

NORTH MERRITT ISLAND SMALL AREA STUDY



"Paddling Trail kayak launch" photo taken from Island Pioneer Trail by Brevard County Staff

BREVARD COUNTY, FLORIDA
Planning & Development Department
2018

Table of Contents

EXECUTIVE SUMMARY	1
STUDY AREA AND BOUNDARIES	3
CHARACTER OF THE COMMUNITY	4
Community Background	4
Historic Aspects.....	5
Access.....	7
Commercial	7
Residential	7
Wayfinding	8
Wildlife and Recreation	8
POPULATION AND DEMOGRAPHICS.....	10
Population	10
Households	12
Housing Types	12
Household Ownership	13
Trends in Brevard and North Merritt Island.....	14
LAND USE AND ZONING	15
General Pattern of Land Use	15
Future Land Use	15
Zoning.....	20
INFRASTRUCTURE AND SERVICE DEMAND	23
Transportation Network	23
Public Schools.....	25
Public Wastewater (Sewer) Service	26
Public Water Service.....	26
Parks and Recreation	27
Fire Rescue	28
Law Enforcement	29
Emergency Management.....	29
Natural and Manmade Hazards	30
Hurricane and Storm Effects.....	30
Flooding	30
Tornadoes	31
Thunderstorms and Lightning	31
Severe Winter Storms	32
Drought	32
Wildfire	32
Agricultural Infestations and Disease.....	34

Hazardous Materials	35
Launch Anomaly	35
Evacuation Routes	36
ENVIRONMENTAL AND ECOLOGICAL FACTORS.....	38
Storm Surge / Coastal High Hazard Area	38
FEMA Flood Zones and Flood Hazard Areas	40
Wetlands.....	43
Soils	46
Elevation (Topography)/ LiDAR	48
Lagoon Levels.....	50
Stormwater	52
Stormwater Projects, Infrastructure, and Mobile Pumps	52
Flooding	53
Staff Gauge Monitoring	55
Maintenance	55
Mosquito Impoundment	55
Septic	56
CITIZEN'S COMMITTEE RECOMMENDATIONS	59
Community & Quality of Life	59
Planning & Land Use.....	59
Transportation & Infrastructure	60
Utilities & Natural Resources	62
Safety & Emergency Management	65
ACHIEVEMENTS	65
APPENDICES	68
APPENDIX A.....	69
APPENDIX B	74

MAP SERIES INDEX

Map 1 Study Area and Boundaries	3
Map 2 Census Tract Boundary	11
Map 3 Future Land Use History	16
Map 4 Adopted Future Land Use	18
Map 5 Zoning Map	21
Map 6 Wildfire Risk Zones.....	33
Map 7 Agricultural Distribution	34
Map 8 Evacuation Zone A	36
Map 9 Evacuation Routes & Zones.....	37
Map 10 Coastal High Hazard Area.....	38
Map 11 Storm Surge Map Series 5 of 5.....	39
Map 12 FEMA Flood Zones	42
Map 13 National Wetlands Inventory.....	45
Map 14 Soil Drainage Characteristics.....	47

Map 15 2008 LiDAR Data	49
Map 16 Increased IRL Water Level Inundation.....	51
Map 17 Department of Health - Wastewater.....	57
Map 18 Storm Surge Map Series 1 of 5.....	69
Map 19 Storm Surge Map Series 2 of 5.....	70
Map 20 Storm Surge Map Series 3 of 5.....	71
Map 21 Storm Surge Map Series 4 of 5.....	72
Map 22 Storm Surge Map Series 5 of 5.....	73
Map 23 Proposed Future Land Use Amendment	74

EXECUTIVE SUMMARY

On August 7th, 2014, the Board of County Commissioners (BCC) directed staff to conduct a study of the area north of the Barge Canal in North Merritt Island (NMI) after a rezoning approval with a Binding Development Plan (BDP) was approved after much discussion and public comment. NMI residents were officially appointed by the District 2 Commissioner on January 9th, 2015 to serve on the North Merritt Island Citizen's Committee to guide the North Merritt Island Small Area Study (herein after known as The Study). The first Citizen's Committee kick-off meeting was January 20, 2015.

The Study set out to take an in-depth look at the area; its infrastructure, economy, and environment; and the community's vision to serve as a tool when planning for careful land development while preserving a unique quality of life. The Study focused on providing data and information to the Citizen's Committee for the purpose of formulating recommendations for future improvement projects, land development regulations or amendments to the Comprehensive Plan. The Study addressed long-term concerns by examining the Character of the Community, Land Use and Zoning, Infrastructure and Service Demand and Environmental and Ecological Factors.

The Citizen's Committee hosted many public meetings in coordination with the County's Planning & Development Department and incorporated data and information from a variety of County departments and State and Federal agencies. A list of thirteen Recommendations, which are arranged by type, rather than priority, are included for the Board's consideration at the conclusion of The Study. Recommendations #7, #8, and #3 were selected by the Citizen's Committee as the top three considerations and are listed below for quick reference.

Recommendation 7 (on page 60) proposes that Brevard County should significantly improve the current Federal Emergency Management Agency (FEMA) stormwater model for North Merritt Island. This stormwater model could then be used to demonstrate whether proposed development would pose any adverse flooding impact on neighbors or streets. Brevard County Natural Resource Management Department has estimated the cost to collect the survey and mapping data to be \$150,000 and the cost to update the FEMA stormwater model to be \$300,000 totaling \$450,000.

Recommendation 8 (on page 62) proposes that Brevard County should create a Special Area of Stormwater Concerns (SASC) within the boundary of the North Merritt Island Small Area Study to require development to meet specific stormwater standards tailored for addressing the drainage challenges and deficiencies within the SASC. These standards could include, but would not be limited to volume limitations, increased discharge rate limitations; higher degrees of stormwater treatment, improving downstream infrastructure, individual lot detention, and lot fill limitations. Brevard County Natural Resource Department has advised that additional detail is necessary to allow evaluation of smaller individual projects for impacts on surrounding properties. Adoption of tailored standards applied within a SASC with support of an updated model as recommended above, could aid in avoiding harmful cumulative flood, drainage and water quality impacts.

Recommendation 3 (on page 58) proposes that for all parcels ≥ 2.5 acres in size with the Residential 1 (Res 1) Future Land Use designation and Agricultural Residential (AU) Zoning classification, Brevard County should amend the Future Land Use Map to Residential 1:2.5 (Res 1:2.5). If so directed by the Board of County Commissioners to implement the recommendation, County staff would initiate a Large Scale Comprehensive Plan Amendment (LSCPA) to modify the Future Land Use Map (FLUM). This FLU change from RES 1 to RES 1:2.5 would reduce the number of dwelling units that can be built in The Study area by approximately 1,492 dwelling units.

As a result of this in-depth look into the concerns over future growth and identifying the main priorities for action, the Board took action to upgrade the FEMA Flood Model for NMI. The Board may wish to consider taking action on the remaining twelve (12) recommendations listed on pages 59 through 65.



Citizen's Committee Members

Darleen Hunt, Chair

John Schantzen, Vice Chair

Jack Ratterman

Susan Smith

Ted Balke

Brevard County Staff

Tad Calkins Planning & Development Director

Erin Sterk Planning & Zoning Manager

Cheryl Campbell Planner III

Anne Rembert Special Projects Coordinator II – GIS & Mapping

In coordination with various County departments and State agencies

STUDY AREA AND BOUNDARIES

The North Merritt Island study area is bound by the Kennedy Space Center to the north and east, the Barge Canal to the south and the Indian River Lagoon to the west.



Map 1 Study Area and Boundaries

CHARACTER OF THE COMMUNITY

Community Background

The study area is bordered by the Barge Canal to the south, and the Kennedy Space Center (KSC) to the north and east, and the Indian River Lagoon on the west. The center of the study area is a bowl or basin with very low elevation, is located on a barrier island, and is subject to evacuation during storm events. An often heard comment by residents of North Merritt Island is that when they drive north over the Barge Canal Bridge, they enter an unlighted rural oasis. The SR 3 corridor totally changes once over the bridge from commercial to rural. This is what most residents and Citizen Committee representatives have said they would like to retain and preserve.

Residents in North Merritt Island are drawn to the area's rural environment with back porch exposure to the natural Florida habitat and wildlife. The areas climate is unique in that it supports a diversity of tropical and subtropical flora and fauna. Close proximity to the beaches and to the Kennedy Space Center adds to the area's desirability as a location for residential housing. Kennedy Space Center is one of the largest employers, lying adjacent to the study area on both the north and east sides. North Merritt Island features amenities such as rural living areas, social activities, biking and hiking, wetlands, protected species and wildlife, oak hammocks, pine forests, and other beautiful sceneries. There are about 1900 acres of recreation and conservation areas within NMI including Kings Park, Manatee Cove Park, Savannahs Golf course, Mitchell Ellington Park, Kabboord Sanctuary, and Pine Island Conservation Area¹. Located just to the east of the study area on the south portion of Kennedy Space Center on East Hall Road is KARS Park I, a recreational activities center operated by the NASA Exchange Council of Kennedy Space Center for the welfare of NASA employees, retirees and their guests. Many people enjoy the rocket launches from the John F. Kennedy Space Center located on Merritt Island.

Generally, the NMI area has remained rural due to having an abundance of land for agricultural use, unique topography, wetland habitat and the desire of the residents to retain a rural quality of life. Prior to the development of the Space Center, North Merritt Island was heavily farmed for citrus. These citrus roots were maintained by families like the Harvey's, Ramshur's, Policicchio's, and the Crisafulli's, but much of the citrus production has been lost in recent decades to citrus greening. The Crisafulli's are no longer actively maintaining their groves, but rather, they have replaced the fruit with cattle. While a few small groves are still maintained, other agricultural uses are being introduced by land owners, including dragon fruit, mangos, avocados, palm tree and plant nurseries, and other tropical species.



Dragon Fruit Farm
Source: Darleen Hunt



Crisafulli Cattle Operation
Source: Darleen Hunt

¹ Source: North Merritt Island Homeowner's Association

Within the study area, North Merritt Island also features an elected advisory board and an active homeowner's association. The North Merritt Island Dependent Special District Board established in 1998 for the purposes of advising the Board of County Commissioners with recommendations on particular rezoning and land development matters which affect the North Merritt Island area of the County. The North Merritt Island Homeowner's Association (NMIHOA) is a non-profit corporation funded by donations and fund-raising efforts of the members. Membership is on a yearly basis. Regular members have all the rights of membership. Non-residents of North Merritt Island can participate in the association as associate members, but may not hold office or vote. Both entities have a vested interest in protecting the interests of the area².

Historic Aspects

Pre-1900s

The North Merritt Island area, along with Cape Canaveral and Cocoa Beach, was home to the Ais Indian tribe of Central Florida. The first recorded contact between the Ais and the Spaniards was in 1513 when Ponce de Leon came ashore at a village south of Cape Canaveral, naming Florida during that same year. In the 1560s, many European fleets, some with treasure, ended in shipwreck along the Florida coast due to hazardous navigation through the Gulf Stream and the fierce hurricanes. In 1605, Merritt Island was called Ulumay and was the first town in the province of the Ais located on the Banana River³.

The first concerted efforts to develop the Indian River region were made during the late 1800s. A group of South Carolina natives from the Sea Islands established a community at Courtenay, named for a former governor of South Carolina and located near the intersection of North Tropical Trail and Church Road. Prominent early settlers included the LaRoche, Sams, Porcher, Campbell, and Dummett families.

