



Report #4
Location of Regulatory Tools

Land Regulatory Response to Sea Level Rise

CITY OF TAMPA

LAND REGULATORY RESPONSE TO SEA-LEVEL RISE

REPORT 4 - Location of Regulatory Tools

Report presenting a crosswalk and map showing where each of the regulatory tools will have the most benefit.

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**BY UNIVERSITY OF SOUTH FLORIDA
FLORIDA CENTER FOR COMMUNITY DESIGN AND RESEARCH**

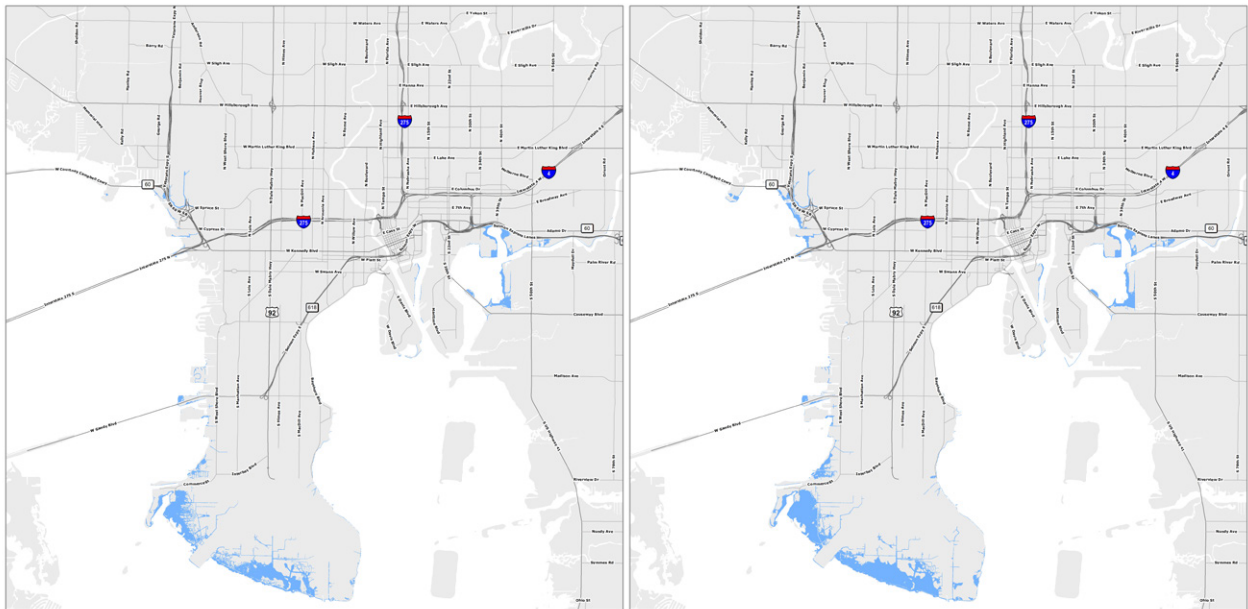
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INTRODUCTION

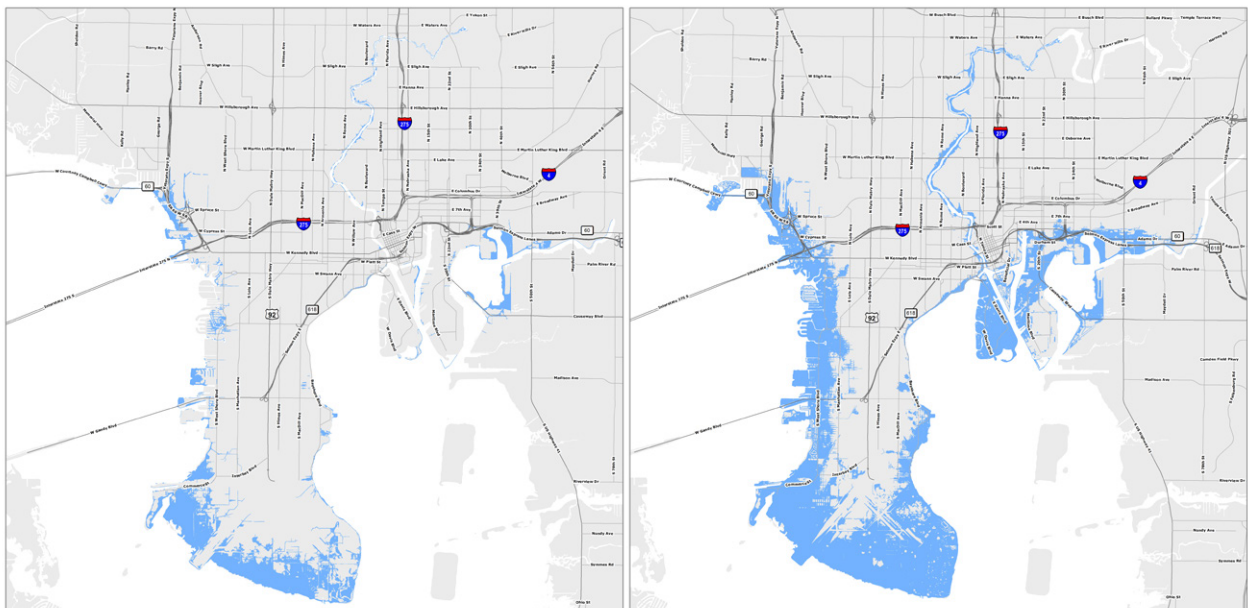
This task builds upon a literature review of precedent policy for sea-level rise and situates such policy in Tampa's geography (see the appendix of this report). Policies are cataloged by *situation*; by geographic location, impact of sea-level rise and other established overlay zones (see appendix for updated list). The following study will help to analyze regulatory options and prioritize best practices for Tampa, specifically, which will occur in the next phase. A more expansive map set is included in the appendix.

Sea-level Rise Scenarios in Tampa, According to the Climate Science Advisory Committee (2019)



2045, Intermediate

2045, High / 2060, Intermediate



2060, High / 2100, Intermediate

2100, High

CITY-WIDE POLICY

At the city-scale, the impacts of sea-level rise can be mitigated by addressing issues at a systems level. For example, the Tampa Bay Climate Science Advisory Committee explains that the extent of future sea-level rise can be directly correlated to immediate efforts that reduce greenhouse gases (CSAP, 2017). Additionally, rising seas and groundwater levels are part of the overall hydrological system, both human and non-human. This includes pipes and outfalls, ponds and water detention systems, river and other shoreline channelization and creation of impervious surfaces. Impacts can be reduced by addressing sea-level rise contextually, in an indirect way. Best-practices policies that can be found in the literature consider:

- Raised groundwater levels and the potential for increased salinity. This can impact drinking water, septic tanks and water retention.
- Drainage and water storage capacity. This can be alleviated by preserving open space, increasing the horizontal area of water detention facilities to make up for lost depth, and increase tail water elevations.
- Planning for and incentivizing building in less vulnerable locations.
- Providing incentives for sustainable building practices.
- Informing the public through different educational mechanisms.
- Planning mitigation projects.
- Expanding flexibility and functionality of landscape systems.
- Utilizing public lands in a more efficient way, combining both flood protection and recreational value.
- Combating climate change by addressing greenhouse gases and improving transportation systems.
- Ensuring equity in all policies while considering climate gentrification and affordable housing when planning for future environmental scenarios.
- In technical planning of bridge heights, allow for navigation in future sea-level rise scenarios.

