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## **NORTH PORT GATEWAY ACTIVITY CENTER MASTER PLAN RECOMMENDED STORMWATER MANAGEMENT IMPROVEMENTS (SUBCONTRACT WORK, CONTRACT #2022-13-03)**

**TO:** Amanda Klepper, AICP

**ADDRESS:** 100 Europa Drive, Suite 270, Chapel Hill, North Carolina 27517

**DATE:** April 10, 2024

**SUBJECT:** Gateway Master Plan Stormwater Assessment Report

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### **EXECUTIVE SUMMARY**

The City of North Port has requested assistance in the development of the Gateway Activity Center Master Plan. The Gateway Activity Center is approximately 177.8 acres of undeveloped land surrounding the interchange of I-75 and Sumter Boulevard. The Gateway Activity Center is essentially four (4) quadrants around the Sumter Boulevard and I-75 intersection (**Figure 1**).

The objective of the assessment is to describe the existing conditions in and around the Gateway Activity Center and identify: (1) a minimum of five different recommended stormwater management improvements for conceptual land use scenarios; (2) a written narrative that explains each recommended stormwater management improvement and its benefits. The assessment covers land use, environmental, stormwater, transportation, and economic development characteristics of the study area. Applied Ecology, Inc. (AEI) has been tasked to provide the stormwater assessment of current conditions and potential future conceptual stormwater management improvements to incorporate into the Master Plan.

Data sources used to perform the assessment of current conditions and to inform potential new stormwater management improvements included wetland maps, soil maps, sub basin shapefiles, Florida Land Use, Cover, and Forms Classification System (FLUCCS), LiDAR data, FEMA flood maps, previously available stormwater reports, and hydrologic and hydraulic (CHAN) model outputs.

The northern quadrants of the Gateway Activity Center are completely within a FEMA Flood Zone (AE Zone). While a portion of the southwest quadrant is within an AE zone (58%) and the southeast quadrant is not within a FEMA flood zone. The soils map shows that this area consists of a combination of hydric and non-hydric soils.

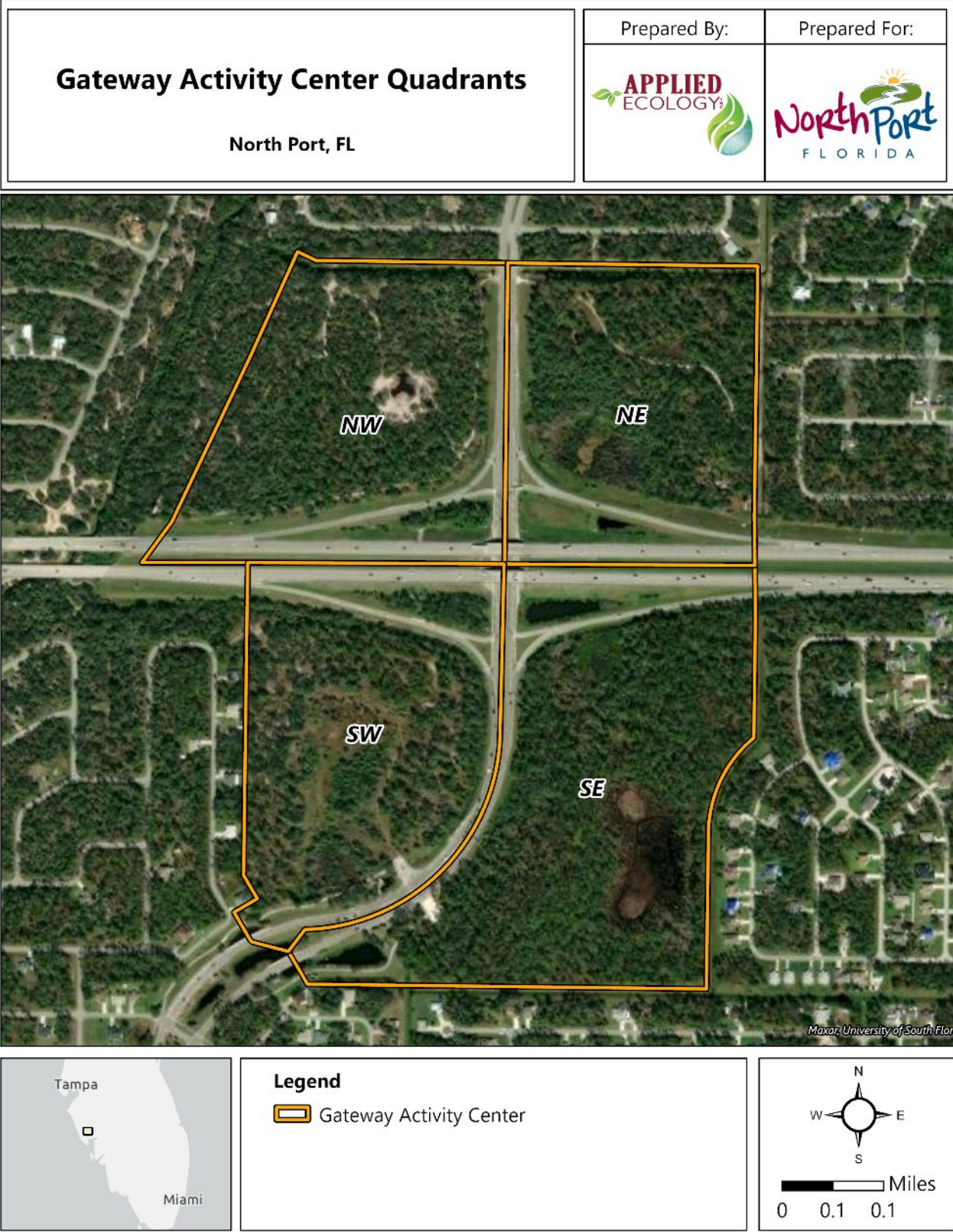


Figure 1. Gateway Activity Center quadrants.

AEI evaluated potential constraints and opportunities associated with the following land-use scenarios:

- Scenario A – High intensity
- Scenario B – Recreation and conservation
- Scenario C – Local economy and active environmental

For each of the scenarios the maximum estimated impervious area was calculated. Within the AE flood zone, the maximum proposed impervious area was used to calculate an estimated compensatory storage volume requirement based on the approximate existing grade and AE Zone base flood elevation (BFE). The estimated compensatory storage requirements for the northern quadrants would require significant storage capacity at an offsite location. This is a significant challenge for any development in AE flood zones within the Gateway Activity Center. For the northern quadrants there is no available space for compensatory storage either on-site or on adjacent, nearby properties.

The following are five stormwater management improvements/recommendations for the Gateway Activity Center:

1. Develop Detailed/Updated H&H Model: Any proposed development in the Development Gateway Center should utilize a detailed and updated H&H model. This H&H model should be developed under the guidance of City stormwater and engineering staff for the watershed that includes the Gateway Activity Center in a more widely used model format, such as ICPR.
2. Avoid/Minimize Development in the Northern Quadrants. Essentially all the NW and NE quadrants are within an AE flood zone. Compensatory storage will need to be identified at off-site locations that are not within a FEMA flood zone. Looking at land use scenarios A and B and their estimated compensatory storage requirements show that development of the northern parcels will be extremely challenging.
3. Avoid Residential Housing and/or Transient Lodging in AE Flood Zones. This Gateway Activity Center should not be slated for any land use that includes housing or transient lodging as it would likely incur a safety risk to residents and first responders during a major flooding event especially given evacuation routes throughout the City have proven to be inaccessible during larger storm events (e.g. 100 yr/24h storm event). The only land use scenario that proposes any of the above uses is Scenario C where the NE quadrant is RV Park/Ballfields.
4. Preserve Wetlands to the Extent Practicable. Wetlands are a critical piece of “natural infrastructure” when dealing with stormwater. Due to the conceptual level of the scenarios provided, it is difficult to determine the probably extend of wetland impacts for any of the land uses.
5. Maximize use of Green Stormwater Infrastructure. GSI can be a very effective stormwater tool to improve a developed site’s stormwater treatment capabilities. In the area of the Gateway Activity Center, because of the hydric soil, GSI should be used with discretion.

