rise and daily inundation with 6.6 feet of sea level rise.
- Lower Pier Parking Lot: expected to be vulnerable to wave runup during a 100-year storm event with 4.9 feet of sea level rise; not expected to experience more extensive storm inundation until after more than 9.8 feet of sea level rise.
- Municipal Pier: specifically designed and intentionally located to be in the potential hazard zones, however, over time, the exposure of the structure to waves and large storm events will increase. Additionally, the assets at the pier (e.g., Roundhouse Aquarium) will experience more frequent wave overtopping with sea level rise.
- Storm Drain Outfalls: expected to be vulnerable to beach erosion and sand blockage with sea level rise. This may lead to more frequent maintenance to remove sand from the outfall before anticipated rainfall events.
- South Bay Cities' Main Sewer Trunk Line: not expected to reach the sewer line under 6.6 feet of sea level rise, but water levels during a 100-year storm could extend to the sewer line between 27th and 32nd Streets and around Marine Avenue. Higher water levels could limit access to the line for maintenance and operation or inundate maintenance holes and increase flows in the system that the treatment plant would then have to process.
- Beach: sea level rise will cause increased levels of erosion (see Beach Erosion section below).

[6] California OPC and California Natural Resources Agency. 2018. State of California Sea-Level Rise Guidance 2018 Update.

The Coastal Act provides the basis, authority, and regulatory framework for LCP Land Use Plan policies to address sea level rise. Additionally, the California Coastal Commission Sea Level Rise Policy Guidance[7] provides information for local municipalities amending LCPs. The guidance document recognizes that the Coastal Act supports: (1) using best available science to guide decisions; (2) minimizing coastal hazards through planning and development standards; (3) maximizing protection of coastal resources, including public access and recreation, coastal habitats, Environmentally Sensitive Habitat Areas and wetlands, water quality and supply, archaeology and paleontological resources, and scenic and visual coastal resources; and (4) maximizing agency coordination and public participation.

Coastal Act policies are incorporated into this LCP by reference. Coastal Act policies relating to shoreline protection require that development that alters natural shoreline processes, such as seawalls and retaining walls, be permitted only where required to serve coastal-dependent uses or protect existing structures or public beaches in danger from erosion, and when designed to eliminate or mitigate adverse impacts on local shoreline sand supply (Public Resources Code §30235). Further, other coastal policies require that new development, such as shoreline protective devices, as well as other activities, be sited and designed to:

1. Prevent significant disruption to or degradation of Environmentally Sensitive Habitat Areas (Public Resources Code §30240).
2. Mitigate adverse impacts to archeological and paleontological resources (Public Resources Code §30244).
3. Protect ocean views, minimize the alteration of natural land forms, and be visually compatible with and subordinate to the surrounding character of the area (Public Resources Code §30251).
4. Provide, and not interfere with, maximum public recreational access to and along the shoreline (Public Resources Code §§30210, 30211, and 30212).

Finally, Coastal Act policies require that all new development minimize risks to life and property in areas of high geologic and flood hazard areas (Public Resources Code §30253(a)) and not create, nor contribute significantly to, erosion, geologic instability, or destruction of a site or surrounding area or in any way require the construction of protective devices that would substantially alter natural landforms along bluffs and cliffs (Public Resources Code §30253(b)).

Figure 1-1 and **1-2** depict areas where daily tidal inundation could potentially occur in the future with sea level rise. **Figures 1-3 and 1-4** show the maximum modeled flood extent for the 1 percent annual chance coastal storm flood event (i.e., the upper range of the CoSMoS uncertainty bounds, which includes uncertainty due to vertical land motion changes, model performance and elevation measurements) to understand the full range of potential exposure. These maps provide a screening-level tool that depicts where site specific technical evaluations may be required and where development standards pertaining to shoreline hazard areas may be applied.

EXTREME RAINFALL HAZARDS

Stormwater infrastructure in coastal cities is usually designed to drain rainfall based on a fixed ocean water level (i.e., the design usually assumes sea water levels are low enough to allow full drainage from the pipes). However, the co-occurrence of extreme rainfall and high ocean water levels can lead to increased flood risk. With rising sea levels, Manhattan Beach may experience increased flooding from rainfall events due to the blockage of the outfalls by higher-than-normal coastal water levels moving up

[7] California Coastal Commission. 2018. California Coastal Commission Sea Level Rise Policy Guidance, Interpretive Guidelines for Addressing Sea Level Rise in Local Coastal Programs and Coastal Development Permits. July 2018.

into the storm drain system. In this situation, reduced outflow capacity at the ocean outlet may propagate through the system leading to extensive flooding inland.