Other existing or suggested overlay zones and their potential policy include:

FEMA FLOOD ZONES

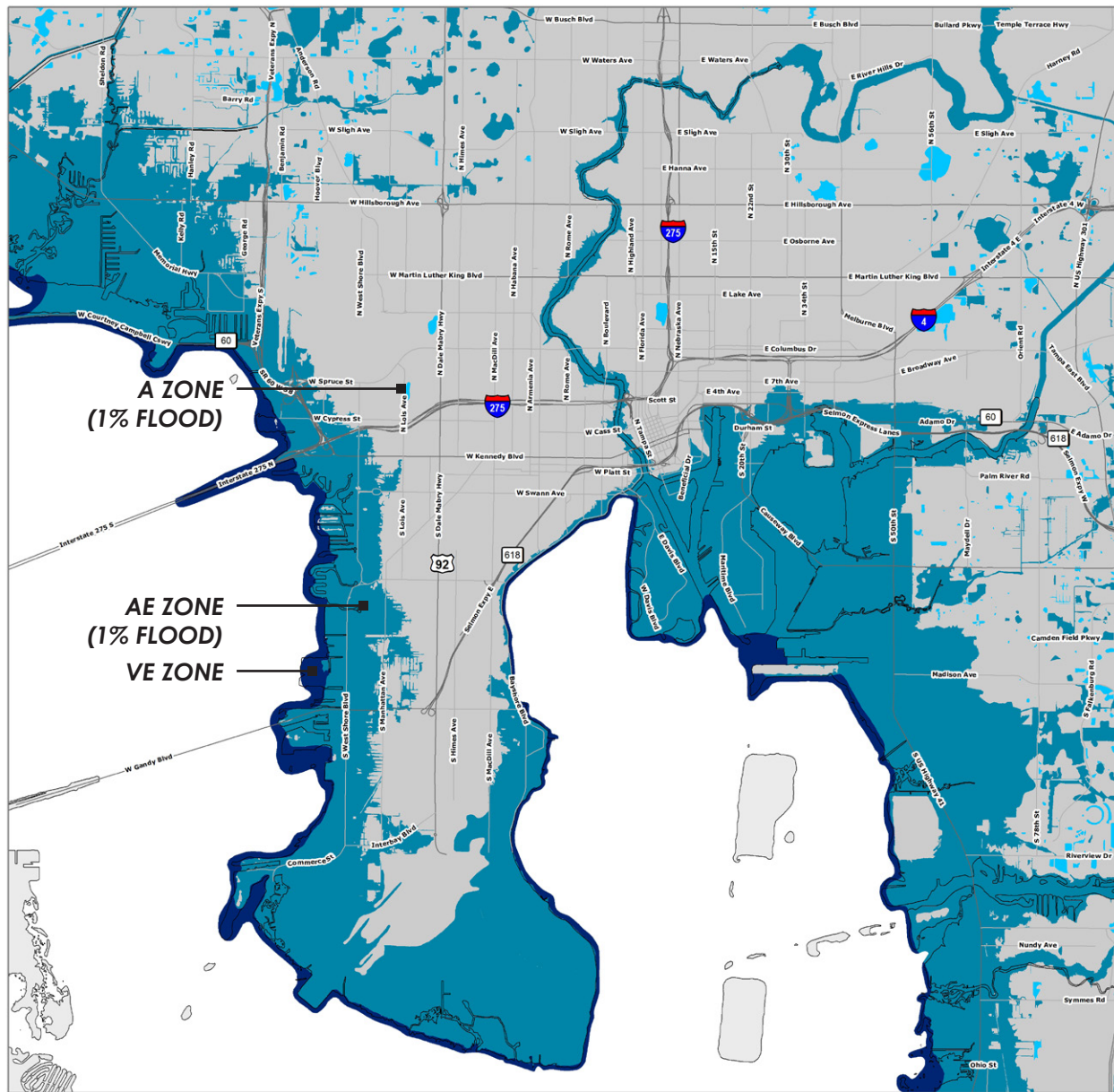
Associated with the 1% Flood Zone

The Federal Emergency Management Association (FEMA) has institutionalized flood zone designations in their Flood Insurance Rate Maps (FIRMs). These maps have been used for insurance purposes but in states like Florida other regulations, such as the Florida Building Code, are associated. This zone also takes into account the compounding impacts of coastal storm surge and inland flooding. These other factors are important to consider with the rising of coastal sea-level elevations.

Since FEMA flood zones do not take into account future sea-level rise projections, recommendations or examples of policy change includes:

- Re-evaluating base flood elevations within the municipality. For example, using the .02% (500 year) flood projections for 'base flood elevation' heights, instead of the 1% (100 year), which is associated with FEMA zones V and A.

Current FEMA Flood Zones in Tampa



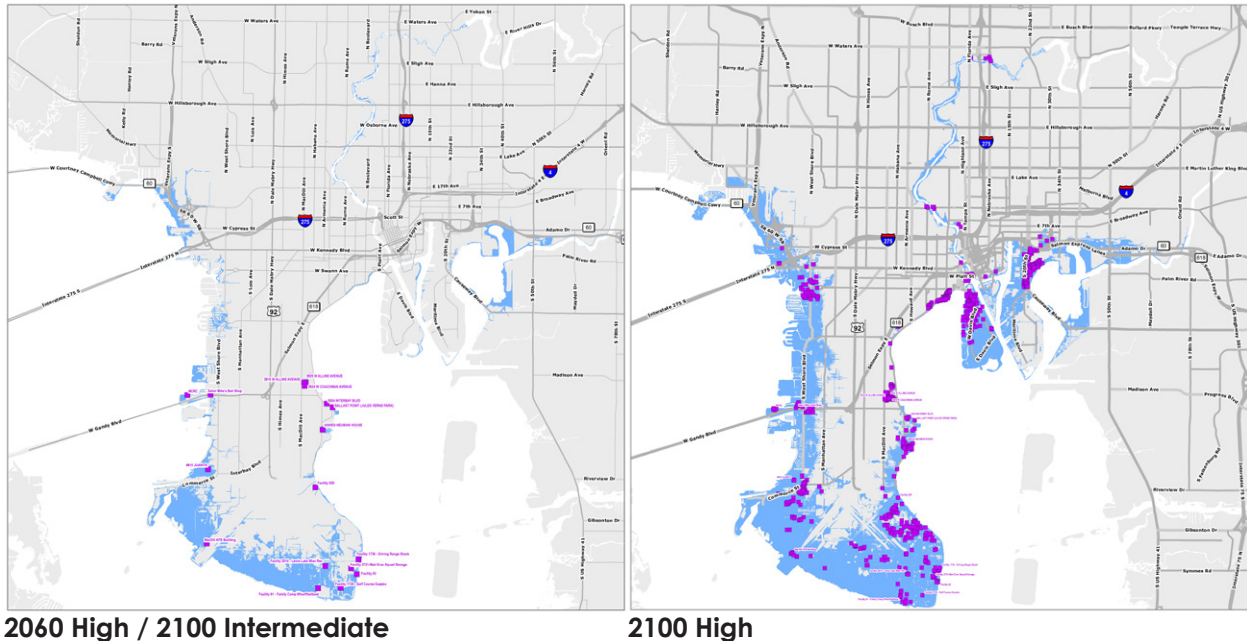
- Develop new 1% (100 year) storm water elevation projections for the 1% flood map, by using projected conditions for sea-level rise, for use in storm water management and other planning processes. One approach is to use a category 2 storm surge elevation as the 1% flood map, until FEMA updates their maps.
- Increased freeboard, or Design Flood Elevations, from 1', which is the current requirement in Florida, to 2', or even 3'.
- Increase elevation requirements for electrical systems and plumbing equipment, to 2' above Base Flood Elevation.
- Providing incentives for property owners to build above the existing Design Flood Elevation, such as a rebate on building permit fees.