## BACKGROUND & OBJECTIVES

The City of North Port has engaged Pritchett Steinbeck Group, Inc. (PSG) to assist in the planning for the Gateway Activity Center Master Plan. The Gateway Activity Center consists of 177.8 acres of undeveloped land surrounding the interchange of Sumter Boulevard and Interstate-1-75 (**Figure 1**).

The objective of the assessment is to describe the existing conditions in and around the Gateway Activity Center and identify: (1) a minimum of five different recommended stormwater management improvements for conceptual land use scenarios; (2) a written narrative that explains each recommended stormwater management improvement and its benefits. The assessment covers land use, environmental, stormwater, transportation, and economic development characteristics of the study area. Applied Ecology, Inc. (AEI) has been tasked to provide the stormwater assessment of current conditions and potential future conceptual stormwater management improvements to incorporate into the Master Plan. The objective of the assessment of the Gateway Activity Center is to provide: (1) a minimum of five different recommended stormwater management improvements for conceptual land use scenarios; (2) a written narrative that explains each recommended stormwater management improvement and its benefits.

## DATA COLLECTION

As part of the assessment AEI was provided or collected the data/information as summarized in **Table 1**.

**Table 1. Data collected and description.**

Data	Data Type	Description
Watershed Management Program Consulting Services in the Big Slough Watershed (K883) Best Management Practices (BMP) Analysis Final Report, Ardaman & Associates, Inc Sept. 2014	Report	The purpose of this study is to evaluate alternatives that could solve flooding conditions with the City of North Port
City of North Port Professional Engineering Services for the Big Slough Flood Reduction Study Stormwater Management Plan, Deloach Engineering Science, May 2019	Report	The purpose of this study is to present a conceptual stormwater management master plan for improvements covering flood-prone areas in the Big Slough Watershed within the City of North Port.
Hydrologic & Hydraulic Modeling	Digital	Modeling of stormwater conditions throughout the City including episodic rainfall events
Sub Basins	Digital	Sub basins are defined during the development of the H&H model to delineate a series of small drainage areas.
Flood Stage Elevation Nodes 25-Year Flood	Digital	Node locations within the H&H model that are used to characterize the peak flood stages/elevations during episodic rainfall events
Land Use Type	Digital	Land Use Land Cover Classifications from Southwest Florida Water Management District
Surface Waters and Wetlands	Digital	Surface Waters and Wetlands Maps, National Wetlands Inventory
Soil Classifications	Digital	Soil Survey Geographic Database contains information about soil as collected by the National Cooperative Soil Survey
Elevation Data	Digital	LiDAR elevation data is a remote sensing method that is used to generate hi-resolution survey data
FEMA Flood Maps	Digital	Flood zones delineated by FEMA for the purposes of identifying high risk flood zones. FEMA flood zones are based on 100-year return interval flood events.

## HYDROLOGIC AND HYDRAULIC MODELING RESULTS

The City of North Port provided AEI with the following stormwater modeling reports that have been previously commissioned by the City:

- Watershed Management Program Consulting Services in the Big Slough Watershed (K883) Best Management Practices (BMP) Analysis Final Report, Prepared for Southwest Florida Water Management District & City of North Port, Ardaman & Associates, Inc. September 2014
- City of North Port Professional Engineering Services for the Big Slough Flood Reduction Study Stormwater Management Plan, Deloach Engineering Science, May 2019

The above reports developed hydrologic and hydraulic (H&H) models of the entire City including the Gateway Activity Center and surrounding communities. The H&H modeling included the evaluation of the entire City under a number of return interval flooding events. Additionally, numerous stormwater alternatives were modeled to identify the most appropriate alternatives to address flooding issues throughout the City, including the Gateway Activity Center.

As reflected in the 2014 Big Slough Watershed (K883) Best Management Practices (BMP) Analysis Final Report (Ardaman, 2014) and the 2019 Big Slough Flood Reduction Study Stormwater Management Plan (Deloach Engineering, 2019), the City's predominant stormwater issues are flooding. This is confirmed by a review of the FEMA Flood Maps for the entire City which were generated via H&H modeling.

The 2014 Ardaman Report evaluated several local and regional Best Management Practices (BMPs) to resolve flooding conditions within the City. A total of fourteen (14) BMPs were evaluated in this study: six (6) regional BMPs; four (4) roadway crossings; one (1) water control structure modification; and four (4) level of service improvements. The following is a list of the BMPs that H&H modeling showed were relevant to the Gateway Activity Center. The BMPs listed below either showed a net improvement or impairment on flooding in the Gateway Activity Center:

- BMP #1 – Remove Structures throughout City of North Port Waterways – Impairment
- BMP #2 – Constrain Flow Entering City of North Port at Big Slough Canal -Improvement
- BMP #3 – Diversion Alternative - Improvement
- BMP #4 – R-580 Improvements - Improvement
- BMP #6 – Upstream Detention Alternatives - Improvement
- Roadway Crossings – Myakkahatchee Creek at I-75 - Improvement

It should be noted that BMP #2 provided the most significant improvement while BMP#1 increased flooding within the Gateway Activity Center.

The 2019 Deloach Engineering Report evaluated (a) localized flooding along the Myakkahatchee Creek and (b) regional conceptual solutions to mitigate flooding.

As part of the 2019 Deloach Engineering Report the following solutions were recommended:

- Construction of a new bypass canal parallel to the Myakkahatchee Creek from Tropicaine Boulevard to north of Price Boulevard.
- Increase conveyance capacity through canal widening and upsizing culverts in the R-36 ditch along the northern and western boundary of the City.
- Restrict high flow into Myakkahatchee Creek near the north City boundary.

The City has purchased numerous properties along the Myakkahatchee Creek that have historically been subjected to chronic flooding. To date, none of the recommended regional solutions in the 2019 Deloach Engineering Report have been implemented as they are considered cost prohibitive.

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## **SUB BASINS**

As part of the City's H&H modeling efforts, sub basins were delineated to characterize a much smaller scale of drainage areas. Sub basins are a critical component in understanding and managing stormwater on both a regional and local scale (**Figure 2**).