The Sea Level Rise Vulnerability Assessment included an analysis of the co-occurrence of extreme rainfall and high ocean water levels for Manhattan Beach. Model results for existing conditions (i.e., current climate conditions) show that the stormwater system can pass the current 25-year rainfall event with limited flooding, but that the 50- and 100-year rainfall events would result in widespread flooding even without a higher coastal water level. During these events, water is expected to back up into the system and flood through maintenance holes because the pipes cannot move the water to the ocean quickly enough.

The model results also show that future sea levels without a rainfall event are not expected to lead to substantial flooding of the stormwater system, primarily because the storm drain system is elevated enough above the outfalls. However, the flooding caused by the co-occurrence of high ocean water levels and increased intensity of rainfall storms is expected to get worse in the future.


Figure 1-1
Tidal Inundation with Sea Level Rise in North Manhattan Beach
45th St
Rosecrans Ave
The Strand
Highland Ave
Marine Ave
N
W
E
S
Current Day
75 cm (2.5 ft) SLR
125 cm (4.1 ft) SLR
175 cm (5.7 ft) SLR
200 cm (6.6 ft) SLR
300 cm (9.8 ft) SLR (H++ proxy)
08/07/2019
Geographic Information System
CITY OF MANHATTAN BEACH


Figure 1-2
Tidal Inundation with Sea Level Rise in South Manhattan Beach
Marine Ave
Manhattan Beach Blvd
The Strand
1st St
N
W
E
S
Current Day
75 cm (2.5 ft) SLR
125 cm (4.1 ft) SLR
175 cm (5.7 ft) SLR
200 cm (6.6 ft) SLR
300 cm (9.8 ft) SLR (H++ proxy)
08/07/2019
Geographic Information System
CITY OF MANHATTAN BEACH

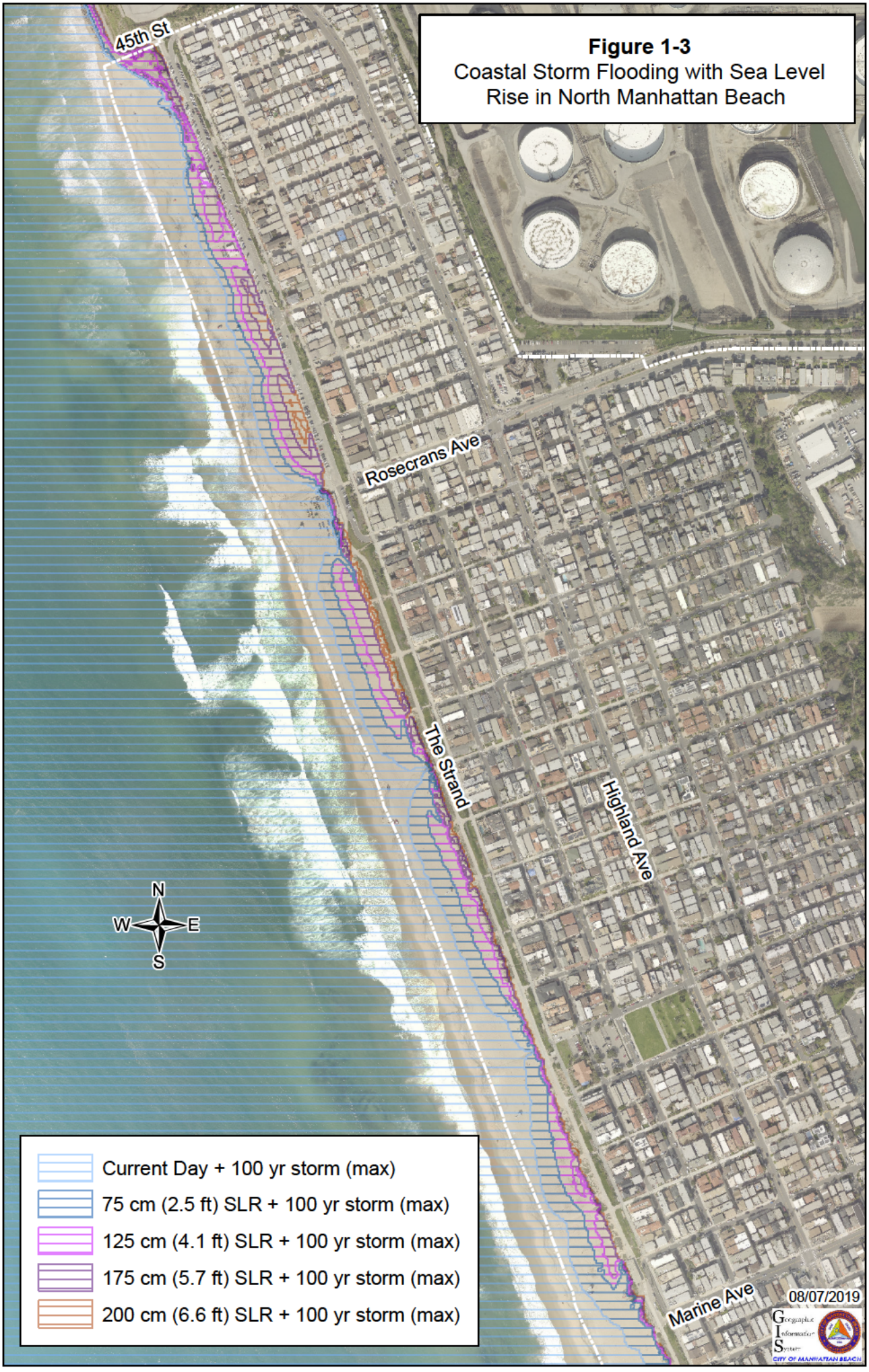
Figure 1-3
Coastal Storm Flooding with Sea Level Rise in North Manhattan Beach
45th St
Rosecrans Ave
The Strand
Highland Ave
Marine Ave
N
W
E
S
Current Day + 100 yr storm (max)
75 cm (2.5 ft) SLR + 100 yr storm (max)
125 cm (4.1 ft) SLR + 100 yr storm (max)
175 cm (5.7 ft) SLR + 100 yr storm (max)
200 cm (6.6 ft) SLR + 100 yr storm (max)
08/07/2019
Geographic Information System
CITY OF MANHATTAN BEACH