Additional policies for properties within the FEMA flood zones may include:

- Showing FEMA flood zones on all future land use maps

- Allowing structures that are raised to exceed height limitations, and/or allowing height to be measured from either design flood elevation or an agreed upon reference plane.
 - Where buildings are raised provide design guidelines and require exterior circulation.
 - Allow buildings on narrow lots to encroach into side and rear setbacks.
- Considering options for enhanced flood-proofing of historically significant buildings.

Historic Buildings and Sea-Level Rise in Tampa



- Requiring hazardous materials to be stored at least 3' above the base flood elevation.
- Setting minimum elevations for low-lying infrastructure, based on an agreed upon sea-level rise scenario, and mapping to identify for compliance. This may include locating roads above the base flood elevation. This also applies to storm water management, landfills, wastewater treatment plants and other infrastructure siting.
 - Set minimum flood wall heights around pump stations.
- Setting more strict flood regulations for critical facilities.
- Encouraging power generation facilities and power transmission infrastructure be sited and designed to take into consideration impacts from climate change, including increasing winds, storm surge, ambient temperatures and sea-level rise.
- Digitally archiving all elevation certificates for easy access and analysis.
- Disclosing in property transactions if the property is located in a special flood hazard area.
- Providing planning and technical assistance to communities in hazardous or repetitive loss areas.
- Mapping streets and public facilities in flood zones and planning for anticipated sea-level rise and potential flooding.

IN THE 1% FLOOD ZONE (FEMA Zones V and A)

- Regulate this area as a "Floodplain Planning Zone." (Somerset County, MD)
- Require that backflow preventers be installed in storm drains.

IN THE .02% FLOOD ZONE

- Use this zone as the base flood elevation.
- Regulate this area as the 'Flood Resiliency Zone.' (New York, NY)

THE COASTAL HIGH HAZARD ZONE (CHHA)

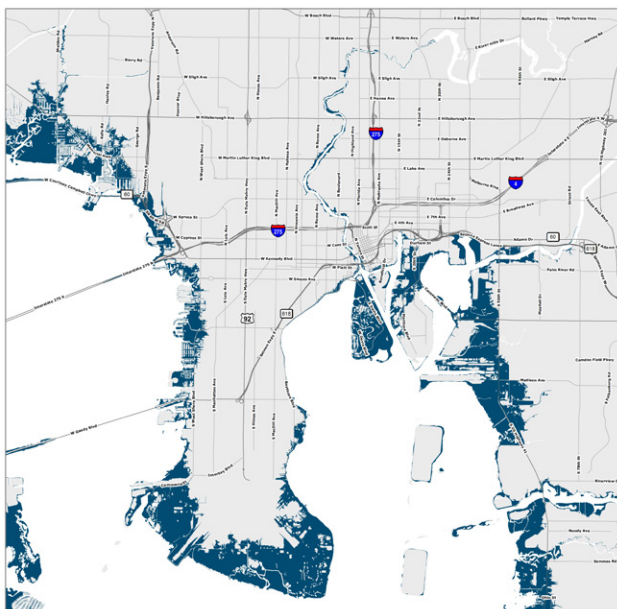
Associated with the FEMA Coastal V Zone or Category 1 Storm Surge

This area is defined by Tampa codes (Section 5-111.3) as areas associated with FEMA flood zone V, which are subject to high velocity storm surge. In Florida statute, however, it is defined as areas below the elevation of a category 1 storm surge as established by the Sea, Lake and Overland Surges (SLOSH) model (Section 163.3178(2)(h)9). Similar to the FEMA flood zones, regulation in this area would take into account the compounding impacts of sea-level rise for storm surge flooding, for future planning and developing urban environments that can accommodate future coastal change.

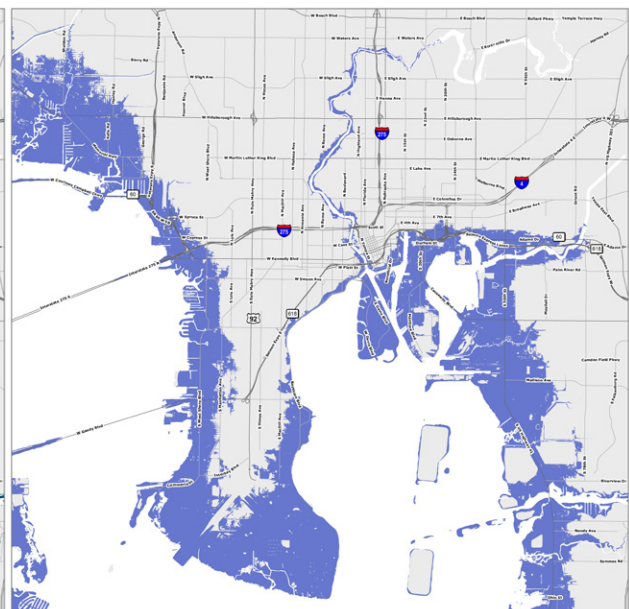
Example policies that address sea-level rise within this zone include:

- Not allowing any new solid waste or hazardous waste sites to be approved.
- Mitigating risks associated with toxic sites.
- Make known the vulnerabilities in this area, by developing a coastal hazards website to inform the public and government officials or possibly investing in a highly visible public outreach campaign.
- Implement an additional tax to address sea-level rise, wetland conservation, drainage projects or other mitigative actions.

The CHHA per City of Tampa



The CHHA According to State Statute



POTENTIAL OVERLAY: A SEA-LEVEL RISE VULNERABILITY ZONE

A Future Flood Scenario or Combination of Flood Factors and Sea-Level Rise

Overlay zones specific to sea-level rise and planning have either been implemented or suggested in a variety of ways. For example, in San Francisco, they use a combined sea-level rise projection (66") and the 1% flood (42") to create a planning area along the coast (San Francisco Planning, 2021). This is used for assessments and capital improvements planning. In Florida, it has been recommended that a sea-level rise specific overlay can be used for comprehensive planning and policy (Ankersen, 2010).