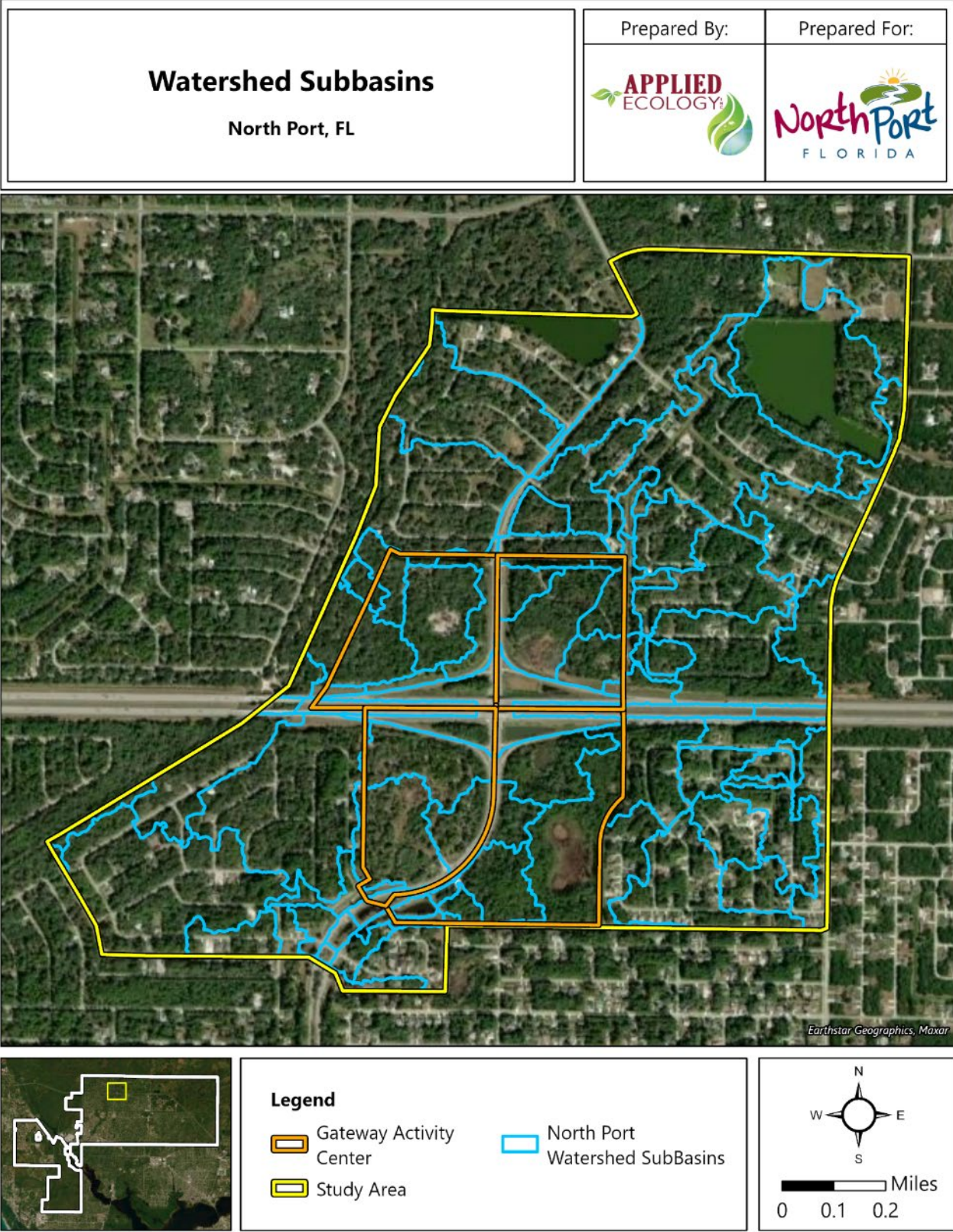


Figure 2. Subbasins within the Gateway Activity Center Study Area.



## FLOOD STAGE ELEVATIONS

Flood model nodes throughout the Gateway Activity Center were examined for both the 25-year and 100-year 24-hour rainfall events (**Figure 3** and **Figure 4**). The difference in the flood model nodes for the 25-year and 100-year event are as follows:

- Northwest (NW) quadrant – 100-year flood elevation is approximately 2 feet higher than the 25-year flood elevation.
- Northeast (NE) quadrant – 100-year flood elevation is approximately 2.5 feet higher than the 25-year flood elevation.
- Southwest (SW) quadrant – 100-year flood elevation is approximately 1 to 1.5 feet higher than the 25-year flood elevation.
- Southeast (SE) quadrant – 100-year flood elevation is approximately 1 foot higher than the 25-year flood elevation.

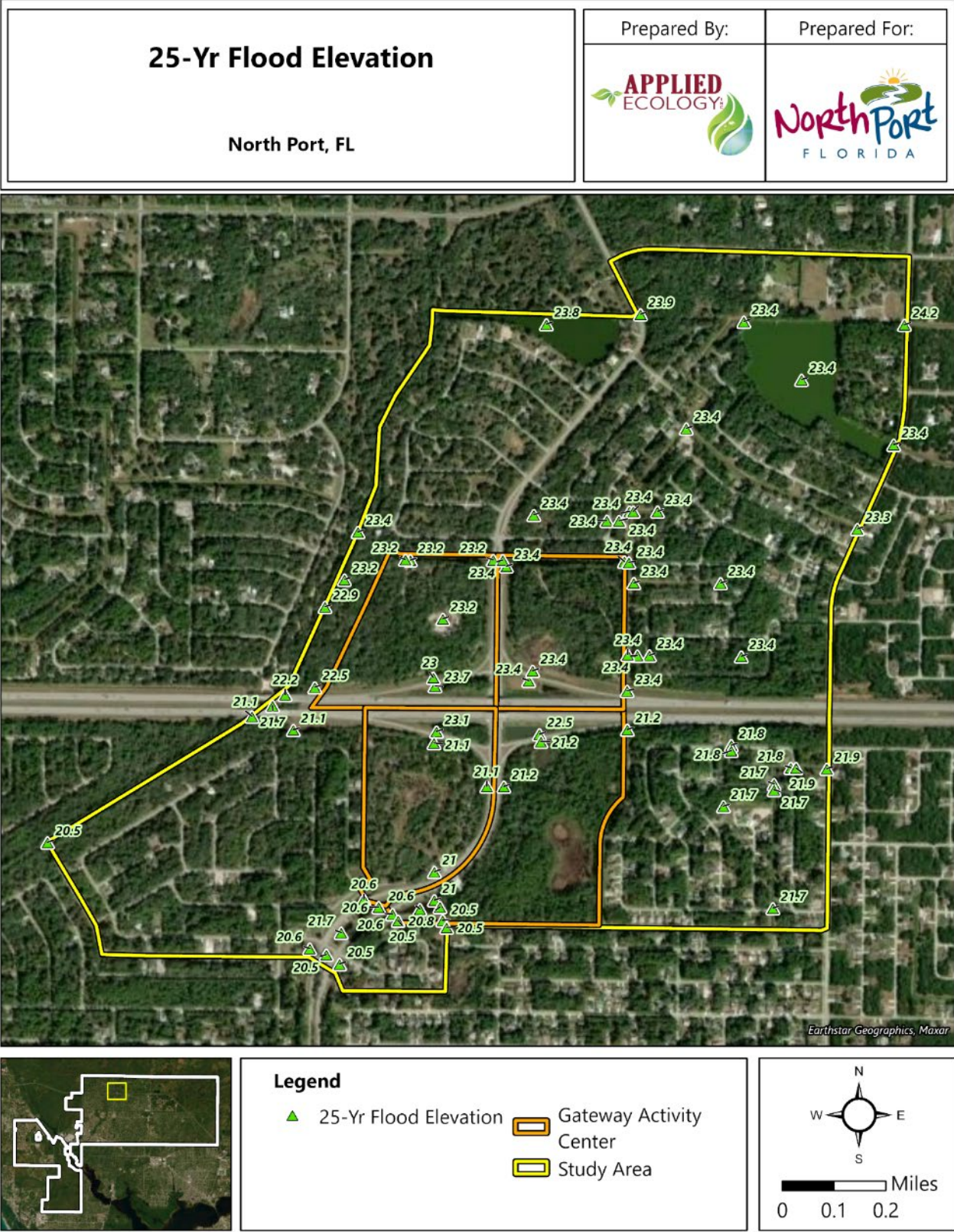


Figure 3. 25-Yr Flood Elevations.