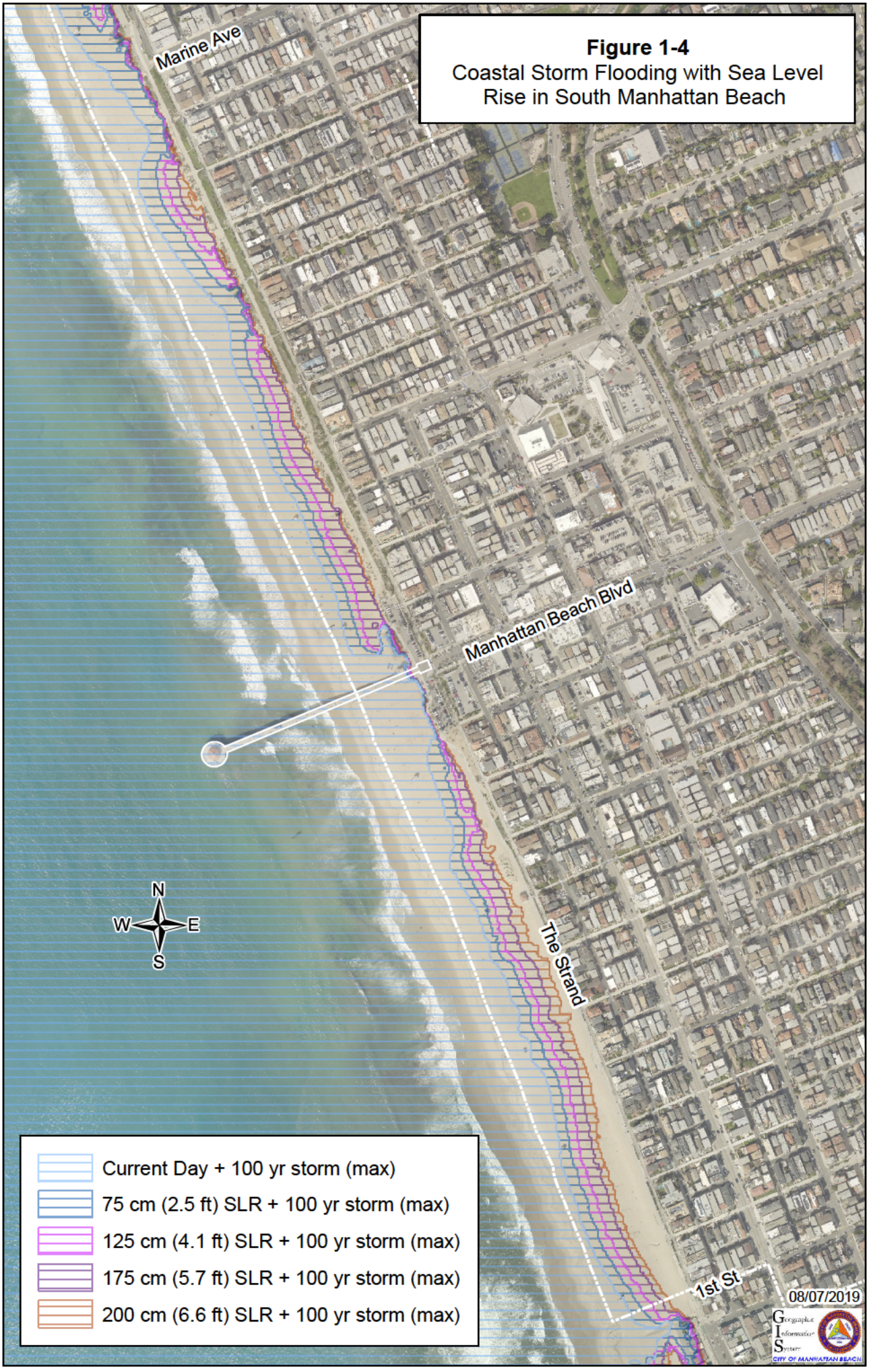
Figure 1-4
Coastal Storm Flooding with Sea Level Rise in South Manhattan Beach
Marine Ave
Manhattan Beach Blvd
The Strand
1st St
N
W
E
S
Current Day + 100 yr storm (max)
75 cm (2.5 ft) SLR + 100 yr storm (max)
125 cm (4.1 ft) SLR + 100 yr storm (max)
175 cm (5.7 ft) SLR + 100 yr storm (max)
200 cm (6.6 ft) SLR + 100 yr storm (max)
08/07/2019
Geographic Information System
CITY OF MANHATTAN BEACH