The LaRoche and Sams families settled at Courtenay on Merritt Island. Together, they had extensive land holdings along the Indian River and the interior, north of what is now State Road 528. The LaRoches all maintained small orange groves, but their main industry centered on vegetable production for northern markets. J.H. Sams raised vegetables and oranges on his 160-acre homestead and also served as superintendent of Brevard County Schools for 40 years⁴. The John H. Sams house is a historic property that has withstood the test of time, storms and hurricanes. Today it is the oldest standing home in Brevard County, now located within the Pine Island Conservation Area. Constructed in 1875, it was originally located in the Eau Gallie area and later moved in 1878 to the North Merritt Island location. Mr. Sams was granted a homestead deed for 156 acres in 1884.

Douglas Dummett filed a land claim under the Armed Occupation Act of March 16, 1843. The Armed Occupation Act of 1842 granted lands to settlers that met certain conditions. Under the conditions of the act, any single man 18 years of age or older or any head of a family could apply for up to 160 acres of land. If the settler established a home within a year, lived on the land for five consecutive years, and cleared and enclosed at least five acres of the granted land, he or she would receive title to the entire parcel for free⁵.

The Dummett Mansion has been described as a one room house that Mr. Dummett shared with his daughter. The property was said to be one mile by one mile in size. At the time, the property was reported to contain 3,000 orange trees on rich sandy soil. Lemons and limes



Sams House
Source: Brevard County Staff

² Source: North Merritt Island Dependent Special District

³ Source: History of Brevard County Volume 1

⁴ Source: Sam's House at Pine Island Conservation Area; <http://nbbd.com/godo/sanctuaries/SamsHouse/>

⁵ Source: Florida Memory State Library & Archives of Florida

also grew right along the side of the oranges on the same tree. It was common to see deer and bears, and the occasional sighting of possums, raccoons, panthers, and wild cats in the groves. Mr. Andrew Jackson worked for Mr. Dummitt. He married Mr. Dummitt's daughter Katie and bought 60 acres of land from Mr. Butler Campbell which was located not far from the Dummitt Groves. Butler Campbell and Andrew Jackson built The Clifton School House, also referred to as The Clifton Colored School, around 1890-1891. Mr. Jackson's four children attended Clifton Colored School, which closed in 1910.



“White Lilly Cemetery” historical marker
Source: Darlene Hunt

St. Luke's Episcopal Church and Cemetery was built in 1888. LaRoche, Porcher and Sams were the founding families of the Gothic style Episcopal Church located in Courtenay at 5555 North Tropical Trail. Bethel A.M.E. Church of Merritt Island & Community (“White Lilly”) Cemetery was established in 1892. It was the first African Methodist Episcopal church on North Tropical Trail and was referred to as “The Little Church on Courtenay.” It served as a place of worship for grove workers. The church burned down in the spring of 1968, and the concrete footers of the brick piers were all that remained. The cemetery has been renamed to the Bethel-Greater Mounty Olive Church Community Cemetery and still in operation at 1240 North Tropical Trail.

Families moving to the area in the 1800s had three ways to reach North Merritt Island via the Indian River. One route was to sail the Atlantic Ocean past Cape Canaveral and through the Indian River Inlet, the only natural waterway into the river along the coast. The route was dangerous due to the open sea and shallow water at the inlet. Others came up the St. Johns River to enterprise on Lake Monroe and made the tortuous journey to Salt Lake or one of the other lakes in the upper reaches of the river. From there, they crossed over to the Indian River and proceeded southward to their destination. The third route was by way of the Mosquito Lagoon, across a small spit of land known as “the Haulover”, and into the Indian River. In 1854, the construction of the Old Haulover Canal was funded by the federal government at a cost of \$5,000 to connect the Mosquito Lagoon on the east with the Indian River on the west. Slaves of a local citrus grower dug the 500 yard long, 3 foot deep and 10 to 14 foot wide canal by hand. Today, the Haulover Canal continues to connect the Mosquito Lagoon with the Indian River and is part of the Intracoastal Waterway.

The 1900s

During the late 1950s and early 1960s, the space race provided the impetus for residential development in the north study area. In the 1960s, North Merritt Island went through a period of depopulation due to the land being acquired by NASA. 88,000 acres on North Merritt Island was acquired at a cost of \$55 million. Families living in the area were relocated to other areas. The half-fallen Clifton School House was still standing in 2004 in a remote area of North Merritt Island; somehow it was spared during the demolition of the area. A historic plaque now marks the site of the school. In 1962, the federal government appropriated \$5,000,000 for the completion of locks to connect Port Canaveral with barge canal across Merritt Island. The 90-foot wide and 600-foot long lock was opened in 1965. A few days prior to the official opening, the Saturn 1B rocket traversed through the new waterway on its way to the Kennedy Space Center.

According to the Citizen's Committee, during the space program, SR 3 was a 2-lane road in which traffic going to the space center would backup to the barge canal. The NMI Homeowners Association petitioned for a new road, collecting 2,000 signatures. 1964, the Emory L. Bennett Causeway (SR 528) toll road opened. It was constructed by Brevard County staff to provide relief for travelers between the mainland and Cape Canaveral. The roadway's single toll booth was removed in 1990. After the Apollo program, employment at the space center drop to approximately 8,000 people from 27,000. The space center was the 2nd largest tourist attraction in Florida, behind Disney. Kennedy Space Center went through two major layoff periods, one during the early 1970s and the second in the late 1980s through early 1990s.

Access

All vehicles entering or exiting North Merritt Island from the south must use the N. Courtenay Parkway (SR 3) four-lane highway to cross the Barge Canal over a double bascule drawbridge. Entering from the north, vehicles cross into Merritt Island from U.S. 1 south of Titusville using the NASA Causeway (SR 405) bridge to head towards KSC. Those heading to North Merritt Island then veer south on Space Commerce Drive before turning south onto the SR 3 arterial highway.

Commercial

The SR 3 corridor, also referred to as North Courtenay Parkway, has some developed retail, warehousing and wholesale businesses. Amongst these there are limited small shopping centers and independent restaurants, professional businesses and mini warehouse storage facilities. A few churches also border the corridor, as well as four service stations with mini-marts, and three commercial plant nurseries. To date, all commercial development is accessed from N. Courtenay Parkway, with none continuing along any other intersecting corridors.

The primary shopping area for NMI residents is outside of the study area, immediately south of the Barge Canal, where a vibrant commercial corridor provides grocery and hardware stores, restaurants, car dealers, thrift stores, auto repair, local government facilities, insurance companies, an enclosed mall and an assortment of business and professional services, all within a 10 mile area. Although residents have expressed an interest in a local grocery store on NMI, major grocery chains require a minimum base of 10,000 residences to warrant a new store, and even at total build out, this number will not be reached within the study area.

The citizens of Merritt Island recognized a need for visual improvement along the North Courtenay corridor and formed a Citizen Resource Group. Together with Brevard County leaders and staff members, the North Courtenay Parkway Corridor Study with recommendations was adopted on November 1, 2005. The primary goal of the study was to visually enhance the corridor to reflect the beauty of the North Merritt Island area. The recommendations address the need for enhanced signage standards that were greater than those in the Land Development Regulations. A new Ordinance amending Brevard County's Sign Standards within the Land Development Regulations was adopted on November 1, 2005. The recommendations also address the need for screening outdoor storage areas along the corridor with an opaque buffer with native trees to be included in landscape plans where new businesses are being developed.



Space Coast Veterinary Hospital
Source: Darlene Hunt

Residential



Single-Family Housing off North Tropical Trail
Source: Darleen Hunt

Residential areas are primarily located off of side roads from SR 3. Types of homes and residences range from trailer park and mobile home communities, assisted living facilities, duplexes, subdivisions, river front and canal front homes, large lot ranch style homes, and agricultural parcels with homes with livestock, horses, palm trees, nut, fruit and vegetable crops.

Low lying areas experience flooding in yards and roads during rainy seasons and some homes have flooded during heavy rains and storm events, leaving driveways and streets impassable in some areas.

North Tropical Trail, a two-lane north-south corridor paralleling SR 3, is located on the west side of the Island and has a slightly higher elevation along a coastal ridge. The south end of North Tropical Trail is lined with subdivisions and has the highest residential density in the study area, with most parcels having the Residential 4 (Res 4) Future Land Use designation, allowing a maximum density of four units per acre.

The northern portion of North Merritt Island consists primarily of large parcels, residential homes and agriculture. The majority of the northern area has a Future Land Use designation of Residential 1 (Res 1), which permits low density residential development with a maximum density of one unit per acre. This area also has Public Conservation lands to the west along the Indian River Lagoon.

Wayfinding

The majority of the SR 3 corridor has limited signage and wayfinding of important historical and environmental areas within the parameters of The Study. There is a lack of uniformity of signs or building design and it is difficult to navigate access points. Signage in place before the 2005 sign regulations does not have to comply with the new standards and is grandfathered in, resulting in haphazard signage along the corridor. The corridor has also been designated a Scenic Byway as part of the Indian River Lagoon National Scenic Byway (IRLNSB) corridor. An IRLNSB publication lists Manatee Cove Park and the Pine Island Conservation Area as sites to visit however there is limited signage in order to easily access these areas.



Indian River Lagoon
National Scenic Byway
Source: Darleen Hunt

Wildlife and Recreation

Wildlife is plentiful throughout the NMI area due to much undeveloped land, but also because it is bordered to the north by the 140,000-acre Merritt Island National Wildlife Refuge, located on Kennedy Space Center Lands. Wildlife frequently sighted include many species of birds and waterfowl, bobcats, coyotes, alligators, wild hogs, raccoons, possum, armadillo, snakes, turtles and tortoises, otter, deer, and even occasionally black bears.



Egret Birds off of Judson Rd.
Source: Brevard County Staff

Several County parks and trails are located within the NMI area. Kings Park has a beautiful multi-use path named Island Pioneer Trail. Manatee Cove Park has a pavilion and playground for children, as well as a Kayak/Canoe launch area used by residents and commercial kayak tour companies. The Pine Island Conservation Area offers two stormwater retention lakes used for fishing, kayaking and canoeing, bird watching and hiking. The Sams House portion offers trails and river access as well as numerous activities and educational programs for all ages. North Merritt Island's history is valued and preserved, as evidenced through the Historical Preservation sites at St. Luke's Episcopal Church, the White Lilly Cemetery, and the Sams House nature center complex.

In 2015, the conceptual alignment of the East Coast Greenway (ECG) was routed through the North Merritt Island study area through the Office of Greenways & Trails and depicted in the Florida Greenways & Trails System (FGTS) as a Land Trail Opportunity. A Feasibility Study to examine the ECG connection from the SR 405 Bridge to the north to SR 528 at the south is funded in FY 2019, which will examine potential future routes and impacts of a completed trail system. The route, if deemed feasible, will provide a connection to the East Coast Greenway National Trail network and also local residents and visitors to the greater Brevard Trails network.

There are recreational parks and conservation public lands on NMI, but there are no public meeting facilities or public schools. Because there are no schools in North Merritt Island, the nearest facilities are

located south of the Barge Canal at the Merritt Island Service Complex and the Merritt Island Public Library. Public meetings are held in local church facilities or at the Merritt Island Service Complex. The 100-acre Mitchell Ellington Park features ball fields, pavilions, and restrooms, but was also designed with a "foot print" to accommodate a County Community Center. Until this is constructed, NMI does not have a public meeting location to accommodate the needs of local residents both above and below the Barge Canal. The County also has building designs for Community Centers that could accommodate emergency staging following major storm events, if needed.