A 50 year time horizon is provided as 'best practice,' considering 1.5' of water level increase during that time with at least 3-5' rise in the next 100 years (Ankersen, 2010). The following shows maps that could possibly be used to define this type of overlay zone, but the ultimate decision needs to be made by the municipality through a clear and transparent community engagement process. In addition, this Vulnerability Zone can be divided into three areas. They will be described in more detail, however these include areas for protection, accommodation, or managed relocation.

Generally, it is suggested that the Sea-level Rise Vulnerability Zone include the following policies:

- Require that sellers of property disclose if they are located in a vulnerable overlay zone, any regulations that restrict development of the parcel, and if the property currently or previously used erosion control methods to address chronic erosion or storm-related damage.
- Designate areas where septic tanks and hazardous materials must be removed to prevent pollution of coastal water bodies. This zone could migrate over time and would provide advanced notice for property owners in future flood areas.

Policy related to the three distinct overlay zones are as follows:

THE PROTECTION ZONE

For areas that include critical infrastructure and significantly dense development, there are few options for adaptation. In places like town or city centers, or historic districts, commitment to continual resistance to the impacts of rising sea levels is one of three strategies. In these areas, hard armoring may be required. However, it is recommended that there is compensation for the deleterious effects to the coastal environment. This decision often proves to be costly and relies on engineering, capital improvement projects, and when considering the potentials for storm surge, may also include other post-disaster effects. However, in establishing these zones, the decision is made that the daily and cultural value is worth trying to maintain in-place. Some of the policies or comprehensive planning considerations for the Protection Zone may include:

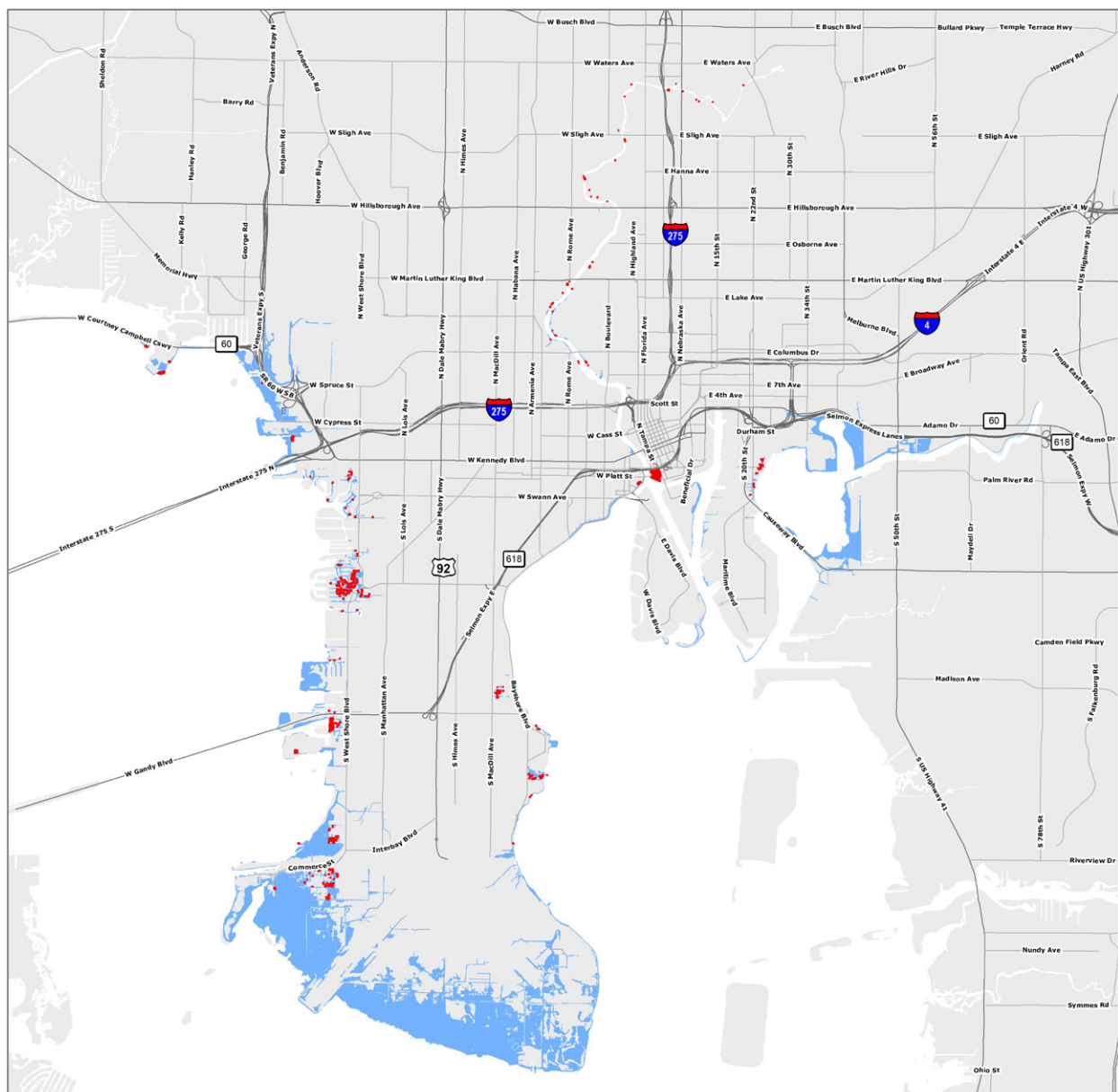
- Using design criteria so that buildings and infrastructure will withstand a minimum service life of 50 years. This includes pumps, well heads and associated walls, sea walls, roads, utilities and sewer lines.
- To acquire a permit, roads and sewer lines shall be elevated to be more resilient to flood impacts.

- Developing a comprehensive shoreline stabilization strategy. To do so, inventory all existing shoreline structures and determine their capacity to function through an established sea-level rise horizon.
- Taking inventory of all public buildings and infrastructures and determining their capacity to maintain functionality through a sea-level rise horizon.
- Compensating for the loss of ecosystem services resulting from hard shoreline stabilization, require adequate mitigation through the construction of living shorelines in front of hard shoreline stabilization structures where feasible.