BEACH EROSION HAZARDS

Beach erosion is a complex response to many processes including marine, terrestrial, and other instabilities such as seismic shifts and biologic changes. In general, under natural conditions, sand is provided to beaches by sediment transport along the coast and from the back beach through wave action as well as from deposition through rivers and streams that empty into the ocean. Winter storms tend to cause heavy wave action which reduces sand content at beaches that will typically recover during milder summer conditions.

Manhattan Beach is part of the Santa Monica Littoral Cell, which spans approximately 49 miles from Point Dume to Palos Verdes Point. In general, studies have found that the sand predominantly moves downcoast (south) through this littoral cell. The Manhattan Beach coastline is characterized by sandy beach. The coastal zone within the city of Manhattan Beach slopes up from the beach with elevations quickly rising out of the flood zone behind the beach.

In general, historic erosion rates in Manhattan Beach show net accretion over time (i.e., beach widening), likely due to the extensive beach nourishment historically in Santa Monica Bay and the construction of sand retention structures downcoast of the City. The Sea Level Rise Vulnerability Assessment provides an analysis of projected beach widths with sea level rise[8]. **Table 1-1** presents the beach erosion over time, if no adaptation actions are taken.

TABLE 1-1: BEACH WIDTH EVOLUTION

YEAR	TOTAL BEACH WIDTH (FT)	% LOSS
2020	370	0%
2030	360	2%
2040	350	5%
2050	330	11%
2060	310	16%
2070	290	22%
2080	260	29%
2090	230	37%
2100	200	47%

Note, Table 1-1 provides the average beach width over time, assuming a sea level rise of 6.8 feet by 2100, and does not account for erosion during episodic storm events. Typical seasonal oscillations of the shoreline are around 30 feet in Southern California but large coastal storm events can cause larger oscillations with the beach eroding by as much as 100 feet.

GROUNDWATER HAZARDS

Rising sea levels can impact coastal groundwater both by increasing groundwater levels and by the intrusion of salt water into coastal aquifers. Higher sea levels cause inland intrusion of denser salt water, which can raise unconfined salt water tables and also force overlying freshwater to rise up. As the water table rises, it can rise above the ground surface, flooding low-lying

[8] The OPC 2018 medium-high risk aversion sea level rise scenario was used for this analysis.

areas or it can infiltrate and damage shallow infrastructure, such as basements, building foundations, and gas lines. Additionally, the intrusion of salt water can impact drinking water supplies.