POPULATION AND DEMOGRAPHICS

Brevard County was founded in 1844 by Theodorus W. Brevard. The County's first recorded population was 139 in 1850. As of 2015, Brevard County's estimated population is 553,591, with a projected 2020 population of 595,700.⁶

Population

The North Merritt Island Study Area is located within Census Tract 699.01. The Study Area encompasses about 12% of the census tract, but was appropriate to utilize for this analysis, as the remaining area within the Census Tract but outside of the Study Area boundary has little to no residential development. This census tract's data will provide an adequate representation of the demographic makeup of the area and can be seen in the **Census Tract Boundary Map** on the next page.

Historical and current population data has been used to evaluate the pace of growth within this rural area. The percent of change calculation is a simple mathematical concept that represents the degree of change over time by making a comparison between two values expressed as a percent increase. **Table 1** below examines the population and change over time within Florida, Brevard County, and then North Merritt Island.

Since 1980, Florida's population has almost doubled, growing by 197%. With that said, the pace of growth has begun to level out, steadily declining over the last several decades. Brevard County's population increased at almost exactly the same rate as the state, growing 199% over the same 30 year period.

In 1980, the population within Census Tract 699.01 was 1,620. By 2010, the population bloomed to 7,926, or a 489% growth over the 30-year period evaluated – a rate that was almost 2.5 times higher than the State or County growth rate. North Merritt Island experienced a 118% increase for the 10 year period between 1980 and 1990, but the growth rate has slowed continually since then. Between 1990 and 2000, North Merritt Island was still experiencing substantial growth at a rate of 79%, but the pace of growth had declined by 39% from the prior 10 year period. From 2000 to 2010, the growth rate slowed to 26%, but was still almost double that of both Brevard County and State.

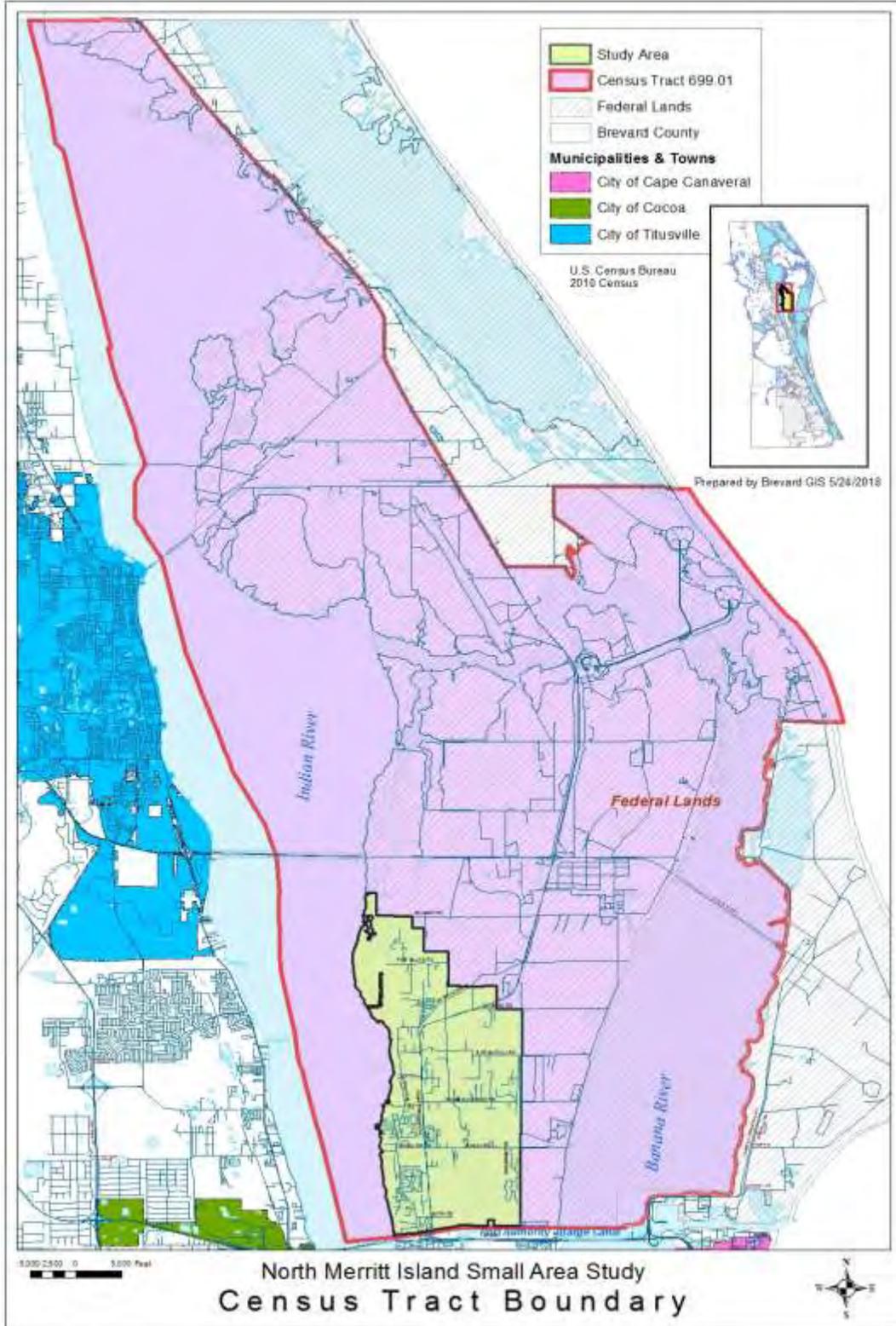
Although the Kennedy Space Center went through two major layoff periods, with one occurring during the early 1970's and the second occurring in the late 1980's through early 1990's, North Merritt Island continued its rapid population growth. The population growth seems to be independent of the Space Center activity, demonstrating that people are attracted to the area for more than employment opportunities. With several new residential projects currently in the works, population in the area is expected to increase.

Table 1 Population Change

	Population Change					
	Florida	% Change	Brevard	% Change	NMI	% Change
1980 Census	9,536,558		272,959		1,620	
1990 Census	12,936,271	36%	398,978	46%	3,529	118%
2000 Census	15,982,261	24%	476,234	19%	6,306	79%
2010 Census	18,801,310	18%	543,376	14%	7,926	26%

Source: Economic Development Commission of Florida's Space Coast, 2018

⁶ Source: Bebr – Projections of Florida Population by county, 202-2045, with Estimates for 2016
<https://www.bebr.ufl.edu/population/data>



Map 2 Census Tract Boundary

Households

Household is defined as set forth in F.S. § 196.075, “a person or group of persons living together in a room or group of rooms as a housing unit, but the term does not include persons boarding in or renting a portion of the dwelling.” The household count in the NMI area has changed from 589 in 1980 to 3,182 in 2010. The overall percent change was an increase of 440% in a 30-year period of time. Population and households are still experiencing growth, however at a slower rate than previous decades. The household change from 1980 to 1990 was roughly 3 times higher than Brevard County and the State of Florida. This trend continued through 2000. In 2010, the household change in NMI slowed by approximately 50%, remained double that of both Brevard County and Florida.

Table 2 Household Change

Household Change						
	Florida	% Change	Brevard	% Change	NMI	% Change
1980 Census	3,667,906		101,051		589	
1990 Census	5,134,521	40%	161,143	59%	1,319	124%
2000 Census	6,337,855	23%	198,194	23%	2,437	85%
2010 Census	7,420,802	17%	229,692	16%	3,182	31%

Source: Economic Development Commission of Florida’s Space Coast, 2018

Housing Types

The NMI area consists predominately of single-family residential housing, manufactured homes, and multi-family residential dwelling units. A single-family dwelling is defined as a private residence building used or designed for use as a home or residence, in which the use and management of all sleeping quarters and all appliances for sanitation, cooking, ventilation, heating and lighting are designed primarily for the use of one family unit. Typically, all rooms within the building must have internal access and the building shall have only one kitchen and one electrical meter. The minimum living area required per single-family dwelling unit varies among zoning classifications up to 2000 square feet. Multi-family dwelling units are defined as a residential building designed for or occupied by more than two families, with the number of families in residence not exceeding the number of dwelling units provided.

Mobile home means a modular unit which is designed for temporary or permanent single-family residential use and which is mobile as defined by F.S. Ch. 320, and is built on an integral chassis with an attached running gear. A mobile home shall be constructed to comply with federal mobile home construction and safety standards promulgated by the United States Department of Housing and Urban Development. All mobile homes used for residential purposes shall have a license from the state division of motor vehicles pursuant to F.S. ch. 320. Further, all regulations contained in F.S. Ch. 319 shall apply. If a mobile home is no longer eligible for a title certificate under F.S. ch. 319, the structure shall no longer be considered a mobile home. This definition does not include modular units.

Manufactured home shall have the same meaning as "manufactured home" in F.S. § 320.01(2) (b). Manufactured Home means a mobile home fabricated on or after June 15, 1976, in an offsite manufacturing facility for installation or assembly at the building site, with each section bearing a seal certifying that it is built in compliance with the federal Manufactured Home Construction and Safety Standard Act.

There are various types of zoning classifications in NMI, which define the minimum floor area of the living area. Single-family dwelling units can vary from 750 square feet to 2000 square feet. Multi-family dwelling units include duplexes and apartments. Duplexes require a minimum floor area of 1,150 square feet with a minimum of 575 square feet per unit. One bedroom apartments require a minimum floor area of 500 square feet, two bedrooms - 750 square feet plus 100 square feet for each additional bedroom, and efficiencies - 400 square feet.

Household Ownership

One measurement of a community's stability is the amount of housing that is owner-occupied. This generally implies a strong vested interest in the community. Residents who own their homes take pride in their property, which is outwardly reflected in the upkeep and maintenance of homes and neighborhoods. The percentage of homeowners versus renters is known as homeownership rate. The homeownership rate is derived by the number of owner-occupied units divided by the total number of occupied household units.

In addition to homeownership, a rental component is an essential aspect of a vital housing market. There are many reasons why individuals need or desire to rent, such as younger couples saving for their first home, individuals without children, or working professionals with a preference for a management company to be responsible for building and outdoor maintenance. The demand for rental housing does not diminish when limited apartments are available. Instead, the market reacts by landlords purchasing single-family homes and then leasing them as rental units. For this reason, a component of well managed rental communities rather than individually managed single-family housing rental units is desirable.

Table 3 Housing Units

	Housing Units								NMI % Change	Brevard % Change
	2000				2010					
	NMI Totals	% of Total	Brevard	% of Total	NMI Totals	% of Total	Brevard	% of Total		
Total	2,636		222,072		3,501		269,864		33%	22%
Owner-Occupied	2,162	82%	147,885	67%	2,671	76%	168,841	63%	24%	14%
Renter-Occupied	297	11%	50,310	23%	511	15%	60,851	23%	72%	21%
Vacant	177	7%	23,877	11%	319	9%	40,172	15%	80%	68%

Source: Economic Development Commission of Florida's Space Coast, 2018

As **Table 3** demonstrates, total housing units increased 33% from 2000 to 2010. Data in the previous population section indicated a population increase of 26% during the same time period. A conclusion can be drawn that the growth of housing units and the relative attractiveness of the location is influencing in-migration. As of 2010, 76% of the 3,501 housing units in the area were owner-occupied, compared to 82% in 2000, decreasing slightly in the Study Area and Brevard County as a whole.

