Executive Summary

The Parkland Estates and Palma Ceia Pines neighborhoods of South Tampa have experienced severe and widespread flooding for decades due to the area's topography and antiquated stormwater infrastructure which conveys excess runoff produced by rainfall several miles to both Old Tampa Bay and Hillsborough Bay**. This flooding results in significant property damage and renders roadways impassable, jeopardizing the health, safety, and welfare of the public during heavy rainfall events.** The Palma Ceia Pines neighborhood includes Hospital Corporation of America (HCA) Florida South Tampa Hospital and medical offices, which are severely impacted by flooding conditions that temporarily eliminate access to these services, jeopardizing the lives of patients.

This topographically depressional low area, which can be visualized as a large bowl, includes the central and eastern portions of Parkland Estates and Palma Ceia Pines, bounded to the north and south by W Kennedy Blvd and W Morrison Ave, respectively, and to the east and west by S Howard Ave and S MacDill Ave, respectively. This topographic bowl's existing stormwater infrastructure (primarily underground pipes and structures) currently drains through three separate outfalls into the bays that surround the South Tampa peninsula. **The stormwater infrastructure is aging and severely undersized by current design standards to handle the present-day development density.** Due to these deficiencies, low-lying roadways and land within these two neighborhoods, and within adjacent neighborhoods, flood when the stormwater infrastructure is overwhelmed by heavy rainfall.

The South Howard Flood Relief (SHFR) project is a City of Tampa (the City) progressive design-build project that aims to alleviate the severe flooding that occurs in these neighborhoods by providing a new large stormwater conveyance system that uses gravity to efficiently move millions of gallons of stormwater runoff into Hillsborough Bay. **The goal of this project is to ensure that roadways are passable during the 5-year/8-hour design storm event, which has a total rainfall accumulation of 5.3 inches** within an 8-hour period. For reference, this design storm event is very similar to what was observed in this area on August 1st, 2015. A photo of that event, taken at W Parkland Blvd (looking northeast toward W Swann Ave) is shown in **Figure 1** and illustrates the magnitude of flooding due to rainfall that this project will be designed for.

Unfortunately, providing enough storage within stormwater vaults or ponds to mitigate flooding for this magnitude of rainfall event is not a feasible solution. After many hydrologic and hydraulic (H&H) model iterations, a recommended solution was developed that uses the most direct and hydraulically efficient route to move stormwater runoff into the bay. This includes the construction of approximately 6,000 linear feet of large box culvert trunkline, which functions as a primary artery for stormwater conveyance and will receive runoff from smaller secondary stormwater collection systems that will alleviate flooding at peripheral locations.



Figure 1 – Flooding in Parkland Estates on August 1, 2015 after approximately 5.4 inches of rainfall

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Existing Conditions Model Analysis

Before analyzing potential alternative solutions, ensuring that the existing conditions H&H model simulates known flooding events associated with the current stormwater collection system is essential. A detailed H&H model update was performed by this project's design-build team, Kimmins Contracting (builder) and AtkinsRéalis (designer). This effort began by building upon the City's Upper Peninsula Watershed model (UPWM) and the planning-level feasibility study performed by an engineering consulting firm, JMT. AtkinsRéalis reviewed in detail both the UPWM and the JMT feasibility study, along with the area's current H&H conditions, to develop a comprehensive and updated revised existing conditions model (RECM) that accurately reflects flooding within Parkland Estates and Palma Ceia Pines along with surrounding neighborhoods within the study area.

This RECM serves as an appropriate tool to analyze the new conveyance system needed to meet the project's flood reduction goals. The model was calibrated and verified by simulating two actual rainfall events observed in 2024 and comparing the model results to observed flooding documented during and after those respective events. The model results aligned extremely closely with what was observed and documented. The development, calibration and verification of the RECM is discussed in detail in **Section 4** of this report. **Figure 2** below provides a map that depicts the following:

1. **SHFR RECM Extents –** approximately 3,500 acres – the geographic limits of the project's H&H model, which performs H&H calculations to predict flood stages (water surface elevations) and flood durations during simulated rainfall events.
2. **SHFR Model Update Area –** approximately 1,000 acres – the area that was thoroughly evaluated for accuracy to ensure the project design is based on a defensible model. H&H conditions were updated throughout this area to reflect the latest available data, which is discussed in **Sections 2 through 4** of this report.
3. **JMT Feasibility Study Drainage Area –** approximately 260 acres – as defined by the JMT report, *"the drainage area likely to see the most significant benefits from the selected alternative"* (selected alternative refers to the JMT feasibility study's recommended alternative).
4. **SHFR Flood Reduction Focus Area** – approximately 225 acres – "The bowl". It is the basis of the project's detailed focus and design. The box culvert trunkline was sized to achieve the flood reduction goal within this area, as this is the most severe concentration of flooding within the model limits.