In the Sea Level Rise Vulnerability Assessment, the depth to groundwater with increasing sea levels was evaluated across Manhattan Beach. Because the land slopes up quickly from the beach, the groundwater under most of the city is deep and there is limited risk to inland flooding. While there is not expected to be any emergence of groundwater leading to backshore ponding in Manhattan Beach, it is possible that groundwater could impact underground infrastructure, such as sewer and electrical lines, but not until after 9.8 feet of sea level rise.

ADAPTATION STRATEGIES

Some adaptation strategies have already been implemented in Manhattan Beach to reduce vulnerabilities to coastal hazards along the City's shoreline. There are also other adaptation strategies used by adjacent jurisdictions, such as building seasonal sand berms, beach nourishment, and wetlands restoration.

Approximately 23% of the Manhattan Beach coastline is protected by coastal armoring structures such as rock revetments (north end of El Porto Beach) and concrete sea walls (El Porto Beach and near the Pier). An inventory of shoreline protective devices was developed in 2005 by NOAA for the entire California coastline and updated for Manhattan Beach by ESA in the Sea Level Rise Vulnerability Assessment. While sea walls and revetments provide protection to existing shoreline development, these structures can contribute to beach erosion and accelerate beach loss.

Beach dune restoration is recognized as a natural way of mitigating backshore erosion, as well as maintaining a wider beach by creating an additional source of sand at the back of the beach, while increasing local sand retention. When dunes are allowed to form and create natural features they provide a cost-effective buffer of protection from sea level rise and storm erosion. The Manhattan Beach Dune Restoration Project[9] will enhance approximately three acres of existing dunes in Manhattan Beach from 36th Street to 23rd Street, across approximately 0.6 miles of coastline. The Manhattan Beach Dune Restoration Project, led by The Bay Foundation in partnership with Los Angeles County Department of Beaches and Harbors, the City of Manhattan Beach, and the California State Coastal Conservancy, is currently in the permitting stage (as of December 2021). The goal of this dune restoration living shoreline project is to increase the resiliency of the beach through the restoration of sandy beach and foredune habitat, implement nature-based protection measures against sea level rise and coastal storms, and increase engagement of the community through enhanced beach experiences.

Manhattan Beach has two active groundwater wells used for drinking water: Well 11A and Well 15. Well 11A is located on the southwest corner of Manhattan Beach Boulevard and Green Lane and Well 15 is located on the southwest corner of Manhattan Beach and Vail Avenue. As a result of pumping out large amounts of fresh groundwater along the coast, salt water from the ocean began to intrude into the spaces left by removal of the groundwater, moving salt water into the groundwater basin in the 1940s. In the early 1950s, the West Coast Basin Barrier Project (WCBBP) was constructed to prevent ocean water from intruding into the underlying aquifers of the West Coast Groundwater Basin, which spans from just south of Ballona Creek through Long Beach. The WCBBP injects mostly recycled water into the groundwater basin to push salt water back towards the ocean. In Manhattan Beach, the injection wells are located between Valley Drive and North Ardmore Avenue. The WCBBP is operated by the West Basin Municipal Water District.

[9] https://www.santamonicabay.org/explore/beaches-dunes-bluffs/beach-restoration/manhattan-beach-dune-restoration-project/manhattan-beach-dune-restoration-project-faq/

The City of Manhattan Beach Sea Level Rise Adaptation Plan[10] (Adaptation Plan) identifies a variety of additional adaptation measures that should be considered as options for responding to sea level rise related hazards. The Adaptation Plan provides a framework for the City to monitor effects of coastal erosion and flooding with sea level rise and prepare for identified vulnerabilities by choosing from a toolbox of adaptation measures. As a guidance document, the Adaptation Plan provides flexibility for the City to choose appropriate adaptation measures over time, as specified thresholds for action are reached.

III. COASTAL HAZARDS AND ADAPTATION POLICIES

A. NATURAL MANAGEMENT OF COASTAL HAZARDS

The Natural Management of Coastal Hazards policies call for non-structural adaptation strategies, such as a beach dune program, winter sand berms, establishment of off-shore reefs and kelp beds, and managed retreat (accepting a narrower beach).

Policy IV.A.1: Maximize natural shoreline values and processes; minimize the perpetuation of shoreline armoring.

Policy IV.A.2: Implement a citywide beach dune restoration program and evaluate softer solutions such as living shoreline projects. The continued viability of dune and other coastal habitats shall be provided for by planning for inland migration and/or replacement of habitats lost to sea level rise.

