

TASK #9 FINAL REPORT

City of St. Marks 2040 Sea Level Rise Vulnerability Analysis and Comprehensive Plan Policy Recommendations

**Prepared For: City of St. Marks Pursuant to Contract
Agreement CM 758 between City of St. Marks and Florida
Department of Environmental Protection**

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Introduction

The Scope of Work approved for the Coastal Resiliency Grant (“**Grant**”) essentially divided the Grant work tasks into two major phases. Phase I (Tasks 1-6) included modeling, technical analysis, mapping, and vulnerability analysis, while Phase II (Tasks 7-9) included policy evaluation requiring review of the City of St. Marks Comprehensive Plan to determine the extent of land use and coastal policies potentially relating to or impacting sea level rise vulnerability, review of the City of St. Marks floodplain ordinance to identify code provisions relating to or impacting sea level rise vulnerability, public workshop to present results of evaluation and to obtain public input on preliminary, draft policies and preparation of this Final Report (Task 9), which specifically includes:

1. Summary of Vulnerability Analysis
2. Summary of Policy Evaluation
3. Summary of Public Participation
4. Draft Policies
5. Technical Appendix

9.1 Summary of Vulnerability Analysis

The purpose of the SLR Risk/Vulnerability Analysis is to identify the relative vulnerability of existing and future development to inundation due to forecasted SLR through 2040. The risk analysis forms the basis for evaluating policy options to reduce the vulnerability of property, structures and infrastructure to SLR flooding. The analysis examines existing land use conditions and the planned future land uses within the forecasted inundation areas, as well as the condition, age and value of affected structures. The *Technical Appendix* includes all maps and datasets produced in the *Vulnerability Analysis*.

The SLR analysis is based on the C-2 (intermediate) and C-4 (intermediate-high) forecast scenarios, which forecast a .5’ and 1.2’ increase, respectively, in sea level rise through the forecast horizon year (2040) as compared to the current mean sea level. These scenarios were selected from a range of C-1 (low) to C-5 (high) and are intended to represent the likely range of expected SLR flooding within the City.

The C-4 scenario inundates 164 acres or about 13% of the City, impacting 39 developed parcels out of 582 total parcels citywide. This represents about three times the acreage affected by the C-2 scenario and about twice the number of affected developed parcels. However, the spatial pattern is quite similar between the C2 and C4 scenarios, as would be expected, with flooding occurring primarily in the relatively low lying, wetland areas in proximity to the shoreline and creeks in the southwest and northwest areas of the City and to a lesser degree in the northeast part of the City. The analysis confirms that most of the affected areas will experience flooding of one foot or less. Even in the C-4 scenario, 85% (140 acres) of the affected 164 acres will flood to one foot or less, while 23 acres will flood within a range of 1-2 feet.

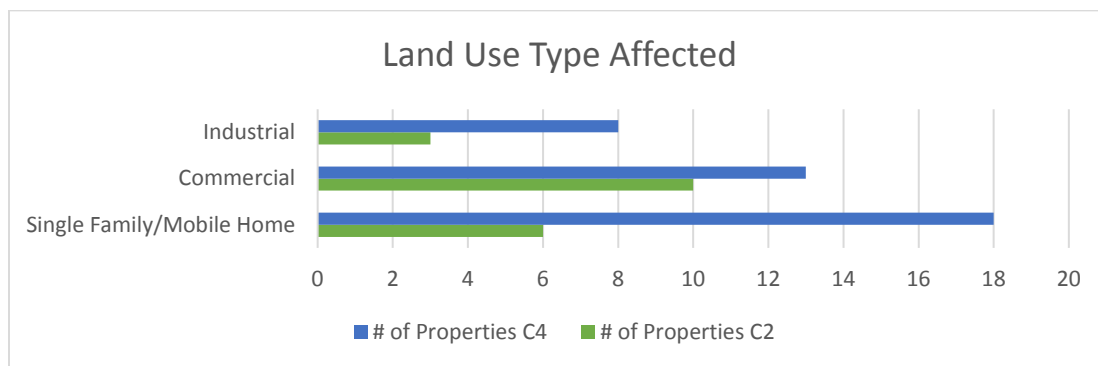
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9.1.1 Existing Land Use within SLR

The following bar chart summarizes the number of developed industrial, commercial and residential parcels within the inundation area for the C-2 and C-4 scenarios. As indicated, the C-4 scenario impacts roughly three times the number of residential and industrial parcels as compared to the C-2 scenario with most of these parcels flooding to 0-1' in depth. From an acreage perspective, the existing land uses impacted by both the C-2 and C-4 consist mostly of public lands, right of way/utilities, timberlands, vacant residential and light manufacturing. These categories collectively comprise about 90% of the affected acreage in both scenarios. The following chart presents the distribution of existing land use impacted by inundation, accounting for all cumulative water depths.