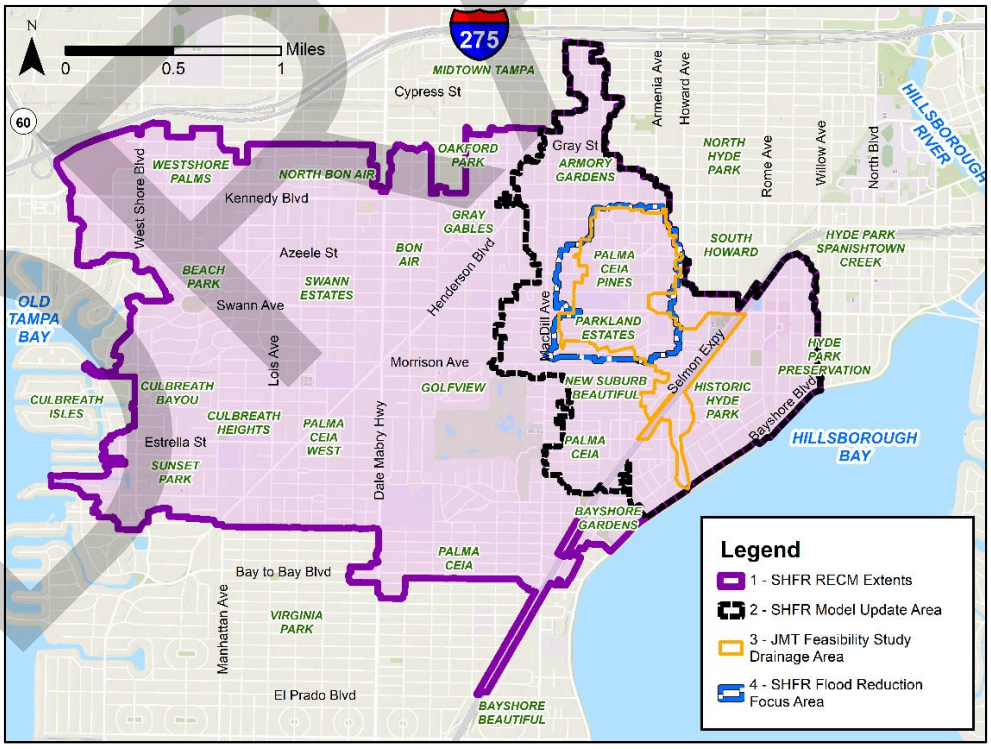


Figure 2 – H&H Model Update Area Map

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The drainage basins that make up the SHFR Flood Reduction Focus Area have been studied for decades, and conceptual solutions to flooding issues have been developed as part of these studies, which are discussed in **Section 2.1** of this report. However, what the previous studies lack is a complete understanding of the interaction of stormwater between drainage basins, which creates a larger and more complicated flooding issue than previously thought. The SHFR project's preliminary engineering study documented in this report has identified this complex problem and has developed a comprehensive solution.

Figure 3 below shows the RECM's predicted flood extents for the 5-year/8-hour design storm in today's existing condition. **It is important to note that the flood extents shown below assume that the existing stormwater infrastructure is in a fully maintained condition.** Even in this maintained condition the depth of water over the roadways reaches up to 4 feet in places within Palma Ceia Pines and Parkland Estates.

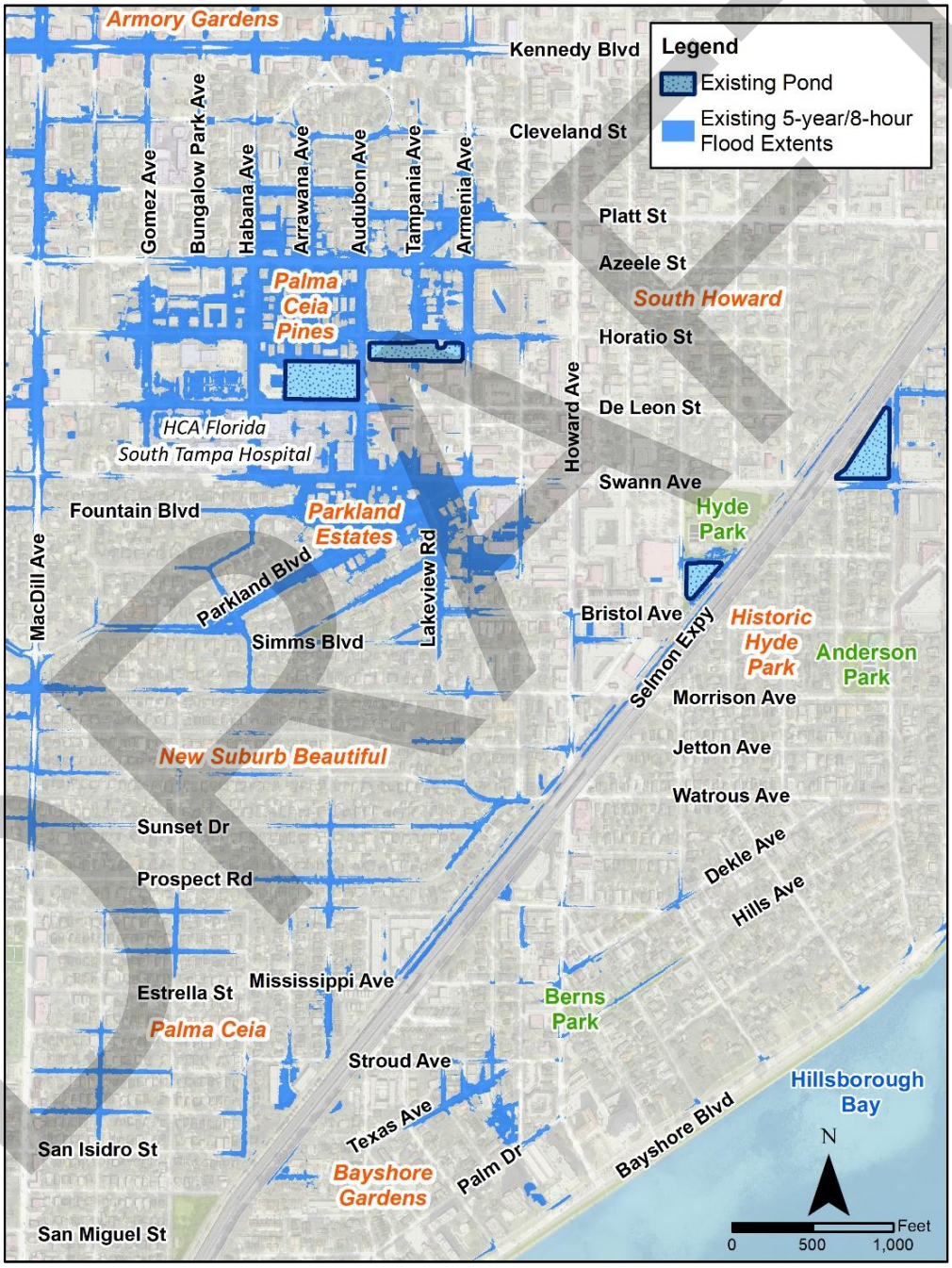


Figure 3 – Existing 5-year/8-hour Flood Extents

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Proposed Conditions Model Analysis and Flood Reduction Benefits

The RECM serves as a base model to develop numerous iterations of proposed conditions models that optimize the configuration of new stormwater infrastructure so that the project's flood reduction goals can be met in a hydraulically efficient, cost-effective manner. These alternative flood reduction solutions began with the proposed system recommended in the project's Design Criteria Package (a 5'x10' box culvert terminating at W Swann Ave & S Audubon Ave, based on the JMT feasibility study) and progressed into larger box culvert sizes that extended further north, providing equity of flood reduction benefits between Parkland Estates and Palma Ceia Pines. Through this analysis, the design team arrived at a solution that will significantly reduce rainfall-induced flooding in both Parkland Estates and Palma Ceia Pines, along with other neighborhoods like South Howard, Historic Hyde Park, New Suburb Beautiful, Palma Ceia, and Bayshore Gardens.

