STORMWATER ANALYSIS

FOR

SLEEPY LAGOON

Prepared for:

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EXECUTIVE SUMMARY

The Town of Longboat Key (Town) identified the Sleepy Lagoon community as an area of concern subject to sunny day flooding due to high tides and king tides and subject to increasing flood risks due to Sea Level Rise (SLR). The Town contracted with Kimley-Horn Associates, Inc. (Kimley-Horn) to evaluate the impacts of rainfall, tidal events and SLR on the roadways and infrastructure in the Sleepy Lagoon community and to identify projects to mitigate impacts.

The impacts of rainfall, tidal events and SLR on the Sleepy Lagoon community were identified through inundation mapping and a preliminary Hydraulic & Hydrologic model (ICPR4 model) developed for the Sleepy Lagoon community. The ICPR4 model was developed to verify the recommendations in this report. The flood risks referenced in this report included:

- Observed High Tide Inundation (*observed 1.8 ft tide on May 18, 2022*)
- Mean Higher-High Water (MHHW) + 2050 SLR (Intermediate High)
- Observed High Tide + 2050 SLR (Intermediate High)
- 25-Year/24-Hour Design Storm with MHHW Tailwater
- 25-Year/24-Hour Design Storm with Observed High Tide Tailwater
- 25-Year/24-Hour Design Storm with MHHW + 2050 SLR (Intermediate High) Tailwater
- 25-Year/24-Hour Design Storm with Observed High Tide + 2050 SLR (Intermediate High) Tailwater

The Land Use is anticipated to remain the same in future conditions. Inundation Mapping is provided in ***Appendix A***. The 25-Year/24-Hour Design Storm floodplain mapping is provided in ***Appendix B.***

A list of general recommendations, mitigation and adaptation strategies, were developed and are discussed in ***Section 3 - Project Recommendations***. These strategies can be implemented in the Sleepy Lagoon community and in the Town as best practices to improve resiliency. A summary of strategies for mitigation and adaptation is included in the ***Section 7 - Conclusion*** in ***Table 6***. The table provides a list of strategies for public and private uses and the mitigation / adaptation value of the strategy identified.

Property owners can implement strategies such as those identified in ***Table 6*** on their private property to retain water on site. Improvements such as stormwater harvesting in cisterns / rain barrels retain water on site and the water can be used on property. Other improvements, such as bioswales, rain gardens and tree box filters promote natural infiltration. By implementing these strategies to capture and retain rainfall, the volume of stormwater runoff reaching the roadway is reduced.

Site-specific strategies discussed in ***Section 3 - Project Recommendations*** in subsection ***3.4 - Sleepy Lagoon Capital Projects*** were developed to contend with unique flood threats found within the Sleepy Lagoon community. Additionally, Kimley-Horn has provided opinions of probable cost for identified capital improvement projects in ***Appendix C.***

A Third-Party Funding Matrix is provided in ***Appendix D*** and provides a list of grants and pertinent information about the grant sources for the Town to develop a funding plan.

Property owners can implement strategies on their private property to retain water on site. Improvements such as stormwater harvesting in cisterns / rain barrels retain water on site and the water can be used on property. Other improvements, such as bioswales, rain gardens and tree box filters promote natural infiltration. By implementing these strategies to capture and retain rainfall, the volume of stormwater runoff reaching the roadway is reduced. A summary of strategies for mitigation and adaptation is included in the ***Section 7 - Conclusion*** in ***Table 6***.

It is recommended the Town complete the following action items within a five-year time frame:

- Condition assessment and maintenance for existing check valves / install check valves;
- Road reconstruction / stormwater management system upgrades (additional inlets / conveyance pipes) identified in ***Appendix C*** as Phase 1, 2, 3, and 4;
- Desktop verification of the existing Stormwater Inventory geodatbase (*StormWaterSurvey.gdb*) including pipe inverts, sizes, and material with available data;
- Implement stormwater utility program for dedicated capital improvement and maintenance fund source / identify matching grant funds;
- Seawall evaluation for condition and elevation assessment;
- Develop existing conditions models for critical areas of the Town;
- Augment the Stormwater Inventory geodatabase (*StormWaterSurvey.gdb*) including pipe inverts, sizes, and material with survey where data is not readily available in desktop verification; and
- Develop guidance document to promote private improvements to stormwater management (bioswales / raingardens / tree wells.)

In the ***Conclusion*** in ***Table 7***, these activities are separated into primary and secondary priorities to provide guidance for the Town to implement the action items.

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ABBREVIATIONS

BFE	Base Flood Elevation
CIP	Capital Improvement Plan
CRS	Community Rating System
DEM	Digital Elevation Model
EC	Elevation Certificate
FEMA	Federal Emergency Management Agency
FFE	Finished Floor Elevation
FIRM	Flood Insurance Rate Map
FIS	Flood Insurance Study
GIS	Geographic Information System
MHHW	Mean Higher-High Water
MLLW	Mean Lower-Low Water
NAVD88	North American Vertical Datum of 1988
NFIP	National Flood Insurance Program
NGVD29	National Geodetic Vertical Datum of 1929
NOAA	National Oceanic and Atmospheric Administration
OHT	Observed High Tide
SFHA	Special Flood Hazard Areas
SLR	Sea Level Rise
SWFWMD	Southwest Florida Water Management District
USGS	United States Geological Survey

DEFINITIONS

100-Year/24-Hour Rainfall Event: A rainfall event with the estimated probability of a 1% chance of happening in any given year.

25-Year/24-Hour Rainfall Event: A rainfall event with the estimated probability of a 4% chance of happening in any given year.

Adaptive Measures: A strategy, project, plan or policy, that aims to increase resilience to acute shocks or chronic stresses.

Base Flood: The Flood having a one percent chance of being equaled or exceeded in any given year, also known as the 100-year Flood.

Base Flood Elevation (BFE): The highest elevation of the water surface associated with the Base Flood.

Check Valve: Structure in the stormwater management system for controlling flow to allow discharge without backflow from saltwater sources.

Chronic Stresses: Weaken fabric of a community on a daily or cyclical basis (i.e. sea level rise, undersized infrastructure, etc.).

Critical Facility: An integral and readily identifiable facility such as schools, nursing homes, hospitals, police, fire and emergency response installations, installations which produce, use or store hazardous materials or hazardous waste, or other facilities that would potentially create a danger to the public health, safety, or welfare if the facility was compromised by flooding.

Community Rating System (CRS): A voluntary incentive program that recognizes and encourages community floodplain management practices that exceed the minimum requirements of the National Flood Insurance Program (NFIP).

Conveyance: Elements of the stormwater management system that can be open (roadside ditches / swales) or closed (pipes) to provide a flow path for stormwater runoff.

Coastal Communities: Communities adjacent to the sea.

Coastal Flooding: Flooding in coastal communities caused by either sea level rise, storm intensification or both

Coastal High Hazard Area: The area subject to high velocity waters caused by, but not limited to, hurricane wave wash. The area is designated on a Flood Insurance Rate Map (FIRM) as Zone V1-30, or VE.

Digital Elevation Model (DEM): Representation of bare ground (bare earth) topographic surface of the earth excluding trees, building, and any other surface objects.

Effective Flood Insurance Rate Map: Official map of a community on which FEMA has delineated the Special Flood Hazard Areas (SFHAs), the Base Flood Elevations (BFEs) and the risk premium zones applicable to the community.

Elevation Certificate (EC): is a document to verify elevations such as the lowest floor elevation of the property and the BFE at the time the EC was issued. The elevation certificate includes the FEMA flood zone and other building characteristics / elevations.

Erosion: The displacement of the upper layer of soil by wind or water to transport material from one location to another location.

Federal Emergency Management Agency (FEMA): The federal agency responsible for leading the Nation's efforts to prepare for, protect and mitigate against, respond to, and recover from the impacts of natural disasters and man-made incidents or terrorist events.

Flood or Flooding: A general and temporary condition of partial or complete inundation of normally dry land areas from the overflow of inland or tidal waters, or the unusual and rapid accumulation or runoff of surface waters from any source, or an abnormal tidal surge, or by some similarly unusual and unforeseeable event which results in Flooding.

Flood Insurance Rate Map (FIRM): An official map of a community, on which the Federal Emergency Management Agency (FEMA) has delineated both the Special Flood Hazard Areas (SFHA) and the risk premium zones applicable to the community. The latest FIRM issued for Sarasota County or Manatee County is referred to as the effective FIRM.

Flood Insurance Study (FIS): The official hydraulic and hydrologic report provided by the Federal Emergency Management Agency (FEMA). The report contains Flood profiles, as well as the Flood Insurance Rate Maps, Flood Boundary Floodway Maps, the water surface elevation of the Base Flood, and other related information.

Flood Level: The elevation of water on dry surfaces caused by an event

Floodplain: Any land area susceptible to being inundated by water from any source (see definition of "Flood or Flooding".

Floodplain Level of Services: Established depth tolerances for flooding during specified rainfall events.

Floodplain Level of Service Deficiency: Locations of standing water depth in excess of established floodplain level of service.

Inlet: Structure in the stormwater management system where surface water enters to closed system.

King Tide: A predictable especially high tide that occurs when the full or new moon is closest to the Earth in orbit, typically occurs twice a year

Lowest Floor: A building's lowest enclosed area (including Basement). The Floodplain Administrator shall not consider an unfinished or flood resistant enclosure, usable solely for parking of vehicles, building access or storage other than a Basement to be the building's Lowest Floor, provided that such enclosure does not violate the applicable non-elevation design requirements of this Article.

Mean Higher-High Water (MHHW): The average of the higher high water height of each tidal day observed over the National Tidal Datum Epoch.

Mean Lower-Low Water (MLLW): The average of the lower low water height of each tidal day observed over the National Tidal Datum Epoch.

Mean Sea Level (MSL): For the purposes of the National Flood Insurance Program, the datum to which Base Flood Elevations are shown on a community's Flood Insurance Rate Map and other legally adopted flood studies are referenced.

National Flood Insurance Program (NFIP): Managed by FEMA, the National Flood Insurance Program provides federally backed flood insurance to property owners in participating communities.

National Tidal Datum Epoch: The specific 19-year period adopted by the National Ocean Service as the official time segment over which tide observations are taken and reduced to obtain mean values (e.g., mean lower low water, etc.) for tidal datums. It is necessary for standardization because of periodic and apparent secular trends in sea level. The present NTDE is 1983 through 2001 and is actively considered for revision every 20-25 years. Tidal datums in certain regions with anomalous sea level changes (Alaska, Gulf of Mexico) are calculated on a Modified 5-Year Epoch.

National Oceanic and Atmospheric Administration (NOAA): United States federal agency responsible for monitoring the climate and the environment.

Non-Special Flood Hazard Area: An area that is in a moderate-to-low risk flood zone designated as Zone X or (Shaded) X, B, or C, as defined on the effective Flood Insurance Rate Maps (FIRM).

North American Vertical Datum of 1988 (NAVD88): The vertical datum used for vertical control surveying and for the effective FEMA FIRM products in Manatee and Sarasota Counties.

Observed High Tide (OHT): Kimley-Horn staff documented a high tide event on May 18, 2022. The event was recorded at elevation 1.8 feet NAVD88.

Pre-FIRM Structures: Structures for which the start of construction commenced on or before June 15, 1971, or the adoption of earliest FIRM.

Pressure Head: The difference in the upstream and downstream surface elevations required to activate the check valve so that fluid can flow to the receiving waterbody.

Resiliency: Capacity of individuals, institutions, businesses, and systems within a community to survive, adapt, and grow, no matter what kinds of chronic stresses and acute shocks they experience. Planning for an uncertain future.

Saltwater Marsh: Coastal wetlands that are flooded and drained by salt water brought in by the tides. They are marshy because the soil may be composed of deep mud and peat. Saltwater marshes protect shorelines from erosion by buffering wave action and provide water quality improvements by filtering nutrients from stormwater runoff and trapping sediments.

Sea Level Rise: The increasing water level of the oceans over time.

Special Assessment District: A district created to fund improvements to a neighborhood and/or community or to provide additional services based on community desires for a group of properties that share in the benefit and cost of the service provided.

Special Flood Hazard Areas (SFHA): or Area of special flood hazard means the land in the floodplain subject to a one percent or greater chance of Flooding in any given year. These areas are designated as Zones A, Al through A30, AE, VI through V30, or VE and defined on the effective Flood Insurance Rate Maps (FIRM).

Stormwater Management System: Engineered system designed to convey stormwater runoff away from road surfaces and properties.

Sunny Day Flooding: Standing water on roadways occurring without a rainfall event and due to a high tide event.

Tailwater: Waters located immediately downstream from a Stormwater Management System.

Tailwater Condition: Tailwater depth (fixed or variable) used to evaluate the function of a Stormwater Management System.

Vulnerability: The predisposition for an asset to be adversely impacted.

Water Level: The elevation of water on or off land.

1. INTRODUCTION

Kimley-Horn Associates, Inc. (Kimley-Horn) has been contracted by the Town of Longboat Key (Town) to perform a stormwater analysis and provide mitigation recommendations to the Sleepy Lagoon community. The intent of the stormwater analysis is to identify alternatives and recommendations to improve the existing stormwater management system. As a part of the analysis, stormwater modeling and Geographic Information System (GIS) mapping was performed to gain an understanding of current storm flooding conditions. Stormwater modeling was performed using Interconnected Channel and Pond Routing Model Version 4 (ICPR4). GIS mapping was used to predict flooding in the Sleepy Lagoon community with different tidal conditions, as well as tide conditions combined with a 25-year storm event.