Most of the affected light manufacturing acreage is located within the St. Marks Powder, Inc., site and is undeveloped. In addition, most of the affected acreage within public lands occurs on undeveloped acreage within the powder plant site, the City-owned parcel immediately north of the powder plant and within conservation lands at the south end of the City. From a land use perspective, vacant residential lands represent the most significant impacted acreage where land use strategies, such as clustering or density transfer, could be potentially effective in reducing long term vulnerability.

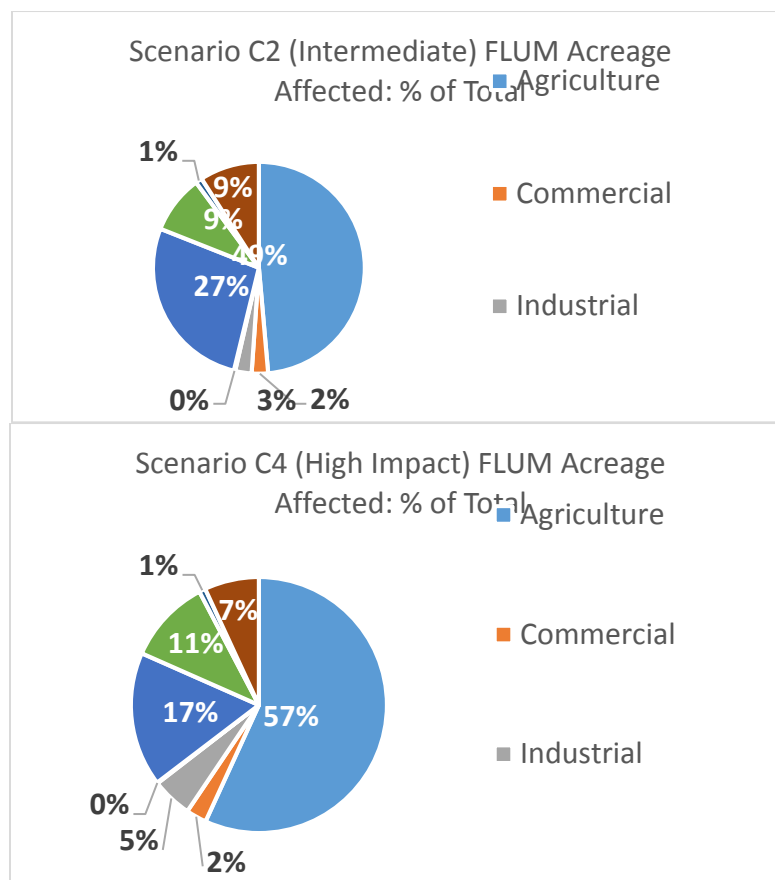
9.1.2 Future Land Use within SLR

The City of St. Marks Comprehensive Plan designates the following future land use categories on the FLUM:

- Agricultural
- Residential
- Commercial
- Industrial
- Mixed Use
- Public Buildings/Grounds
- Recreation Conservation

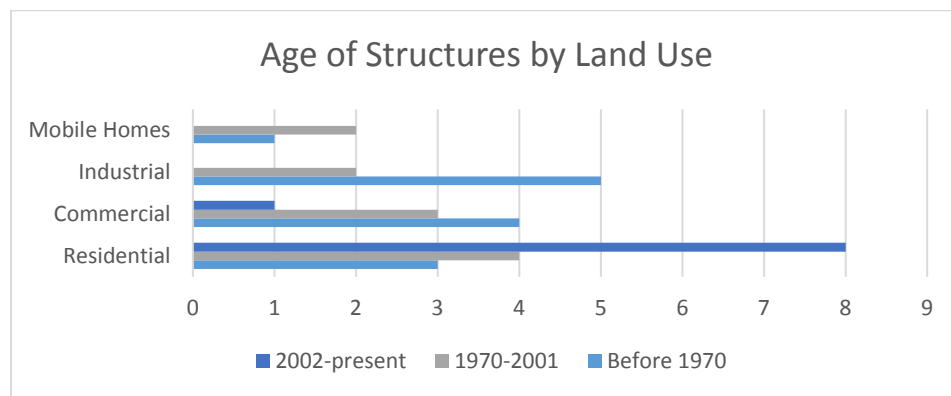
- Riverfront Redevelopment (Special Area Plan)