The goal of this project is a flood reduction solution that limits flood depths for the 5-year/8-hour design storm event (5.3 inches of rainfall) to a maximum of 4 inches of water depth over the lowest edge of pavement (EOP) – a condition where roadways are considered passable for vehicles, and most notably emergency response vehicles. This goal is referred to as the project's flood protection level of service (FPLOS) and has been applied throughout the project's 225-acre Flood Reduction Focus Area, among other flood-prone areas adjacent to the project route. **Although the proposed infrastructure has been sized to reduce roadway flooding for the 5-year design storm, it will also significantly reduce structure flooding and duration of roadway flooding for a range of more severe rainfall events.** In fact, the model simulations documented in this report suggest that the project will provide the additional benefit of substantial flood reduction during higher precipitation events up to and beyond the 100-year/24-hour design storm (important for insurance and regulatory considerations). This includes storms like Hurricane Milton, which devastated the area in 2024. The project will also provide noticeable flood reduction benefits to adjacent areas within the model's geographic limits that are outside of the SHFR Flood Reduction Focus Area.

Table 1 and **Table 2 below summarize the predicted existing flood impacts and anticipated reduction in roadway and structure flooding provided by all phases of the project** for a wide range of potential rainfall events. These values are predicted using the project's detailed H&H models, recently surveyed finished floor elevations for over 200 buildings (which include over 400 individual first floor homes and businesses) within Parkland Estates and Palma Ceia Pines, and the latest available (2017) Light Detection and Ranging (LiDAR)-based digital elevation model (DEM). The data in the table includes all proposed infrastructure shown in **Figure 4**. Although Hurricane Milton's rainfall totals and flood stages were greater than those of the 100-year/24-hour design storm (synthetic rainfall event used for insurance and regulatory considerations), the Hurricane Milton proposed conditions model results show greater flood protection due to an overall less intense distribution of rainfall.

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Table 1 – Summary of Existing Condition Flood Impacts

Flood Impact	2.33-year/ 24-hour Design Storm (4.5 inches)	5-year/ 8-hour Design Storm (5.3 inches)	10-year/ 24-hour Design Storm (7.0 inches)	25-year/ 24-hour Design Storm (8.0 inches)	50-year/ 24-hour Design Storm (10.0 inches)	100-year/ 24-hour Design Storm (11.0 inches)	Hurricane Milton (13-14.5 inches*)
Existing Number of Homes/Businesses Inundated**	0	96	123	203	255	272	333
Existing Duration of Roadway Flooding on W Swann Ave at S Audubon Ave (hours)	6	8	10	12	14	15	19
Existing Max. Depth of Roadway Flooding, Parkland Estates (feet)	3.2	4.0	4.3	4.6	4.9	5.1	5.4
Existing Max. Depth of Roadway Flooding, Palma Ceia Pines (feet)	1.9	2.5	2.9	3.2	3.5	3.7	4.0

*Hurricane Milton rainfall totals vary across the model's geographic limits, and were estimated by radar (source: NEXRAD)
**Includes total number of ground floor dwellings, including single family homes, businesses, and individual apartment or townhome units, within the 206 specific buildings surveyed in 2025 by the design-build team, as predicted by the RECM, and has not been otherwise verified.

Table 2 – Summary of SHFR Project's Flood Reduction Benefits

Flood Reduction Benefit	2.33-year/ 24-hour Design Storm (4.5 inches)	5-year/ 8-hour Design Storm (5.3 inches)	10-year/ 24-hour Design Storm (7.0 inches)	25-year/ 24-hour Design Storm (8.0 inches)	50-year/ 24-hour Design Storm (10.0 inches)	100-year/ 24-hour Design Storm (11.0 inches)	Hurricane Milton (13-14.5 inches*)
Proposed **Reduction** of Inundated Homes/Businesses**	N/A	96	123	198	197	164	235
% Reduction of Inundated Homes/Businesses**	N/A	100%	100%	98%	77%	60%	71%
Proposed Duration of Roadway Flooding on W Swann Ave at S Audubon Ave (hours)	0	0	1	2	3	4	4
Proposed **Reduction** of Roadway Inundation (miles)	6.0	8.1	5.0	4.6	3.9	3.3	4.6

*Hurricane Milton rainfall totals vary across the model's geographic limits, and were estimated by radar (source: NEXRAD)
**Includes predicted total number of ground floor dwellings, including single family homes, businesses, and individual apartment or townhome units, within the 206 specific buildings surveyed in 2025 by the design-build team.
Note: Benefits reflect all proposed improvements in **Figure 4** below. Additional future projects that reduce runoff to this area could further increase these benefits.

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Figure 4 shows the project's reduction in flood extents for the 5-year/8-hour design storm. The purple shading represents existing flooding extents predicted by the model that would be eliminated during the same storm event once all phases of the project shown in the figure are complete.