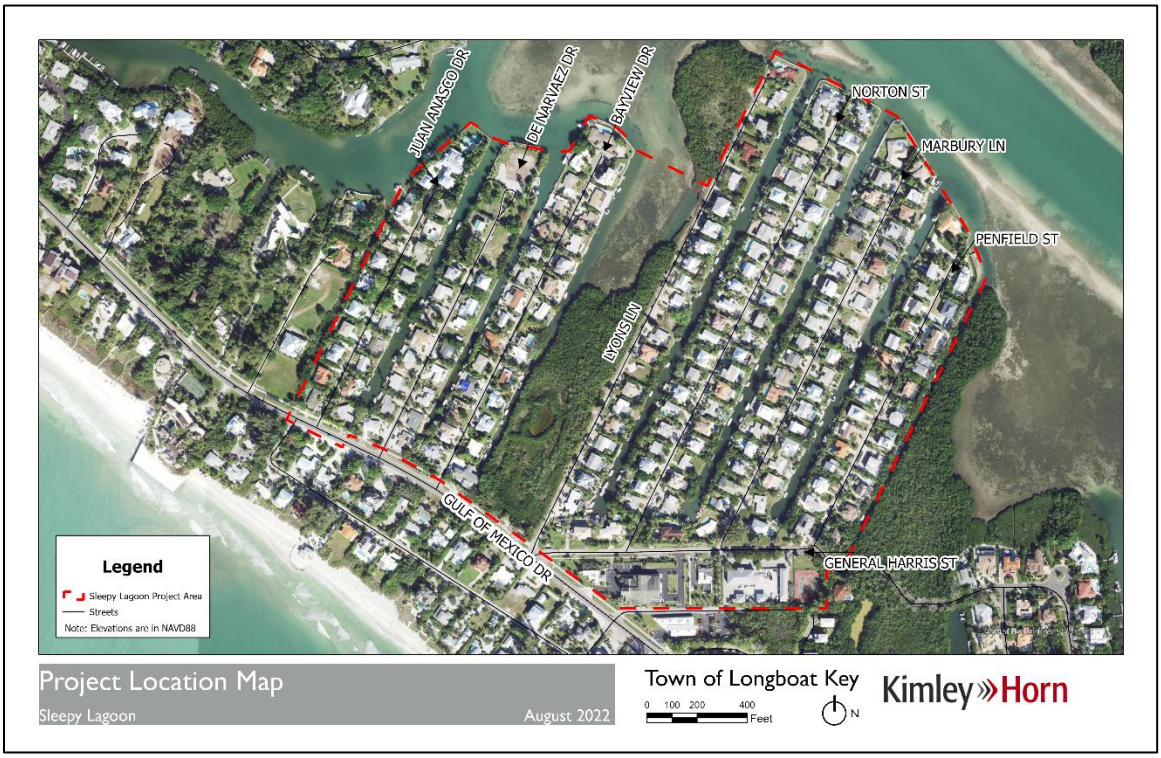


Figure 1: Project Location

The project objective is to provide the Town and the residents of Sleepy Lagoon with recommendations to mitigate the current stormwater conditions of the Sleepy Lagoon community. The Sleepy Lagoon Stormwater Analysis consisted of two primary sources of standing water described below:

Sunny Day Flooding

Tidal and sunny day flooding refers to the flooding of streets, parking areas, and property with salt water solely from the tides and not from a rainfall event. Using available tidal data from the National Oceanic and Atmospheric Administration (NOAA) and the 2018 Florida Digital Elevation Model (DEM) from the United Stated Geological Survey (USGS), Kimley-Horn quantified and visualized the extents of the tidal flooding in the Sleepy Lagoon community. This tidal flooding was investigated based on the Mean Higher-High Water (MHHW), the Observed High Tide (OHT), and both of those sea levels with the additional rise estimated by the NOAA Intermediate High SLR in 2050.

Rainfall Event Flooding

Kimley-Horn evaluated the current conditions of Sleepy Lagoon's stormwater infrastructure by creating an ICPR4 stormwater model. This model incorporated stormwater survey data provided by the Town, the 2018 Florida DEM Lidar from USGS, and site visit data collected on May 4, 2022, and May 18, 2022. Kimley-Horn used the stormwater model and 2018 Lidar to visualize the flooding occurring throughout the community during the 25-Year/24-Hour storm event. Four tailwater conditions were used in the evaluation – the MHHW, the OHT, and both of those sea levels with the additional rise estimated by the NOAA Intermediate High SLR in 2050. The analysis enabled areas of concern to be located within the community's infrastructure.

2. STORMWATER ANALYSIS

2.1 Data Collection

All horizontal data referenced in this analysis uses the Florida State Plane Coordinates of NAD83/11 Florida West Zone and all vertical elevation data is referenced to the NAVD88 vertical datum. Readily available data recorded in the NGVD29 vertical datum was converted to the NAVD88 vertical datum by subtracting 1.08 feet from the NGVD29 elevations (NGVD29 - 1.08 ft = NAVD88).

Survey

Kimley-Horn contracted with Hyatt Survey Services, Inc. (Hyatt) to collect data along Gulf of Mexico Drive, General Harris Street, and Penfield Street. Hyatt collected pipe and inlet data between Juan Anasco and De Narvaez Drive on Gulf of Mexico drive and between Norton Street and Marbury Lane on General Harris Street. In addition, elevation data for the ditch/swale that drains a portion of Penfield Street was included in the survey.

SWFWMD Environmental Resource Permits

Kimley-Horn collected a series of permits, plan sets, and as-builts from the Southwest Florida Water Management District's (SWFWMD) Environmental Resources Permit (ERP) database to aid in the development of the ICPR 4 model. Information for the Town's Public Works building (ERP #46212520) and the Christ Church of Longboat Key (ERP #4676061 and #4676062) was available from SWFWMD.

GIS Files

The Town provided GIS data for stormwater conveyance infrastructure *(Stormwater Survey.gdb),* which included inlet / structure and outfall locations, pipe locations, and some additional information regarding the location of check valves. Since the Sleepy Lagoon community is a part of Manatee County, GIS data regarding parcel information, land use, and roadway infrastructure was downloaded from Manatee County's open-source GIS database. A summary of GIS files used for this analysis are as follows:

- Manatee County Parcels
- Manatee County Building Footprint
- Manatee County Roads
- Town of Longboat Key Stormwater Inventory (*StormWaterSurvey.gdb*)
  - Outfalls
  - Pipes
  - Inlets / Structures

Field Data Collection

Kimley-Horn conducted a site visit on May 4, 2022, in Sleepy Lagoon to collect storm grate elevations. Elevations were collected using an EOS Arrow Gold RTK with a survey antenna and a GIS field map. The data was processed using GIS ArcPro Z-Value analysis tool. All the data collected in the field uses NAVD88 vertical datum. Storm grate inverts and sizes collected from the field were used as the primary inputs into the Kimley-Horn ICPR4 model.

A second site visit was conducted on May 18, 2022, to document the high tide event occurring at approximately 2 pm. The event was recorded at elevation 1.80 feet NAVD88 and was used to evaluate the Sleepy Lagoon roadways for sunny day flooding conditions.

2018 DEM

The 2018 Florida Peninsular Digital Elevation Model (DEM) was published by USGS on the USGS Science Base-Catalog and is in the vertical datum of NAVD88. The data collection for the DEM was conducted from November 2018 to January 2019; thus, the DEM does not include topographical changes that took place after January 2019.

Finish Floor Elevation Certificates

The Town provided Kimley-Horn with available Elevation Certificates (EC). In the Sleepy Lagoon community, 58 parcels have an Elevation Certificate with dates of certification beginning in 1990. The certificates provide verification of the lowest floor elevations in relation to the BFE in the vicinity.

Sea Level Projection Data

The 2017 NOAA SLR Projections (Intermediate High) were utilized in this stormwater analysis. The closest NOAA tidal benchmark station to the project area is 8726520 – St. Petersburg, FL. See Figure 2, Figure 3, and Table 1 below for inputs and projection data.

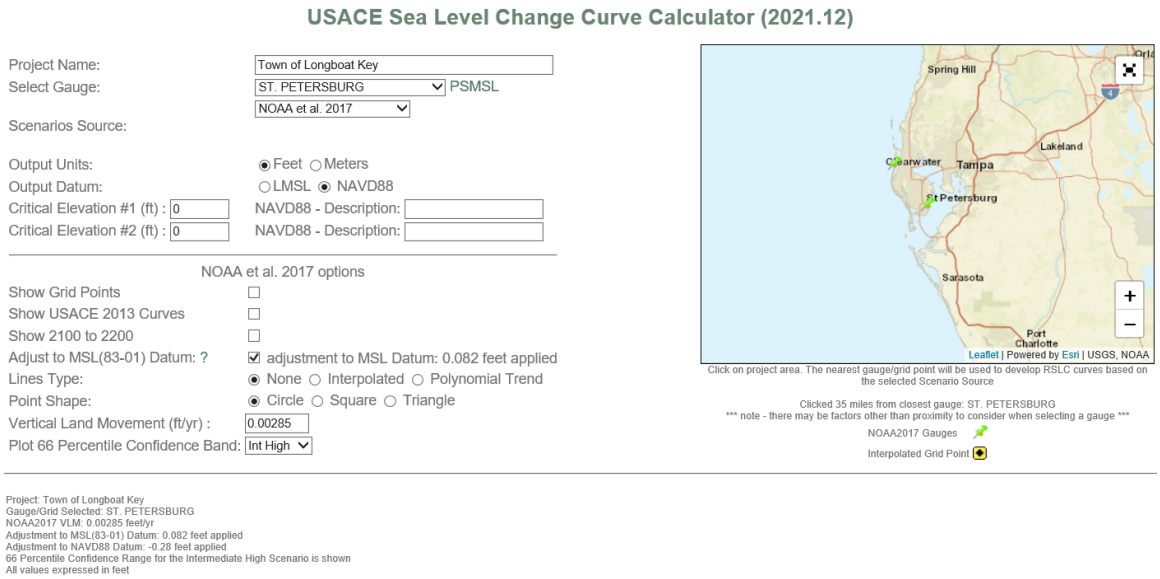


Figure 2: US Army Corps of Engineers data inputs.

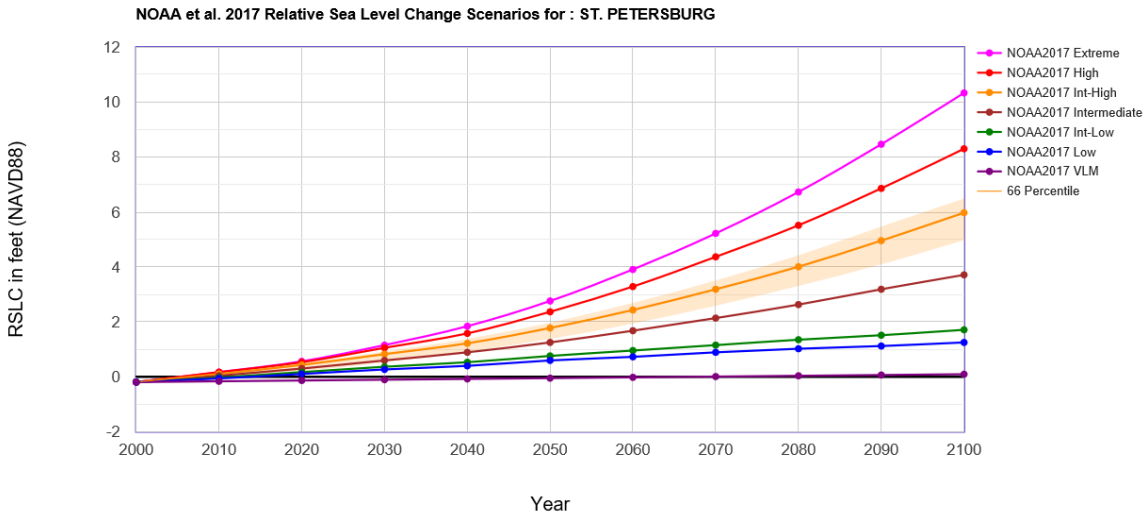


Figure 3: NOAA 2017 Relative Sea Level Change data.

Table 1: NOAA 2017 Sea Level Change Data

Town of Longboat Key
Scenarios for ST. PETERSBURG
NOAA2017 VLM: 0.00285 feet/yr
All values are expressed in feet

Year	NOAA2017 VLM	NOAA2017 Low	NOAA2017 Int-Low	NOAA2017 Intermediate	NOAA2017 Int-High	NOAA2017 High	NOAA2017 Extreme
2000	-0.19	-0.19	-0.19	-0.19	-0.19	-0.19	-0.19
2010	-0.16	-0.06	-0.03	0.04	0.10	0.17	0.17
2020	-0.14	0.10	0.17	0.30	0.43	0.53	0.56
2030	-0.11	0.27	0.36	0.59	0.82	1.05	1.15
2040	-0.08	0.40	0.53	0.89	1.22	1.58	1.84
2050	-0.05	0.59	0.76	1.25	1.78	2.37	2.76
2060	-0.02	0.73	0.95	1.68	2.43	3.28	3.91
2070	0.01	0.89	1.15	2.14	3.19	4.37	5.22
2080	0.03	1.02	1.35	2.63	4.01	5.52	6.73
2090	0.06	1.12	1.51	3.19	4.96	6.86	8.47
2100	0.09	1.25	1.71	3.71	5.97	8.30	10.34

2.2 Hydraulic and Hydrology Modeling

The stormwater modeling for this analysis was conducted using Interconnected Channel and Pond Routing, Version 4 (ICPR4). This model was created from scratch and includes the project area and the surrounding areas that drain through the project. Using the 2018 DEM, survey data, Town of Longboat Key Stormwater Inventory (*StormWaterSurvey.gdb*), and field collected data; basins, nodes, and links were placed to best represent the existing drainage patterns. To analyze the model, four design storm events and three boundary stage conditions were used to emulate a storm and tidal event occurring at the same time. The results were then used to create several GIS maps exhibiting flooding in the design scenarios.

Basin Delineation

Using the 2018 LiDAR data and the locations of the stormwater inlets, drainage basins were delineated to represent the existing conditions in the Sleepy Lagoon community. Basins for the Christ Church of Longboat Key, the Town's Public Works building, and General Harris Street were delineated using as-built plans obtained from SWFWMD. While the other roads within the community all followed the same delineation strategy, where the back half of each housing lot was assumed to drain directly into the canals, while the front halves were assumed to drain into the roadway. From there the basins were further divided based upon the storm inlets, swales, and the location of high points in the roadway.

Schematic Design and Input

Kimley-Horn developed the required parameters for the basins including curve numbers (CN) and time of concentration (Tc) based upon the methodology described in TR-55. Boundary conditions were added and are representative of various sea level elevations. Mean Higher-High Water (MHHW) level was used as the standard condition for this analysis. MHHW elevation was obtained by the NOAA Tidal Benchmark using station 8726384 – Port Manatee, FL and all elevations were converted to NAVD88 vertical datum.

Grate inlets were modeled as two nodes. One node represents the top of grate and the storage in the basin, and a second node represents the box. Specific dimensions for the inlet grates were used to model restricted flow from the surface into the conveyance system. Pipes in the Sleepy Lagoon community with check valves that prevent salt water from back flowing up through the inlets were modeled in ICPR4 as positive flow only, meaning water could only flow out through the conveyance system.