The designation and extent of future land use categories generally follow the spatial pattern of existing land uses. The greatest extent of inundation occurs within existing agricultural lands, followed by recreation/conservation lands, which together account for about three-fourths of all inundated land use for the C-2 and C-4 scenarios. These areas are mostly undeveloped and represent the lowest potential risk in terms of development potential. Conversely, residential land use categories comprise only 10%-12% of the total inundation area. Public Buildings comprise less than one percent and are charted as 0%. Right of way and other linear public lands not otherwise included under Public Buildings/Grounds are not represented by a FLUM category, but represent 12% and 9% of the total inundation area, respectively, for the C-2 and C-4 scenarios, as previously identified under the existing land use analysis. The following pie charts present the distribution of FLUM categories impacted by inundation at all water depths cumulatively. (Note: The Mixed Use FLUM category was unaffected by inundation and is, therefore, not shown in the pie charts.)



9.1.3 Age of Structures

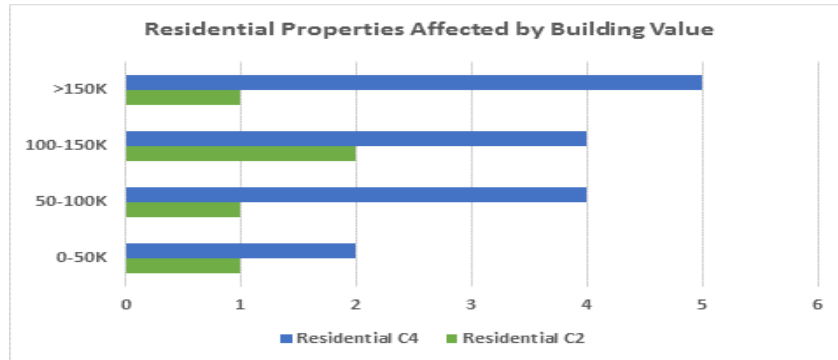
The analysis classifies the age of structures into three categories. Structures built prior to 1970 pre-dated the City's participation in the NFIP program and would typically mean that the structures are located below base flood elevation. Structures built between 1970 and 2001 were built pursuant to the City's floodplain ordinance requirements, but pre-date significant FBC improvements amendments adopted in 2001. Finally, those structures built in 2002 or later would typically incorporate the code improvements. The following bar chart confirms the number of structures by land use type within C-4 inundation areas based on the three age classifications. Of the 39 structures impacted by the C-4 scenario, only 13 structures pre-dated the City's participation in the floodplain management program. These are anticipated to be nonconforming structures that would require compliance if future substantial improvements are proposed.



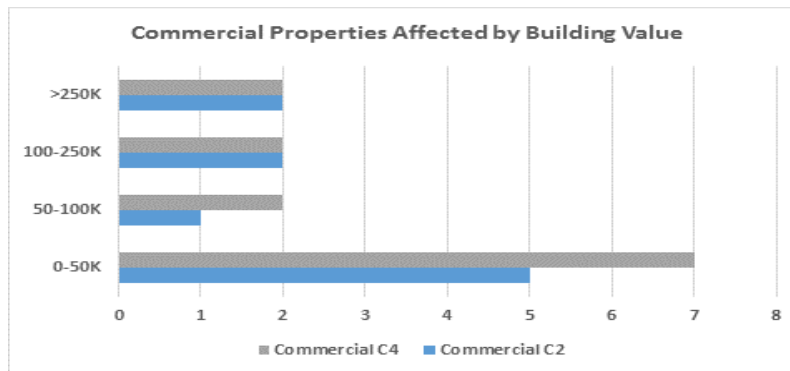
9.1.4 Value of Structures

The parcel database includes the assessed value of the structures located within inundation areas based on the C-2 and C-4 scenarios. The aggregate value of all structures within the C-4 inundation area totals to about \$4 million with the highest value structures approaching \$500,000. Like the other variables, these structures were classified as residential, commercial and industrial and cross-tabulated by assessed value. Residential (\$2.3MM) accounts for about 59% of the value, while commercial (\$1.5MM) accounts for about 38% of the value. Industrial represents a minor percentage with most structures valued at less than \$35,000.