THE ACCOMMODATION ZONE

This zone should be applied to moderately to intensely developed but non-critical areas. In this area the expectation is that flooding will occur in the future, or with

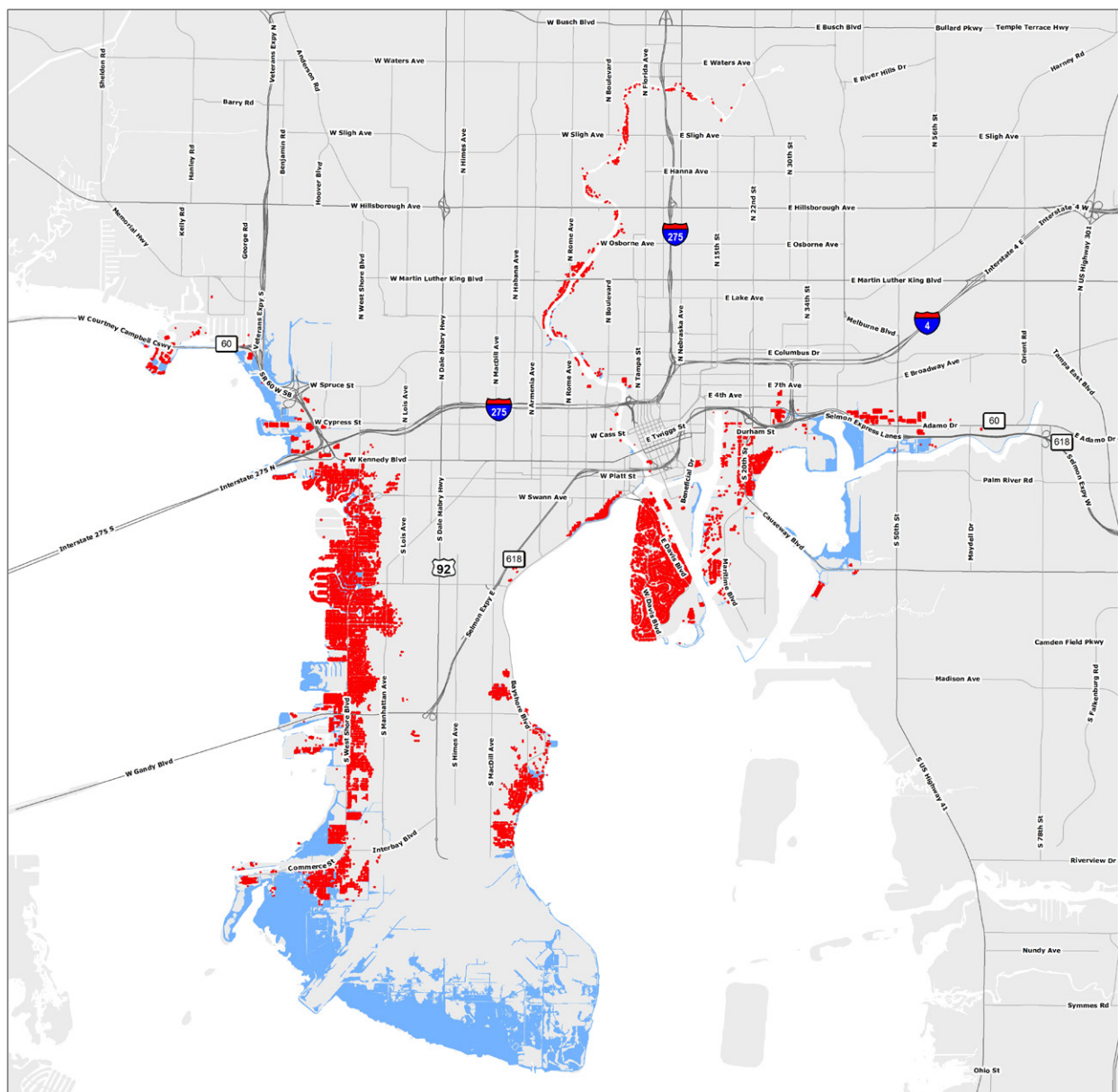
Buildings Impacted by the 2060 High / 2100 Intermediate Sea-level Rise Scenario



storm surge, but that property owners will incorporate higher sea levels into the built environment. Strategies in the Accommodation Zone include down-zoning and modifying property regulations to incorporate water into future conditions, to concentrate flooding areas, directing them away from critical places of resource or infrastructure. Strategies include:

- All environmental impacts statements (EIS) must offer in-depth analysis of how the proposals will impact or be impacted by sea-level rise.
- Creating plans to facilitate tidal wetland migration in response to sea level rise, and support through the requirement of vegetated buffers.
- Implementing hardened shoreline stabilization only where critical or where there is no other alternative. Work at removing hardened shorelines and implement living shorelines.

Buildings Impacted by the 2100 High Sea-level Rise Scenario



- Setting development densities or water-dependent use requirements, or only allowing residential, recreational, agricultural and commercial fishing uses within the 1% zone. This could also include such strategies as prohibiting or limiting property subdivision, prohibiting or limiting expansion of building footprints, clustering development and requiring a greater percentage of open space.
- Incentivizing reduction of density, for example:
 - Amending the conservation tax credit program to make the donation of unbuildable or threatened lots a more appealing option to homeowners, providing tax credits for other preservation of property open space.
 - Establishing and highly motivating a transfer of development rights program.
 - Use rolling easements, which provide homeowners future certainty and tax credits while putting coastal or wetland-adjacent land into conservation.
- Using design criteria so that buildings and infrastructure will withstand a minimum service life of 50 years, and that they can withstand periodic inundation due to sea-level rise.
- Raising the design flood elevation and allowing for increased freeboard (ie. up to 6 feet). For smaller lots (of a determined size), allow them to expand horizontally into setbacks, to maintain street character.
- Utilizing setbacks and buffers to allow space for future coastal migration. This may include:
 - Specifying that the upland portion of the lot be developed while the low-lying area is reserved or put into a conservation easement.
 - Requiring a percentage of shoreline (ie. 50%) must include riparian vegetation at a minimum width (ie. 15'), and potentially include low maintenance plants.
 - Establishing erosion-based setbacks, or tiered for different building types.
- Maintaining road access but removing roads where feasible, when servicing only a few occupied residences.
- Establishing goals to substantially reduce or eliminate repetitive loss properties, through property purchase.
- Providing inspection services to homeowners to help identify ways in which they could retrofit their homes to make them more resilient to sea-level rise.

THE MANAGED RELOCATION / CONSERVATION ZONE

In this area the goal is to reduce the density and intensity of future land use along unprotected shorelines. This could include areas comprised predominantly of single-family residential and lower density development, where expectations are of consistent inundation due to sea-level rise, and/or where there are environmental interest. The process of relocating property ownership can require significant investments in community and property owner engagement, to work with property owners on strategies for future relocation.

Suggested strategies include:

- Incentivizing reduction of density, through the programs described in the Accommodation Zone, such as transfer of development rights and rolling easements.
- Restricting shoreline armoring to soft or natural solutions. This includes creating plans to remove existing hardened shorelines.
- Creating plans to facilitate tidal wetland migration in response to sea level rise, and

- support through the requirement of vegetated buffers.
- Long-term relocation by community zoning or land-use plans that identify a frontal zone of buildings likely to be impacted by known erosion rates or predicted flood levels from storm surge and coastal flooding. Support planning to work with community members.
- Establishing a goal to substantially reduce or eliminate currently developed building sites subject to repetitive flood loss events. Strategies include purchasing properties, incentives, zoning requirements, impact fees and special assessments.
 - Target sites that have been flooded three or more times in the last 10 years.
 - Place a priority on coastal land acquisition through the Florida Forever program.
 - Extend floodplain buyout programs to properties threatened by future sea level rise; governments can preemptively acquire developed properties in order to remove at-risk structures and restore floodplain function.
 - Utilize money from the (City of Tampa) Landscape Area Trust Fund.
- Enact post-storm measures that include building moratoria, policies on reconstruction and a program for rapid acquisition of land.