Design Storms

For this analysis, the 25-Year/24-Hour rainfall event was used with four boundary conditions. The cumulative rainfall data was retrieved from the SWFWMD Applicant Handbook II and is provided in Table 2.

Table 2: Design Storm Event

Reoccurrence Interval (Years)	Duration (Hours)	Cumulative Rainfall (Inches)	Rainfall Distribution
25	48	8.0	SCS Type II FL Modified

Observed High Tide (OHT) elevations are from a site visit with information coming from NOAA Tides and Currents station 8726384 – Port Manatee, FL for May 18th, 2022. The 2050 SLR projection is based on the intermediate high of station 8726520 – St. Petersburg and was added to both the MHHW and the OHT to create the other two tidal scenarios. The boundary conditions are in Table 3.

Table 3: 25YR-24hr Boundary Stage Conditions

Boundary Condition	Elevation (ft)*
MHHW	0.6
OHT	1.8
MHHW + 2050 SLR	2.4
OHT + 2050 SLR	3.6

* All Elevations are in NAVD88

2.3 Floodplain and Inundation Mapping

Kimley-Horn developed GIS maps to illustrate the flooding extent for both tidal and rainfall events. These maps utilized ArcGIS Pro and the 2018 Florida Peninsular DEM to create polygons that identify areas of standing water in each scenario.

Inundation Maps

Inundation maps were created to visualize the extent to which the Sleepy Lagoon community was flooding with salt water during various high tide events. Inundation maps, or tidal flooding maps, were created for the OHT, MHHW + 2050 SLR, and OHT + 2050 SLR. Inundation Mapping is provided in ***Appendix A***. A tidal event equal to the observed high (1.8 ft) resulted in flooding in every street in Sleepy Lagoon except for Juan Anasco Drive. The MHHW + 2050 SLR of an elevation of 2.4 ft resulted in major flooding in all streets within the community. While the OHT + 2050 SLR of an elevation of 3.6 ft further increased flooding and nearly inundated the entire community. The combined inundation map (Map A-4) shows the progression of flooding within the community across the different conditions.

Floodplain Maps

Floodplain maps were created based upon the ICPR4 model results using the 25-Year/24-Hour Design Storm with the four boundary conditions listed above. The maps are provided in ***Appendix B***. Each storm simulation resulted in flooding that affected every road in the community, even with the boundary condition set at the lowest value of 0.6 ft. The 25-Year/24-Hour Design Storm with the highest boundary condition of 3.6 ft resulted in nearly the entire community impacted by some amount of standing water both in the road right-of-way and on private property.

3. PROJECT RECOMMENDATIONS

To mitigate and adapt to current and future threats to infrastructure from storm events, sea level rise, and tidal influences, implementation of mitigation strategies can increase resiliency and reduce flood risk.

3.1 General Projects

Kimley-Horn has developed a list of recommended mitigation strategies to reduce flood risk and potentially improve water quality for the surface water discharging to the Sarasota Bay and ultimately the Gulf of Mexico. General mitigation strategies that could be applied within the Kimley-Horn project area are as follows:

Road reconstruction: Using the available topographic data, roadways are evaluated for elevation and reconstruction. Looking at the adjacent properties, King Tide, and SLR data, maximum elevations are set to improve access and the effectiveness of the conveyance system. As SLR progresses, future road elevation and reconstruction may be needed. With elevation of the roadway, the function of the check valves will also improve providing additional access improvement.

Additional inlets: Install additional inlets along roadway right-of-way where ponding occurs to provide a flow path for surface water runoff / ponding areas. Additional inlets increase underground storage capacity for storm runoff but may be dependent on the tide / tailwater conditions. Added inlets are incorporated in the road reconstruction projects.

Modular / Linear Wetland systems: Provides runoff volume reduction, water quality/nutrient removal, and vegetative buffers, see Figure 4, Figure 5, and Figure 6. Addition of modular / linear wetlands will be constrained by road right-of-way.

Figure 4: Modular / Linear Wetland System Schematic

Figure 5: Installed Modular / Linear Wetland System

Figure 6: Installation of Modular / Linear Wetland System

Tree Box Filters: Provides water quality / nutrient removal, stormwater runoff storage, and room for tree growth. Trees along roadways provide traffic calming, increase

pavement life, and reduce impact of urban heat islands. Besides the storage in the box, tree canopies also capture a portion of the rainfall volume. In addition, tree boxes capture debris and prevent the debris from entering receiving water bodies. Additional routine maintenance is required to clear captured debris from the tree boxes. With limited right-of-way in the Sleepy Lagoon community, tree box filters would be a use for private properties and could be promoted through an incentive program. See Figure 7 below.

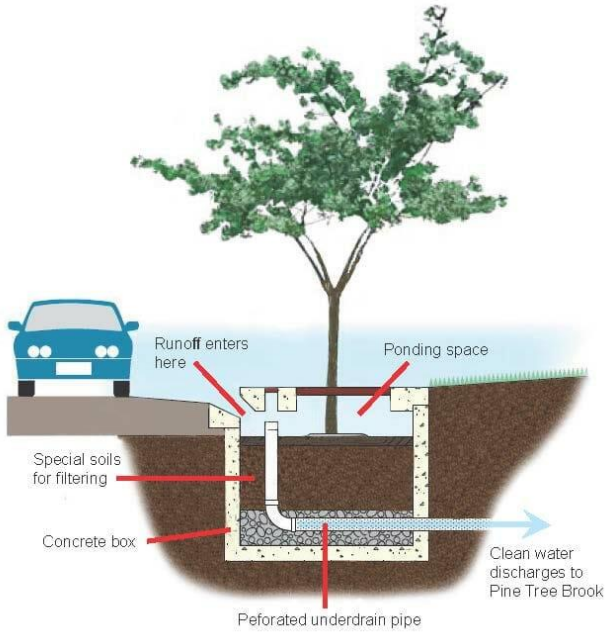


Figure 7: Tree Box Filter

Bioswales / Rain Gardens: Bioswales and Rain Gardens provide some flood control and water quality improvement benefit. Bioswales are depressional areas that collect and retain surface water runoff. Through natural percolation / infiltration, evapotranspiration, and a defined outfall system, the bioswale recovers the storage volume. A Rain Garden is also a depressional area that relies solely on the natural percolation / infiltration and evapotranspiration to recover the storage volume. With limited right-of-way in the Sleepy Lagoon community, bioswales and rain gardens would be a use for private properties and could be promoted through an incentive program.

Cisterns / Rain Barrels: Cisterns and rain barrels are storage containers that collect rainwater, often from roofs via downspouts, that hold a small volume of water. The benefits of cisterns and rain barrels include the reduction of rainfall runoff collecting in the streets and the water collected can be used for irrigation. Cisterns and rain

barrels would be a use for private property owners and could be promoted through an incentive program.

As SLR progresses, these applications may become less effective. In the development of plans, consideration should be made for expected project life cycle when selecting from these options.

3.2 Conceptual Recommendations to Address SLR and King Tide

Kimley-Horn recommends a seawall analysis to develop a plan to address impacts of SLR and King Tides.

Seawall Analysis and Improvements: Evaluate the existing seawalls to determine condition, ownership (public or private), and elevation to develop the CIP for elevating seawalls. The analysis should evaluate property rights and limitations, additional ordinance changes, set back requirements, upland stormwater drainage needs, upstream flooding and seawall construction code requirements, including material and modular system requirements. The Town may consider development and adoption of a seawall ordinance that includes a minimum seawall height; a maximum seawall height differential from neighboring properties; and enforcement mechanisms. Additionally, the Town may consider establishing a timeline to have all seawalls in compliance, evaluate incentive programs, explore the creation of a MSBU or MSTU to fund a seawall elevation project, and redevelopment of requirements for property owners with private seawalls.

3.3 General Projects to Address SLR and King Tide

The general mitigation strategies below could be implemented anywhere within the project boundary or other areas in the Town as deemed necessary:

Hardened Pump Stations: Elevation and reconstruction of roadways in Sleepy Lagoon will provide an initial adaptive phase. Over time, the addition of small, localized pump stations can provide a secondary level flood protection to supplement the road reconstruction benefits for both public and private property. Small pump stations would have the capability to reduce the depth and duration of roadway flooding with raised electrical equipment above the Base Flood Elevation.

The effectiveness and efficiency of the pump stations would be limited by the seawall elevations / overland flow connections between the road right-of-way and the Sarasota Bay. Pump stations can be installed in areas with existing point source discharges to the receiving waters and surrounding drainage areas can be routed to the pump station for piped discharge to the receiving water. The pump stations may be evaluated separately, or in coordination with future roadway elevation phases.

Check Valves: Maintenance of check valves at outfalls will mitigate backflow of tidal waters into the system and increases underground storage capacity in system for storm runoff. Replacement / addition of check valves or inline check valves provides additional protection from tidal / salt waters. Inline check valves may facilitate the maintenance and reduce long term maintenance costs; however, inline check valves may require larger junction boxes to facilitate maintenance and replacement. The maintenance effectiveness verses the additional costs and space requirements will need to be evaluated prior to using inline check valves. Check valves would be implemented and maintained by the Town in the public stormwater management system. See Figure 8 below.

Figure 8: Check Valve

Seawall Improvements: Raising seawalls would provide greater resilience to wave action and storm surge. A seawall analysis would need to be completed and the Town would need to determine a cost-effective seawall elevation to meet the Town's Level of Service. Seawall elevation would be the responsibility of each property owner as the seawalls are on private property. The Town can implement enforcement mechanisms to require seawall elevation when certain circumstances trigger the enforcement or under a Special Assessment District with the Town coordinating a capital improvement project to elevate all seawalls at one time.

3.4 Sleepy Lagoon Capital Projects

The recommended Sleepy Lagoon Capital Projects are road reconstruction projects and were identified for the community based on the low elevation and topography of the roads, the limited right-of-way, and projected SLR. Road reconstruction is proposed to elevate the roads to an edge of pavement elevation of 2.4 NAVD88 and a road crown elevation of 2.6 NAVD88.

During the design phase careful attention to the finished floor elevations of adjacent homes is critical to set the final grade of the road. Considerable coordination will be necessary with each property owner to ensure the elevation change does not adversely impact the private properties. The elevation of the roadway will create a greater head differential to improve the function of check valves. While the road elevation projects will provide relief from sunny day flooding (King Tides), the improvements will have limited benefits during extreme weather events, storm surge and hurricanes.

The Sleepy Lagoon community has very narrow right-of-way with a 25-foot-wide right-of-way dedicated for most streets. With these right-of-way constraints, the projects will require temporary construction easements from every property to allow for grading to tie back to existing elevations. The activities that will be required in the temporary construction easements driveway reconstruction, grading, and landscaping. In addition, utility adjustments and other property specific activities may be necessary in the temporary construction easements.

In addition to the temporary construction easements along the road right-of-way, additional permanent utility and drainage easements may be required at some locations to be determined during design (parallel to side lot lines and possibly adjacent to the roadside for inlets or utilities) to optimize the stormwater management system and provide for future access to maintain the system. Full commitment by all the property owners along each road will be necessary to construct the roadway elevation projects.

Proposed Capital Improvement Projects and the opinions of probable cost for identified projects are included in ***Appendix C.*** The road reconstruction for the Sleepy Lagoon community has been divided into four phases. Project phasing is based on the elevations for the project areas in the Stormwater Inventory (*StormWaterSurvey.gdb*); the 2018 Florida Peninsular DEM published by USGS; spot elevations at inlets collected during the May 4, 2022, site visit; and comments provided during the public engagement period. The project phasing also accounted for the interim construction phases such that construction of a phase should have minimal adverse impact to areas in the future phases:

Phase 1 - Norton Street - Road Reconstruction

In reviewing the available data, Norton Street was identified as the street with the lowest elevation and highest susceptibility to SLR, King Tide flooding, and standing water during rainfall event that are concurrent with a high tide. The lowest elevation on Norton Street is at 1.1 NAVD88. During the public engagement phase, submitted comments identified five (5) specific properties and four comments were made on Norton Street on the interactive map. In addition, several pictures and anecdotal information was provided by residents on Norton Street. The road reconstruction

project will elevate the road by up to 1.3 feet at the edge of pavement and elevation of the road will vary depending on existing grade. A stormwater management system of inlets and pipes will be designed to provide an efficient, positive outfall for the roadway. ***See Figure C-1 in Appendix C***.

Phase 2 - Bayview Drive and Penfield Street - Road Reconstruction

The lowest elevation on Bayview Drive is at 1.1 NAVD88. Submitted comments identified three (3) specific properties and one (1) comment was made on Bayview Drive on the interactive map. The road reconstruction project will elevate the Bayview Drive by up to 1.3 feet and elevation of the road will vary depending on existing grade.

On the east side of Bayview Drive near the north end of the road, there is a low-lying parcel / area allowing overland flow for the bay. This area is lower that some high tides and sunny day flooding is observed. The road reconstruction design should evaluate and include improvements to limit the overland flow.

The lowest elevation on Penfield Street is at 1.4 NAVD88. During the public engagement phase, submitted comments identified one (1) specific property and no comments were made on Penfield Street on the interactive map. The road reconstruction project will elevate the Penfield Street by up to 1.1 feet and elevation of the road will vary depending on existing grade.

On the east side of Penfield Street near the intersection with General Harris Street, there is a low-lying undeveloped parcel / area allowing overland flow for the bay. This area is lower that some high tides and sunny day flooding is observed. The road reconstruction design should evaluate and include improvements to limit the overland flow. ***See Figure C-2 in Appendix C***.

Phase 3 - General Harris Street and Marbury Lane - Road Reconstruction

The lowest elevation on General Harris Street is at 1.5 NAVD88 General Harris Street as a wider right-of-way with swales along the roadway where standing water can be observed during high tides. During the public engagement phase, one (1) comment was made on the interactive map. Several anecdotal comments were provided by residents regarding flooding along General Harris Street especially regarding standing water. The road reconstruction project will elevate the Bayview Drive by up to 0.9 feet and elevation of the road will vary depending on existing grade. Along General Harris Street there are low lying locations where overland flow occurs. These areas are lower that some high tides and sunny day flooding is observed. The road reconstruction design should evaluate and include improvements to limit the overland flow.

The lowest elevation on Maybury Lane is at 1.3 NAVD88. During the public engagement phase, submitted comments identified five (5) specific properties and five (5) comments were made on Maybury Lane on the interactive map. The road reconstruction project will elevate the Maybury Lane by up to 1.1 feet and elevation of the road will vary depending on existing grade. ***See Figure C-3 in Appendix C***.