Renter-occupied housing units in the Study Area increased slightly between 2000 and 2010, whereas Brevard saw no change with regards to percentage of housing units used as rental properties. Overall, renter-occupied housing units increased by 72% from 2000 to 2010, whereas Brevard County saw an increase of only 21%.

The percentage of vacant housing units increased marginally in the Study Area and Brevard County, with North Merritt Island's vacancy rate or 9% in 2010 being significantly lower than the 15% vacancy rate within Brevard County as a whole.

Table 4 Median Household Income

Median Household Income			
	Florida	Brevard	NMI
2010 ACS	\$ 47,661	\$ 49,523	\$ 58,472
2011 ACS	\$ 47,827	\$ 50,068	\$ 63,306
2012 ACS	\$ 47,309	\$ 49,099	\$ 60,789
2013 ACS	\$ 46,956	\$ 48,039	\$ 59,439
2014 ACS	\$ 47,212	\$ 48,483	\$ 63,889
2015 ACS	\$ 47,507	\$ 48,925	\$ 64,583
2016 ACS	\$ 48,900	\$ 49,914	\$ 65,684

Source: American Community Survey (ACS)

As **Table 4** demonstrates, as of 2016, the median household income – defined as half of NMI households making less than this amount, and half making more – was \$65,684 in the NMI area. The data indicates the median household income has been significantly higher than Florida's and Brevard County's between the years of 2010 to 2016. Most recently, the median household income in North Merritt Island was almost 32% higher than Brevard County and 38% higher than Florida as a whole. This trend indicates that the average household income on NMI may be associated with the growth in aerospace manufacturing and spaceflight technology on Merritt Island and other high-paying jobs within Brevard County.

Trends in Brevard and North Merritt Island

Since 1844, Brevard County has proven to be an attractive place to live. With a projected 2020 population of 595,700, it can be expected that The North Merritt Island Study Area will see its share of growth. Between 1980 and 1990, NMI experienced its highest growth in population. The area has proven to be an attractive area to live despite major layoffs to the space program. NMI population growth was 2 to 4 times higher than the County and the State of Florida between 1980 and 2010. This demonstrates that population growth within North Merritt Island is independent of the space exploration activity.

Owner-occupied housing represents about three-fourths of the housing units in the North Merritt Island, having a greater percentage of homesteaded properties than the County overall. Areas with high homeownership rates typically demonstrate stability and social solidarity, which is evident in North Merritt Island by the NMI Homeowners Association and the actions of this Citizen's Committee to bring forth this Study. Furthermore, North Merritt Island consistently has a higher median household income when compared to the County and the State, which implies that the area is likely to continue to maintain stable conditions. Although some agricultural productions, such as citrus farming have declined in the area, there still remain examples of agriculture uses that have been historically present. North Merritt Island's rural appeal, tropical climate, larger lots and agricultural pursuits make it great and growing place to live.

LAND USE AND ZONING

General Pattern of Land Use

The NMI Study Area contains a mix of commercial and residential development. The Study Area is predominately made up of single-family residential. Commercial land uses are limited to being in close proximity to the North Courtenay Parkway (SR 3) arterial roadway. An examination of the general pattern of land uses is critical to understanding what zoning classifications will help to preserve the area's character.

Future Land Use

Originally established in 1988, the purpose of the Future Land Use Map (FLUM) is to delineate Brevard County's vision of how the communities within it are developed and maintained. The FLUM is required as part of the Comprehensive Plan authorized by Chapter 163, Florida Statutes. The FLUM identifies the goals of development of an area by assigning each parcel of land in Brevard County a Future Land Use designation, which defines establishes densities (the number of residential dwelling units in a given land area per acre) and intensities (amount of non-residential development per acre). Density is an important characteristic in relationship between land use, transportation and Level of Service standards.

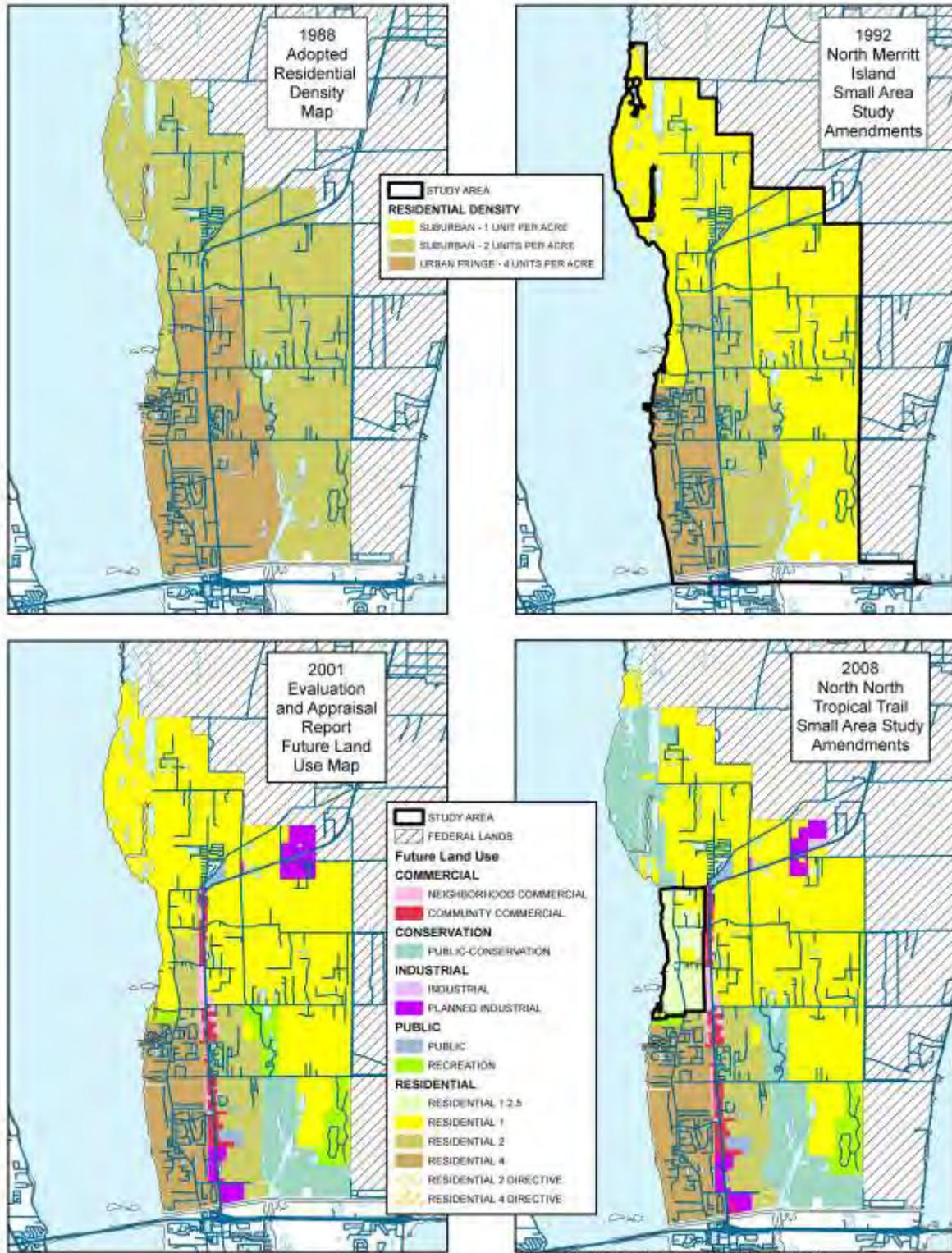
North Merritt Island has experienced a number of density reductions in the last few decades and the map on the following page and narrative below demonstrates the changes over time.

The 1988 Brevard County Comprehensive Plan was prepared in accordance with Chapter 163, Part II, Florida Statutes, "The Local Government Comprehensive Planning and Land Development Regulation Act of 1985", and Florida Administrative Code Rule 9J-5, "Minimum Criteria for Review of Local Government Comprehensive Plans and Determination of Compliance". The 1988 Brevard County Comprehensive Plan replaced the County Comprehensive Plan which was adopted in July of 1981 as mandated by the Local Government Comprehensive Planning Act of 1975 (See map on page 16).

On June 1, 1992 a North Merritt Island Small Area Study (SAS) was completed by County staff at the direction of the Brevard County Board of County Commissioners. From the SAS a list of recommendations were prioritized. The amendments that were proposed by Brevard County Staff and Adopted by the County Commission based upon these recommendations resulted in changes to the Density Map reducing dwellings units by 5,732 dwelling units over 8,423.6 acres. (See map on page 16).

In 2001, Brevard County received approval by the Department of Community Affairs (DCA) of the Evaluation and Appraisal Report (EAR) which included amending the Future Land Use Map. Prior to the Future Land Use Map Amendment in 2001, the County utilized both a Density Map and a Future Land Use Map. When this amendment was completed, the County had combined the two maps into one map calling it the Future Land Use Map which created twenty-two (22) different Future Land Use categories. (See map on page 16).

In 2004, the Brevard County Board of Commissioners directed County staff to conduct a Small Area Study for portions experiencing recent growth pressures in Merritt Island. The study area was located north of State Road 528 and is approximately bordered by the Indian River Lagoon on the west, by N. Tropical Trail on the north, Porcher Road and the Treasure Lagoon Development on the south and by the commercial corridor along Courtenay Parkway (SR 3) on the east. As a result of the recommendations that were derived from the study, the majority of the parcels within the study area received a Future Land Use change from Residential 2 (RES 2) and Residential 1 (RES 1) to Residential 1:2.5 (RES 1:2.5) significantly reducing the density within this area. (See map on page 16).