Policy IV.A.3: Stabilize dunes and back beach with the installation and maintenance of drought-tolerant native southern California coastal dune plant species capable of enhancing dune stability and the removal of non-native vegetation. Development shall be set back from dunes through buffers of sufficient width and design to protect native costal vegetation from impacts of adjacent uses, including a bike path set back of a minimum of three feet and a beach grooming set back of a minimum of five feet.

Policy IV.A.4: The beneficial reuse and placement of sediments for sand nourishment projects should use beach-quality sand to enhance the use, safety, and appearance of the City's beaches when adverse impacts to the beach, intertidal, offshore resources, and surf are minimized and avoid significant disruption to marine and wildlife habitats and water circulation. Any beach nourishment project shall protect water quality and minimize and mitigate potential adverse biological and recreational resource impacts by considering the method, location, and timing of placement.

Policy IV.A.5: Participate in any Regional Sediment Management (RSM) programs for beach sand replenishment and retention. Participate in and encourage other long-term beach sand replenishment and retention programs at the federal, state, and regional level.

Policy IV.A.6: Support giant kelp reforestation programs, including through minimization of dredging activities, suspended sediment loads, and urban runoff.

Policy IV.A.7: Implement eelgrass restoration and enhancement programs to protect eelgrass meadows for their important ecological function as a nursery and foraging habitat within the Manhattan Beach ecosystem.

Policy IV.A.8: Develop and implement, when necessary, a winter season temporary sand berm program that minimizes potential adverse biological, scenic, and recreational resource impacts.

[10] ESA. 2021b. City of Manhattan Beach Sea Level Rise Adaptation Plan. Prepared for the City of Manhattan Beach. July 2021.

B. SHORELINE PROTECTION DEVICES

The Shoreline Protection Devices policies relate to engineered structural protective devices, such as groins, seawalls, or rock revetments. As detailed in the Adaptation Plan, seawalls and revetments can contribute to erosion and accelerate beach loss. Therefore, the policies limit construction of new shoreline protection devices, while also minimizing the effects of any such approvable developments.

Policy IV.B.1: Limit shoreline protection devices, including revetments, breakwaters, groins, seawalls, and other such construction that alters natural shoreline processes. When required to serve coastal-dependent uses or protect existing principal structures or public beaches in danger from erosion, site shoreline protection devices to avoid sensitive resources, if feasible, and mitigate adverse impacts on all coastal resources.

Policy IV.B.2: Discourage shoreline protective devices on public land. Such protective devices shall only be permitted if no other less environmentally damaging alternative is available, including avoidance, restoration of the sand supply, beach nourishment, and planned retreat.

Policy IV.B.3: When allowed, shoreline protection devices shall be designed to blend visually with the natural shoreline, provide for public recreational access. If impacts cannot be avoided, they shall be mitigated through options such as providing equivalent new public access or recreational facilities or undertaking restoration of nearby beach habitat. If such options are not feasible, proportional in-lieu fees that consider the full value of the beach – including with respect to impacts on shoreline sandy supply, sandy beaches, public recreational access, public views, natural landforms, beach ecology, and water quality – may be used as a vehicle for impact mitigation provided that such in-lieu fees are deposited in an interest bearing account managed by the City of Manhattan Beach and used only for acquisition or improvements of coastal public access, biological restoration, or other relevant mitigation in the vicinity of the project.

Policy IV.B.4: Require modifications to existing shoreline protective devices to ensure that such devices are functioning in a way that has the least impact on coastal resources such as recreation, public access, and coastal resources as possible, including evaluation of possible removal and shoreline restoration. Any permittee of a protective device shall be responsible for removing all recoverable debris associated with the development from the beach or ocean and lawfully dispose of the material in an approved disposal site.

C. SHORELINE REDEVELOPMENT AND NEW DEVELOPMENT

The Shoreline Development policies address both redevelopment[11] of existing buildings/facilities along the coast and new coastal development. The policies are intended to guide future development in a manner that minimizes hazard risk and is

[11] Redevelopment: A development proposal reaches the threshold of being a replacement structure or redevelopment if it meets criteria a) or b). Development meeting this definition must be brought into conformance with all coastal resource protection policies in this LCP.

a) Development that consists of alterations including (1) additions to an existing structure, (2) exterior and/or interior renovations, and/or (3) demolition or replacement of an existing home or other principal structure, or portions thereof, which result in either:

1) Replacement (including demolition, renovation or alteration) of 50% or more of major structural components including exterior walls, floor, roof structure or foundation, or a 50% increase in gross floor area. Alterations are not additive between individual major structural components; or

2) Replacement (including demolition, renovation or alteration) of less than 50% of a major structural component where the proposed replacement would result in cumulative alterations exceeding 50% or more of that major structural component, taking into consideration previous replacement work undertaken on or after January 1, 1977; or an alteration that constitutes less than 50% increase in floor area where the proposed alteration would result in a

capable of adapting to future shoreline conditions without the need for protection. Refer to Figures 1-1 through 1-4 for the mapped coastal hazard areas that are referenced in policies below.