Phase 4 - De Narvaez Drive and Juan Anasco Drive - Road Reconstruction

The lowest elevation on De Narvaez Drive is at 1.3 NAVD88. During the public engagement phase, submitted comments identified one (1) specific property and no comments were made on De Narvaez Drive on the interactive map. The road reconstruction project will elevate the Bayview Drive by up to 1.1 feet and elevation of the road will vary depending on existing grade.

The lowest elevation on Juan Anasco Drive is at 1.9 NAVD88. No properties were identified, and no online comments were made on Juan Anasco Drive on the interactive map. The road reconstruction project will elevate the Juan Anasco Drive by up to 0.5 feet and elevation of the road will vary depending on existing grade. ***See Figure C-4 in Appendix C***.

For the Opinion of Probable Cost (OPC), Phase 4, the Phase 4A cost estimate was developed based on the same reconstruction methodology as Phases 1, 2, and 3. The cost is presented in ***Table 4*** as Phase 4A. Phase 4B cost estimate was developed as a milling and resurfacing option with targeted road reconstruction for lower areas in the roadway and the cost estimate is presented in ***Table 4*** as Phase 4B. Estimates were within $60,000 and a more detailed look at the alternatives may reduce costs, but the roads would benefit from the construction of the stormwater management system (inlets and pipes) to provide a positive outfall for stormwater runoff. The Phase 4A and Phase 4B cost estimates both include construction of a stormwater management system.

4. OPINION OF PROBABLE COSTS

In Table 4, a summary of the Opinion of Probable Costs for the Sleepy Lagoon Capital Projects – Phase 1 through 4. For Phase 4, two options were evaluated for cost – full reconstruction of the road with elevation is listed as Phase 4A. Phase 4B considers the cost of milling and resurfacing with just added fill to elevate the roadway without reconstruction of the base as part of the project.

Table 4: Summary of Phase 1 – 4 Opinion of Probable Costs

SUMMARY - OPINION OF PROBABLE CONSTRUCTION COSTS				
ITEM	**DESCRIPTION**	**QTY**	**UNIT**	**AMOUNT**
SLEEPY LAGOON CAPITAL PROJECTS - ROAD RECONSTUCTION				
Phase 1	Norton Street	1	LS	$1,351,526.02
Phase 2	Bayview Drive and Penfield Street	1	LS	$1,861,233.58
Phase 3	General Harris Street and Maybury Lane	1	LS	$1,715,475.32
Phase 4A	De Narvaez Drive and Juan Anasco Drive - Reconstruction	1	LS	$1,152,230.50
Phase 4B	De Narvaez Drive and Juan Anasco Drive - Mill and Resurface	1	LS	$1,095,583.97
Note: Costs developed based on FDOT Historical Item Averages Statewide 6-Month Revolving Cost Information as of May 31, 2022, with contingency added.				
Disclaimer: The Engineer has no control over the cost of labor, materials, equipment, or over the Contractor's methods of determining prices or over competitive bidding or market conditions. Opinions of probable costs provided herein are based on the information known to Engineer at this time and represent only the Engineer's judgment as a design professional familiar with the construction industry. The Engineer cannot and does not guarantee that proposals, bids, or actual construction costs will not vary from its opinions of probable costs.				

For alternative projects requiring improvements on private properties, Table 2 of unit costs had been provided. While these projects are generally anticipated for private properties, there may be opportunities in public areas to incorporate these options.

Seawall improvements are a potential alternative project but will require additional data collection and analysis to develop a project approach and associated cost estimate.

Table 5: Unit Costs for Alternative Projects

SUMMARY - OPINION OF PROBABLE CONSTRUCTION COSTS UNIT COSTS FOR ALTERNATIVE PROJECTS					
ITEM	**DESCRIPTION**	**QTY**	**UNIT**	**UNIT PRICE**	**AMOUNT**
CHECK VALVES					
1	Flap Gate, Size Varies (Installed)	1	EA	$23,000.00	$23,000.00
LINEAR WETLANDS (PER LOCATION)					
1	Regular Excavation (3' depth)[1]	100	SY	$14.00	$1,400.00
2	Linear Wetland Prefabricated	1	LS	$25,000.00	$25,000.00
3	Landscape Complete - Small Plants	1	LS	$3,200.00	$3,200.00
				SUBTOTAL	**$29,600.00**
TREE BOX (PER LOCATION)					
1	Regular Excavation (3' depth)[1]	50	SY	$14.00	$700.00
2	Tree Box	TBD	LS	TBD[2]	TBD[2]
BIOSWALES (PER LOCATION)					
1	Regular Excavation (12" depth)[1]	100	SY	$14.00	$1,400.00
2	Landscape Complete - Small Plants	1	LS	$3,200.00	$3,200.00
				SUBTOTAL	**$4,600.00**
PUMP STATIONS					
1	Small Local Pump Station	1	LS	$20,000.00	$20,000.00
2	Property Acquisition	TBD	LS	TBD[2]	TBD[2]
3	Easement Acquisition	TBD	LS	TBD[2]	TBD[2]
Notes: 1. Costs developed based on FDOT Historical Item Averages Statewide 6-Month Revolving Cost Information as of May 31, 2022, with contingency added. 2. Costs or quantities marked TBD indicate projects that require site-specific information currently unavailable to the Engineer.					
Disclaimer: The Engineer has no control over the cost of labor, materials, equipment, or over the Contractor's methods of determining prices or over competitive bidding or market conditions. Opinions of probable costs provided herein are based on the information known to Engineer at this time and represent only the Engineer's judgment as a design professional familiar with the construction industry. The Engineer cannot and does not guarantee that proposals, bids, or actual construction costs will not vary from its opinions of probable costs.					

5. FUNDING SOURCES

Stormwater services are currently provided using various funding sources including property taxes. Funding sources for the capital improvements to seawalls, roadways, and the stormwater management system may include special assessments based on property benefits.

A dedicated funding source for stormwater management system maintenance and capital improvements provides a funding source that can be reliably leveraged for matching grant funds including Southwest Florida Water Management District Cooperative Funding and Federal Grant programs.

Projects developed for flood control and mitigation need to be added to the Local Mitigation Strategy (LMS) for eligibility of federal funding programs.

In the development of a mitigation and adaptation plan, regional projects will increase funding opportunities. Additional grant opportunities may be available for improvements for emergency management ingress and egress.

6. STORMWATER UTILITY

Many communities have elected to meet their current and future water quality and water quantity management objectives by establishing a stormwater utility. There are over 180 stormwater utilities in the State of Florida. Some communities, such as Sarasota County, have maintained and leveraged stormwater utilities for several decades. Stormwater utilities have proven to be an effective, proactive approach to enhancing maintenance and funding stormwater management programs including water quality and capital improvement programs.

The potential creation of a stormwater utility for the Town of Longboat Key provides an opportunity to address resiliency issues as well as localize flooding. Some specific examples of the benefits to the property owners resulting from the use of a stormwater utility include the following:

Dedicated and stable revenue stream: A dedicated revenue for stormwater management will allow the Town to create a proactive approach to climate resiliency and stormwater management. Communities with a funding source dedicated to stormwater management increase the probability of grant awards as the matching funds are identified and specifically collected for stormwater management efforts. The community can adopt a longer view in planning for capital investments, a proactive maintenance plan, a community resiliency plan, and staff development with a dedicated revenue source rather than year-to-year funding affected by other community priorities.

Proactive System Maintenance: A dedicated revenue stream allows for proactive management of the stormwater system rather than a reactive process to problem solving. The ability to proactively maintain an asset is less costly than making reactive repairs. A proactive approach will result in lower system costs and reduced costs to property owners. Generally, a well-maintained system will provide better performance and reduce stormwater issues within the community.

Collaborative Funding: The dedicated funding source allows communities to take advantage not only of federal, state, and local grants but also opportunities to coordinate with other capital projects including those funded by other agencies such as FDOT or other utilities (water, sewer, etc.) to address stormwater needs in a wholistic project. The collaborative funding approach to projects generally also yields reduced cost for the improvements and minimized disruption for the community.

Financing Capital Projects: The assets resulting from a stormwater improvement project have a long-expected life cycle (30 to 60 years). Communities with stormwater utilities (dedicated funding sources) can use debt financing to fund projects and extend the payment for the construction to the life of the asset. This approach also reduces the one-time impact on property owners to fund significant capital projects by spreading the costs over time and the project benefit cost stays with the property.

Financial Resiliency: A stormwater utility supports financial resiliency. As a special revenue fund, the stormwater utility can build an emergency reserve fund for use in hazard declarations and for unexpected system expenditures. A resilient funding source is becoming an increasingly important aspect of stormwater utilities, due to aging infrastructure and the increase in frequency of extreme weather events.

Increased Equity and Full Participation: A stormwater utility fee is based on the estimated stormwater runoff generated from a parcel o align the fee with the use of the stormwater system rather than based on the property value. Use of property taxes for stormwater management programs excludes tax-exempt properties from contributing monetarily to stormwater management. A stormwater utility can include all properties that contribute runoff to the stormwater system. This can result in more contributing properties and reduces stormwater management costs to all property owners.

Improved Transparency and Accountability: Property owners benefit from a dedicated funding source for stormwater management knowing that fees are exclusively for the maintenance, management, and improvements to the stormwater system.

7. CONCLUSION

Mitigation and adaptation strategies are designed to increase resiliency, but the prioritization and order of execution is critical to that success. The mitigation and adaptation recommendations suggested in this report will provide benefit to transportation mobility, emergency access to the community, and private property preservation. Table 6 below summarizes the discussed strategies for rainfall events, SLR, High Tides (King Tide), and identifies those strategies that provide a water quality benefit and improved mobility.

Table 6: Mitigation and Adaptation Strategies

	Application		Mitigation			Adaptation	
Strategy	Public	Private	Rainfall Events	Water Quality	Improved Mobility	Sea Level Rise	King Tide
Road Reconstruction	X		X		X	X	X
Additional Inlets	X		X		X		
Linear Wetlands	X		X	X			
Tree Box Filters*	X	X	X	X			
Bioswales / Rain Gardens*	X	X	X	X			
Cisterns / Rain Barrels		X	X	X			
Pump Stations*	X	X	X		X	X	X
Check Valves	X				X	X	X
Seawall Improvements		X				X	X

**Public applications may be limited by available right-of-way and / or easements.*

Kimley-Horn has categorized the recommendations in this report into first and second priority. First priority recommendations are items that can proceed immediately and are needed to proceed with second priority recommendations. Second priority recommendations are projects that can be completed within 5 years and will generate an immediate benefit. See Table 7 for the priority recommendations.

Table 7: Priority Recommendations

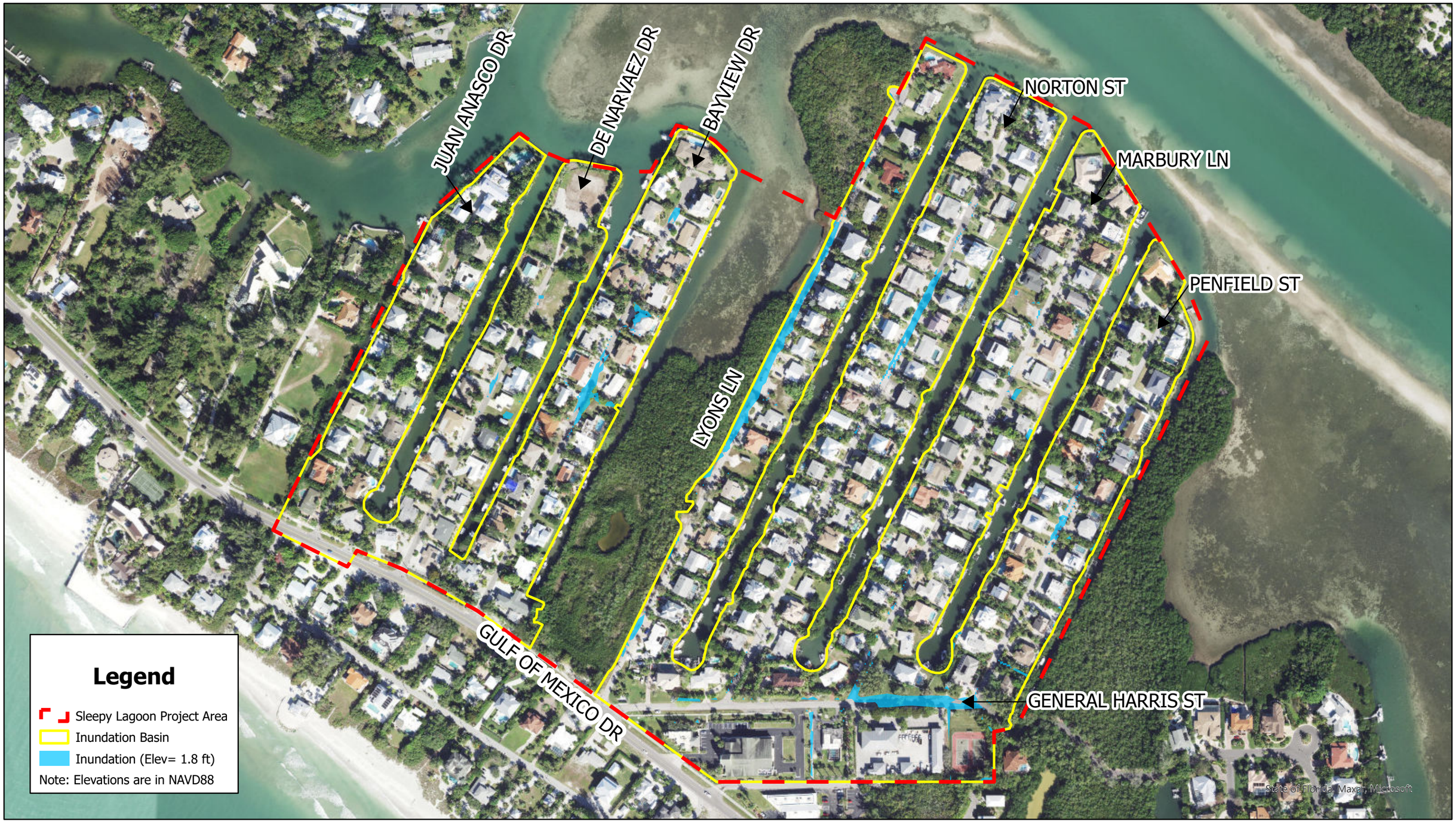
First Priority (0-2 Years)	Second Priority (0-5 Years)
Condition assessment and maintenance for existing check valves / install check valves	Seawall evaluation for condition and elevation assessment
Develop existing conditions models for critical areas of the Town	Road reconstruction / stormwater management system upgrades (additional inlets / conveyance pipes)
Desktop verification of the existing Stormwater Inventory geodatabase (*StormWaterSurvey.gdb*) including pipe inverts, sizes, and material with available data	Augment the Stormwater Inventory geodatabase (*StormWaterSurvey.gdb*) including pipe inverts, sizes, and material with survey where data is not available
Implement stormwater utility program for dedicated capital improvement and maintenance fund source / identify matching grant funds	Develop guidance document to promote private improvements to stormwater management (bioswales / raingardens / tree wells) to mitigate backdoor events from private infrastructure

As more communities are threatened by climate threats such as sea level rise and storm intensification the Town can capitalize on available grant funding to address the needs in the Town to maintain a safe and prosperous future for its citizens and businesses.