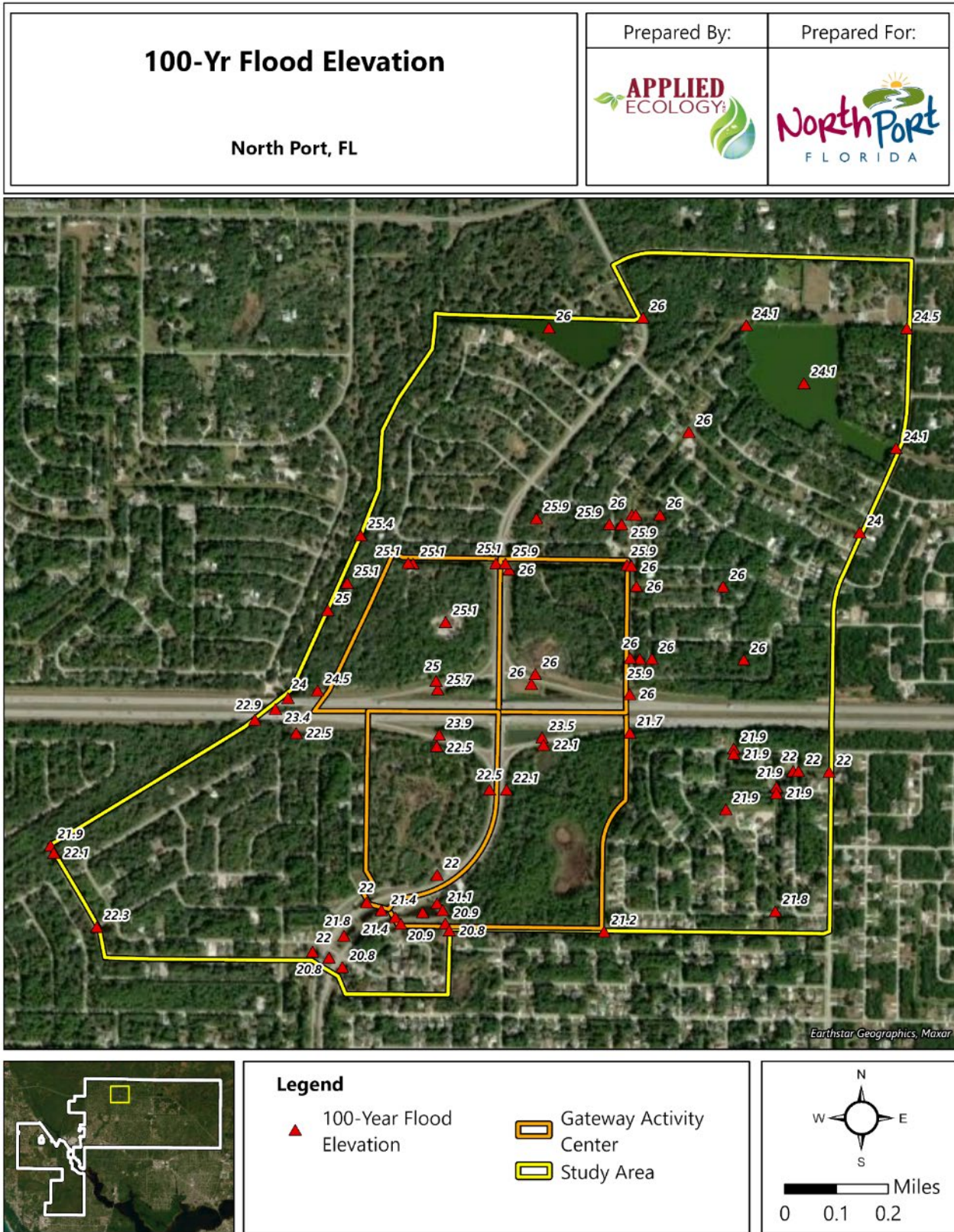


Figure 4. 100-Yr Flood Elevations.

## SURFACE WATERS AND WETLAND MAPS

The surface waters within the Gateway Activity Center include some natural creeks and man-made canals/ditches that drain to the Myakkahatchee Creek. While the man-made canals tend to surround the perimeter of the Gateway Activity Center, a small number of natural meandering creeks are adjacent to the Myakkahatchee Creek, in the NW quadrant (**Figure 5**). It should be noted that the wetland maps in the northern quadrants may not be completely accurate since these areas have not been flagged and surveyed by qualified professionals and the data were strictly based on the U.S. Fish and Wildlife National Wetland Inventory (NWI).

A summary of the types of wetlands and percent coverage are provided in **Table 2**. Depending on the type, quality, and amount of proposed impact to wetlands, regulatory agencies may require wetland mitigation that can potentially be costly.

*Table 2. Wetland types and percentages within each quadrant.*

Quadrant	Area (acres)	Wetlands		
		Classification	(acres)	%
NW	26.31	Freshwater Forested/Shrub Wetland	3.73	14%
		Freshwater Emergent Wetland	1.30	5%
NE	23.02	Freshwater Forested/Shrub Wetland	3.47	15%
		Freshwater Emergent Wetland	2.29	10%
SW	31.41	Freshwater Forested/Shrub Wetland	0.61	2%
		Freshwater Emergent Wetland	1.22	4%
SE	43.14	Freshwater Forested/Shrub Wetland	6.16	14%
		Freshwater Emergent Wetland	2.85	7%