Policy IV.C.1: Avoid coastal hazard risks and minimize resource impacts when making redevelopment decisions. New development shall do all of the following:

- Minimize risks to life and property in areas of high geologic, flood, and fire hazard.
- Assure stability and structural integrity, and neither create nor contribute significantly to erosion, geologic instability, or destruction of the site or surrounding area or in a way require the construction of protective devices that would substantially alter natural landforms along bluffs and cliffs.
- Where appropriate, protect special communities and neighborhoods that, because of their unique characteristics, are popular visitor destination points for recreational uses.

Policy IV.C.2: Development should be sited to avoid coastal hazard areas including wave, flooding, and erosion zones as they move inland within the expected duration of the development (see the Sea Level Rise Vulnerability Assessment for additional information about the coastal hazard zones and sea level rise timing). A site-specific coastal hazards report prepared by a qualified geologist/engineer would be required to ensure that such development can be built in a manner consistent with applicable LCP coastal hazard policies for any new development and redevelopment within the mapped hazard areas in Figures 1-1 through 1-4. If avoidance of coastal hazard areas is infeasible, development should have a design resilient to flooding and erosion to minimize impacts to public safety and property without reliance on current or future shoreline protection features. The design of the development should also minimize unavoidable coastal resource impacts, including impacts to coastal access and recreation, environmental resources, and visual resources. For cases where resilient design may not be enough to address sea level rise impacts over the full life of the structure, the applicant shall develop a long-term plan that identifies future adaptation strategies (potentially up to and including relocation) to address sea level rise and coastal resource impacts.

Policy IV.C.3: Site and design new structures to avoid the need for shoreline protective devices during the economic life of the structure. Applicants for new development and/or redevelopment are required to waive any rights that may exist under Section 30235 of the Coastal Act and LUP Policy IV.B.1, because Section 30235 of the Coastal Act and LUP Policy IV.C.2 collectively require new development to assure stability and structural integrity without reliance on shoreline protective devices. Typical economic lifetimes of development include:

- Ancillary development or amenity structures (e.g. trails, bike racks, playgrounds, parking lots, shoreline restrooms): 5-25 years
- Manufactured or mobile homes: 30-55 years
- Residential or commercial structures: 75-100 years

---

cumulative addition of 50% or greater of the floor area, taking into consideration previous additions undertaken on or after January 1, 1977. OR

b) Development that consists of any alteration of a structure, the cost of which equals or exceeds 50 percent of the market value of the structure before the start of construction, based on the documented construction bid costs and either an appraisal by a professional property appraiser or County assessor data, if it is based on current market values.

- Critical infrastructure: 100-150 years

Permit applicants are required to record a deed restriction again the properties involved in the application acknowledging that the structure may be required to be removed or relocated and the site restored if it becomes unsafe. Removal would only be necessary if other adaptation strategies contemplated in the Adaptation Plan do not work.

Policy IV.C.4: As a condition of approval of development on a beach or shoreline which is subject to wave action, erosion, flooding, or other hazards associated with development on a beach in which avoidance is infeasible, the property owner shall be required to execute and record a deed restriction which acknowledges 1) the development is located in a hazardous area or an area that may become hazardous in the future; 2) that sea level rise could render it difficult or impossible to provide services to the site; 3) that the boundary between public tidelands and private land may shift with rising seas and the development approval does not permit encroachment onto public trust land; 4) that additional adaptation strategies may be required in the future to address sea level rise consistent with the Coastal Act and certified LCP. Additionally, the deed shall acknowledge said risks and waives any future claims of damage or liability against the permitting agency and agrees to indemnify the permitting agency against any liability, claims, damages or expenses arising from any injury or damage due to such hazards.

Policy IV.C.5: Monitor the frequency of maintenance required for storm drains to identify when further improvements and adaptation actions (including shortening the outfalls) are needed due to vulnerabilities from beach erosion and sand blockage with sea level rise. Refer to the Adaptation Plan for more information on the triggers that indicate the need for adaptation actions. Future projects, such as stormwater infiltration projects along the backshore, should consider sea level rise during feasibility assessments and include measures to minimize impacts from coastal hazards as well as avoid impacts to water quality, public access, scenic and visual resources, and other coastal resources.