The following bar graph summarizes the range of assessed values for residential for the C-2 and C-4 scenarios. As shown, most residential structures range between \$50,000 and \$150,000. Generally, the lower value residential structures are older, at-grade homes, while the higher value residences are typically elevated.



The following bar graph summarizes the range of assessed values for commercial for the C-2 and C-4 scenarios. Roughly half of the commercial structures are valued at less than \$50,000 and would typically be older structures at grade that pre-dated floodproofing requirements. Conversely, newer structures exceeding \$150,000 in value would have required floodproofing, given that the structures are located within the A-flood zone areas of the City and are not elevated.



9.1.5 Infrastructure

The City's infrastructure consists of local roads, a wastewater treatment plant, water and sewer transmission lines, and a limited urban stormwater system recently constructed along Port Leon Drive and Riverside Drive. Although not generally considered infrastructure, the City includes public buildings and parks, which have also been evaluated under Infrastructure policies. In addition, the City of Tallahassee provides electric service via the Sam O. Purdom Generating Station located in St. Marks and the network of overhead power lines.

Several roadways serving the residential neighborhoods to the west of Port Leon Road are forecasted to flood in both the C-2 and C-4 scenarios. The right of way flooding is nominal in the C-2 category with only .28 acres affected, but the C-4 scenario is forecast to inundate nearly eight acres of right of way with about 75% flooding at 0-1' and 25% at 1-2' in depth. The roadways and adjacent lots within this area are not served by a designed stormwater management system.

Based on the above findings, it is evident that the swales serving these neighborhoods essentially function as very limited drainage retention areas, which would not provide effective stormwater management or significantly reduce the potential extent of inundation from sea level rise.

The wastewater treatment plant is located less than 200' from the St. Marks River, but was built on filled land and is not forecast to flood. In addition, five lift stations exist within the City, but are not located within the forecasted inundation area. However, two are relatively proximate to forecasted inundation areas. The electrical panels for those two lift stations are a few feet above ground, and should be further elevated in the future.

9.2 Summary of Policy Evaluation

An Evaluation Matrix was created as a tool to evaluate the City's existing Comprehensive Plan policies as follows:

- classifies each policy based on the type of strategy: land use, regulatory, incentive-based, funding, education or engineering solution;
- confirms whether the policy applies Citywide or to a geographic subarea;
- assesses whether the policy supported or conflicted with sea level rise mitigation objectives;
- determines whether clarifications were necessary to avoid conflicts with sea level rise mitigation objectives;
- evaluates specific regulatory parameters including:
 - o density, intensity, permitted uses and clustering;
 - o parking limitations, impervious controls and fill limitations;
 - o stormwater standards and location criteria;
 - o base flood elevation standards and other flood control regulatory requirements; and
 - o Right of Way/Road locational requirements/standards.

9.2.1 Land Use Policy Findings

The City has applied its lowest density future land use categories, Agricultural (one unit/ten acres) and Recreation Conservation (one unit/three acres), to areas where extensive wetlands occur. As such, these areas generally correspond to those areas most vulnerable to sea level rise.

The Riverfront Redevelopment (RR) land use category is targeted as an economic development opportunity and is planned as the highest density land use category at 16 units per acre. While most of the RR category occurs outside of the SLR inundation area, the RR will be impacted to some degree by the 2040 sea level rise forecast. The City has also contemplated the expansion of the RR land use category. In general, the expansion area, which would occur further inland, would not be impacted by 2040 forecasted sea level rise. The City should reconsider its current exemption of the RR category from pre-post runoff standards.

The Evaluation Matrix confirms the following key points regarding the City's land use related policies:

- Policies direct higher density away from the wetland areas, which generally direct higher density away from the forecasted sea level rise areas;
- Policies direct land acquisition to protect wetland areas and to expand the City's recreational opportunities along the waterfront;
- Policies require clustering to avoid wetlands, but do not require clustering as related to locations in relation to the floodplain;
- Policies do not provide incentives to encourage land owners to avoid developing within flood prone areas;
- Policies include development standards to avoid unnecessary compaction of soils, control the location of fill, direct stormwater away from structures, limit impervious surfaces, avoid large expanses of impervious areas and encourage pervious alternatives;
- Policies define and map the Coastal High Hazard Area, but do not generally direct higher densities to other locations. Limited mixed use at four units per acre and non-residential categories occur outside of the Coastal High Hazard Area.