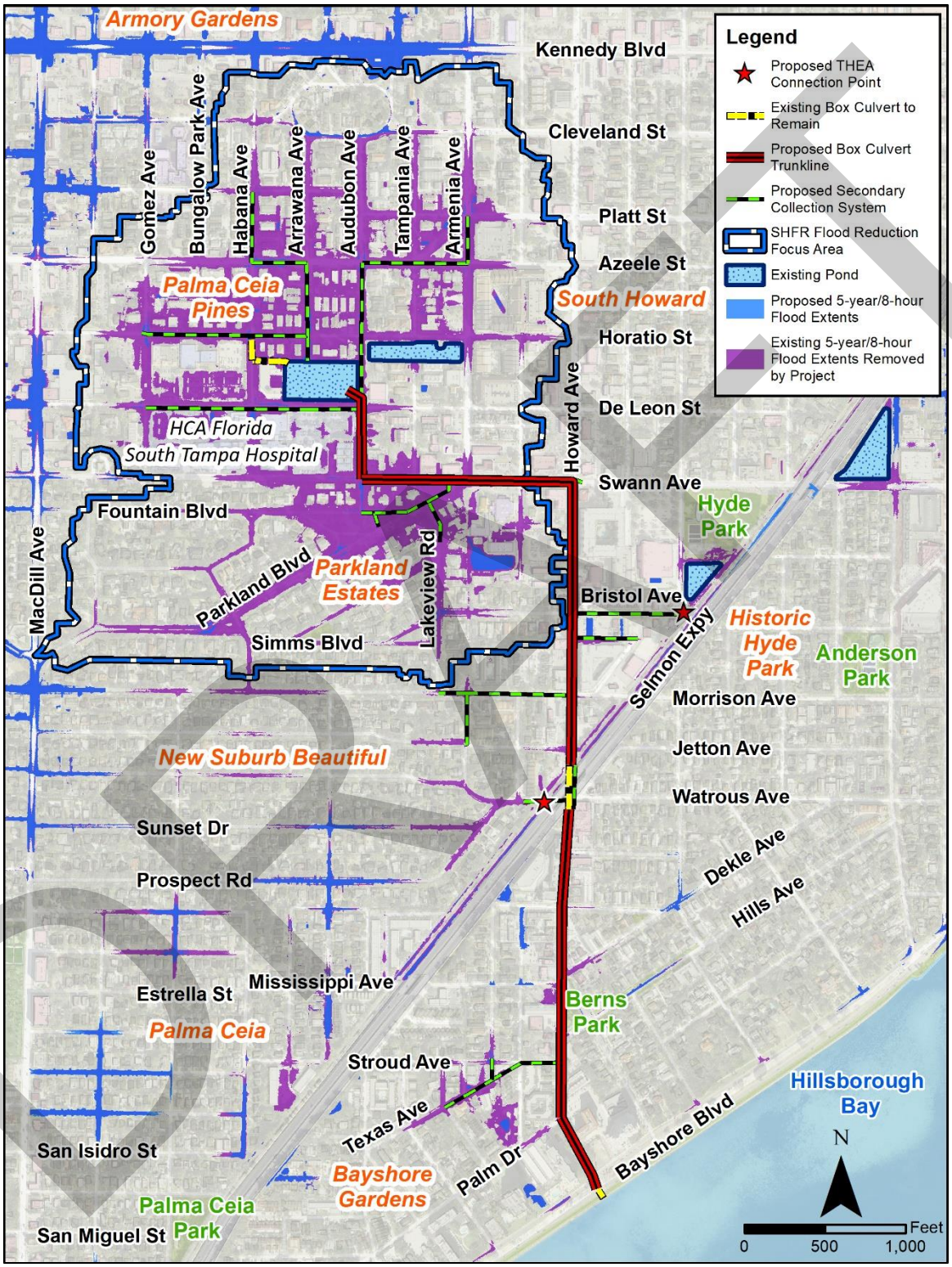


Figure 4 – 5-year/8-hour Proposed Flood Extents Reduction

Alternatives Analysis Findings

Although **Figure 4** on the previous page shows the recommended solution and associated flood reduction benefits, there were numerous potential alternatives evaluated as part of this study to ensure that the most hydraulically efficient, cost effective, and reliable solution is designed and constructed. The design-build team took into consideration input and suggestions from the community while evaluating potential options. All other potential alternatives evaluated were deemed to not be as prudent as the selected alternative for reasons such as increased construction cost and construction duration, constructability concerns, inability to meet the project's flood reduction goal, and lack of available real estate. **Section 5.4** of this report provides a more detailed discussion of all the alternatives reviewed for this project.

Based on the H&H model results and alternatives analysis, the following key conclusions have been drawn:

- While stormwater maintenance issues certainly can exacerbate flooding, **maintenance-based solutions alone will not fix the chronic flooding that occurs within Parkland Estates and Palma Ceia Pines – it is a conveyance capacity issue.** The calibrated RECM, which predicts flooding that very closely resembles what was observed and documented for actual recent rainfall events, assumes that existing stormwater pipes, ditches and ponds are clear and maintained so that proposed infrastructure can be sized adequately. Even under this assumption, severe flooding is still predicted, supporting the conclusion that **the existing stormwater infrastructure is simply antiquated and severely undersized for the current level of development.**

- **A regional storage alternative (stormwater pond or vault)** of adequate size and depth to manage the modeled flood volumes **is not feasible** given the region's natural topography, lack of available real estate, extremely large volumes of stormwater, and anticipated groundwater conditions. In addition, constructing an adequately sized regional storage facility would displace hundreds of residents and significantly reduce housing stock.

- **A new large stormwater conveyance system and connection to the bay is needed** to move millions of gallons of stormwater from the SHFR Flood Reduction Focus Area into Tampa Bay to effectively reduce flooding in Parkland Estates and Palma Ceia Pines.

- Even though its storage capacity is extremely inadequate, the **City-maintained AMI detention pond can serve as a massive stormwater inlet for Palma Ceia Pines**, directly discharging through the 10'x10' box culvert trunkline while using a new weir structure to maintain the pond's existing stormwater treatment capabilities. This reduces the number of additional inlets needed to receive the significant runoff rates anticipated during extreme rainfall events.

- **Sending stormwater runoff to Hillsborough Bay is a shorter (~ 1 mile) and more direct and hydraulically efficient route than continuing to send water west into Old Tampa Bay (~ 2.5 miles)** through a densely developed area that already experiences flooding due to overburdened and antiquated stormwater infrastructure.

- **A gravity system is preferred over a pump station and force main outfall** because it significantly reduces operation and maintenance costs. A gravity system would also mitigate the risk of a pump-based alternative system failing due to power outage or storm damage when it is needed most – during severe storm events, such as Hurricane Milton. In addition, it is extremely difficult for pumping systems to keep up with the large volume of runoff anticipated in high-intensity rainfall events and a large pump station would bring permanent noise and aesthetic impacts to the surrounding residential area.