REFERENCES

1. NOAA Tides & Currents. (n.d.). Retrieved from https://tidesandcurrents.noaa.gov/map/index.html?region=Florida
2. NOAA Sea Level Change Curve Calculator. (n.d.). Retrieved from https://coast.noaa.gov/digitalcoast/tools/curve.html
3. NOAA Tidal Datums. (n.d.). definitions Retrieved from https://tidesandcurrents.noaa.gov/datum_options.html

APPENDIX A: INUNDATION MAPS



Observed High Tide Inundation

Sleepy Lagoon

August 2022

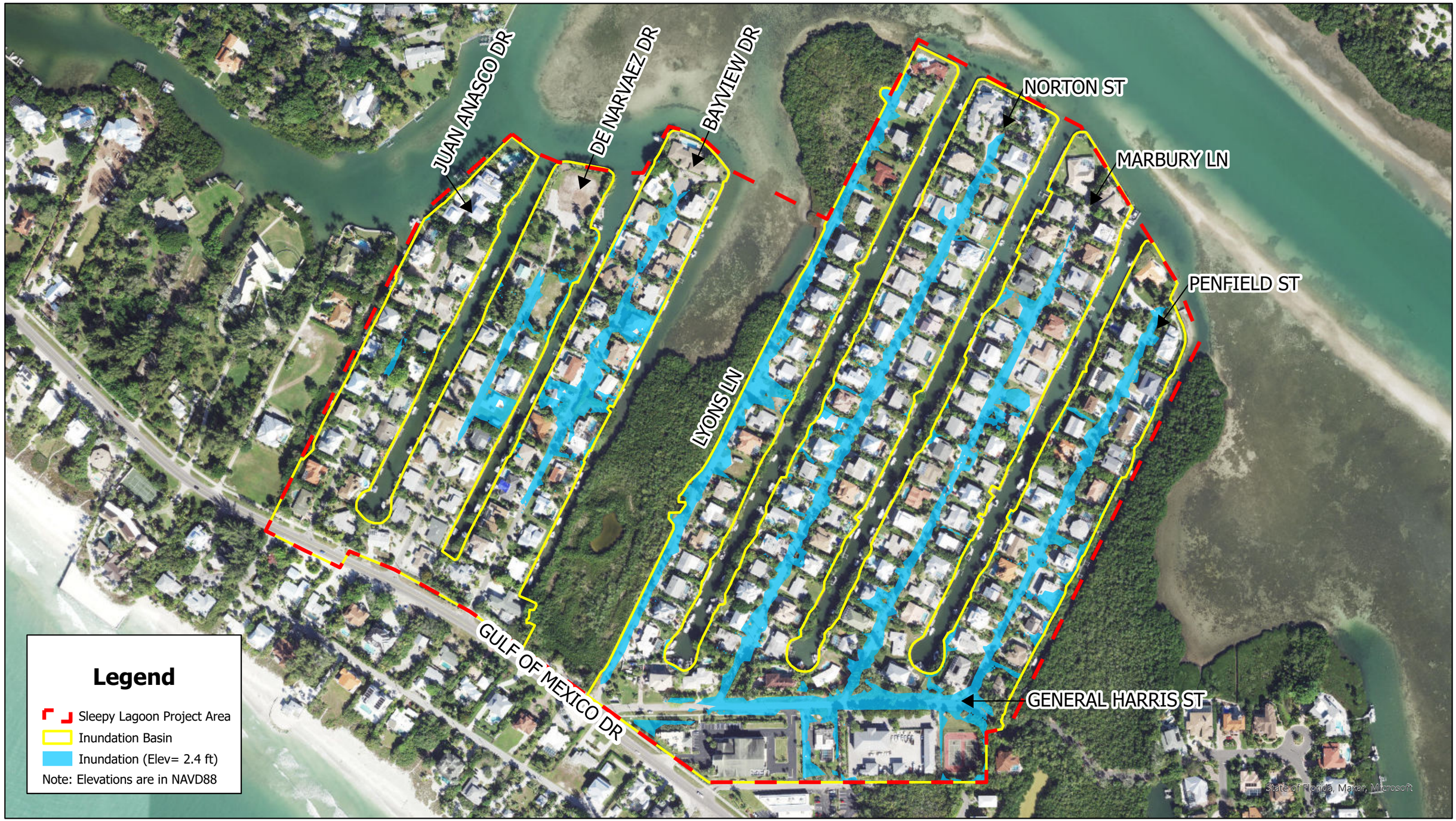
Town of Longboat Key

0 100 200 400 Feet

N

Kimley»Horn

A-1



MHHW + 2050 SLR (Intermediate High)

Sleepy Lagoon

August 2022

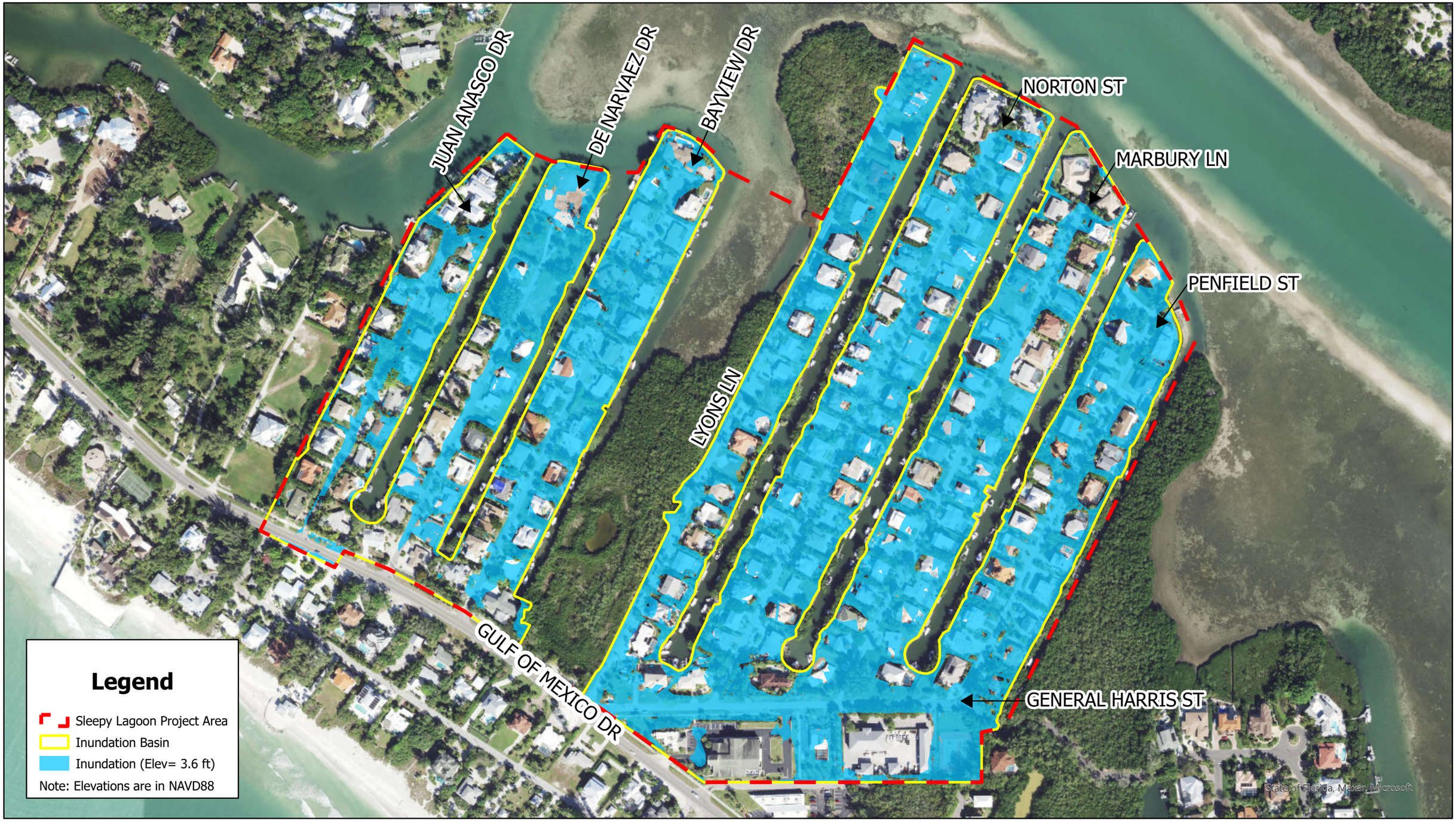
Town of Longboat Key

0 100 200 400 Feet

N

Kimley»Horn

A-2



Observed High Tide + 2050 SLR (Intermediate High)