Policy IV.C.6: New public beach facilities shall be limited to only those structures which provide or enhance public recreation activities and only when alternative sites upland of the beach are not feasible.

D. PUBLIC ACCESS, RECREATION, AND SENSITIVE COASTAL RESOURCES

The Public Access, Recreation, and Sensitive Coastal Resources policies aim to protect public access, recreation, and sensitive coastal resources, which are identified by the California Coastal Commission (CCC) as necessary considerations in plans addressing sea level rise in the coastal zone.

Policy IV.D.1: Avoid impacts to beach dune habitat when designing and siting recreation areas, and direct public access to use well-defined footpaths and the Strand rather than over dune habitat areas through symbolic/protective fencing, signage, and similar methods.

Policy IV.D.2: Consider options to retrofit or relocate recreation and visitor serving facilities to avoid sea level rise impacts and maximum opportunities for coastal access and recreation.

Policy IV.D.3: New development and redevelopment shall maximize public coastal access to the maximum extent feasible (unless public access would pose a safety risk or threat to fragile resources, or where adequate access exists nearby, consistent with the Coastal Act), including with consideration for future sea level rise, by ensuring that public access and recreational opportunities account for the social, physical, and economic needs of all people.

Policy IV.D.4: Public recreational access facilities (e.g., public parks, restroom facilities, parking, bicycle facilities, trails, and paths) shall be sited and designed in such a way as to limit potential impacts to coastal resources over the structure's lifetime. As appropriate, such development may be allowed within the immediate shoreline area only if it is sited in an area that avoids current and future hazards, will not require new or expanded shoreline protective devices, and will not cause or accelerate beach erosion. Public recreational access facilities shall be sited and designed to be adaptable and/or non-permanent, in anticipation of potential loss due to coastal hazards and sea level rise.

E. DECISION-MAKING, COORDINATION, AND PARTICIPATION

The Decision-making, Coordination, and Participation policies relate to decision making, coordination, and participation in planning for sea level rise, which are identified by the CCC as key principles for addressing sea level rise in the coastal zone.

Policy IV.E.1: Use the best available science to determine locally relevant and context-specific sea level rise projections for all stages of planning, design, and reviews.

Policy IV.E.2: Coordinate planning and regulatory decision making with other appropriate local, State, and federal agencies.

Policy IV.E.3: Provide for maximum public participation in planning and regulatory processes.

Policy IV.E.4: Update the City's existing Sea Level Rise Adaptation Plan as substantive new information is available, or as major updates occur to the State of California Sea Level Rise Guidance. In addition, the LCP shall be updated if warranted by an Adaptation Plan update.

Policy IV.E.5: Educate the public about the effects of sea level rise and shoreline hazards. Pursue various methods to notify and educate owners, residents, tenants, and potential future owners of property located in areas potentially subject to shoreline hazards and the effects of sea level rise. Support legislation to include the risks of sea level rise and shoreline hazards on real estate disclosures included in the sales of property.

Policy IV.E.6: Create a Shoreline Monitoring Program, in consultation with other regional, state, and federal agencies as well as regional experts, as detailed in the City's Sea Level Rise Adaptation Plan. Monitor, assess, and inform the public and City decision-makers about the effects of sea level rise on coastal resources, coastal access, public infrastructure and facilities, and existing development in order to identify when Adaptation Plan triggers have occurred to make informed recommendations on adaptation and revise plans and policies as needed. This includes, but is not limited to, activities such as:

Policy IV.E.6.a: Tracking the following resources for science updates: California Coastal Commission Sea Level Rise Policy Guidance; OPC Sea Level Rise Guidance; California Climate Change Assessment; U.S. Geological Survey Coastal Change Hazards Program; National Oceanic and Atmospheric Administration Tides and Currents, Santa Monica Bay station; and coordinate with academic institutions to follow scientific reports they produce on sea level rise in Southern California.

Policy IV.E.6.b: Record coastal flooding and storm damage events and information (photos, videos, reports of events or damage, date, type, location, and severity of flooding) where the Manhattan Beach Sea Level Rise Risks, Hazards, and Vulnerability Assessment (May 2021) found that flooding may occur, including but not limited to the Marvin Braude

Bike Trail, buildings along the beach, the lower pier parking lot, the municipal pier, storm drain outfalls, and the South Bay Cities' main sewer trunk line.

Policy IV.E.6.c.: Topographic surveys of the beach (e.g., beach elevation transects) to measure beach width over time.