Overall, the land use strategies are effective in terms of allocating land uses and regulating development, but lack other strategies that could be implemented as further discussed.

9.2.2 Infrastructure Policy Findings

The evaluation matrix confirms the following key points regarding the City's infrastructure related policies:

- Recreation Conservation and Agricultural categories, which are planned as the lowest density areas, are not generally served by public infrastructure;
- Policies do require appropriate floodproofing of potable water and sewer infrastructure;
- Policies do not include specific locational criteria for future, local roadways within the City, but do call for projects to be evaluated based on health, efficiency, maintenance, level of service, and for designs to maintain or improve drainage patterns;
- Policies plan for an elevated riverwalk to connect the commercial area to the waterfront recreational area to the west and an open plaza/market along the riverfront, which is generally intended to promote revitalization of the waterfront in conjunction with Riverfront Redevelopment Area; and
- Stormwater policies are generally appropriate. However, the Riverfront Redevelopment Area (RRA) is exempted from the pre-post runoff area and is subject only to unspecified Best Management Practices for stormwater management.

The policies should be amended to limit public infrastructure expenditures for water and sewer within the Recreation Conservation and Agricultural areas. In addition, the policies planning for the Riverwalk, Plaza and Riverfront Redevelopment Area should be re-evaluated to provide

additional direction for implementing engineering solutions in conjunction with the proposed improvements. The RRA policy should be reevaluated to develop alternatives to the exemption from stormwater standards. For example, it would be appropriate to consider off-site parking locations outside of the SRA that would reduce the potential need for impervious coverage in the RRA, and policies to require landscape pavers or other permeable surfaces within the RRA.

9.2.3 Policy Groupings

Task 7 confirmed that the City's existing Comprehensive Plan policies and Floodplain Management Ordinance regulations are not designed to specifically address sea level rise. However, the analysis confirmed 2040 sea level rise flooding occurs primarily as a result of breaching along creeks and as a result of the water table elevation increasing within and proximate to wetlands. Forecast inundation areas will essentially expand the extent of wetlands in St. Marks. Therefore, the City's wetland policies and regulations will effectively limit the extent of future development within expanded future wetlands resulting from sea level rise. The Comprehensive Plan should maintain the wetland restrictions, but should also more assertively coordinate land use, regulatory and infrastructure policies to direct development away from the areas vulnerable to sea level rise.

The Evaluation Matrix confirms the need for land use strategies, infrastructure and regulations directly focused on reducing future development potential within sea level rise inundation areas and mitigating sea level rise impacts for existing development and future development that does occur within forecasted inundation areas. It also clearly confirms the need for complementary strategies to direct capital investment, additional funding strategies to support engineering studies and implementation of select engineering solutions, and incentive programs to encourage voluntary actions by landowners to reduce development potential and mitigate where development does exist or occurs in the future. Finally, public education programs should be expanded. The following summary outlines the components of each potential strategy.

Land Use Strategies

Land use strategies are primarily intended to minimize the extent and density/intensity of future development within forecasted inundation areas. These strategies would include land acquisition and density controls.

- Land acquisition should be pursued in the low lying areas within the Residential Conservation and Residential land use categories.
- The City should also adopt policy language to prohibit comprehensive plan amendments and zoning amendments that would increase density within these areas.
- Policies and regulations should require clustering of future development to the portion of a parcel not subject to forecasted inundation where sufficient acreage is available.
- The City should also consider incentives to reduce density within inundation areas through a transferable development rights (TDR) program.

- The Riverfront Redevelopment land use category should be amended based on the 2040 sea level rise forecasted inundation areas. The area north of Wilson Street is vulnerable to sea level rise and should be re-evaluated from a land use and regulatory perspective to limit development and impervious areas at that location, cluster to south of Wilson Street and to maintain as a recreational area. The City should consider incentives to encourage offsite parking.