ADAPTATION ACTION AREAS

Florida initiated the concept and designation of Adaptation Action Areas (AAA) in 2011 through statute in the Community Planning Act. It provides an optional comprehensive plan designation for areas that “experience coastal flooding and are vulnerable to the related impacts of rising sea levels, for the purpose of prioritizing funding for infrastructure needs and adaptation planning.” (FDEO & SFRPC, 2014) The AAA designation could be used similarly to the potential “Sea-level Rise Vulnerability Zone,” to create planning efforts to either protect, accommodate or remove properties from the impacts of sea-level rise. It could also include areas vulnerable to storm surge or other forms of flooding.

WATERFRONT PROPERTY

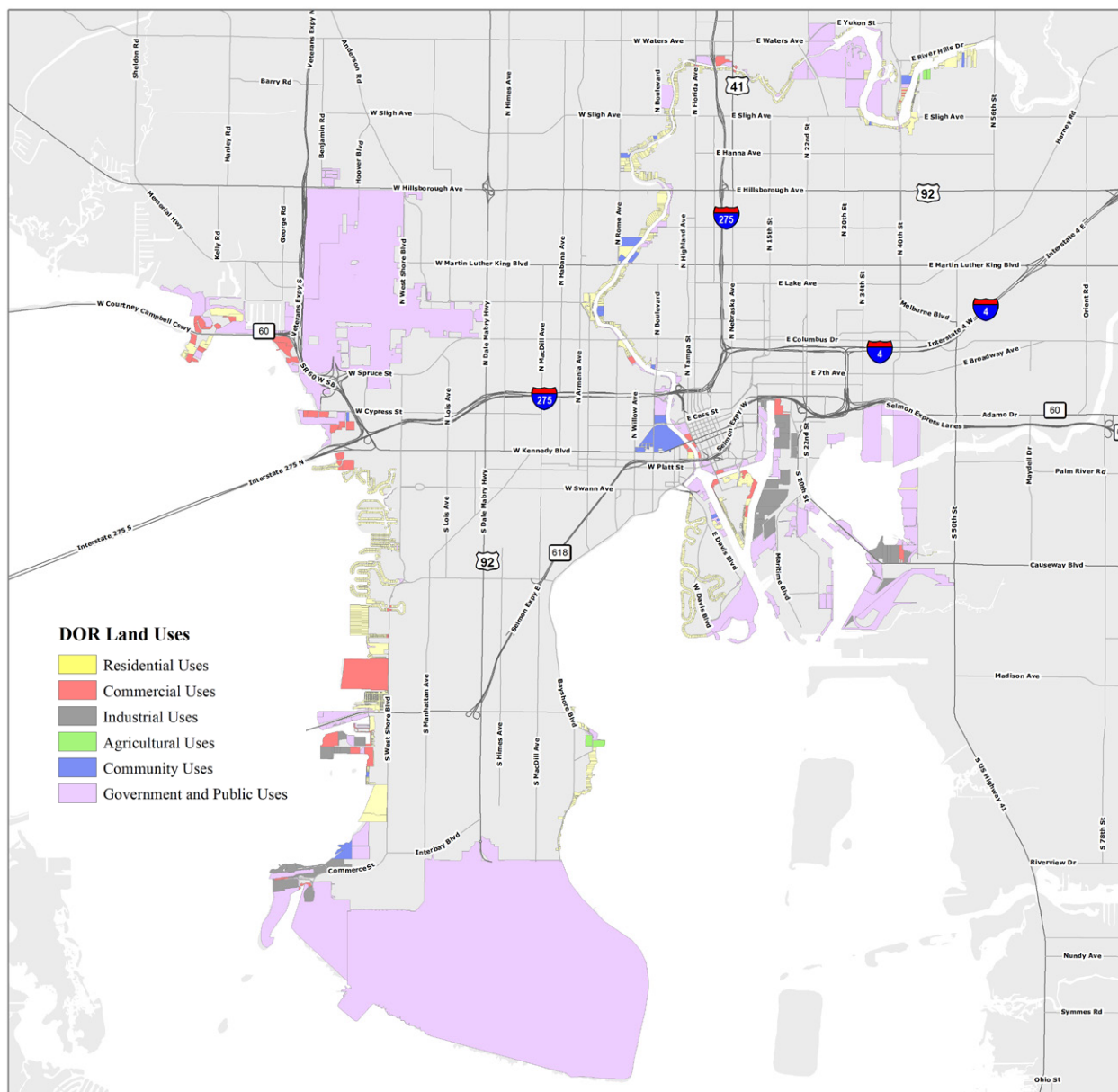
At the coast, properties will have to deal more directly with sea-level rise and have different infrastructures to contend with, such as sea walls. They also have different criteria for building, such as setbacks, erosion control and plant maintenance. The following example policies for waterfront properties will help them to meet the future challenges of rising sea elevations:

- Require developers to pay a fee to mitigate impacts to natural resources from coastal armoring, to cover the costs of future armoring, or to flood-proof infrastructure that services the new development.
- Establish and defining sea wall policy.
 - Establish a standard top of sea wall elevation.
 - Sea walls must be in good repair or property owners will receive fines.
 - Require soft armoring (natural infrastructure) for roadways on the water's edge.
- Prohibiting new channelization or hardening of natural coastal shorelines and

tidal creeks except in cases of overriding public interest. Where the maintenance and or alteration of existing hardened shoreline is allowed, require mitigation of environmental impacts. Such mitigation may include, but is not restricted to, the installation of appropriate living shorelines.

- Based on projected rates of sea level rise within the SLR planning horizon, inventory all existing shoreline stabilization structures and determine their capacity to maintain functionality throughout the SLR planning horizon.
- Developing a comprehensive shoreline stabilization strategy to address protection of the built environment where it has been determined to be feasible and in the best interest of the City/County to protect economic investment and public and private infrastructure.
- Promote living shorelines and prioritize the protection of coastal habitats.