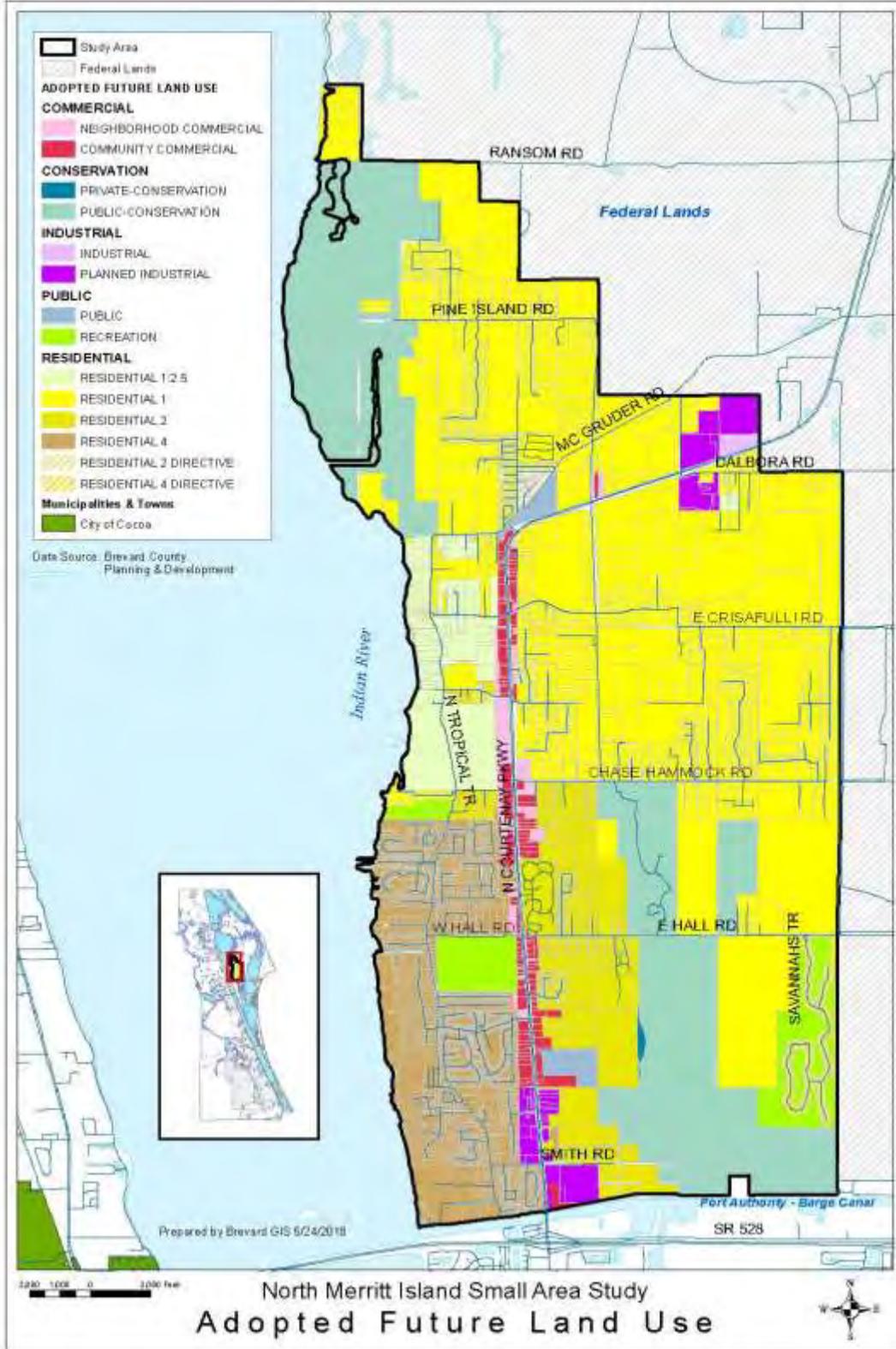


Map 3 Future Land Use History

Table 5 All Future Land Use Map Designations for Study Area

Future Land Use Designation		Total Acreage	% of Total Acreage	Vacant Acreage	% of Future Land Use Designation Vacant
Residential Land Uses		7623	71.47%	3414	44.79%
RES 4	Residential 4	1162	10.90%	150	12.90%
RES 2	Residential 2	859	8.06%	402	46.80%
RES 1	Residential 1	5117	47.98%	2701	52.78%
RES 1:2.5	Residential 1:2.5	463	4.35%	155	33.42%
RES 4_DIR	Residential 4 Directive	4	0.04%	1	13.50%
RES 2_DIR	Residential 2 Directive	16	0.15%	6	34.37%
Commercial Land Uses		302	2.83%	141	46.66%
CC	Community Commercial	206	1.93%	98	47.59%
NC	Neighborhood Commercial	96	0.90%	43	44.66%
Industrial Land Uses		241	2.26%	158	65.36%
IND	Industrial	17	0.16%	0	0.00%
PI	Planned Industrial	224	2.10%	158	70.46%
Conservation Land Uses		2114	19.82%	2047	96.84%
PRIVCONS	Private Conservation	9	0.08%	9	100.00%
PUBCONS	Public-Conservation	2105	19.73%	2038	96.83%
Public Facilities & Recreation Land Uses		386	3.61%	35	8.95%
PUB	Public Facilities	74	0.69%	29	39.48%
REC	Recreation	312	2.92%	5	1.69%
Total under County Jurisdiction		10665	100.00%	5794	54.33%

Source: Brevard County Planning & Zoning Office March 2018



Map 4 Adopted Future Land Use

The North Merritt Island Study Area is estimated to include 10,665 acres. Overall, 5,794 acres, or 54.33%, of the land in the Study Area remains vacant. Residential Future Land use designations represent 7,263 acres, or 71.47% of the Study Area. Of the Residentially designated land, Residential 1 FLU is the most represented designation at 5,117 acres, or 47.98% of the Study Area, with density limited to one unit to the acre. Within Brevard County, there are eight FLU designations, Residential 30 being the highest which allows up to 30 dwelling units per acre. Presently in North Merritt Island, Residential 4 is the highest FLU designation, allowing up to 4 dwelling units per acre.

Residential Future Land Use	Maximum Density
Residential 4	4 dwelling units per acre
Residential 2	2 dwelling units per acre
Residential 1	1 dwelling unit per acre
Residential 1:2.5	1 dwelling unit per 2.5 acres

Residential development potential in NMI is limited by a 23.43% of the Study Area being made up of Conservation, Public Facilities, and Recreation Land Uses, accounting for about one fourth of all acreage in the Study Area.

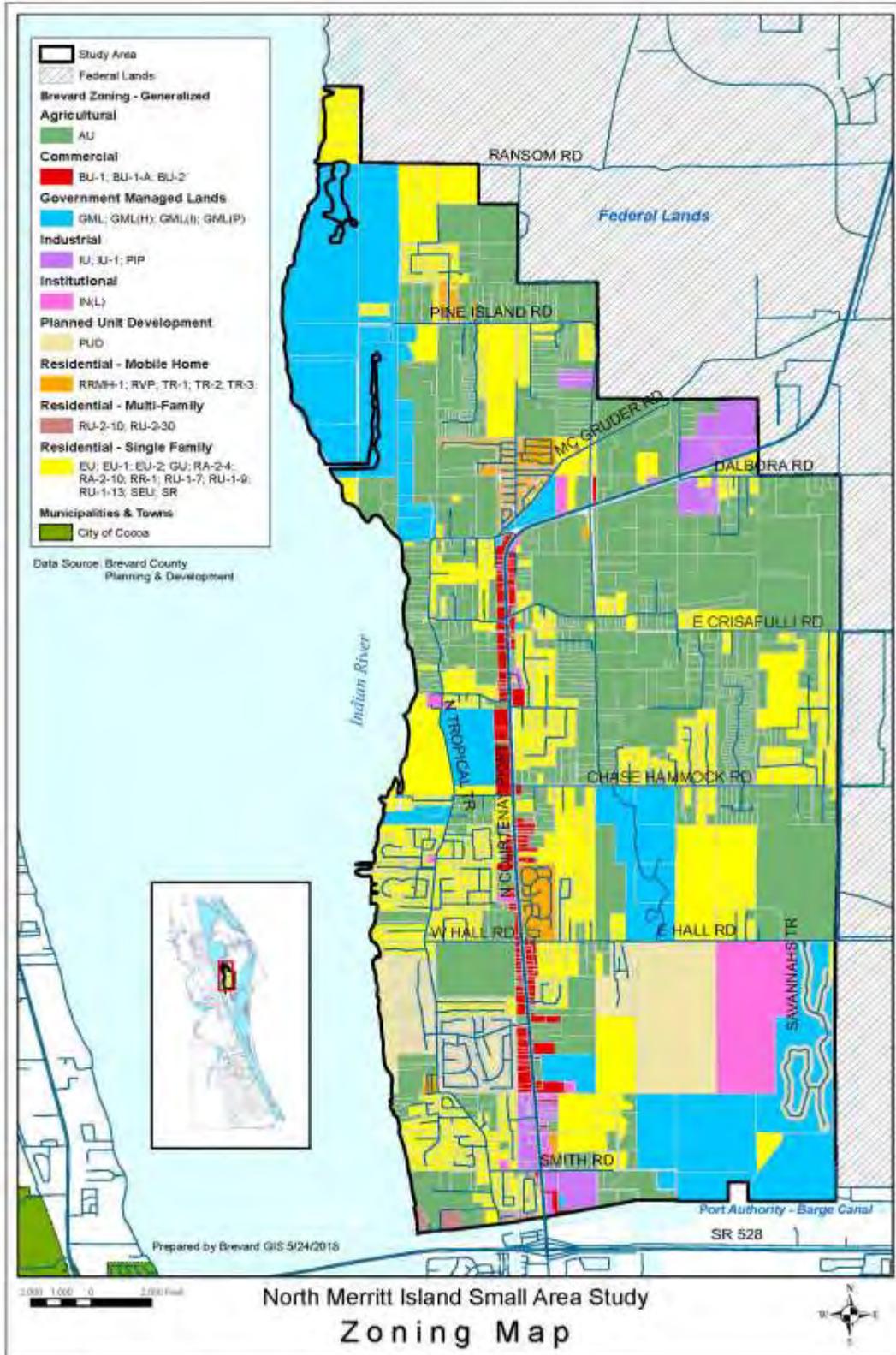
The limited commercial and industrial development is located along North Courtenay Parkway (SR 3), which, when combined, constitutes a mere 5.09% of the Study Area. Of the land with commercial FLU designations, 46.66% remains undeveloped. Of the land with industrial FLU designations, 65.36% remains undeveloped.

Zoning

Table 6 All Zoning Land Use Map Designations for Study Area

Zoning Classification		Total Acreage	% of Total Acreage	Vacant Acreage	% Vacant of Zoning Class.
Unimproved, Agricultural & Residential Zonings		6901	64.94%	3634	52.66%
GU	General Use	462	4.35%	442	95.57%
AU	Agricultural Residential	4194	39.47%	2365	56.39%
RR-1	Rural Residential	1030	9.69%	349	33.93%
SEU	Suburban Estate Residential	6	0.06%	4	59.58%
SR	Suburban Residential	475	4.47%	195	41.10%
EU	Estate Use Residential	226	2.13%	49	21.85%
EU-1	Estate Use Residential	22	0.21%	2	7.90%
EU-2	Estate Use Residential	394	3.71%	207	52.64%
RU-1-7	Single-Family Residential	0	0.00%	0	0.00%
RU-1-9	Single-Family Residential	3	0.03%	0	11.93%
RU-1-13	Single-Family Residential	49	0.46%	7	13.37%
RA-2-4	Single-Family Attached Residential	13	0.12%	13	100.00%
RA-2-10	Single-Family Attached Residential	26	0.25%	1	2.27%
Multiple-Family Residential Zonings		31	0.30%	14	43.94%
RU-2-10	Medium-Density Multiple-Family Residential	30	0.28%	14	46.60%
RU-2-30	High-Density Multiple-Family Residential	2	0.02%	0	0.00%
Mobile Home Residential & Rec. Vehicle Park Zonings		206	1.94%	15	7.38%
RRMH-1	Rural Residential Mobile Home	27	0.25%	6	21.19%
TR-1	Single-Family Mobile Home	64	0.61%	7	10.35%
TR-2	Single-Family Mobile Home	7	0.07%	3	38.54%
TR-3	Mobile Home Park	103	0.97%	0	0.24%
RVP	Recreational Vehicle Park	5	0.05%	0	0.00%
PUD Zonings		768	7.22%	331	43.16%
PUD	Planned Unit Development	768	7.22%	331	43.16%
Commercial Zonings		210	1.98%	97	46.29%
BU-1-A	Restricted Neighborhood Retail Commercial	35	0.33%	19	55.40%
BU-1	General Retail Commercial	111	1.05%	55	49.34%
BU-2	Retail, Warehousing and Wholesale Commercial	64	0.60%	23	36.10%
Industrial Zonings		261	2.46%	165	63.23%
PIP	Planned Industrial Park	216	2.03%	158	73.13%
IU	Light Industrial	25	0.24%	2	8.77%
IU-1	Heavy Industrial	20	0.18%	5	24.93%
Special Zonings		2249	21.17%	1532	68.13%
GML	Government Managed Lands	485	4.56%	207	42.66%
GML(H)	Government Managed Lands High-Intensity	97	0.91%	0	0.00%
GML(I)	Government Managed Lands Institutional	29	0.27%	28	97.92%
GML(P)	Government Managed Lands Parks & Conservation	1322	12.44%	1296	98.04%
IN(L)	Institutional Use Low	318	2.99%	2	0.60%
Total under County Jurisdiction		10626	100.00%	5789	54.48%

Source: Brevard County Planning & Zoning Office March 2018



P

Map 5 Zoning Map

Land uses are divided into residential, commercial and industrial Zoning districts. Zoning districts function for the purposes of defining a list of rules. These rules typically establish a list of land uses permitted in each district and a series of specific standards governing lot size, building height, and required setback provisions. The NMI Study Area encompasses a variety of Zoning classifications requiring as much as 5 acres down to 7,500 square feet per parcel.