- **A pump station** would likely not reduce construction impacts to stakeholders along the project route since it **requires a pressurized outfall pipe that is similar in size to the selected gravity alternative** in order to safely discharge flow rates needed to achieve the project's goal.

- **A significant amount of stormwater runoff enters Palma Ceia Pines from Armory Gardens (north of Kennedy Blvd)** when undersized existing pipes designed to convey water to the west become overwhelmed, and the excess runoff flows south over several roadway corridors toward Kennedy Blvd.

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- **Constructing a gravity system that reaches Hillsborough Bay to the east of South Howard Ave would have significant challenges** such as conflict with a 48-inch sanitary sewer force main, significant traffic impacts to Bayshore Blvd and Davis Islands due to construction of a new outfall, increased construction cost and duration due to longer route, and limited conveyance beneath the railroad and Selmon Expressway.

- Given the ground elevations within the project's corridors (generally 15 to 21 feet above sea level), **a gravity system will still be hydraulically effective during high tides and storm surge events**, such as that of Hurricane Helene in 2024. In fact, the project's models already assume a conservative and constant tidal stage of elevation 2.0 (ft, NAVD88) in the design storm simulations, which is about a foot higher than a normal high tide for Hillsborough Bay (per NOAA data for Ballast Point, Station 8726639).

To expand upon the key conclusion above, and to further demonstrate the hydraulic efficiency of the proposed project during storm surge events, the proposed conditions model was simulated with a constant Tampa Bay water surface elevation of 8.0 (ft, NAVD88), which is the estimated peak surge elevation observed in Hillsborough Bay and Old Tampa Bay during Hurricane Helene in 2024 according to NOAA tide gauge data. The flood reduction benefits observed in that model simulation are extremely significant, showing that even when Hillsborough Bay is at a surge elevation of 8 feet, the proposed project **still reduces peak stages in Parkland Estates by approximately 3 feet during a 5-year/8-hour rainfall event. This occurs even while Bayshore Blvd is fully submerged by the bay**. This is because 7 feet or more of hydraulic head, which can be thought of as energy available to push water through the culvert, is enough to force a large volume of stormwater runoff from Parkland Estates into the elevated bay in a relatively short amount of time.

This can be thought of as two separate bowls of water, connected by a straw (representing the proposed box culvert) at their bottoms – as long as the water surface in one bowl (Parkland Estates and Palma Ceia Pines) is higher than the water surface in the other (Hillsborough Bay), gravity is going to force water through the straw until the water levels in each bowl are equal. A catastrophic storm surge of 15 to 20 feet would have to occur for Hillsborough Bay to come back through the system and flood these neighborhoods. This would also happen in today's condition through the three existing stormwater trunklines that connect Palma Ceia Pines to Old Tampa Bay and Hillsborough Bay.

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Evaluation of Alternatives

This Preliminary Engineering Report (PER) includes a comprehensive analysis of predicted flood stages and durations for a spectrum of rainfall events and evaluates alternative solutions that address FPLOS deficiencies within the study area. The report provides a comparative analysis of the three primary alternatives specified in the project scope that includes flood reduction benefit, project cost, and impacts to affected stakeholders. The report also comparatively evaluates the feasibility of numerous other solutions proposed as alternatives to the three primary alternatives. This is discussed in more detail in **Section 5** of this report.

The three primary alternatives analyzed in this report are listed below, in an order that does not reflect priority or ranking of the routes:

1. Alternative 1 – W Morrison Ave to S Howard Ave
2. Alternative 2 – W Bristol Ave to S Howard Ave
3. Alternative 3 – W Swann Ave to S Howard Ave

The three primary alternatives each use South Howard Avenue for several reasons:

- Minimize total length of box culvert needed between the area of flooding concern and Hillsborough Bay – this not only significantly reduces cost but provides a more direct and hydraulically efficient pathway to move runoff from Palma Ceia Pines and Parkland Estates to Hillsborough Bay, in comparison to other potential alternatives.
- Use existing box culverts already in place beneath the CSX railroad, Selmon Expressway, and Bayshore Boulevard – this reduces cost and duration of permitting and construction. It also avoids construction of a new discharge point into Hillsborough Bay that would require a temporary shutdown of the northeast bound lanes of Bayshore Boulevard, along with a costly vertical relocation of a 48" sanitary sewer force main.

Other alternatives suggested by various community members and evaluated by the design-build team – further discussed in Section 5.4 and Appendix M – include the following:

- **W Swann Ave Gravity System** – a large box culvert system that uses W Swann Ave only to reach Bayshore Blvd and Hillsborough Bay. **This alternative is 30% longer** than the selected route and comes with hurdles that would **significantly increase construction costs and duration**, such as the need to relocate an existing 48-inch diameter sanitary sewer force main and the need for a new outfall into Hillsborough Bay, which would result in significant traffic impacts on vehicles entering Davis Islands. **This alternative simply shifts temporary construction impacts to another group of businesses and residents and requires much more money to achieve the same flood reduction goal, lowering the project's benefit-cost ratio substantially.**
- **Stormwater Detention Ponds only (no new conveyance system)** – This alternative converts the lowest portions of Parkland Estates and Palma Ceia Pines into stormwater ponds which use existing pipe systems to discharge excess stormwater to the bay, eliminating the need for a new conveyance system. This alternative is not realistic, as **it would displace hundreds of residents and would require eminent domain to purchase over 200 properties**, which have an estimated combined value of over $150 million.
- **Parkland Estates Stormwater Pump Station –** A pump alternative located within the green space along W Fountain Blvd and W Parkland Blvd (instead of a large box culvert) would require a massive pump station with a discharge capacity of 600 cubic feet per second (CFS), and a 10-foot diameter force main pipe that connects Parkland Estates to Hillsborough Bay, resulting in **similar construction impacts along S Howard Ave** (or an alternative route). Along with an increase in construction costs, this alternative would result in **permanent noise impacts, higher operation and maintenance costs (including power consumption) and would have a much higher risk of failure due to loss of power when it is most needed** – during severe storms like Hurricane Milton.
- **Hyde Park Softball Field Stormwater Pump Station –** Even if this City-owned park were to be converted into a massive 3-acre underground storage vault at depths over 20 feet below ground, a large stormwater pump station with a 300 CFS capacity pump station would be needed, along with a new 7-foot diameter force main pipe