Waterfront Land-Use in Tampa



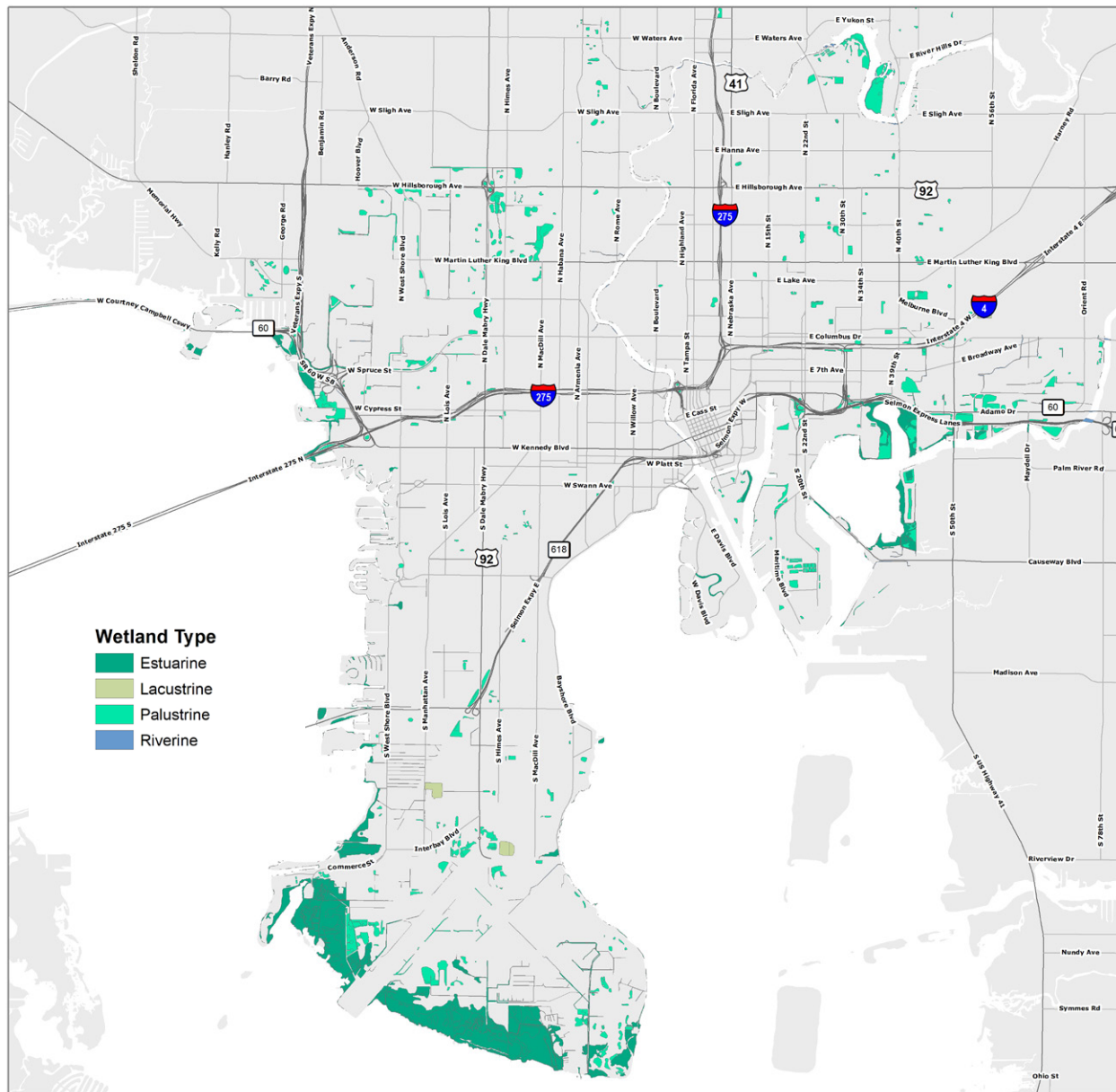
- Where on open water, establish robust living shorelines that include mangroves and/or marshes.
- When on canals or in other limited-space waterways, support the regeneration of living oyster reefs.
- Limit the development of oceanfront hotels and condominiums.
- Establishing coastal buffers that reflect projected rates of sea level rise within the planning horizon for all tidally influenced or vulnerable water bodies. Such buffers shall be designed to allow the conversion of adjacent uplands to wetlands while retaining transitional ecotones where ecologically feasible.
- Adopting policies requiring the removal of existing structures and the restoration of the site to its natural condition if waters rise to touch the structure for a specified amount of (six) consecutive months. This includes sea walls that come to be located on an inter-tidal zone (seaward of the mean high tide line) for a period of six consecutive months.
- No heavy industrial use sites along the shoreline, except when uses are water-dependent or water related.
- Require a permit for any dredging, filling, construction, or other activity within or immediately adjacent to inventoried tidal wetlands which may substantially alter or impair the natural condition of the tidal wetland area. Require a permit for any construction that could affect the salt marsh, such as marinas, community docks, bridges, dredging and bank stabilizations.
- Requiring coastal property developers to perform a vulnerability assessment and address found issues through design criteria.
- Providing mechanisms for buyers of coastal property to receive a hazard assessments prior to purchase.
- Minimizing interference with beneficial natural shoreline processes such as water circulation, sand and gravel movement, and erosion and accretion.
- Take advantage of the Landscape Area Trust Fund to establish functional park space, to create a flexible coastline and mitigate the effects of sea-level rise.

WETLAND AREAS

Wetlands occur at the coasts, as mangroves and marshes, but fresh water wetlands are also important to consider for water quality and system functionality. At the coast, suggested policies include:

- Situating roads other infrastructure and most new construction at least 75 feet from a tidal wetland.
- Require Low Maintenance Zones (LMZ) to be established between developed areas and shorelines, contiguous to any water body, wetland or seawall. Establish littoral edge requirements for all drainage ponds.
- Prohibit cesspools, septic tanks, or other sewage devices, or any fuel storage device within 200 feet of a freshwater or tidal wetland or beach.
- Assess wetland losses and identify suitable areas to accommodate sea level encroachment and conversion to new wetlands.