Residential Zoning classifications make up 74.4% of the Study Area. Typically made up of single-family homes, the total acreage of Unimproved, Agricultural & Residential Zonings is 6,901 acres or 64.94% of the Study Area, of which 52.66% remains undeveloped.

The most popular single-family residential Zoning classification is Agricultural Residential (AU), which makes up 39.47% of the Study Area and 58.75% of the Unimproved, Agricultural & Residential Zonings. Of the AU Zoned acreage, 56.39% remains undeveloped. Additionally, a large percentage of the improved parcels with AU Zoning may be underdeveloped, with many parcels significantly larger than 2.5 acres in size.

Original AU zoning for Brevard County was established May 2, 1958 [Lot sizes were required to be a minimum lot size of 5,000 square feet, having a minimum width of 50 feet and a minimum depth of 75 feet]. On March 6, 1975, Agricultural residential (AU) zoning classifications were required to be an area of not less than one acre, having a minimum width of 125 feet and a minimum depth of 125 feet. After 1975, AU requirements were amended to a minimum lot size of two and one-half acres, having a minimum width of 150 feet and a minimum depth of 150 feet. Lots are determined as "Nonconforming lots of record" if they do not meet today's standards and had been recorded or platted prior to or on March 6, 1975.

Multiple-Family Residential Zonings make up only 31 acres and about 44% of that land remains vacant. While almost all of the land zoned for Mobile Home Residential and Recreational Vehicle Park (206 acres) are utilized, 7.38% remains vacant.

Commercial and Industrial Zoning classifications account for 4.44% of the total land area. However about 46% of commercial land is vacant and approximately 63% of industrial land is vacant. Conservation, Public Facilities and recreation are considered Special Zoning and account for 21.17% of the Study Area's lands.

INFRASTRUCTURE AND SERVICE DEMAND

Transportation Network

North Courtenay Parkway (State Road 3) is the major north-south corridor providing external access to North Merritt Island. Vehicular access is limited to the rural area by the Canaveral Barge Canal at the southern end and Space Commerce Way at the northern end. North Courtenay Parkway is intersected at approximately one mile segments by Grant Road/Smith Road, Hall Road, Chase Hammock Road, and Crisafulli Road. There are three signalized locations along North Courtenay Parkway: a U-turn signal located approximately one-quarter mile north of the Canaveral Barge Canal for users accessing the marine harbor and exiting Sea Ray Drive, a signal at the intersection with Grant Road/Smith Road, and a signal at the intersection with Hall Road. Unpaved roads, such as Judson Road, are common in the area.

North Courtenay Parkway is a four-lane divided highway that is functionally classified as an urban principal arterial from the southern study area limits to Pine Island Road and a rural principal arterial from Pine Island Road to the northern study area limits. The drawspan of the Christa McAuliffe Drawbridge, located across the Barge Canal at the southern study limits, opens daily for vessel traffic on the hour and half-hour from 6 a.m. to 10 p.m.; except that from 6:15 a.m. to 8:15 a.m. and from 3:10 p.m. to 5:59 p.m., Monday through Friday. The drawspan does not open on Federal holidays. From 10:01 p.m. to 5:59 a.m., every day, the drawspan must open on signal if at least 3 hours' notice is given to the drawtender. The drawspan must open as soon as possible for the passage of public vessels of the United States and tugs with tows. The Florida Department of Transportation (FDOT) assumed jurisdiction of North Courtenay Parkway in the early 1990's after completion of a roadway widening project. This roadway was widened from two lanes to four lanes to relieve congestion for commuters traveling to and from the Kennedy Space Center.

North Tropical Trail is a parallel north-south roadway located west of North Courtenay Parkway. North Tropical Trail is a two-lane undivided highway that is functionally classified as an urban minor collector. The northern section terminates at North Courtenay Parkway approximately one-half mile southwest of Pine Island Road. In a report by Vanasse Hangen Brustlin, Inc. (1991), North Tropical Trail was identified as a "constrained corridor" meaning it cannot be widened by two or more lanes. This restriction is considered a policy constraint and not a physical constraint. The SAS prepared in 1992 suggested alternative solutions including improvements to North Courtenay Parkway to reduce "cut-through" traffic on North Tropical Trail, as a large number of vehicles traveled on this corridor in order to bypass the congestion of North Courtenay Parkway. The existing traffic volumes along the North Tropical Trail corridor are very low, which would indicate the corridor is being utilized by local traffic. This concern existed prior to the widening effort of North Courtenay Parkway and appears to have been addressed with the corridor improvements.

Intersection improvements were constructed at North Courtenay Parkway and Hall Road in 2014. The project included the replacement of the span signal to mast arms, major drainage improvements, and turn lane improvements. The intersection improvements increased the efficiency of the intersection and improved the overall flow of the North Courtenay Parkway corridor.

The Space Coast Transportation Planning Organization (SCTPO) maintains a traffic count database to monitor traffic volumes on arterial and collector roadways in Brevard County. Within the study area, the SCTPO performs annual traffic counts for seven roadway segments. Existing traffic volumes were reviewed to evaluate the current operating conditions of the overall roadway network. **Table 7** provides a summary of the 2017 Annual Average Daily Traffic (AADT) and current Maximum Acceptable Volume (MAV) published by the SCTPO on May 10, 2018.

Space Coast Area Transit's last major update to the Transit Development Plan occurred September 2017. Route expansion can be modeled as part of a service change evaluation by performing route timing and logistics to determine if an expansion can occur without reducing service elsewhere in the network. That information was evaluated within the 2017 Transit Development Plan, but service expansion was ultimately determined not to be feasible to be extended into North Merritt Island at this time.

Table 7 – North Merritt Island 2017 AADT Summary Table

Roadway	Segment		2017 AADT	MAV	% MAV	LOS
	From	To				
N. Courtenay Pkwy	SR 528 North Ramps	Hall Rd	22,960	41,790	55%	C
N. Courtenay Pkwy	Hall Rd	N Tropical Trl	15,220	41,790	36%	C
N. Courtenay Pkwy	N Tropical Trl	Space Commerce Way	9,710	40,300	24%	C
N Tropical Trl	Grant Rd	Hall Rd	660	15,600	4%	C
N Tropical Trl	Hall Rd	Crisafulli Rd	1,800	15,600	12%	C
N Tropical Trl	Crisafulli Rd	N Courtenay Pkwy	1,800	15,600	12%	C
Hall Rd	N Courtenay	N Tropical	3,270	15,600	21%	C

The MAV indicates the maximum traffic volumes allowed based on the Level of Service (LOS) desired. Comparing the AADT with the MAV, all segments of the major roadway network are currently operating at an acceptable level of service. A large percentage of the vehicular trips on North Courtenay Parkway are concentrated on the southern segment and do not traverse the length of the corridor. Both Hall Road and North Tropical Trail are very low volume roadways.

The 10 year AADT data collected by the SCTPO is summarized in **Table 8**. In reviewing the five year growth trend, the overall traffic volumes are increasing. However, with the exception of Hall Road, the current traffic volumes do not exceed traffic volumes observed in 2008. Furthermore, as shown in **Table 7**, the existing roadway volumes are significantly below the maximum allowable volume.

Table 8 – North Merritt Island 10 Year AADT Summary Table

Roadway	Segment		AADT									
	From	To	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
N. Courtenay Pkwy	SR 528 North Ramps	Hall Rd	24,280	25,070	24,530	23,740	20,900	20,420	19,090	22,300	21,170	22,960
N. Courtenay Pkwy	Hall Rd	N Tropical Trl	17,330	18,160	17,820	16,550	13,040	13,570	14,270	15,090	13,490	15,220
N. Courtenay Pkwy	N Tropical Trl	Space Commerce Way	12,070	13,560	13,080	10,510	8,370	8,650	8,690	9,350	9,060	9,710
N Tropical Trl	Grant Rd	Hall Rd	750	-	630	-	580	-	-	-	660	-
N Tropical Trl	Hall Rd	Crisafulli Rd	1,900	1,810	1,680	1,870	-	1,670	1,530	1,640	1,720	1,800
N Tropical Trl	Crisafulli Rd	N Courtenay Pkwy	1,710	1,710	1,650	1,580	1,460	1,360	1,380	1,490	1,440	1,800
Hall Rd	N Courtenay	N Tropical	2,960	2,900	2,690	3,040	2,890	2,960	-	2,950	3,080	3,270

The surrounding roadway network adjacent to North Merritt Island exhibits similar growth characteristics as shown in **Table 9**. The roadways are below the maximum allowable volume and are operating at an acceptable level of service.

Table 9 – Adjacent Roadway Network 10 Year AADT Summary Table

Roadway	Segment		AADT										MAV
	From	To	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	
N. Courtenay Pkwy	SR 528 South Ramps	SR 528 North Ramps	30,680	30,960	30,590	25,790	27,350	27,850	28,960	29,210	28,190	32,190	41,790
Space Commerce Way	SR 3	Nasa Causeway	-	-	-	-	-	-	-	3,090	3,040	3,780	12,900
Nasa Causeway	US 1	Space Commerce Way	15,710	15,790	13,870	12,060	11,200	10,520	11,110	10,170	12,070	12,260	30,400

Public Schools

As of 2017, there was an estimated 1,479 students ranging from ages five to nineteen years of age living within The Study Area⁷. Students residing in the Study Area attend either Lewis Carroll, Audubon, Mila, and Stevenson (School of the Arts) Elementary Schools. Stevenson is a School of Choice meaning any student in Merritt Island can attend this school however parents are obligated to provide transportation. Students in 7th and 8th grade would attend Jefferson Middle School or Edgewood Junior/Senior High School (7th-12th grades). Merritt Island High School is the primary high school for Merritt Island, however Edgewood Junior/Senior High School, a school of choice provides parents and students an alternative. None of these public schools are located within the Study Area and are instead located on Central Merritt Island, with students traveling by vehicle to school rather than biking or walking. The elementary school is the closest school located to the Study Area, at an approximate distance of 1.25 miles, followed by the high school at a little over 2 miles away. The middle school is the farthest away at approximately 5.25 miles away from the southern boundary of the Study Area.