Sleepy Lagoon

August 2022

Town of Longboat Key

0 100 200 400 Feet

N

Kimley»Horn

A-3

Combined Inundation Map

Sleepy Lagoon

August 2022

Town of Longboat Key

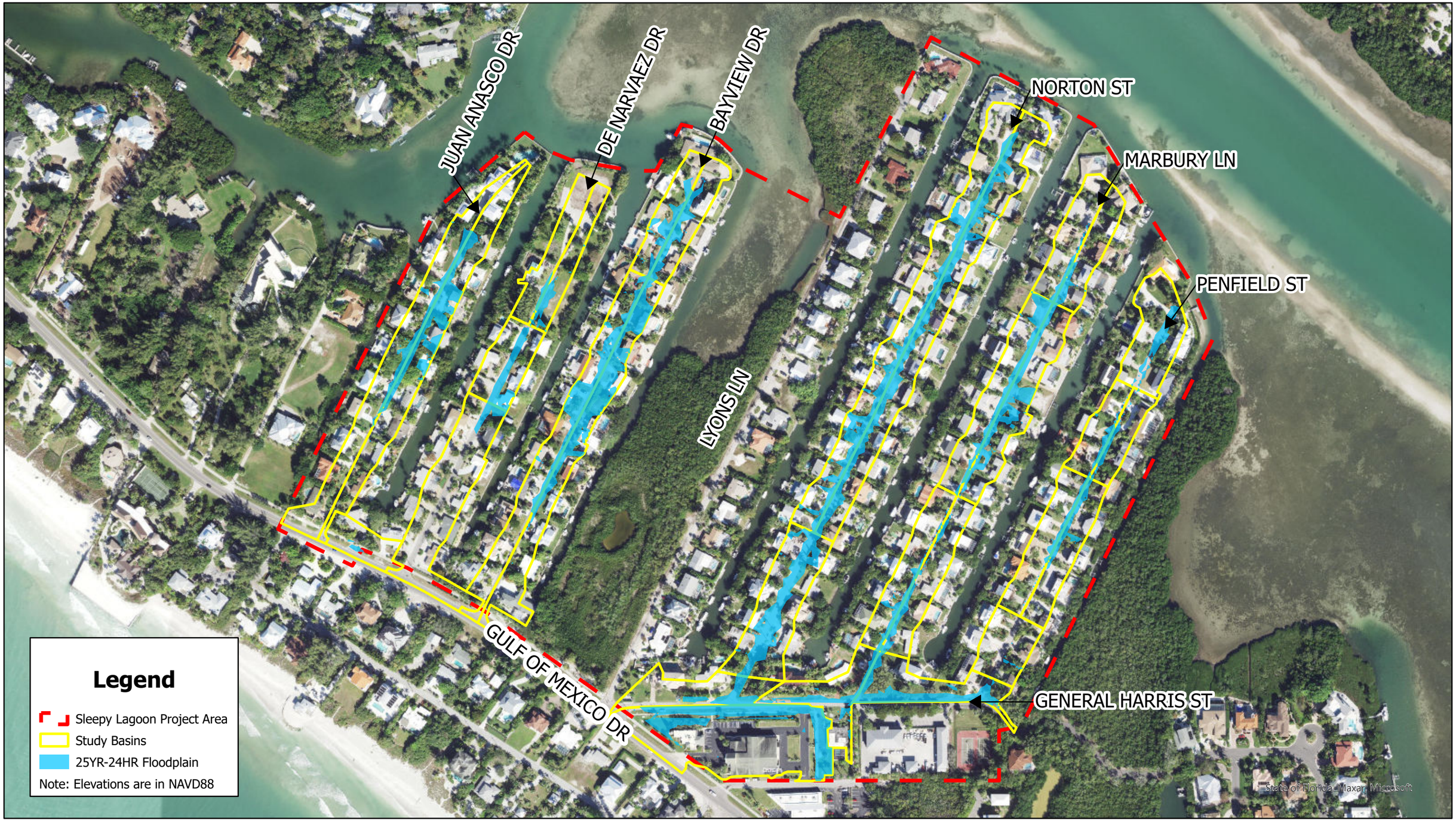
0 100 200 400 Feet

N

Kimley»Horn

A-4

APPENDIX B: FLOODPLAIN MAPS



25YR-24HR Storm w/ MHHW of 0.6 ft

Sleepy Lagoon

August 2022

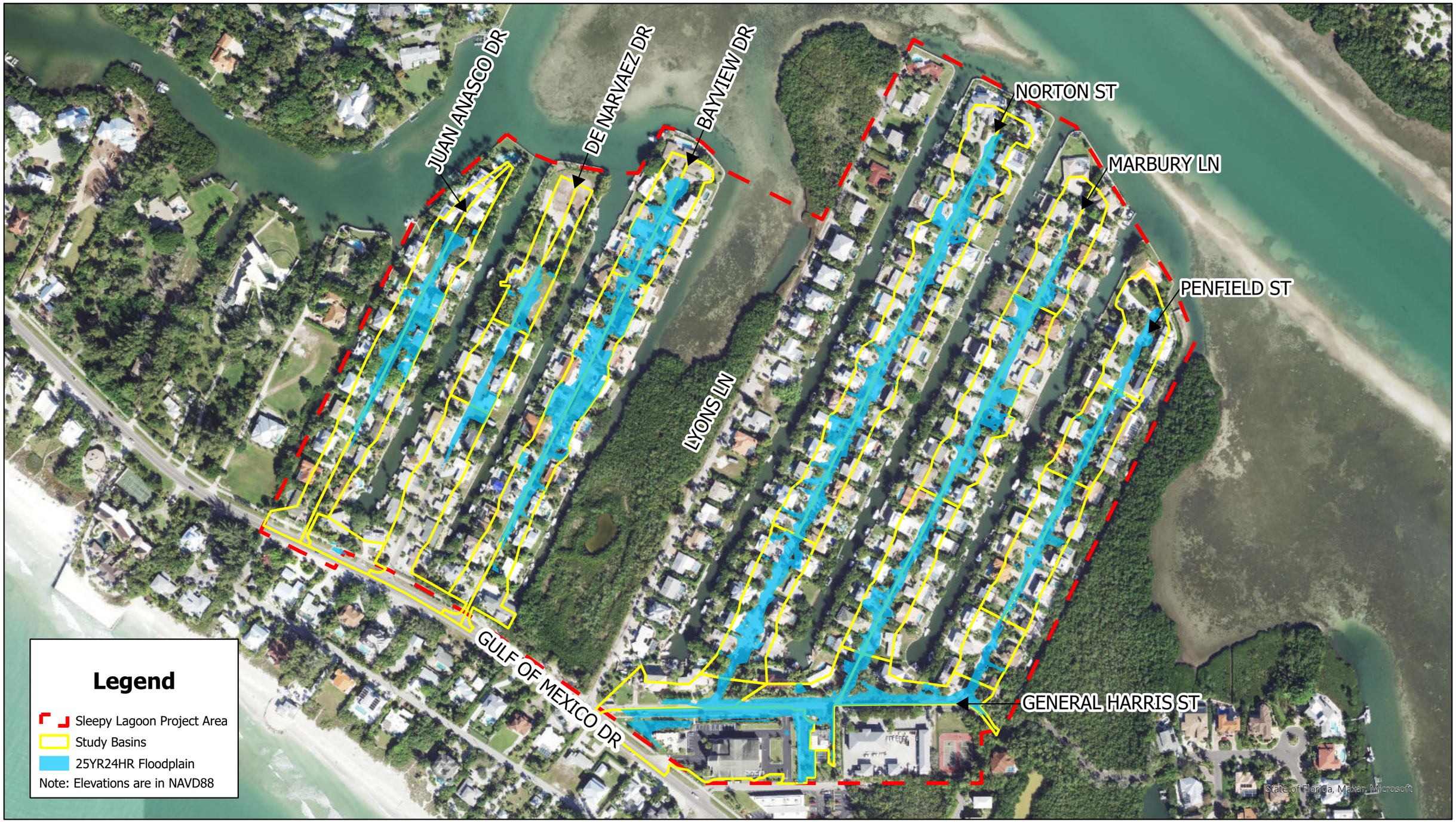
Town of Longboat Key

0 100 200 400 Feet

N

Kimley»Horn

B-1



25YR-24HR Storm w/ Observed Tide

Sleepy Lagoon

August 2022

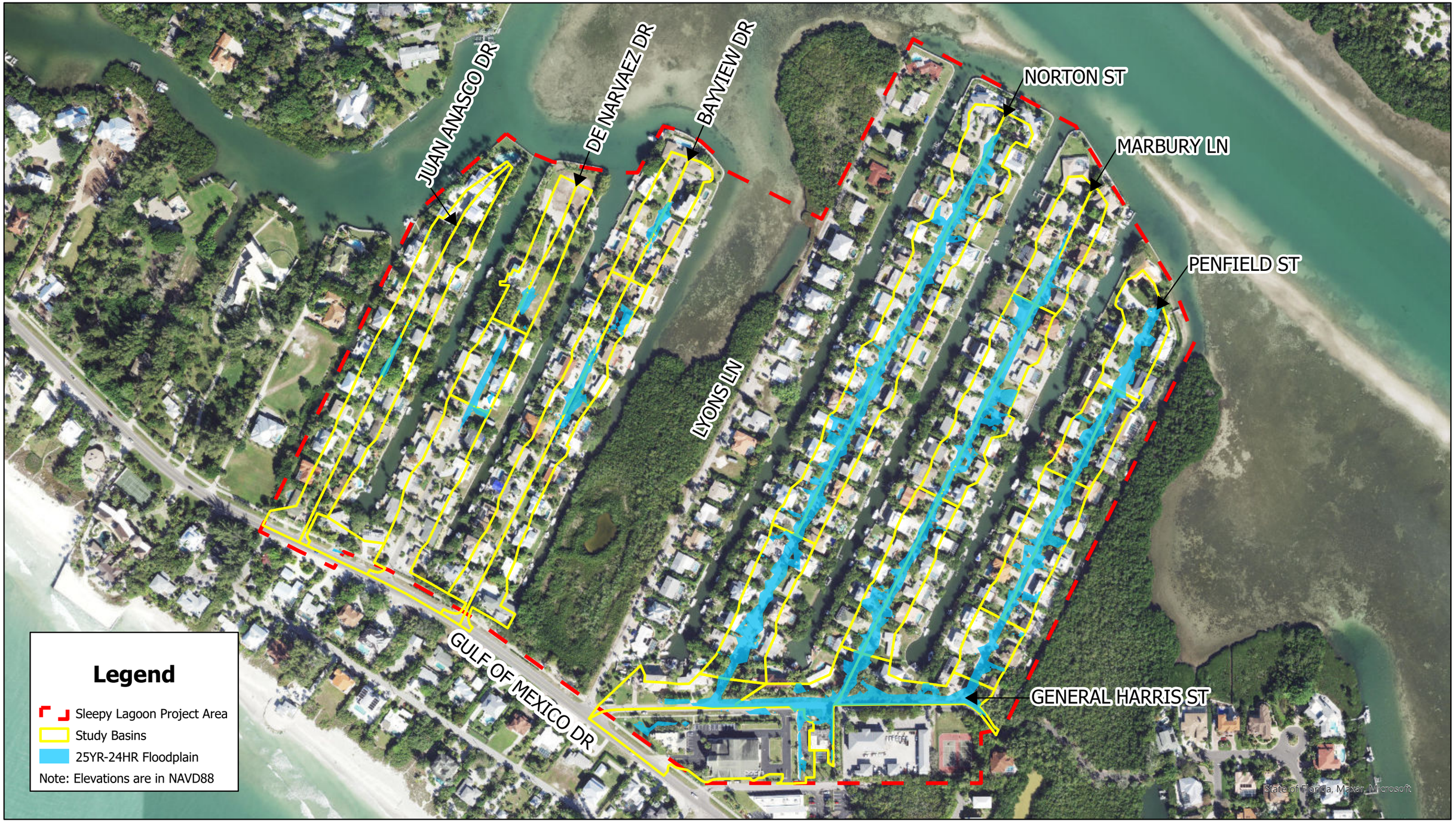
Town of Longboat Key

0 100 200 400 Feet

N

Kimley»Horn

B-2



25YR-24HR Storm w/ MHHW + 2050 SLR

Sleepy Lagoon

August 2022

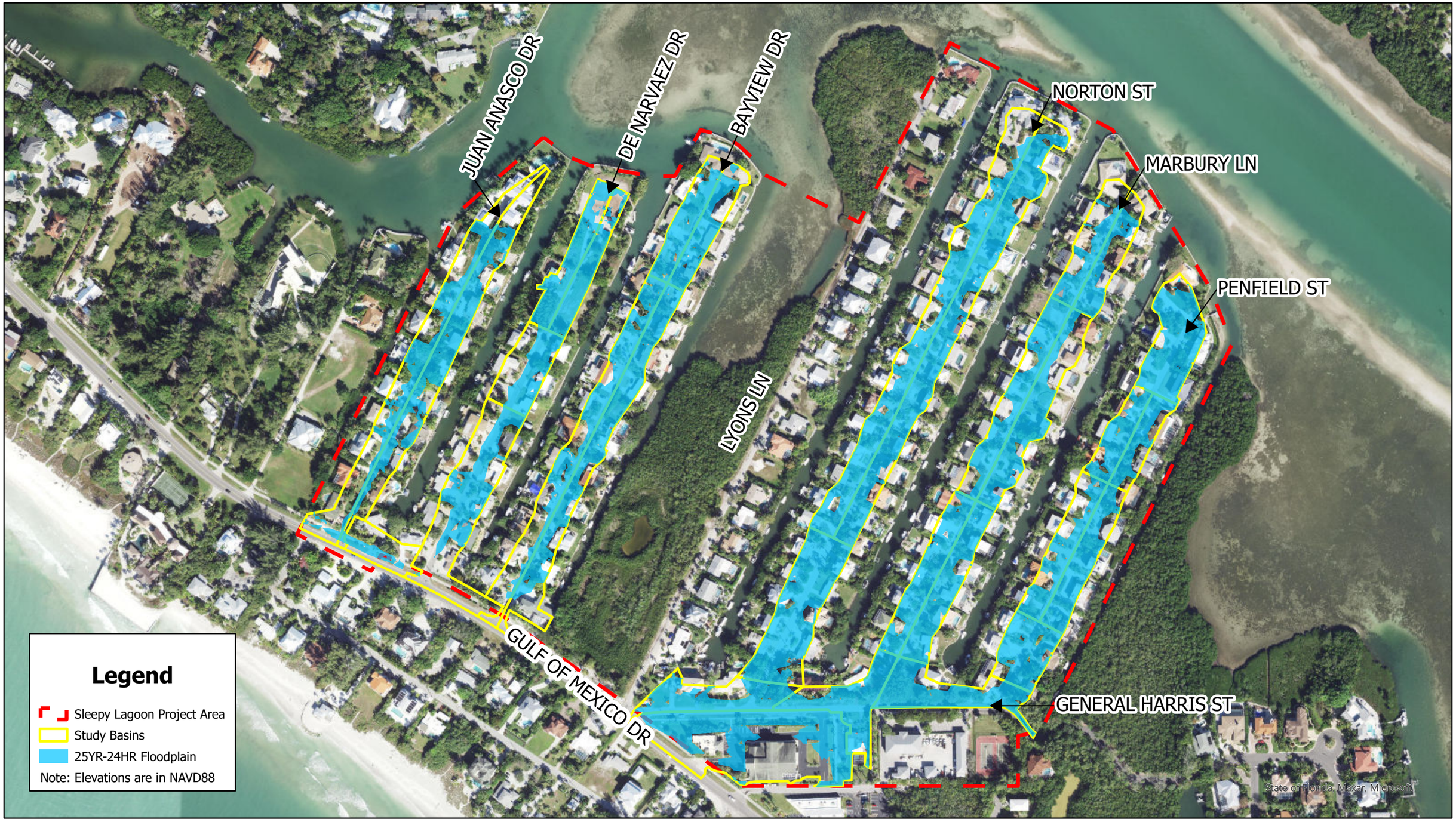
Town of Longboat Key

0 100 200 400 Feet

N

Kimley»Horn

B-3



25YR-24HR Storm w/ Observed Tide + 2050 SLR

Sleepy Lagoon

August 2022

Town of Longboat Key

0 100 200 400 Feet

N

Kimley»Horn

B-4

APPENDIX C: PROPOSED PROJECTS

Phase 1 - Norton Street Road Reconstruction

- Type: Resiliency Project

Phase 2 - Bayview Drive and Penfield Street Road Reconstruction

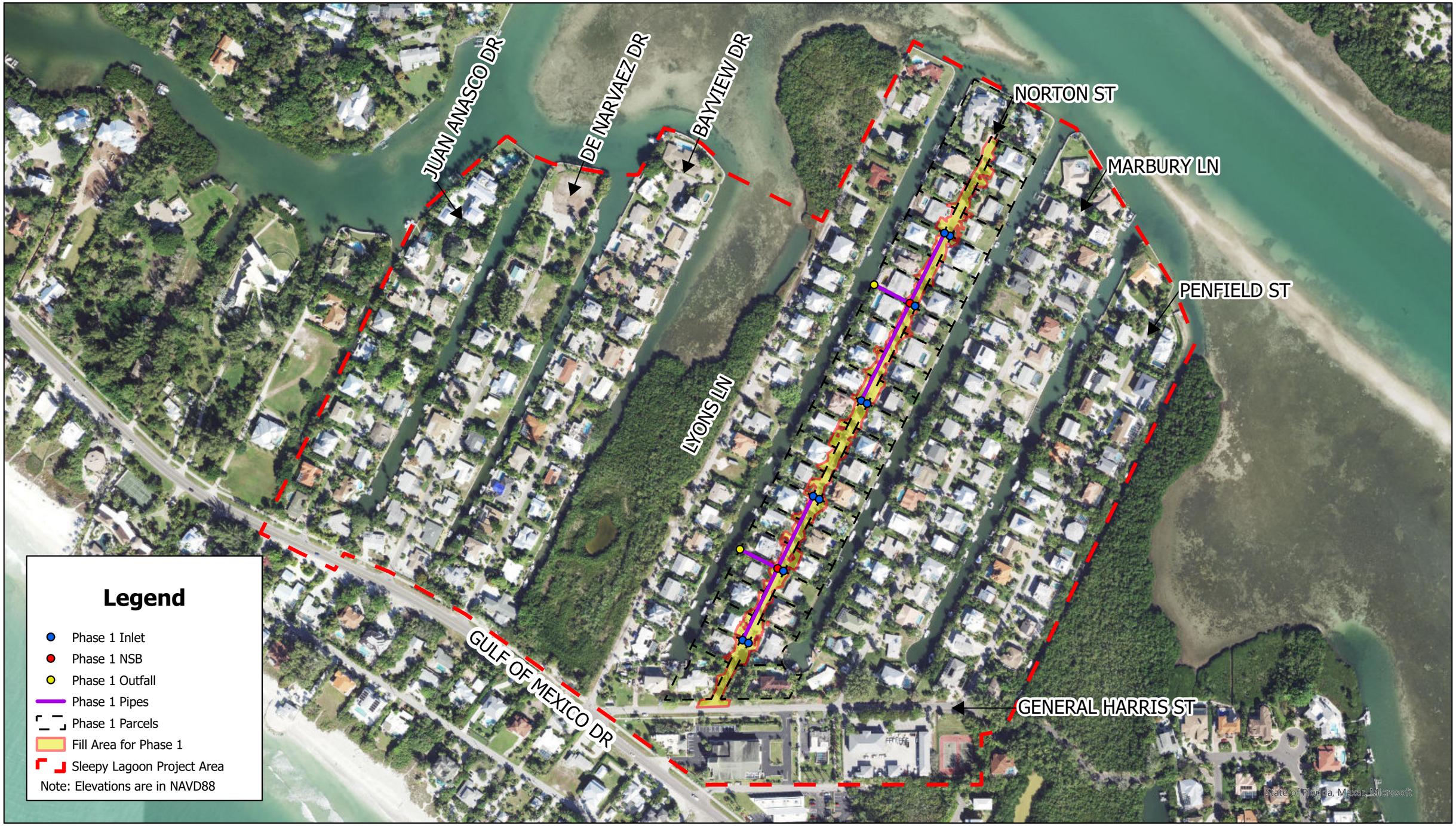
- Type: Resiliency Project

Phase 3 - General Harris Street and Marbury Lane Road Reconstruction

- Type: Resiliency Project

Phase 4 - De Narvaez Drive and Juan Anasco Drive Road Reconstruction

- Type: Resiliency Project



Phase 1 - Norton Street

Sleepy Lagoon

August 2022

Town of Longboat Key

0 100 200 400

Feet

N

Kimley»Horn

C-1

Kimley»Horn

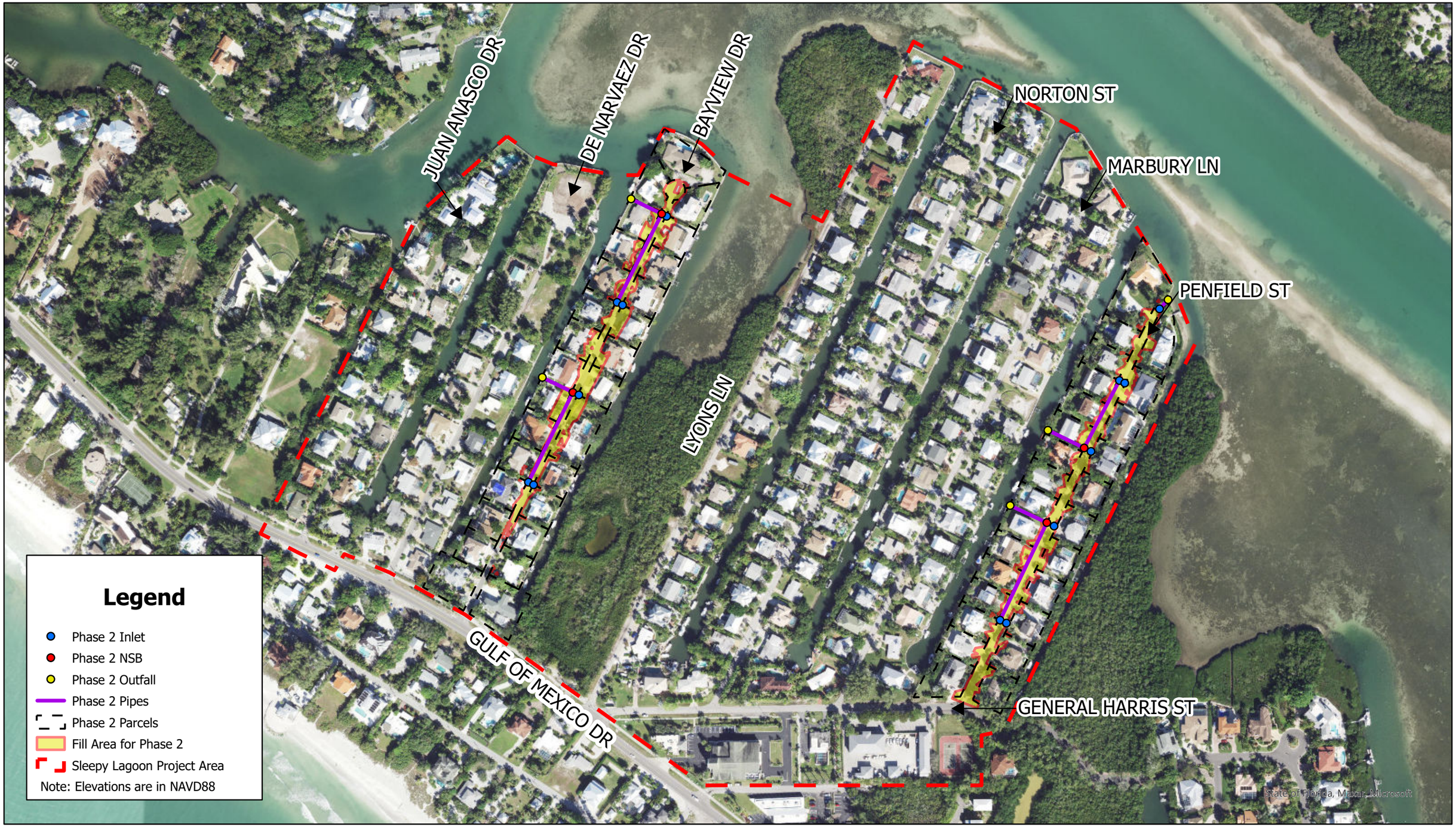
SLEEPY LAGOON - PHASE 1

Norton Street - Reconstuction

DRAFT - CONCEPTUAL LEVEL EXTIMATE

ITEM	DESCRIPTION	QTY	UNIT	UNIT PRICE	AMOUNT
1	Mobilization	1	LS	$ 67,600.00	$ 67,600.00
2	Maintenance of Traffic	1	LS	$ 67,600.00	$ 67,600.00
3	Erosion Control	1	LS	$ 40,500.00	$ 40,500.00
4	Excavation	150	CY	$ 13.68	$ 2,052.00
5	Embankment	750	CY	$ 25.26	$ 18,945.00
6	Optional Base, Base Group 6	930	CY	$ 28.03	$ 26,067.90
7	Asphalt Concrete Friction Course	430	TN	$ 147.82	$ 63,562.60
8	Superpave Asphaltic Concrete	430	TN	$ 109.50	$ 47,085.00
9	Inlets, Ditch Bottom, Type C, < 10'	10	EA	$ 5,359.30	$ 53,593.00
10	Nutrient Seperation Baffle Box	2	EA	$ 50,000.00	$ 100,000.00
11	Pipe Culvert, Optional Material, Round, 18" S/CD	1,200	LF	$ 130.51	$ 156,612.00
12	Pipe Culvert, Optional Material, Round, 24" S/CD	500	LF	$ 158.70	$ 79,350.00
13	Performance Turf (Sod)	5,430	SY	$ 3.53	$ 19,167.90
14	Landscape Restoration (Per Lot)	45	EA	$ 1,500.00	$ 67,500.00
15	Driveway Restoration (Per Lot)	45	EA	$ 3,000.00	$ 135,000.00
16	Utility Adjustments (Per Lot)	45	EA	$ 1,000.00	$ 45,000.00
17	Backflow prevention - Marine grade stainless steel	2	EA	$ 25,000.00	$ 50,000.00
SUBTOTAL BID PRICE					$ 1,039,635.40
PLUS CONTINGENCY ALLOWANCE (30% of Subtotal Bid Price)					$ 311,890.62
TOTAL BID PRICE (Subtotal Bid Price plus 30% Contingency Allowance)					$ 1,351,526.02

Disclaimer: The Engineer has no control over the cost of labor, materials, equipment, or over the Contractor's methods of determining prices or over competitive bidding or market conditions. Opinions of probable costs provided herein are based on the information known to Engineer at this time and represent only the Engineer's judgment as a design professional familiar with the construction industry. The Engineer cannot and does not guarantee that proposals, bids, or actual construction costs will not vary from its opinions of probable costs.