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that somehow reaches Hillsborough Bay. Concerns with the Parkland Estates pump station alternative apply here as well. **Another downside of a pump alternative is that no additional drainage improvements can be included along the force main route downstream of the pump station, while a gravity system provides opportunity for smaller projects to "tap in" later.**

- **Box Culvert or Force Main along CSX railroad and Selmon Expressway –** There is simply **not enough space available between the railroad and the Selmon Expressway** to construct a conveyance system large enough to meet the project's flood reduction goal. If there were enough space (if CSX were to donate their right of way, for example), this would still **increase the project length by 80%,** resulting in a much more expensive and less hydraulically efficient system when compared to the selected alternative.
- **S Georgia Ave to W Mississippi to S Howard Ave Gravity System –** This route is 30 percent longer than the selected alternative, increasing construction costs and duration substantially. It also has significant constructability challenges due to large and deep box culvert installation through narrow, residential streets within the Parkland Estates, New Suburb Beautiful, and Palma Ceia neighborhoods.
- **W Morrison Ave to S Rome Ave -** This route is 20 percent longer than the selected alternative, increasing construction costs and duration substantially. Like the S Georgia Ave/Mississippi alternative, it also has significant constructability challenges due to large and deep box culvert installation through narrow, residential streets within the Parkland Estates and Historic Hyde Park neighborhoods. Like the W Swann Ave gravity alternative, this would also require temporary shutdown and relocation of the large 48-inch diameter sanitary sewer force main along S Rome Ave.
- Other project alternatives that were previously studied by the City (as documented in the 2022 JMT report) were evaluated at a high level to assess feasibility. None of these options are considered both feasible **AND** adequately sized to meet the project's flood reduction goal.

Based on the detailed analysis of the three primary alternative routes, along with evaluation of feasibility and constructability of other alternative routes proposed by both previous studies and the community, **Alternative 3 has been selected because it has the lowest capital costs, the shortest duration of construction, and is the least impactful to the environment while meeting the project's flood reduction goal within Parkland Estates, Palma Ceia Pines, and areas adjacent to the project limits**. A comparative analysis of the three primary alternatives can be found in **Section 5.3.**

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Project Phasing

The overall conceptual design has been sized to meet the flood reduction goal for the entire SHFR Flood Reduction Focus Area, as well as other specific areas adjacent to the project route that have localized flooding issues, as shown in **Figure 4 and Figure 5**. However, due to current funding limitations, the current project scope does not include formal design and construction of all secondary stormwater collection systems needed to achieve that goal. **Therefore, for the purposes of this report, components of the overall solution will be separated into two phases, as shown in Figure 5:**

1. **Phase I** – 10'x10' primary box culvert trunkline between Bayshore Blvd and the AMI stormwater detention pond, secondary stormwater collection system within Parkland Estates and at each intersection along the project route, and connection points for the Selmon Expressway project. Pipe stub-outs from the Phase I system will be provided at specific locations where a future secondary collection system extension has been modeled, as discussed in **Section 5.1.**
2. **Future Phases** – Secondary stormwater collection systems needed to achieve FPLOS goal for specific roadways and intersections. This includes Palma Ceia Pines and identified flood-prone areas adjacent to South Howard Ave between W Swann Ave and Bayshore Blvd.

The future phase collection systems have been sized through H&H modeling to meet the FPLOS goal, and their locations are shown in green in **Figure 5** below. These secondary systems will be reevaluated and refined based on detailed survey, geotechnical investigations, and subsurface utility exploration in a subsequent evaluation and design phase.

During this later design phase, it is anticipated that opportunities to intercept the overland stormwater flows that currently enter Palma Ceia Pines from north of W Kennedy Blvd will be evaluated to reduce flooding along W Kennedy Blvd and within Palma Ceia Pines. Intercepting these flows could significantly reduce the size and extents of the secondary collection systems needed in Palma Ceia Pines to meet the project's FPLOS goal throughout the SHFR Flood Reduction Focus Area. **However, even if all overland flows are intercepted north of W Kennedy Blvd before reaching Palma Ceia Pines, it will not eliminate the need for the SHFR project.**

This, along with additional value engineering, alternative construction delivery methods, and other potential future conditions resulting from other stormwater improvements projects, will likely affect the construction costs of future phase projects.

A map of the phased recommended project is shown in **Figure 5**. Key project details, findings, and assumptions are listed below:

- Includes new 10'x10' box culvert trunkline from Bayshore Blvd to the AMI detention pond, along S Audubon Ave between W De Leon St and W Horatio St.
- Existing box culverts remain in place beneath Bayshore Blvd, Selmon Expressway, and the CSX railroad.
- Additional parallel 60" pipe is to be installed beneath Selmon Expressway and CSX railroad via microtunnel.
- The route includes S Howard Ave, W Swann Ave, and S Audubon Ave corridors.
- Includes new weir that uses gravity to control water levels within and discharges from the City-maintained AMI Pond between W Horatio St, W De Leon St, S Audubon Ave, and S Habana Ave, eliminating the need for the existing pump that recovers the pond's available storage and treatment volume. The pond's primary existing outfall – a 4'x8' box culvert along W Horatio St – will remain to function as a secondary outfall.
- **Estimated Phase I Construction Cost: $92,136,452** (cost estimate is based on 30% design and can be found in **Appendix L**)
- Future project phases will include smaller stormwater trunklines throughout Palma Ceia Pines and local roads adjacent to the main trunkline's route to collect stormwater runoff and address FPLOS deficiencies.