Capital Improvements and Investment/Funding

Capital improvement policies should direct infrastructure improvements in a manner that would improve stormwater management within existing developed areas located within forecasted inundation areas, while avoiding investments that would support new or expanded development within forecasted areas. This would generally mean that the City should avoid infrastructure investments in the low-lying inundation areas in the Residential land use category and in the Agricultural land use category. Capital improvement policies supporting redevelopment along the riverfront should direct that public improvements incorporate engineering solutions and develop policies to implement public private partnerships in funding stormwater improvements, seawall construction and parking alternatives.

Existing policies prohibit septic tanks and package plants. This means that any development occurring within the recreation conservation land use category and in the residential category would require centralized services, which would generally conflict with the intent of directing development away from these vulnerable areas. This underscores the need to target land acquisition programs to those areas, require clustering out of the sea level rise inundation area where feasible, and to implement incentive-based approaches such as TDRs. Policies should require that the landowner bear the cost of infrastructure improvements that would serve development within areas vulnerable to sea level rise inundation.

Potential Engineering Solutions

Potential engineering solutions are limited in St. Marks, but could potentially include:

- Construction of new seawalls in conjunction with other planned improvements;
- Strengthening and possibly increasing the elevation of existing seawalls and revetments;
- Stormwater management improvements, including improvements to the capacity of the swale system, to reduce flood potential within existing developed areas forecast as inundation areas;
- Evaluation of areas appropriate for curb and gutter improvements, potential expansion of the stormwater sewer system and stormwater management detention areas;
- Elevating future components of the wastewater treatment plant where feasible or otherwise floodproofing;
- Elevating electrical systems for lift stations and other infrastructure components where feasible;

- Engineering analysis to consider limited road improvements to ensure adequate access within existing developed areas subject to sea level rise and to consider the potential for related stormwater management improvements; and
- On-site improvements to route floodwaters away from existing structures and to implement structural improvements.

Land Development Regulations

Land development regulations should be evaluated to determine the feasibility of more stringent standards as related to:

- stormwater standards in forecasted inundation areas as related to frequency, duration and recovery standards.
- placement of fill within forecasted sea level rise flood areas;
- increase the cumulative time period (currently one year) applying to the calculation of substantial improvements to nonconforming structures to discourage development within the sea level rise flood areas;
- increase the freeboard requirement within vulnerable areas; and
- implement the recommended clustering policy and the TDR policy as discussed under land use strategies.

Incentive and Education Programs

Wherever possible, incentive-based approaches are preferable over land use and regulatory strategies that would adversely impact property rights and potentially lead to litigation. From a land use perspective, vacant residential lands represent the most significant impacted acreage where land use strategies, such as clustering or density transfer, could potentially be effective in reducing long term vulnerability. The TRD program would allow landowners to transfer density from sender sites located within forecasted inundation areas to receiver sites located outside of forecasted inundation areas. The sender site would be eligible to transfer the density authorized by its land use category/zoning district. The receiver site would be permitted to develop at a density higher than otherwise allowed by using TDRs. The TDR program works as an incentive, but requires guiding policies and implementing regulations to establish the appropriate density controls and administrative framework. The administrative costs for the program can be funded by establishing an application fee.

Construction incentives could also be considered. For example, application fees could be reduced or waived to induce voluntary improvements such as elevating, floodproofing or relocating existing development. The City participates in the Community Rating System in conjunction with Wakulla County. Policies should recognize the program and call for a periodic evaluation to consider options for increasing the City's rating, which could potentially prioritize the sea level rise vulnerability areas. Public education programs should be implemented to inform the public

regarding regulatory requirements and incentive programs, including reduced insurance rates for voluntarily exceeding minimum regulatory requirements.

9.3 Public Participation

Two workshops were held in accordance with the scope of work to ensure the public was well informed regarding the grant process and to encourage public participation throughout the process. The first public workshop was held on November 28, 2018 following completion of the Vulnerability Analysis and the second public workshop was held on February 14, 2019 and continued on March 18, 2019 following completion of the policy evaluation to obtain public input on potential policy strategies.

The primary objectives of the first workshop were to:

- explain the grant process and encourage public participation;
- review the concepts and modeling approach for forecasting 2040 sea level rise;
- review GIS maps showing the extent and types of existing and future land use and infrastructure elements within the sea level rise inundation areas for the intermediate and high scenarios;
- review statistics confirming the type, age and value of structures impacted by the intermediate and high sea level rise scenarios;
- discuss preliminary policy options to reduce and mitigate sea level rise; and
- obtain public input and encourage continued public participation.