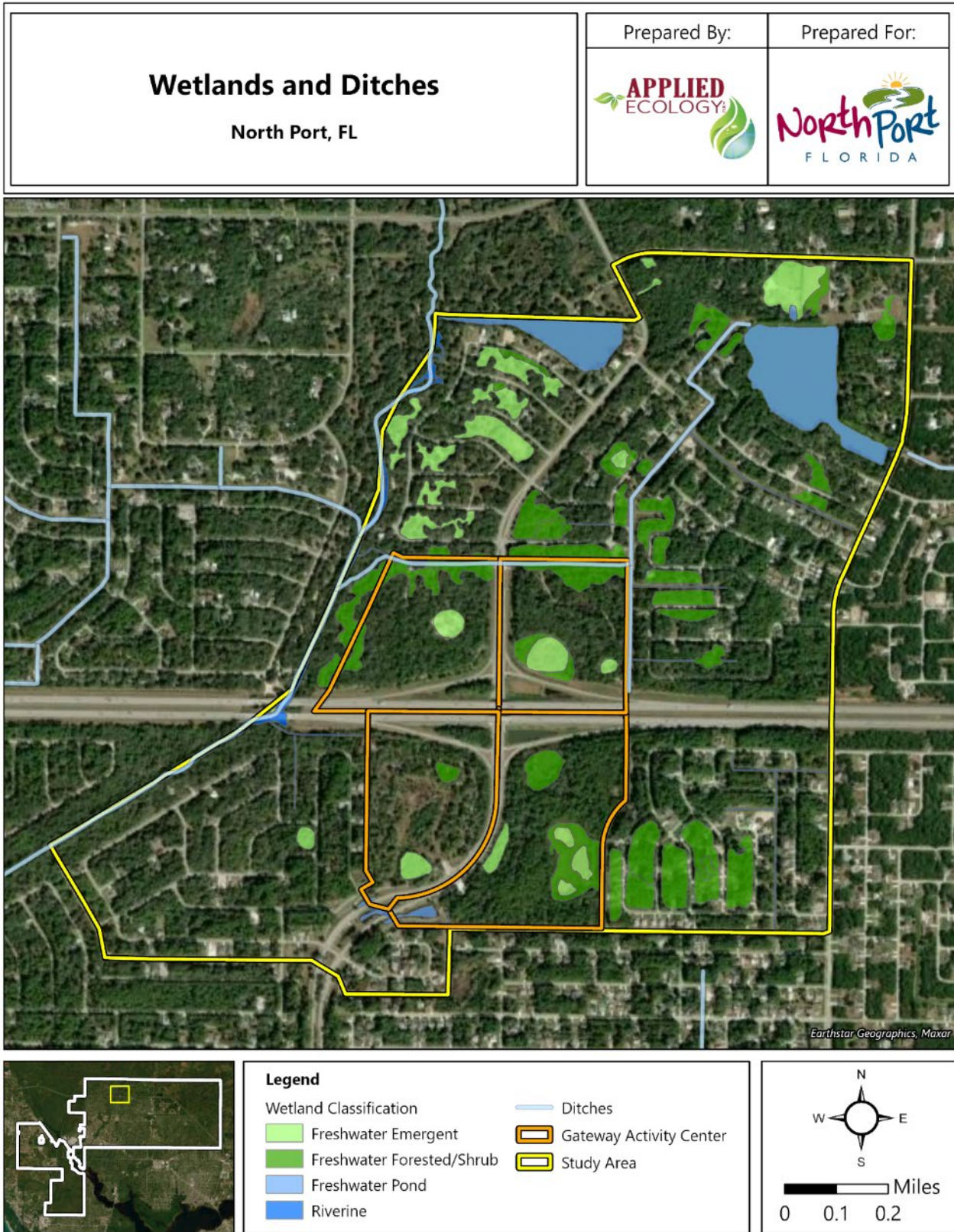


Figure 5. Wetlands and surface waters within the Gateway Study Area.

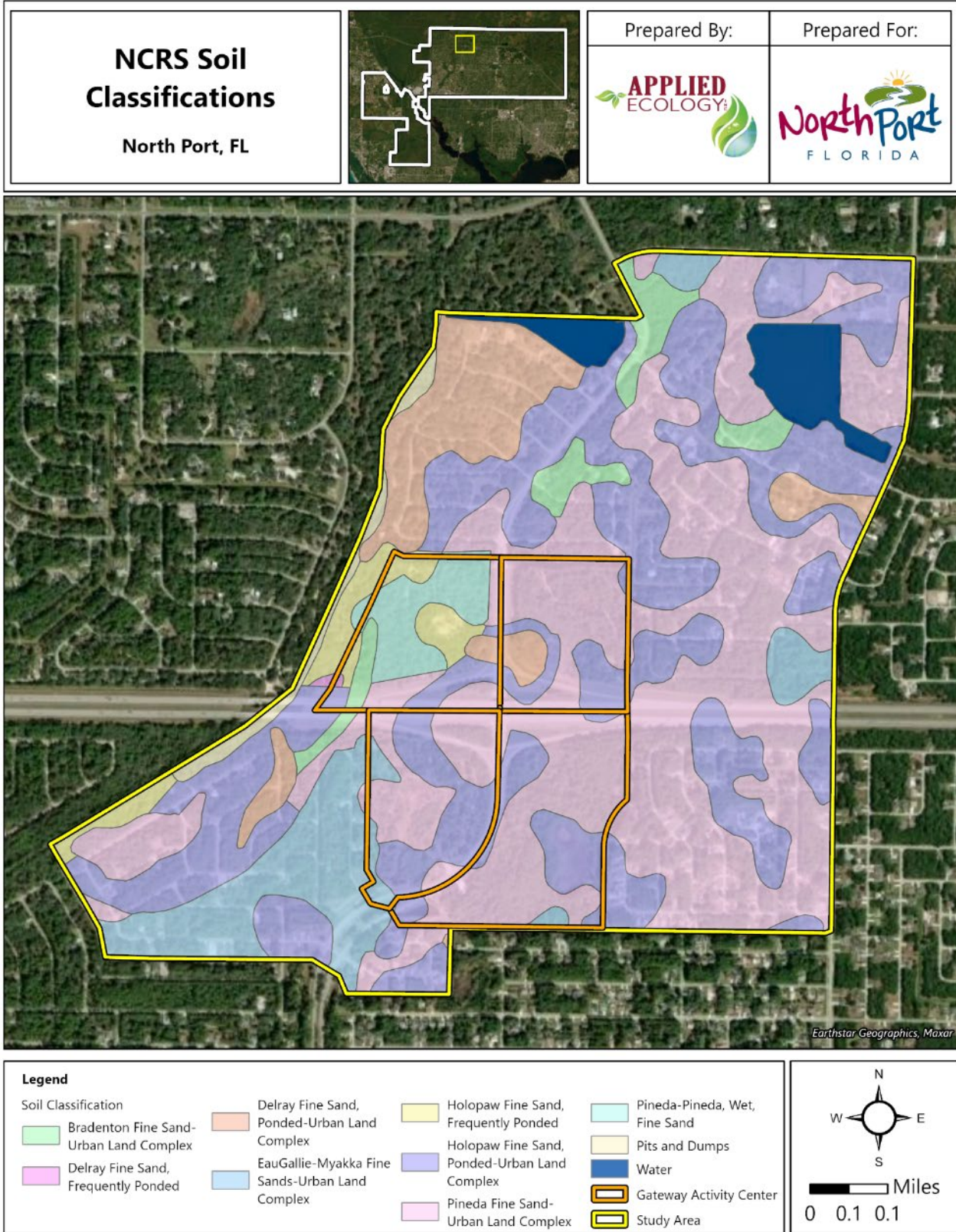


*Figure 6. Picture of landscape in NW quadrant previously classified as wetlands based on NWI data.*

The U.S. Department of Agriculture, Natural Resources Conservation Service (NRCS) Soil Survey was evaluated to determine the types and quality of the soils within the Gateway Activity Center (**Figure 7**). As reflected in **Figure 7**, there is a mix between hydric and non-hydric soils. Hydric soils are typical for areas of regular saturation, flooding, or ponding. These soils are typical of low-lying wetland areas. As reflected below, there is a relatively “even” mix of hydric and non-hydric soils amongst the quadrants. The summary in **Table 3** is based on the hydric rating provided in the NWI database. The hydric soils generally align with the locations of the wetlands shown in **Figure 5**.

*Table 3. Hydric and non-hydric soils within each quadrant.*

Quadrant	Area (acres)	Hydric vs Non-Hydric Soils		
		Classification	(acres)	%
NW	26.31	Hydric	5.15	20%
		Non-Hydric	21.16	80%
NE	23.02	Hydric	16.4	71%
		Non-Hydric	6.62	29%
SW	31.41	Hydric	2.38	8%
		Non-Hydric	29.03	92%
SE	43.14	Hydric	24.42	57%
		Non-Hydric	18.72	43%



**Figure 7. Soil classifications in the Gateway Activity Center Study Area.**

## ELEVATION DATA

Elevation data was obtained in the form of Light Detection and Ranging (LiDAR) survey data for the Gateway Activity Center from the Florida Geographic Information Office (FGIO). The LiDAR survey itself was conducted on November 30, 2018. These data provide high-resolution topographic information which can be used to determine stormwater pathways, areas that are prone to flooding, and waterbodies/wetlands.

The 2018 LiDAR data (**Figure 8**) show that the overall topography of the Gateway Activity Center will cause stormwater to flow from the northeast to the southwest towards the Myakkahatchee Creek. However, the existence of numerous ditches, Sumter Boulevard, and Interstate-75 disrupt the natural flow direction and have essentially compartmentalized this area into four distinct quadrants. Canals along the northern and eastern perimeter direct some of the stormwater from on-site to the west and south. An examination of elevation data throughout each of the quadrants shows very flat, uniform elevations. Except for berms that have been created as a result of drainage ditch construction around the site's perimeter, elevations are within +/- 1 foot of one another.