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Because the future phase systems will be smaller and shallower than the Phase I infrastructure, the City may be able to construct these systems using alternative delivery procurement methods, such as use of City construction crews and competitively bid construction contracts. A range of preliminary construction costs for these future phases, reflective of present-day dollars, have been developed by the City based on recently bid stormwater projects, and are included in **Table 5** and **Table 6.**

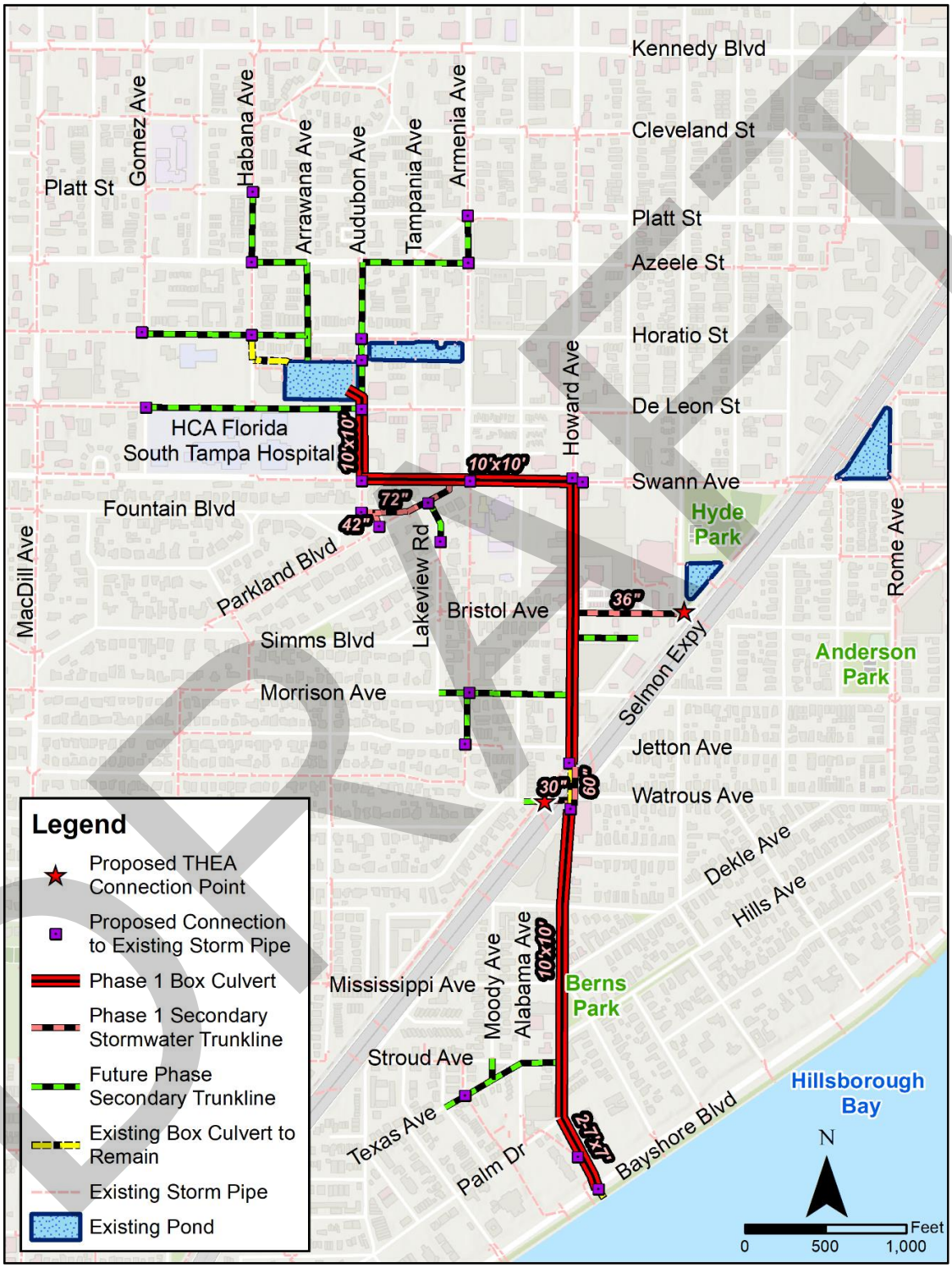


Figure 5 – Recommended Project Map

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Figure 6 shows the reduction in flood extents for the 5-year/8-hour design storm **for only the Phase I project**. The purple shading represents existing flooding extents predicted by the model that would be eliminated during the same storm event once the project is complete. **What is not visible in the figure is the significant reduction in structure flooding and the reduced duration of roadway flooding after the completion of Phase I.**