Phase 2 - Bayview Drive and Penfield Street

Sleepy Lagoon

August 2022

Town of Longboat Key

0 100 200 400 Feet

N

Kimley»Horn

C-2

Kimley»Horn

SLEEPY LAGOON - PHASE 2

Bayview Drive and Penfield Street - Reconstruction

DRAFT - CONCEPTUAL LEVEL EXTIMATE

ITEM	DESCRIPTION	QTY	UNIT	UNIT PRICE	AMOUNT
1	Mobilization	1	LS	$ 93,100.00	$ 93,100.00
2	Maintenance of Traffic	1	LS	$ 93,100.00	$ 93,100.00
3	Erosion Control	1	LS	$ 55,800.00	$ 55,800.00
4	Excavation	60	CY	$ 13.68	$ 820.80
5	Embankment	300	CY	$ 25.26	$ 7,578.00
6	Optional Base, Base Group 6	1,370	CY	$ 28.03	$ 38,401.10
7	Asphalt Concrete Friction Course	627	TN	$ 147.82	$ 92,683.14
8	Superpave Asphaltic Concrete	627	TN	$ 109.50	$ 68,656.50
9	Inlets, Ditch Bottom, Type C, < 10'	12	EA	$ 5,359.30	$ 64,311.60
10	Nutrient Seperation Baffle Box	4	EA	$ 50,000.00	$ 200,000.00
11	Pipe Culvert, Optional Material, Round, 18" S/CD	1,400	LF	$ 130.51	$ 182,714.00
12	Pipe Culvert, Optional Material, Round, 24" S/CD	550	LF	$ 158.70	$ 87,285.00
13	Performance Turf (Sod)	5,600	SY	$ 3.53	$ 19,768.00
14	Landscape Restoration (Per Lot)	55	EA	$ 1,500.00	$ 82,500.00
15	Driveway Restoration (Per Lot)	55	EA	$ 3,000.00	$ 165,000.00
16	Utility Adjustments (Per Lot)	55	EA	$ 1,000.00	$ 55,000.00
17	Backflow prevention - Marine grade stainless steel	5	EA	$ 25,000.00	$ 125,000.00
SUBTOTAL BID PRICE					$ 1,431,718.14
PLUS CONTINGENCY ALLOWANCE (30% of Subtotal Bid Price)					$ 429,515.44
TOTAL BID PRICE (Subtotal Bid Price plus 30% Contingency Allowance)					$ 1,861,233.58

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JUAN ANASCO DR
DE NARVAEZ DR
BAYVIEW DR
LYONS LN
NORTON ST
MARBURY LN
PENFIELD ST
GULF OF MEXICO DR
GENERAL HARRIS ST

Legend

- Phase 3 Inlet
- Phase 3 NSB
- Phase 3 Outfall
- Phase 3 Pipes
- Phase 3 Parcels
- Fill Area for Phase 3
- Sleepy Lagoon Project Area

Note: Elevations are in NAVD88

Phase 3 - General Harris Street and Marbury Lane

Sleepy Lagoon

August 2022

Town of Longboat Key

0 100 200 400 Feet

N

Kimley»Horn

Kimley»Horn

SLEEPY LAGOON - PHASE 3

General Harris Street and Maybury Lane Reconstuction

DRAFT - CONCEPTUAL LEVEL EXTIMATE

ITEM	DESCRIPTION	QTY	UNIT	UNIT PRICE	AMOUNT
1	Mobilization	1	LS	$ 85,800.00	$ 85,800.00
2	Maintenance of Traffic	1	LS	$ 85,800.00	$ 85,800.00
3	Erosion Control	1	LS	$ 51,500.00	$ 51,500.00
4	Excavation	100	CY	$ 13.68	$ 1,368.00
5	Embankment	570	CY	$ 25.26	$ 14,398.20
6	Optional Base, Base Group 6	1,350	CY	$ 28.03	$ 37,840.50
7	Asphalt Concrete Friction Course	620	TN	$ 147.82	$ 91,648.40
8	Superpave Asphaltic Concrete	620	TN	$ 109.50	$ 67,890.00
9	Inlets, Ditch Bottom, Type C, < 10'	16	EA	$ 5,359.30	$ 85,748.80
10	Nutrient Seperation Baffle Box	3	EA	$ 50,000.00	$ 150,000.00
11	Pipe Culvert, Optional Material, Round, 18" S/CD	750	LF	$ 130.51	$ 97,882.50
12	Pipe Culvert, Optional Material, Round, 24" S/CD	400	LF	$ 158.70	$ 63,480.00
13	Performance Turf (Sod)	8,000	SY	$ 3.53	$ 28,240.00
14	Landscape Restoration (Per Lot)	56	EA	$ 1,500.00	$ 84,000.00
15	Driveway Restoration (Per Lot)	56	EA	$ 3,000.00	$ 168,000.00
16	Utility Adjustments (Per Lot)	56	EA	$ 1,000.00	$ 56,000.00
17	Backflow prevention - Marine grade stainless steel	6	EA	$ 25,000.00	$ 150,000.00
SUBTOTAL BID PRICE					$ 1,319,596.40
PLUS CONTINGENCY ALLOWANCE (30% of Subtotal Bid Price)					$ 395,878.92
TOTAL BID PRICE (Subtotal Bid Price plus 30% Contingency Allowance)					$ 1,715,475.32