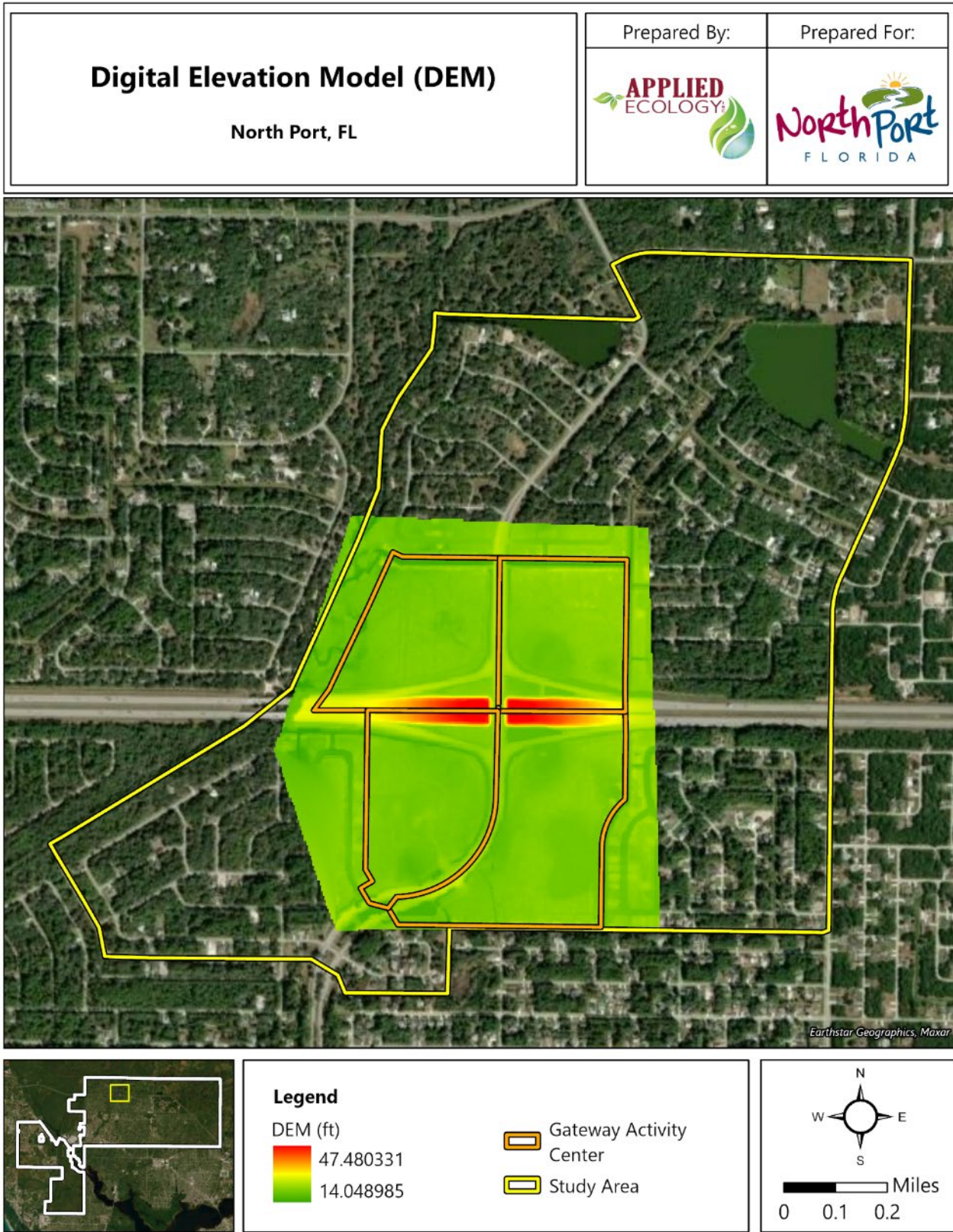


Figure 8. 2018 LiDAR data for the Gateway Activity Center

## FEMA FLOOD MAPS

FEMA flood maps for the Gateway Activity Center were reviewed to determine the risk of flooding and stormwater requirements for alternatives evaluated as part of this effort. The FEMA flood map (**Figure 9**) shows that of the 177.8 total acres amongst the four quadrants. Those quadrants are further broken down to areas within each quadrant that are undeveloped and could potentially be used for future development. The undeveloped areas do not include roadways such as Sumter Boulevard and I-75. The actual area available for potential development is about 124 acres. The northern quadrants are generally 100% within the AE flood zone. In the SW quadrant the undeveloped area totals just over 31 acres. The SW quadrant is broken down to about 58% in the X zone and 42% in the AE zone. The SE quadrant has plans for a medical center currently underway. The site plan has been approved by the State. The medical center parcel occupies approximately 32 acres of the SE quadrant where approximately 19.1 acres is proposed to be impervious. The remaining 11 acres of the SE quadrant is a separately owned parcel and remains undeveloped.

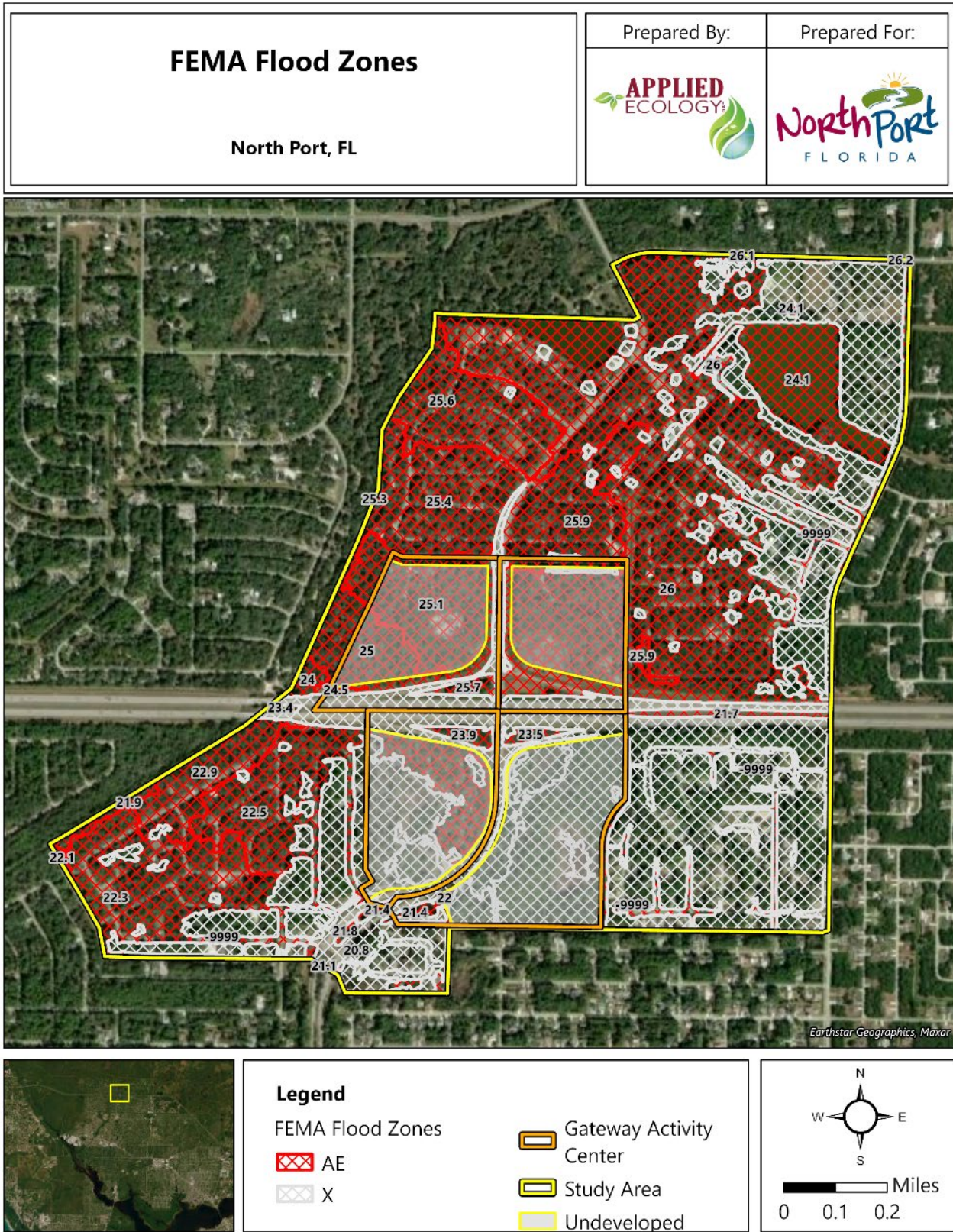


Figure 9. FEMA flood zones within the Gateway Activity Center Study Area.