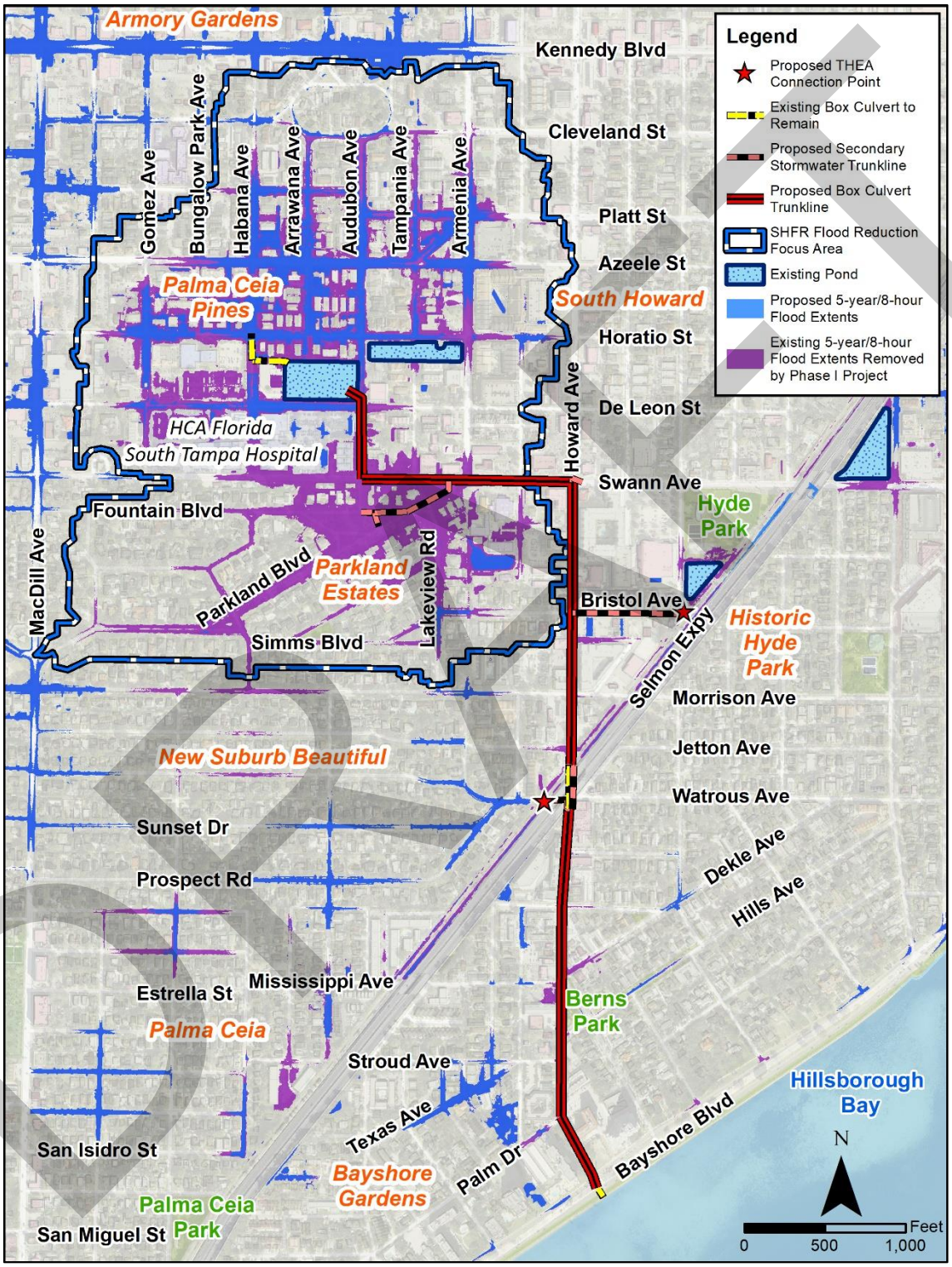


Figure 6 – Phase I - 5-year/8-hour Proposed Flood Extents Reduction

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Table 3 below provides a summary of benefits anticipated after the construction of **only Phase I.** When compared to the overall solution's benefits in **Table 2**, it is apparent that **Phase I alone provides most of the structure flooding reduction. It will also significantly reduce the duration of roadway flooding both inside and outside of the SHFR Flood Reduction Focus Area.** Phase I provides the major artery needed for stormwater conveyance that future phases will connect into. These smaller future phase projects will provide a significant reduction in volume of roadway flooding that allows specific roadways and intersections to meet the FPLOS goal.

Table 3 – Summary of Proposed Phase I Flood Reduction Benefits

Flood Reduction Benefit	2.33-year/ 24-hour Design Storm (4.5 inches)	5-year/ 8-hour Design Storm (5.3 inches)	10-year/ 24-hour Design Storm (7.0 inches)	25-year/ 24-hour Design Storm (8.0 inches)	50-year/ 24-hour Design Storm (10.0 inches)	100-year/ 24-hour Design Storm (11.0 inches)	Hurricane Milton (13-14.5 inches*)
Proposed Reduction of Roadway Inundation (miles)	3.1	4.6	3.9	4.0	3.4	2.9	3.9
Proposed Reduction of Inundated Homes/Businesses**	N/A	96	113	172	183	153	225
% Reduction of Inundated Homes/Businesses**	N/A	100%	92%	85%	72%	56%	68%

*Hurricane Milton rainfall totals vary across the model's geographic limits, and were estimated by radar (source: NEXRAD)
**Includes predicted total number of ground floor dwellings, including single family homes, businesses, and individual apartment or townhome units, within the 206 specific buildings surveyed in 2025 by the design-build team.
Note: Benefits reflect all proposed Phase I improvements as depicted in red in **Figure 6.** Additional future projects that reduce runoff to this area will further increase these benefits.

Table 4, Table 5, and **Table 6** below provide a summary of the incremental benefit-cost analysis (BCA) for Phase I and the future phases, using the Southwest Florida Water Management District's (SWFWMD) Stormwater Improvement Flood Protection (SIFP) Benefit Cost Analysis Tool. **Estimated project costs shown in each table include construction costs as well as engineering and permitting fees.**

A detailed estimate of the Phase I construction cost can be found in **Appendix L** and is based on the 30% design. A formal cost estimate of future phase projects has not been developed for this report, and the estimated range of their combined project costs was provided by the City.

It is important to note that the estimated costs are preliminary, based on present-day economic conditions when this document was written, and are subject to change. It is also important to remember that the future phases include Palma Ceia Pines, as well as other secondary stormwater collection systems that extend beyond the Phase I project corridor (see **Figure 5**), which are subject to change. Details regarding the BCA are discussed in **Section 6.6** of this report.

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Table 4 – Benefit-Cost Analysis – Phase I only

Expected Annual Damage Without Project	$21,040,904
Expected Annual Damage with Project	$12,496,761
Expected Annual Damage Benefit	$8,544,143
Discount Rate	7.0%
Project Useful Life (# years)	50
Present Value of Future Benefits	$117,915,552
Estimated Project Cost	$99.8M
Benefit/Cost Ratio	**1.2**

Table 5 – Benefit-Cost Analysis – Future phases only, with Phase I already complete

Expected Annual Damage Without Project	$12,496,761
Expected Annual Damage with Project	$7,276,528
Expected Annual Damage Benefit	$5,220,233
Discount Rate	7.0%
Project Useful Life (# years)	50
Present Value of Future Benefits	$72,043,108
Estimated Project Cost	$32M to $50M*
Benefit/Cost Ratio	**1.4 to 2.2**

*Future phase project cost estimate range was provided by the City, and is based on present day dollars

Table 6 – Benefit-Cost Analysis – Total Project (Phase I and Future Phases)

Expected Annual Damage Without Project	$21,040,904
Expected Annual Damage with Project	$7,276,528
Expected Annual Damage Benefit	$13,764,376
Discount Rate	7.0%
Project Useful Life (# years)	50
Present Value of Future Benefits	$189,958,660
Estimated Project Cost	$132M to $150M*
Benefit/Cost Ratio	**1.3 to 1.4**

*Future phase project cost estimate range was provided by the City, and is based on present day dollars

Document disclaimers:
This document is a draft.
Sections referenced in this document will be added at a later date as they are finalized.

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