When new development application or building permit is submitted for review, the Brevard Public Schools under the Facilities Planning Department receives notification of the project for the purposes of completing a school concurrency review. The concurrency review is cumulative to ensure no thresholds are tripped. Redistricting of schools occurs when a threshold is tripped, however, there known of the schools mentioned have exceeded any thresholds with the current development. The School Board of Brevard County owns three parcels, located at southeast corner of N. Tropical Trail and McGruder Rd. The parcels continue northeast bordering McGruder Rd and N. Courtenay Parkway for combined total acreage of 29.22. There are no plans for developing the site within the next 5 years.

⁷ 2017 American Community Survey (ACS)

Public Wastewater (Sewer) Service

The public wastewater service is provided by the Brevard County Utility Services Department. The Sykes Creek Plant serves the entire Merritt Island area and has a maximum capacity of 6 millions of gallons a day (mgd). The plant is currently operating at 3.1 mgd. Although the Sykes Creek Plant has the existing capacity to serve future development in the study area, in a total build-out scenario the existing the system would need to be extended to the new service areas and upgrades to some pump stations and force mains would also be required.

The plant treats the influent wastewater to F.D.E.P. Standards, as a condition of the Utility's Operation Permit, and has two effluent disposal alternatives: Reclaim water customers or deep well injection. The plant provides reclaimed water to 1,100 customers located north of the Barge Canal.

Table 10 Wastewater Generation

Description	# of Units	Sq. Ft.	Avg. GPD	Generation Total
Current Usage				
Residential	1,320	602,528	200	264,000
Commercial	17		750	12,750
Total Current Demand				276,750

Source: Brevard County Utilities Services Dept.

Units: GPD-Gallons Per Day

Assumptions:

1. GDP Flows Based on 2015 Report
2. Current Usage Based Upon 2/19/18 GIS connections estimates
3. Buildout Potential assumes extending sewer service to all area in Study Area, actual feasibility may vary.
4. Total Unit Buildouts based on GIS data provided from Planning and Development Department

The adopted Capital Improvement Plan (CIP) includes funding of the installation of a force main to serve area between Hall Road and 5335 North Courtenay Parkway.

Public Water Service

The public water service is provided by the City of Cocoa Utilities. The City Engineering Division has confirmed that they have existing capacity to meet the future needs of North Merritt Island.

Table 11 Water Generation

Description	# of Units	Avg. GPD	Generation Total
Current Usage	3,508	265	929,620
Current Generation			
Residential	3,348	265	887,220
Commercial	*160	265	42,400
Total Current Demand			929,620

Source: City of Cocoa Utilities Dept.

* The average commercial unit size is assumed at 1,000 sq. ft. of principal structure or storefront in a plaza.

Parks and Recreation

Brevard County extends 72 miles along Florida's Atlantic coastline, creating a uniquely diverse variety of natural resources, vegetation and wildlife species. Predominant geographic features include the Indian River Lagoon and the coastal ridge with its pine and oak forests. The most renowned environmental feature is the Indian River Lagoon surrounding Merritt Island, separated from the Atlantic Ocean by a barrier peninsula. This lagoon is the nation's most diverse estuary system with more than 4,300 species of plants and animals.

There are three community parks located within the North Merritt Island Small Study Area, including Kings Park, Mitchell Ellington Park and Manatee Cove Park. In addition to the parks, Pine Island Conservation Area is also within the Study Area. This conservation area is a 947 acre Florida wildlife sanctuary, which houses the historic Sams House. At this historic landmark visitors enjoy hiking, biking, fishing canoeing and kayaking through five different habitats and over five miles of trails.

Kings Park is a 240 acre community river park, which is primarily a wetland preserve, hosting a variety of freshwater fishing opportunities. Within the park are a deep freshwater lake which offers a ramp for kayaking and canoeing and a smaller lake with canoeing and rustic walking trails which invite adventures and explorations. This park is the home of the Island Pioneer Trail which is a 10 foot wide multi-use trail. A feasibility study for an extension of the North Merritt Island Pioneer Trail is proposed to provide a multimodal connection between the NASA Causeway (SR 405) at the Barge Canal to North Courtenay Parkway (SR 3).

Mitchell Ellington Park is a 114 acre regional park that features athletic facilities to include football, baseball, soccer and softball. This regional park has two pavilions and a multi-featured playground with pedways and benches. The park is bound by wetlands to the north and woods to the east and west with a lake and a pond located in the central area.



Pine Island Conservation Area
Source: Brevard County Staff 2018

Indian River Anthropological Society conducted an in depth study. Archaeologists discovered not only the rich history of the pioneering Sams family, but also prehistoric fossils, which provide evidence of ancient human habitation. These artifacts are on display within the learning center.



Island Pioneer Trail
Source: Brevard County Staff 2018

Manatee Cove Park is a 29.49 acre community river park known for being a fisherman's haven. This park hosts an equestrian facility with access to a small lagoon where visitors can launch their kayaks and canoes and see manatees and a variety of birds and wildlife. The park also has a pavilion and children's playground.

The 947 acre Pine Island Conservation Area is a Florida wildlife refuge that offers opportunities for horseback riding, biking, fishing, canoeing and wild life viewing through its five different habitats. This conservation area is also home to the oldest standing home in Brevard County, the Sams Family Cabin which was built in 1875 and the newly restored building known as the 1988 Sams Family main house. The Cabin now serves as the Environmentally Endangered Lands (EEL) program's central regional management location and education center. The EEL program acquired this land in 1996. The

Fire Rescue

Brevard County Fire Rescue (BCFR) is the largest fire and emergency medical services (EMS) provider in the County providing emergency services from 32 fire stations. Emergency response resources include 18 class-A fire engines, 5 ladder trucks, 31 ambulances, 3 special operations units and other command and wildfire units. All primary emergency response units are capable of providing patient care at the paramedic level (ALS). Each year, over 50,900 emergency medical patients are cared for and transported to area hospitals. More information about Brevard County Fire Rescue can be found on their website at brevardfire.us.



Engine 40 at Station 40
Source: Brevard County Fire Rescue staff

The North Merritt Island Study Area is served by BCFR Engine 40; the fire station is located at 6400 N. Tropical Trail. The fire station is staffed 24/7 with three firefighters; the engine provides advanced life support (ALS) emergency medical care at the paramedic level. Fire engine 40 was specifically designed and built to fit inside the NMI smaller than standard Fire Station. Initial fire engine response to building structure fires is Engine 40, Ladder Truck 41 (300 Alma Dr. MI), Engine 42 (840 N. Banana River Dr. MI) and Engine 841 (Merritt Island Vol. Fire Dept., 300 Alma Dr. MI)

Within the Study Area, Rescues 41 (300 Alma Blvd. MI) and 43 (902 Airport Rd. MI) are the two primary ambulances dispatched to transport emergency medical patients to area hospitals. Both rescue units are housed in fire stations located on Merritt Island.

BCFR includes additional Brevard County fire rescue services such as a Special Operations Team, Fire Prevention, 911 Dispatch and Ocean Rescue. Additional safety information can be found on the department's website at www.brevardfire.us

Table 12 BCFR & EMS Calls for Service – North Study Area & NMI

Type of Call	Total NMI SAS	Total MI (not including NMI SAS)	Total All MI	% NMI SAS To All of MI
Total Medical/EMS Calls	619	4987	5606	11.04%
Total Fire Calls	113	1063	1176	9.61%
Other Type Calls	96	995	1091	8.80%
Total Calls	828	7045	7873	10.52%
Fire Alarms	22	329	329	6.69%
Brush Fires	10	9	19	52.63%
HAZMAT	1	30	31	3.23%
Miscellaneous Fires	22	72	94	23.40%
Structure Fires	9	95	104	8.65%
Vehicle Fires	2	22	24	8.33%
Average Turn Out Time	00:00:59:000	00:01:02:000		
Average Response Time	00:08:05:000	00:06:21:000		
Average On Scene	00:39:34:000	00:29:20:000		

Source: Brevard County Fire Rescue

Law Enforcement

The Brevard County Sherriff's Office East Precinct provides the majority of the east area unincorporated law enforcement services. The Precinct is located at 2575 N. Courtenay Parkway in Merritt Island. The East Precinct covers zones 20 and 21 and has a service responsibility of Merritt Island north to Nasa/US Government land, east to the Atlantic Ocean, south to the southern tip of Merritt Island with the exception of the Canaveral Precinct Patrol Area and west to the western side of the Indian River Lagoon. Table 9 depicts calls for service in both 2016 and 2017 for Zones 20 and 21 of the East Precinct and the percentage change in calls over that time.

Table 13 Percent of Increase/Decrease East Precinct Calls for Service – North Study Area Zones 20 & 21

Zones 20 & 21			% Change
Type of Call	2016	2017	2016-2017
Assist Motorist/Disabled Vehicle	47	40	-15%
Battery	31	39	26%
Burglary	30	30	0%
Burglary Business	1		-100%
Burglary Vehicle	35	8	-77%
Fraud/Forgery	45	53	18%
Injured/Ill Person	526	546	4%
Intoxicated Driver	7	9	29%
Narcotics	16	14	-13%
Reckless Driving	95	71	-25%
Robbery	1		-100%
Sex Offense	4	3	-25%
Shooting In Area	28	41	46%
Theft	61	43	-30%
Traffic Enforcement	70	63	-10%
Traffic Stops	335	463	38%
Vehicle Stolen	20	7	-65%

These do not represent all of the calls for service, but many of the categories that directly affect the residents within the Study area. The residents' complaints about speeding vehicles and traffic violations are also reflected in the number of citations and traffic stops performed by the Sherriff's Department. Out of the 17 types of calls within the area 10 of the types of calls depict a decrease between the years 2016 and 2017 as much as a 100%. Calls related to burglary's (not business related burglary calls) remained the same and 5 out of the 17 types of calls depict a percentage increase between 2016 and 2017. The East Precinct's General Crime Unit has been exemplary in the ability to solve business, residential and vehicle burglaries. The percentage drop in business related burglaries shows a 100% decrease in crime.

The East Precinct has taken an active role in reducing the amount of crime while also taking in consideration the need to assist the public in their needs no matter what the event may be.

Emergency Management

Brevard County Emergency Management is responsible for the disaster preparedness of all residents to include the residents within the Study Area. Brevard County implements emergency response actions in two general ways: (1) through field operations and through support operations conducted by the activated County emergency support functions (ESFs) operating from the County EOC. Brevard County Emergency Management serves as the coordinating group for County agencies, municipal governments, and community organizations during pre-disaster planning and programming, as well as during actual emergency response and disaster recovery operations. Each ESF is managed by a primary agency that is assisted by several designated support agencies. Brevard County Emergency Management is the lead

organization “in-charge” through the coordination and direction of the Policy Group and ESF recommendations.

The Policy Group is responsible for major, county-wide policy and planning decisions during and after disasters. This group includes the:

County Commission Chairperson

- County Manager
- County Emergency Management Director
- County Fire Chief
- County Attorney
- County Sheriff
- Superintendent of Brevard Public Schools
- Space Coast Public Management Assoc. Rep.

Natural and Manmade Hazards

Hurricane and Storm Effects

Hurricane and storms effects can produce high winds, storm surge, flooding, tornadoes, thunderstorms and lightning. The probability for more hurricane and storm effects to strike the peninsula of Florida and consequently, the Brevard County area, are very high and will occur once a year or more. The greatest threats are storm surge along the barrier islands, wind damage to homes, businesses and coastal lands, inland flooding and mass casualty.