## PROPOSED LAND USE SCENARIOS

The following land use scenarios were evaluated for their stormwater improvement needs and potential impacts. For the SE quadrant, a medical center is currently in the permitting phase so the use of this quadrant will remain constant in each scenario.

1. Scenario A – High intensity
  - a. NW Quadrant – Office/Retail with less than 30% impervious area
  - b. NE Quadrant – Retail/Medical with less than 25% impervious area
  - c. SW Quadrant – Hotel/Retail with less than 50% impervious area
  - d. SE Quadrant – Medical use with less than 60% impervious area
2. Scenario B – Recreation and conservation
  - a. NW Quadrant – Nature Park/Outdoor Retail with less than 1% impervious area
  - b. NE Quadrant – Outdoor Recreation with less than 5% impervious area
  - c. SW Quadrant – Indoor Entertainment/Medical with less than 50% impervious area
  - d. SE Quadrant – Medical use with less than 60% impervious area
3. Scenario C – Local economy and active environmental
  - a. NW Quadrant – Active Park/Small Retail with less than 5% impervious area
  - b. NE Quadrant – RV Park/Ballfields with less than 10% impervious area
  - c. SW Quadrant – Mainstreet/Stormwater Feature with less than 50% impervious area
  - d. SE Quadrant – Medical use with less than 60% impervious area

*Table 4. Gateway Activity Center land use scenarios.*

Scenario	Quadrant	Impervious Area (%)	Land Use
<b>A</b>	NW	<30	Office/Retail
	NE	<25	Retail/Medical
	SW	<50	Hotel/Retail
	SE	<60	Medical*
<b>B</b>	NW	<1	Nature Park/Outdoor Retail
	NE	<5	Outdoor Recreation
	SW	<50	Indoor Entertainment/Medical
	SE	<60	Medical*
<b>C</b>	NW	<5	Active Park/Small Retail
	NE	<10	RV Park/Ballfields
	SW	<50	Main Street/Stormwater Feature
	SE	<60	Medical*

\* Site Plan for medical center approved by State. Medical center site plan shows 32 acres with 19.1 acres of impervious area, and 7.75 acres of wetland impacts.

## DISCUSSION

A major component of the stormwater management consideration for the Gateway Activity Center is the Big Slough or Myakkahatchee Creek immediately west of the study area. The Myakkahatchee Creek runs from north of the City limits coming from the Myakka Conservation Area through the northern City limits southwest until it meets the Myakka River. The Myakkahatchee Creek is a critical component of drainage for because it is the tailwater for the basin that drains the Gateway Activity Center and surrounding communities. It is also the source of flooding for this area during episodic storm events.

As reflected in the FEMA Flood maps (**Figure 9**), the areas along Myakkahatchee Creek north of I-75 have a significantly higher BFE as compared to the areas south of I-75. Although the existing grades of the NE and SE quadrants are slightly higher than that of the NW and SW quadrants, I-75 restricts the natural flow of Myakkahatchee Creek resulting in base flood elevations that are 1 to 2 feet higher than the AE zones to the south I-75. It should be noted that the SE quadrant is not within an AE flood zone so the above description of base flood elevations does not apply.

Given the soil conditions, City-wide flooding issues, and FEMA flood zones within most of the quadrants in the Gateway Activity Center and in the adjacent communities, providing compensatory storage of stormwater must be taken into consideration. Any impervious surface within a FEMA flood zone will require compensatory storage. This is an especially challenging problem to address in the northern quadrants because there is no area for storage on site. Even properties adjacent to the northern quadrants are within the AE flood zone so offsite compensatory storage is generally unavailable or would likely be cost prohibitive.

The tailwater conditions of the Gateway Activity Center are dictated by the water levels in the Myakkahatchee Creek. During episodic storm events, the tailwaters will not allow for any stormwater to discharge into the Myakkahatchee Creek like during normal tailwater conditions. Even during a 25-year, 24-hour event, most of the northern quadrants will be inundated by flood waters, while the SW quadrant would experience less severe flooding than the 100-year event, and the southeast quadrant would not experience any flooding. When the tailwater elevation exceeds the existing ground elevation of a study site, the entire storm event at the study site must be retained until a positive, gravity outfall is achieved.

As reflected in **Table 5**, the northern quadrants are generally 100% within the AE flood zone. With that said, development in the north quadrants should be extremely limited. In the SW quadrant the undeveloped area totals just over 31 acres. The SW quadrant is broken down to about 58% in the X zone and 42% in the AE zone. From a stormwater management perspective, a minimal impact to the AE flood zone would make addressing stormwater needs more manageable.

The SE quadrant has plans for a medical center currently underway. The site plan has been approved by the State. The medical center parcel occupies approximately 32 acres of the SE quadrant where approximately 19.1 acres is proposed to be impervious. The remaining 11 acres of the SE quadrant is a separately owned parcel and remains undeveloped.

**Table 5. FEMA Flood Zones and Wetland Composition for the Gateway Activity Center by Quadrant.**

Quadrant	Area	AE		X		Wetlands	
	(acres)	(acres)	%	(acres)	%	(acres)	%
NW	26.31	26.31	100%	0.00	0%	5.03	19%
NE	23.02	22.58	98%	0.44	2%	5.76	25%
SW	31.41	13.31	42%	18.10	58%	1.83	6%
SE*	43.14	0.00	0%	43.14	100%	9.01	21%

\* Medical Center in SE quadrant is currently in permitting phase. The medical center parcel is approximately 32 acres with 19.1 acres of impervious area, and 7.75 acres of wetland impacts.

For each of the scenarios listed in **Table 4** the maximum impervious area was calculated based on the area in each quadrant in **Table 5**. For any of the areas where AE flood zones exist, the maximum estimated impervious area can be used to calculate an estimated compensatory storage volume requirement based on the approximate existing grade and the AE Zone base flood elevation (BFE). This estimate has been calculated for each of the quadrants that are within the AE flood zone (**Table 6**). An example of how the “acre-ft” volumetric measurement works, is if there is 1-acre of impervious development in an AE zone with a 3.5-foot flood depth, then the compensatory storage will require a volume that has a 1-acre footprint with a depth of 3.5 feet. For every ac-ft of AE Zone filled, the fill volume will need to be replaced “cup for cup”; however, the storage initiates upward of the seasonal high-water table or the 10- or 25-year flood plain, as designated by the state permitting agency (e.g. Southwest Florida Water Management District). As reflected in the compensatory storage requirements for the northern quadrants would require significant storage capacity at an offsite location.

For any site development within an AE zone, approximately 25 to 30% of the developed area will need to be reserved for stormwater management facilities to accommodate the volume for, at minimum, the 100-year, 24-hour storm event. This does not include the compensatory storage requirements for the direct impacts to the flood zone nor the regulatory water quality treatment requirements as specified by the Southwest Florida Water Management District (SWFWMD).