The primary objectives of the second workshop were to:

- review policy evaluation findings and evaluation matrix;
- present strategies focused particularly on reducing density potential in the Residential Conservation and Residential land use categories through land acquisition and density controls;
- discuss density clustering and TDR policy concepts;
- focus on engineering solutions and other strategies targeting opportunities for implementing in conjunction with redevelopment strategies along the City's waterfront;
- reviewing regulatory strategies that could be implemented to implement Comprehensive Plan policy recommendations;
- present and discuss draft policies; and
- obtain public input and encourage continued public input through future workshops and public hearings on the draft policies.

Powerpoint presentations were utilized for both public workshops. Graphics were utilized to illustrate density concepts at the second workshop. The technical appendix includes documentation from the workshops.

9.4 Draft Policies

The proposed amendments to the Comprehensive Plan to address sea level rise mitigation could be addressed by amending existing policies or by proposing a new specific objective and set of new implementing policies focused directly on sea level rise. We recommend the latter approach for several reasons. First, as indicated by the Evaluation Matrix, the Comprehensive Plan includes a broad scope of policies that directly or indirectly relate to flooding, but are not focused geographically, except for the coastal high hazard area to some degree, which encompasses most of the City. Similarly, the flood protection policies appropriately address many topics directly addressing flooding, but are generally designed to guide City regulations concerning the flood management program required for federal flood insurance. Finally, sea level rise should be addressed in an organized set of policies to bring recognition to the challenge, and to ensure the policies are focused directly on sea level rise reduction/mitigation strategies. Some overlap in strategies will occur between a new set of sea level rise policies and the existing comprehensive plan policies, but that is appropriate given that other policies implement other flood related programs such as federal flood insurance. As confirmed by the Evaluation Matrix, nearly all of the existing policies are considered consistent with sea level rise mitigation objectives and are complementary.

See Technical Appendix for Draft Policies.

**St. Marks Sea Level Rise
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Technical Appendix**

- 1. GIS Shapefiles (Folder 1)**
- 2. Existing Land Use Maps (Folder 2)**
 - C-2 Existing Land Use in SLR Inundation Area (0'-1')
 - C-2 Existing Land Use in SLR Inundation Area (1'-2')
 - C-2 Existing Land Use in SLR Inundation Area (2'-3')
 - C-2 Existing Land Use in SLR Inundation Area (3'-4')
 - C-4 Existing Land Use in SLR Inundation Area (0'-1')
 - C-4 Existing Land Use in SLR Inundation Area (1'-2')
 - C-4 Existing Land Use in SLR Inundation Area (2'-3')
 - C-4 Existing Land Use in SLR Inundation Area (3'-4')
- 3. Future Land Use Maps (Folder 3)**
 - C-2 Future Land Use in SLR Inundation Area (0'-1')
 - C-2 Future Land Use in SLR Inundation Area (1'-2')
 - C-2 Future Land Use in SLR Inundation Area (2'-3')
 - C-2 Future Land Use in SLR Inundation Area (3'-4')
 - C-4 Future Land Use in SLR Inundation Area (0'-1')
 - C-4 Future Land Use in SLR Inundation Area (1'-2')
 - C-4 Future Land Use in SLR Inundation Area (2'-3')
 - C-4 Future Land Use in SLR Inundation Area (3'-4')
- 4. Infrastructure Maps (Folder 4)**
 - C-2 Infrastructure in Combined SLR Inundation Area (0'-4')
 - C-4 Infrastructure in Combined SLR Inundation Area (0'-4')
- 5. Spreadsheets/Tables (Folder 5)**
 - Acreage and Parcels Affected in SLR Inundation Area
 - Existing Land Use in SLR Inundation Area
 - Future Land Use in SLR Inundation Area
 - Type and Condition of Structures in SLR Inundation Area
 - Age of Structures in SLR Inundation Area
 - Value of Structures in SLR inundation Area

- 6. November 28, 2018 Workshop Documentation (Folder 6)**
- 7. Evaluation Matrix (Folder 7)**
- 8. February 14, 2019/March 28, 2019 Workshop Documentation (Folder 8)**
- 9. Draft Policies (Folder 9)**