Wetlands in Tampa

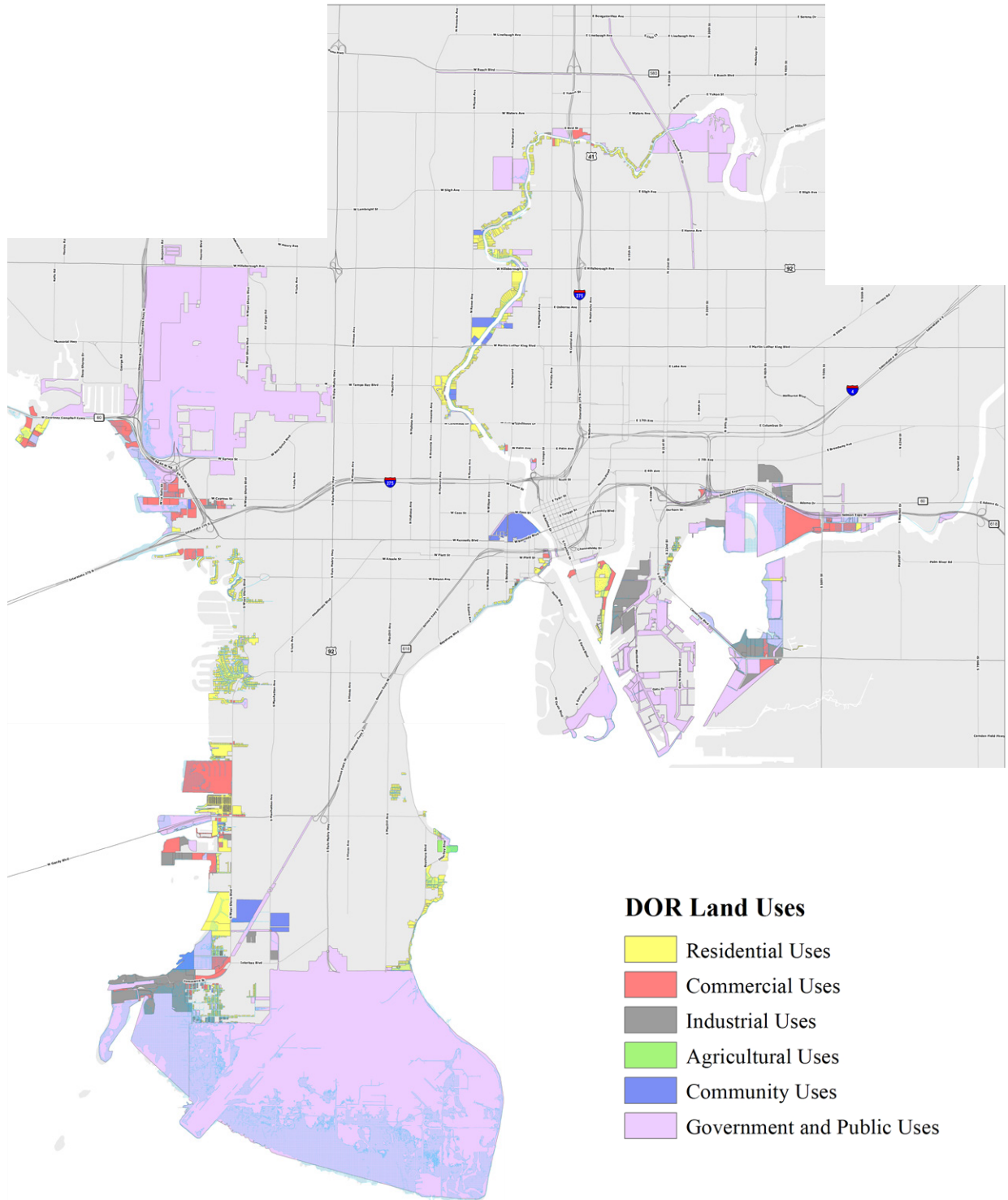


ESTUARY

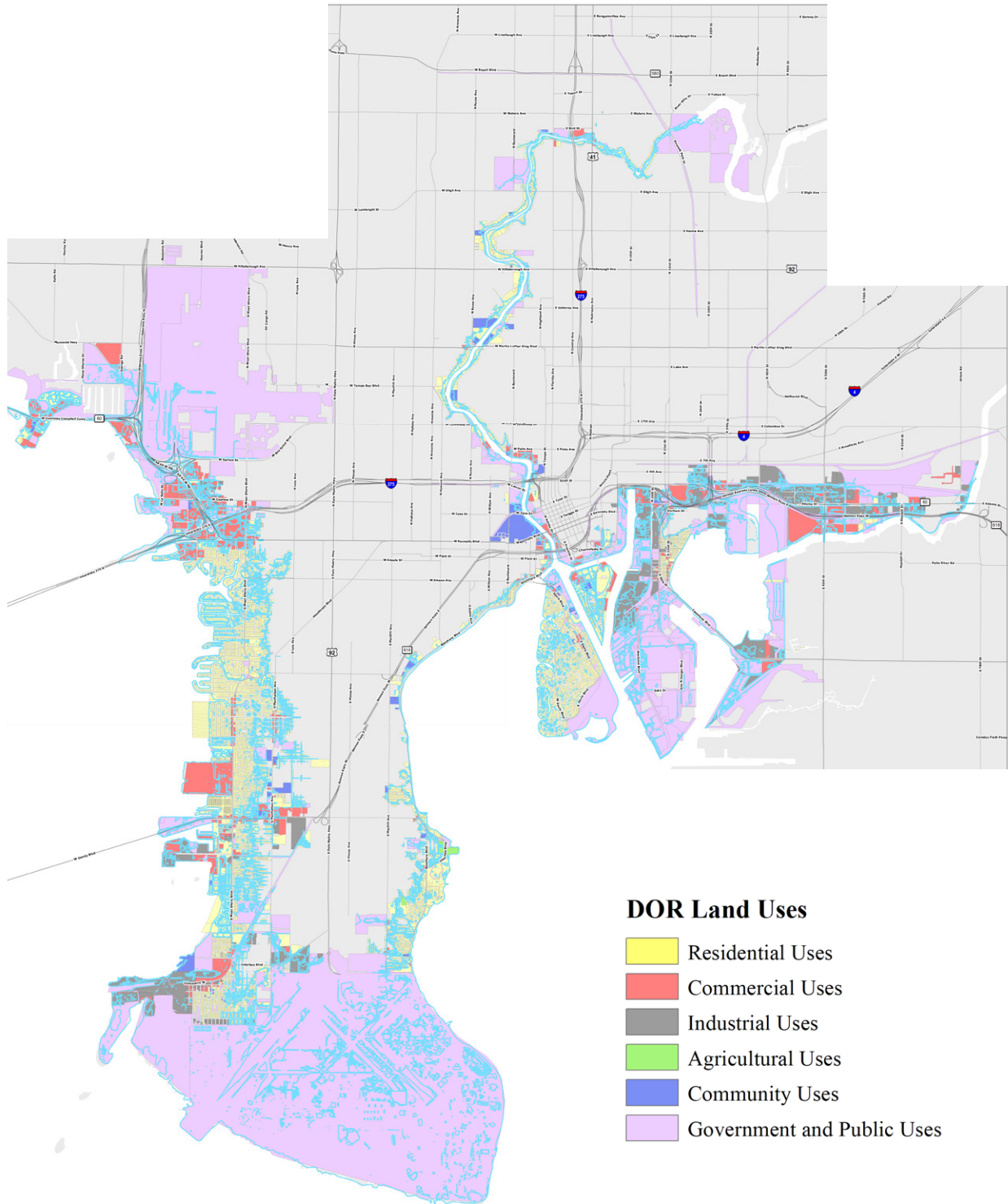
The estuary is an important environment in the Tampa Bay region, connected to economic success and cultural enjoyment. This project does not review policies connected to the estuary, as an open water body, however one policy recommendation is:

- To monitor changes in the volume of the commercial fish catch and the amount of fish and shellfish annually landed.

Land Use in Areas Affected by the 2060 High / 2100 Intermediate Scenario



Land Use in Areas Affected by the 2100 High Scenario



GROUNDWATER INTRUSION AREAS

A significant factor of sea-level rise is the associated increase in groundwater levels.

This has been shown to reduce water storage areas (Davtalab et al., 2020), to impact fresh water sources and to effect below-ground infrastructure. Policy related to this issue includes:

- Using future data groundwater maps and modeling to inform new development and infrastructure.
- Reviewing groundwater maps before allowing septic tanks to be installed.
- Requiring storm water drainage facilities and systems to be designed to the established level of service standard in order to provide protection from flooding. This should include impacts from reduced storage and percolation from increased groundwater levels and outflow tail water elevations.

SUMMARY AND NEXT STEPS

This report provides a generalized summary of potential policies to address sea-level rise, situated by area with reference maps provided. The information will be used to initiate an engagement process to identify and prioritize policy specific to Tampa and to understand the required immediacy for action.

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