Based on the compensatory storage requirements estimated in **Table 6**, the scenarios with the largest compensatory storage requirements will be the most challenging to accomplish and are in the following order:

1. Scenario A – The total compensatory storage requirement for all quadrants is 97.2 acre-ft. Where 73.6 acre-ft is within the northern quadrants.
2. Scenario C - The total compensatory storage requirement for all quadrants is 68.4 acre-ft. Where 44.9 acre-ft is within the northern quadrants.
3. Scenario B - The total compensatory storage requirement for all quadrants is 35.1 acre-ft. Where 11.5 acre-ft is within the northern quadrants.

It should be noted that for the SW quadrant, in all scenarios, has the same compensatory storage volume. This volume could be significantly reduced if development within the SW quadrant AE zone was avoided/minimized.

**Table 6. Approximation of flood depths and compensatory storage volumes for each scenario/quadrant.**

Scenario	Quadrant	Area (acres)	Impervious Area		Approximate AE Flood Depth (ft)	Compensatory Storage Volume Required (acre-ft)	Land Use
			(acres)	%			
A	NW	26.3	7.89	<30	3.5	27.6	Office/Retail
	NE	23	5.75	<25	3.0	17.3	Retail/Medical
	SW	31.4	15.7	<50	1.5	23.6	Hotel/Retail
	SE	43.1	25.86	<60	0	0.0	Medical*
B	NW	26.3	13.15	<1	3.5	46.0	Nature Park/Outdoor Retail
	NE	23	9.2	<5	3.0	27.6	Outdoor Recreation
	SW	31.4	15.7	<50	1.5	23.6	Indoor Entertainment/ Medical
	SE	43.1	25.86	<60	0	0.0	Medical*
C	NW	26.3	1.315	<5	3.5	4.6	Active Park/Small Retail
	NE	23	2.3	<10	3.0	6.9	RV Park/Ballfields
	SW	31.4	15.7	<50	1.5	23.6	Main Street/Stormwater Feature
	SE	43.1	25.86	<60	0	0.0	Medical*

\* Site Plan for medical center approved by State. Medical center site plan shows 32 acres with 19.1 acres of impervious area, and 7.75 acres of wetland impacts.

## CONSIDERATIONS & RECOMMENDATIONS

### CONSIDERATIONS

The following considerations are important components to the recommended stormwater management improvements.

1. A regional approach to address the recurring flooding issues within the City limits will be necessary to alleviate the tailwater conditions for the Gateway Activity Center, especially those in the northern quadrants.
2. Both regional and localized stormwater management retrofit capital improvement projects will be necessary to meet the SWFWMD water quality standards.
3. Any development in the northern quadrants will require:
  - a. Potable water and sewer, currently only available to the southern quadrants.
  - b. Compensatory storage for all impervious areas constructed within the AE flood zones. On-site storage is not available for the NW and NE quadrants. Storage off-site on adjacent areas is extremely limited.
    - i. The most challenging land use scenarios are in the following order:
      1. Scenario A
      2. Scenario C
      3. Scenario B
4. Any development within the Gateway Activity Center should be done in a manner to ensure that flooding of adjacent properties is not exacerbated.
5. Flood modeling has shown that even under a 25-year flood event, both the NW and NE quadrant would still experience severe flooding but to a lesser extent than the 100-year flood event. During episodic storm events, high tailwater conditions will require all stormwater during these events to be retained on-site until tailwater conditions recede.

### RECOMMENDATIONS

The following sections provide five stormwater management improvements/recommendations for the Gateway Activity Center. The recommendations below are based on conceptual-level land use scenarios with very limited information.

#### DEVELOP DETAILED/UPDATED H&H MODEL

An H&H model is critical for the evaluation of any development in or adjacent to AE Flood Zones. Any proposed development in the Development Gateway Center should utilize a detailed and updated H&H model. This H&H model should be developed under the guidance of City stormwater and engineering staff for the watershed that includes the Gateway Activity Center in a more widely used model format, such as ICPR. The previously used CHAN stormwater model is a less widely used model format less familiar to many stormwater engineers. The benefits of an updated H&H model in a more universal format are that it can be provided to developers. The developers can input the stormwater parameters of the proposed



development and a stormwater report be generated and provided to City staff for review. City staff will have reviewed, vetted, and approved the H&H model which will provide for consist reporting for all proposed development. The conceptual land use scenarios can be further refined with the use of an appropriate H&H model.

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## **AVOID/MINIMIZE DEVELOPMENT IN THE NORTHERN QUADRANTS**

As reflected in **Table 5**, essentially all the NW and NE quadrants are within an AE flood zone. Compensatory storage will need to be identified at off-site locations that are not within a FEMA flood zone. Most properties adjacent to the north quadrants are within a FEMA flood zone and are not suitable for stormwater storage. The NW and NE quadrants should be restricted to natural/environmental park areas with little to no impervious areas. A park or parks, such as the Myakkahatchee Environmental Park, is an example of appropriate development in the northern quadrant of the Gateway Activity Center. Any impervious area will require compensatory storage – cup for cup – a significant challenge to accommodate in the Gateway Activity Center.

Looking at land use scenarios A and B and their estimated compensatory storage requirements show that development of the northern parcels will be extremely challenging.

Additionally, avoiding/minimizing development in the northern quadrants will: (a) limit the potential of developed properties being inundated/damaged by major flooding; (b) eliminate the hazard to people and first responders if developed properties are flooded; (c) leave open space for emergency overflow during flood events; and (d) eliminate the possibility of exacerbating flooding in adjacent developed communities.

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## **AVOID RESIDENTIAL HOUSING AND/OR TRANSIENT LODGING IN AE FLOOD ZONES**

This Gateway Activity Center should not be slated for any land use that includes housing or transient lodging as it would likely incur a safety risk to residents and first responders during a major flooding event especially given evacuation routes throughout the City have proven to be inaccessible during larger storm events (e.g. 100 yr/24h storm event). The only land use scenario that proposes any of the above uses is Scenario C where the NE quadrant is RV Park/Ballfields. This recommended stormwater alternative provides similar benefits as the above alternative. It eliminates the potential for residents and first responders to be put in harm's way and it eliminates the potential of exacerbating flooding in adjacent communities.

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## **PRESERVE WETLANDS TO THE EXTENT PRACTICABLE**

Wetlands are a critical piece of “natural infrastructure” when dealing with stormwater. Wetlands can retain flood waters during storm events and provide water quality treatment as the water percolates through the wetland and the vegetation removes nutrients and pollutants. Wetlands can also be utilized as emergency overflows during flood events.

Due to the conceptual level of the scenarios provided, it is difficult to determine the probably extend of wetland impacts for any of the land uses.

As reflected in the **Table 3** and **Figure 7**, the soils in and adjacent to mapped wetlands are hydric soils that are poorly drained. Any development on or adjacent to these types of soils will have to consider this in their stormwater design.

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## **MAXIMIZE USE OF GREEN STORMWATER INFRASTRUCTURE**

Maximize use of Green Stormwater Infrastructure (GSI) where practicable within the Gateway Activity Center. GSI can be a very effective stormwater tool to improve a developed site's stormwater treatment capabilities. GSI is used to infiltrate rainwater into the ground at or near the location where it falls. It is often a critical design element of stormwater infrastructure used to meet water quality targets set forth by the SWFWMD. It can also provide aesthetic appeal to the landscape. In the area of the Gateway Activity Center, because of the hydric soil, GSI should be used with discretion. It should not be considered as a tool to address flooding issue in the FEMA flood zones because GSI generally requires separation between the groundwater table. During periods of high water or flood events GSI will not be able to infiltrate into the ground; therefore, dry retention or bioretention, for example, may not perform well unless substantial clean fill having higher permeability rates is used to elevate parking, structures, and associated stormwater management facilities.

## REFERENCES

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