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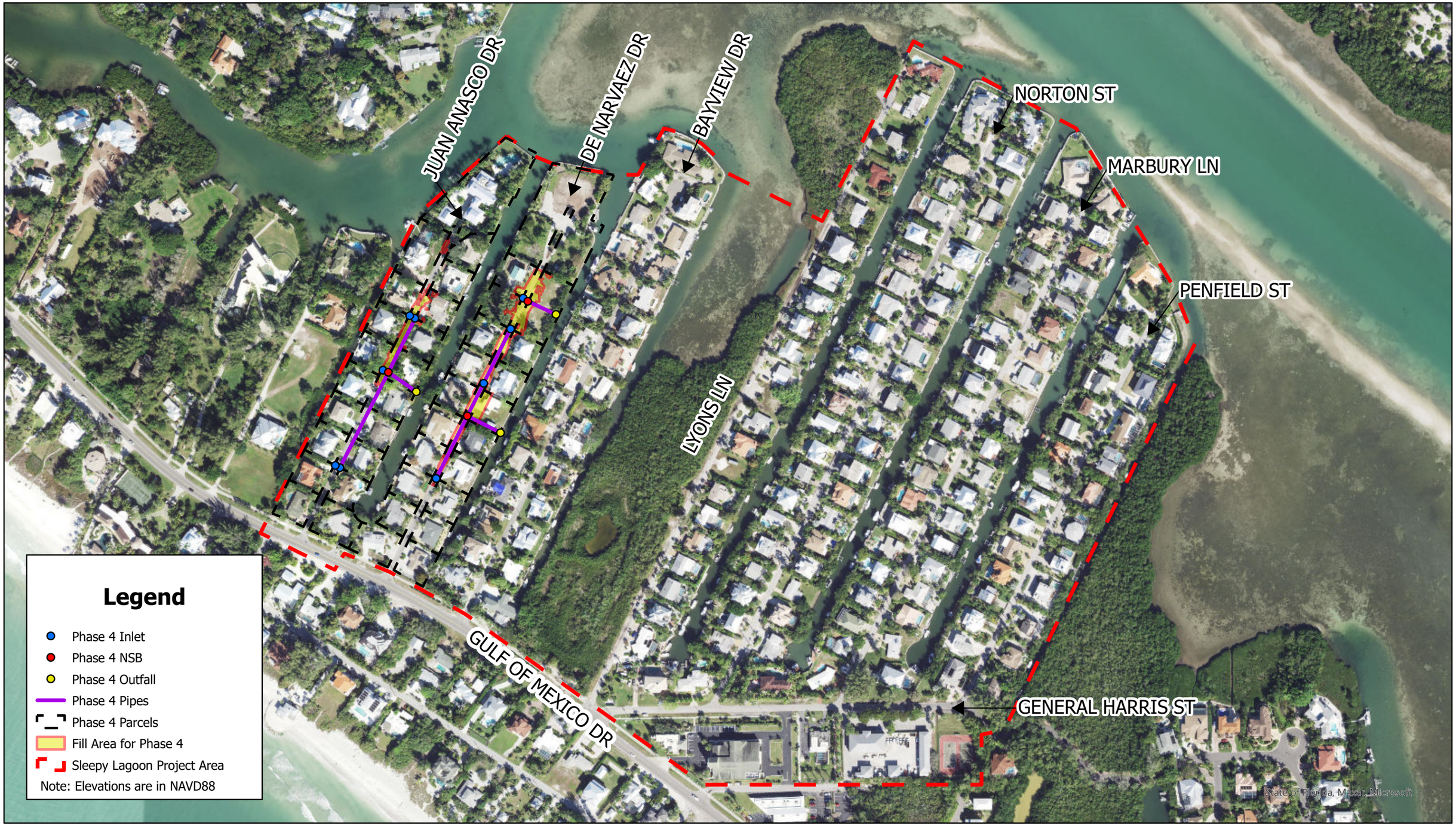

Phase 4 - De Narvaez Drive and Juan Anasco Drive

Sleepy Lagoon

August 2022

Town of Longboat Key

0 100 200 400 Feet

N

Kimley»Horn

C-4

Kimley»Horn

SLEEPY LAGOON - PHASE 4A

De Narvaez Drive and Juan Anasco Drive- Reconstruction

DRAFT - CONCEPTUAL LEVEL EXTIMATE

ITEM	DESCRIPTION	QTY	UNIT	UNIT PRICE	AMOUNT
1	Mobilization	1	LS	$ 57,600.00	$ 57,600.00
2	Maintenance of Traffic	1	LS	$ 57,600.00	$ 57,600.00
3	Erosion Control	1	LS	$ 34,600.00	$ 34,600.00
4	Excavation	1,064	CY	$ 13.68	$ 14,555.52
5	Embankment	200	CY	$ 25.26	$ 5,052.00
6	Optional Base, Base Group 6	1,027	CY	$ 28.03	$ 28,786.81
7	Asphalt Concrete Friction Course	471	TN	$ 147.82	$ 69,623.22
8	Superpave Asphaltic Concrete	471	TN	$ 109.50	$ 51,574.50
9	Inlets, Ditch Bottom, Type C, < 10'	12	EA	$ 5,359.30	$ 64,311.60
10	Nutrient Seperation Baffle Box	3	EA	$ 50,000.00	$ 150,000.00
11	Pipe Culvert, Optional Material, Round, 18" S/CD	1,050	LF	$ 130.51	$ 137,035.50
12	Pipe Culvert, Optional Material, Round, 24" S/CD	450	LF	$ 158.70	$ 71,415.00
13	Performance Turf (Sod)	900	SY	$ 3.53	$ 3,177.00
14	Landscape Restoration (Per Lot)	12	EA	$ 1,500.00	$ 18,000.00
15	Driveway Restoration (Per Lot)	12	EA	$ 3,000.00	$ 36,000.00
16	Utility Adjustments (Per Lot)	12	EA	$ 1,000.00	$ 12,000.00
17	Backflow prevention - Marine grade stainless steel	3	EA	$ 25,000.00	$ 75,000.00
SUBTOTAL BID PRICE					$ 886,331.15
PLUS CONTINGENCY ALLOWANCE (30% of Subtotal Bid Price)					$ 265,899.35
TOTAL BID PRICE (Subtotal Bid Price plus 30% Contingency Allowance)					$ 1,152,230.50

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Kimley»Horn

SLEEPY LAGOON - PHASE 4B

De Narvaez Drive and Juan Anasco Drive - Mill and Resurface

DRAFT - CONCEPTUAL LEVEL EXTIMATE

ITEM	DESCRIPTION	QTY	UNIT	UNIT PRICE	AMOUNT
1	Mobilization	1	LS	$ 54,800.00	$ 54,800.00
2	Maintenance of Traffic	1	LS	$ 54,800.00	$ 54,800.00
3	Erosion Control	1	LS	$ 32,900.00	$ 32,900.00
4	Excavation	440	CY	$ 13.68	$ 6,019.20
5	Embankment	200	CY	$ 25.26	$ 5,052.00
6	Optional Base, Base Group 6	440	CY	$ 28.03	$ 12,333.20
7	Milling Existing	6,200	SY	$ 2.99	$ 18,538.00
8	Asphalt Concrete Friction Course	470	TN	$ 147.82	$ 69,475.40
9	Superpave Asphaltic Concrete	200	TN	$ 109.50	$ 21,900.00
10	Inlets, Ditch Bottom, Type C, < 10'	12	EA	$ 5,359.30	$ 64,311.60
11	Nutrient Seperation Baffle Box	3	EA	$ 50,000.00	$ 150,000.00
12	Pipe Culvert, Optional Material, Round, 18" S/CD	1,050	LF	$ 130.51	$ 137,035.50
13	Pipe Culvert, Optional Material, Round, 24" S/CD	450	LF	$ 158.70	$ 71,415.00
14	Performance Turf (Sod)	900	SY	$ 3.53	$ 3,177.00
15	Landscape Restoration (Per Lot)	12	EA	$ 1,500.00	$ 18,000.00
16	Driveway Restoration (Per Lot)	12	EA	$ 3,000.00	$ 36,000.00
17	Utility Adjustments (Per Lot)	12	EA	$ 1,000.00	$ 12,000.00
18	Backflow prevention - Marine grade stainless steel	3	EA	$ 25,000.00	$ 75,000.00
SUBTOTAL BID PRICE					$ 842,756.90
PLUS CONTINGENCY ALLOWANCE (30% of Subtotal Bid Price)					$ 252,827.07
TOTAL BID PRICE (Subtotal Bid Price plus 30% Contingency Allowance)					$ 1,095,583.97

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APPENDIX D: THIRD-PARTY FUNDING MATRIX

Town of Longboat Key
Third-Party Funding Matrix

Grant Name	Agency	Funding Max	Required Match	Date Open	Date Due	Eligible Activities	Types of Projects
319(h) Nonpoint Source Stormwater Management Grant	Florida Department of Environmental Protection (FDEP)	Varies	Yes. 1:1 Match Required	Project proposals may be submitted anytime throughout the year.	Department review and evaluation periods are expected to occur in September/ October and March/April of each year, or as needed. If the project is not funded in the current selection cycle, it will be considered in the following cycle with no need to resubmit (unless there is a need to update the proposal). If your project is not selected within the current state fiscal year, the proposal will need to be resubmitted for evaluation.	Financial assistance is available to Florida's local governments, including county and municipal governments, special districts, water management districts, other state agencies, public universities/ colleges and national estuary programs located in Florida.	Eligible projects include/not limited to: 1. Demonstration and evaluation of best managements practices (BMP's), 2. Nonpoint pollution reduction in priority watersheds (Sarasota Bay), 3. Green stormwater infrastructure / low impact development for stormwater, 4. Ground water protection from nonpoint source, 5. Public education programs on nonpoint source management, and 6. Septic to sewer projects.
Building Resilient Infrastructure and Communities (BRIC)	Federal Emergency Management Agency (FEMA)	$600,000 (Up to $300,000 for mitigation planning and planning-related activities per applicant)	Yes. 75% Grant 25% Match	Late September	Mid November	Projects that: 1. Increase resilience and public safety, 2.Reduce injuries and loss of life, and 3. Reduce damage and destruction to property, critical services, facilities, and infrastructure.	Projects that: 1. Reduce the risks from disasters and natural hazards, 2. Incentivize public infrastructure projects, 3. Incentivize projects that mitigate risk to one or more lifeline, and 4. Incentivize projects that incorporate nature-based solutions.

Town of Longboat Key
Third-Party Funding Matrix

Grant Name	Agency	Funding Max	Required Match	Date Open	Date Due	Eligible Activities	Types of Projects
Coastal Partnership Initiative (determined by County)	Florida Department of Environmental Protection (FDEP)	$10,000-$60,000 for Construction, Restoration, Invasive Species Removal, and Land Acquisition. No more than $30,000 for Planning, Design, and Coordination Activities	Yes. 1:1 Match Required	October	December	**Resilient Communities:** Assist coastal communities to prepare for and respond to the effects of climate change, natural hazards and disasters. *(Hurricane Evacuation Route)* . **Coastal Resource Stewardship:** To promote stewardship and appreciation of fragile coastal resources, applicants may request funds for community-based projects that involve the public, volunteers and the local government.	Available to 35 coastal counties and all municipalities
Community Challenge Grant	American Association of Retired Persons (AARP)	$100 - $50,000	None	Early May	Notification to applicant early July / Notification to public mid-August	Eligible activities include: 1. Permanent physical improvements in the community, 2. Temporary demonstrations that lead to long-term change, and/or 3. New, innovative programming or services.	Supports projects that: 1. Increase civic engagement, 2. Deliver a range of transportation and mobility options, 3. Demonstrate the tangible value of "Smart Cities", and/or 4. Other community improvements.

Town of Longboat Key
Third-Party Funding Matrix

Grant Name	Agency	Funding Max	Required Match	Date Open	Date Due	Eligible Activities	Types of Projects
Hazard Mitigation Grant Program (HMGP)	Federal Emergency Management Agency (FEMA)	Varies	Yes. 75% Grant 25% Match	Funding is historically available following a Presidentially-declared disaster.	Varies	Projects that involve: 1. Protection or purchasing public or private property that experienced, or is in danger of experiencing, repetitive damage, 2. Purchasing and removing a flood-prone property from an individual, 3. Developing and adopting hazard mitigation plans, which are required for state, local, tribal and territorial governments to receive funding for their hazard mitigation projects, or 4. Using aquifer storage and recovery, floodplain and street restoration, flood diversion and storage, or green infrastructure methods that may reduce the impacts of flood and drought.	Projects that include long-term efforts to reduce the impacts of future disasters. Examples include flood mitigation projects.
Partners for Places	The Funders Network Partners for Places	$25,000 and $75,000 for one-year projects/ $75,000 and $150,000 for two-year projects	Yes. 1:1 Match Required	January	**January**- Applications Open; **May**-New Awards made; **June**-New invitation to apply released; **July**-Applications are due; **November**-Awards are made; **December**-New invitation to apply released.	Projects that advance frontline community needs and priorities; Projects that develop a new partnership or deepen an existing one; and Projects that apply a racial equity approach to both the collaboration and project.	Projects that support the planning and the implementing of urban sustainability and green stormwater infrastructure projects.

Town of Longboat Key
Third-Party Funding Matrix

Grant Name	Agency	Funding Max	Required Match	Date Open	Date Due	Eligible Activities	Types of Projects
Rebuilding American infrastructure with Sustainability and Equity (RAISE) * could tie into water/ wastewater/ stormwater projects	U.S. Department of Transportation (DOT)	$5,000,000- $25,000,000	Yes. 80% Grant 20% Match	March	April	Capital projects that include: 1. road or bridge projects eligible under title 23, US Code; 2. public transportation projects eligible under chapter 53 of title 49, US Code; 3. port infrastructure investments; and 4. intermodal projects.	Supports projects that are for planning and capital investments in surface transportation infrastructure to projects that will have significant local and regional impact, including road, bridge, transit, rail, port, and intermodal transportation projects.
Southwest Florida Water Management District (SWFWMD)	Southwest Florida Water Management District (SWFWMD)	Varies	Yes. 1:1 Match Required	Applications are due the first Friday in October.	Spring/Summer	1. Water supply projects; 2. Water quality projects; 3. Natural systems restoration projects; and 4. Flood protection projects.	Assists in creating sustainable water resources, provide flood protection, and enhance conservation efforts.
State of Florida - Resilient Florida Grant Program	Florida Department of Environmental Protection (FDEP)	$50,000 - $500,000	Not necessary	7/1/2022	9/1/2022	Planning projects and regional resilience entity projects.	Communities that have yet to perform a vulnerability assessment pursuant to statutory requirements will be prioritized for funding.

Town of Longboat Key
Third-Party Funding Matrix

Grant Name	Agency	Funding Max	Required Match	Date Open	Date Due	Eligible Activities	Types of Projects
State of Florida - Resilient Florida Grant Program	Florida Department of Environmental Protection (FDEP)	$1,000's to $1,000,000's	Not necessary	7/1/2022	9/1/2022	Implementation projects to be included in the Statewide Flooding and Sea Level Rise Resilience Plan	Local governments are eligible to apply for implementation project funding after conducting a vulnerability assessment, evaluation, report, or other similar document that demonstrates a risk of flooding or risks due to sea level rise to a critical asset or the project area. Beginning in 2024, a Vulnerability Assessment meeting the requirements of section 380.093, F.S. will be a requirement to receive funding.
State Water Quality Assistance Grant (SWAG)	Florida Department of Environmental Protection (FDEP)	Varies	Yes. 1:1 Match Required	December	Spring/Summer	Sustainability projects and efforts.	Water quality improvement projects and flood mitigation efforts.