While it is possible for the County to be hit by a category 4 or 5 hurricane, it is very unlikely based on past trends that have seen Florida’s northeastern region mainly receiving tropical depressions/storms and categories 1-3. Impacts from these storms can include tree and natural environment destruction, infrastructure and house damage or collapse, downed power lines, blocked roads, flooding, and massive amounts of storm-generated debris. All structures in North Merritt Island are susceptible to impacts of hurricanes, especially buildings in floodplains, low lying areas and unsound housing or mobile homes. Because this County has experienced hurricanes and/or storms with associated hazards annually it can be assumed to occur again with a similar frequency.

This hazard would prompt evacuation to the entire Study Area. When winds exceed 40 mph, responders cannot safely respond to incidents. Wide spread disruption and destruction of critical infrastructure would hinder commerce and delivery of services. The restoration of power and telecommunications may take weeks to complete.

Flooding

Vulnerable populations are those in flood zones including isolated low lying areas, flow ways for streams and creeks, seepage hill bases, wetlands, and coastal areas. Some areas in the zones include North Merritt Island between Hall Road to the south, north and east boundaries of the Kennedy Space



Center, and west boundary of State Road 3. The probability that Brevard County will continue to experience flooding as described is highly likely, a once a year or more occurrence. The majority of North Merritt Island is located within Flood Zone AE.

Residents are strongly advised to heed public officials when noticed on a flooding event. Brevard County Emergency Management encourages everyone to stay informed and sign up for emergency alerts. Resident can get more information at <http://www.brevardfl.gov/EmergencyManagement>.

Those residents in flood prone areas should devise a plan so that first responders are not put in danger rescuing them. Here is a place to find out your risks, <http://www.brevardfl.gov/EmergencyManagement/KnowYourRisk>. Resident can also use the following link to start a plan, <http://www.brevardfl.gov/EmergencyManagement/HaveAPlan>. Finally, if rescues are warranted, then boat, high profile vehicles, and helicopters could be dispatched, as in the recent flooding associated with Hurricane Harvey in Houston.

NMI currently does not have a pre-identified staging area in the event of an emergency. There are many shelters within Brevard County that may be utilized by NMI residents. Shelters opening are dependent on the incident and locations would be announced publicly via press releases, the "embrevard.com" website and social media. Brevard County Emergency Management lists a range of hazards that may impact the County and in particular North Merritt Island. The following sections discuss identified natural and manmade hazards: Hurricane and Storm Effects, Storm Surge, Flooding, Tornadoes, Thunderstorms and Lightning, Severe Winter Storms, Drought, Wildfires, Agricultural Infestations and Disease, Sea Level Rise, Hazardous Materials, and Launch Anomaly.

Tornadoes

A tornado is a violently rotating column of air, often (but not always) is visible as a funnel cloud. Brevard County historical area-adjusted tornado activity is above Florida state average. It is 3.3 times above overall U.S. average. Tornadoes in Brevard County have caused 12 fatalities and 638 injuries as recorded between 1950 and 2004. The last recorded tornado to impact NMI formed within or southeast of The Savannahs Trail on September 10, 2017. It was recorded as an EF-1 with estimated peak winds of 100-110 mph. The path width was approximately 100 yards causing pool screen enclosures, snapped trees, minor roof damage, and destroyed several mobile homes along the way.

The entire County and all of its municipalities are at risk for tornado-related wind or debris damage. They can be a threat in events ranging from tropical storms to the most powerful hurricanes. Since the worst tornado experienced to date within the boundaries of Brevard County was an F-4 tornado, it can be assumed that all of Brevard County is susceptible to an F-4 tornado, and could expect to experience a tornado of this strength in the future. The probability of future tornados is considered highly likely, with a once a year or more occurrence. A worst case scenario for high winds due to tornadoes would be for a front with multiple tornadoes to move across areas of the County with concentrations of mobile and manufactured homes. Mobile homes and older manufactured homes would be most at risk.

Thunderstorms and Lightning

Thunderstorms produce meteorological effects including wind, heavy rainfall, lightning and thunder, and sometimes hail. Central Florida also has one of the highest density lightning flashes in the world. On average, Brevard County is hit with more than 22,166 lightning strikes a year, the most dangerous months being June, July and August when thunderstorm activity is greatest. Florida has more lightning-related deaths and injuries than any other state. The majority of the strikes which cause deaths have occurred in open areas or recreational settings such as golf courses, followed by water related areas like lakes and beach, under trees, and driving equipment like tractors.

Not only is the danger to individuals, but the frequency with which it occurs can cause wild fires. Brevard County experiences about 70-80 thunderstorm days a year. The entire County and all of its municipalities are considered to be at risk from thunderstorms and lightning. These events can cause damage to structures, disruption of utilities (mainly electrical), and surface/air transportation problems.

Structures experiencing direct strikes would suffer differing degrees of damage, from slight to total losses if fires ensued. Damaged systems could be repaired or replaced within a few days or weeks, depending on

the system and the extent of the damages. The actual vulnerability to lightning strikes is a factor of the characteristics of the community and the vulnerability of its designated critical facilities and neighborhoods.

Severe Winter Storms

A severe winter storm for Brevard County would be an event producing unusually low and prolonged temperatures which may be accompanied by ice or sleet storms. In Brevard County, freezing temperatures can pose a severe threat to the agriculture industry. The County has experienced several damaging freezes in the past 20 years, including in 2000-2001, when the County was part of a Presidential Disaster Declaration. Recently, in early January 2010, an unusual period of cold temperatures occurred over several days which caused some damage to the area's citrus crop.

The locations most vulnerable to severe winter weather in Brevard County would be agricultural lands. There are approximately 146,470 acres of farm land in Brevard County according to the 2012 Census of Agriculture. Business closures and significant damages to the County's citrus and horticultural industries would result in substantial economic damages.

Drought

A drought is a period of unusually persistent dry weather lasting long enough to cause serious problems such as crop damage and/or water supply shortages. The severity of the drought depends upon the degree of moisture deficiency, the duration and the size of the affected area. Brevard County Emergency Management regularly monitors information from the National Oceanographic and Atmospheric Administration, National Weather Service, St. Johns River Water Management District and the Florida Forest Service Keetch-Byram Drought Index for decreases in water, river, and lake levels.

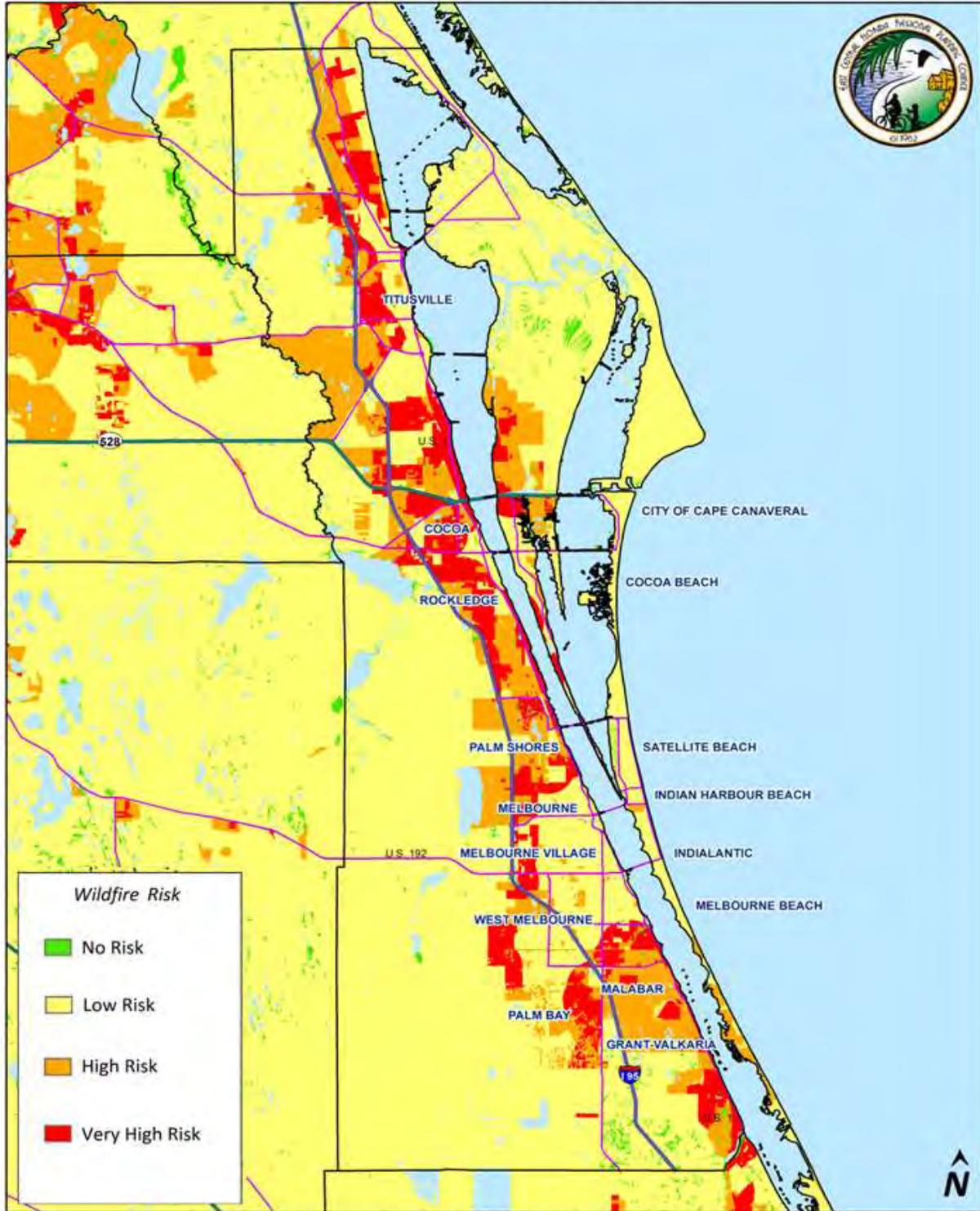
There are distinct wet and dry seasons in Brevard. The dry season lasts from December through May, the wet from June through November. During the dry season, periods of drought often occur, and can lead to a persistent and high wildland fire threat. 23% of Brevard County including NMI is agricultural-usable for citrus, raising cattle or horses. Cattle ranches and citrus growers would be affected when drought occurs that affects surficial and Florida aquifer water supplies. There is a medium to high risk of losing crops and plants, as well as a decrease in available water to the public.

Wildfire

There is a high risk of wildfires occurring during a drought. The most at-risk locations are areas where development has occurred or is occurring at the edge of previously undeveloped vegetated areas, such as forests, grasslands, wetlands, etc. Distribution of the locations most vulnerable to wildfire can be seen on the summary map, Locations of Wildfire Levels of Concern and Fire Risk Areas. The map depicts different degrees of vulnerability of development to wildfire that are calculated by combining indices for wildland fire susceptibility and general fire effects given terrain and other geographic features.

Brevard County is susceptible to wildfires throughout the year, particularly during the months with minimal rainfall amounts (December through April). The major causes of brush and forest fires are due to lightning, human negligence, or cases of criminal mischief. In recent years, homes and businesses have been threatened by encroaching wildfires. Brevard County has a considerable amount of undeveloped area with prime fuel source for fires.

Wildfire Risk Zones

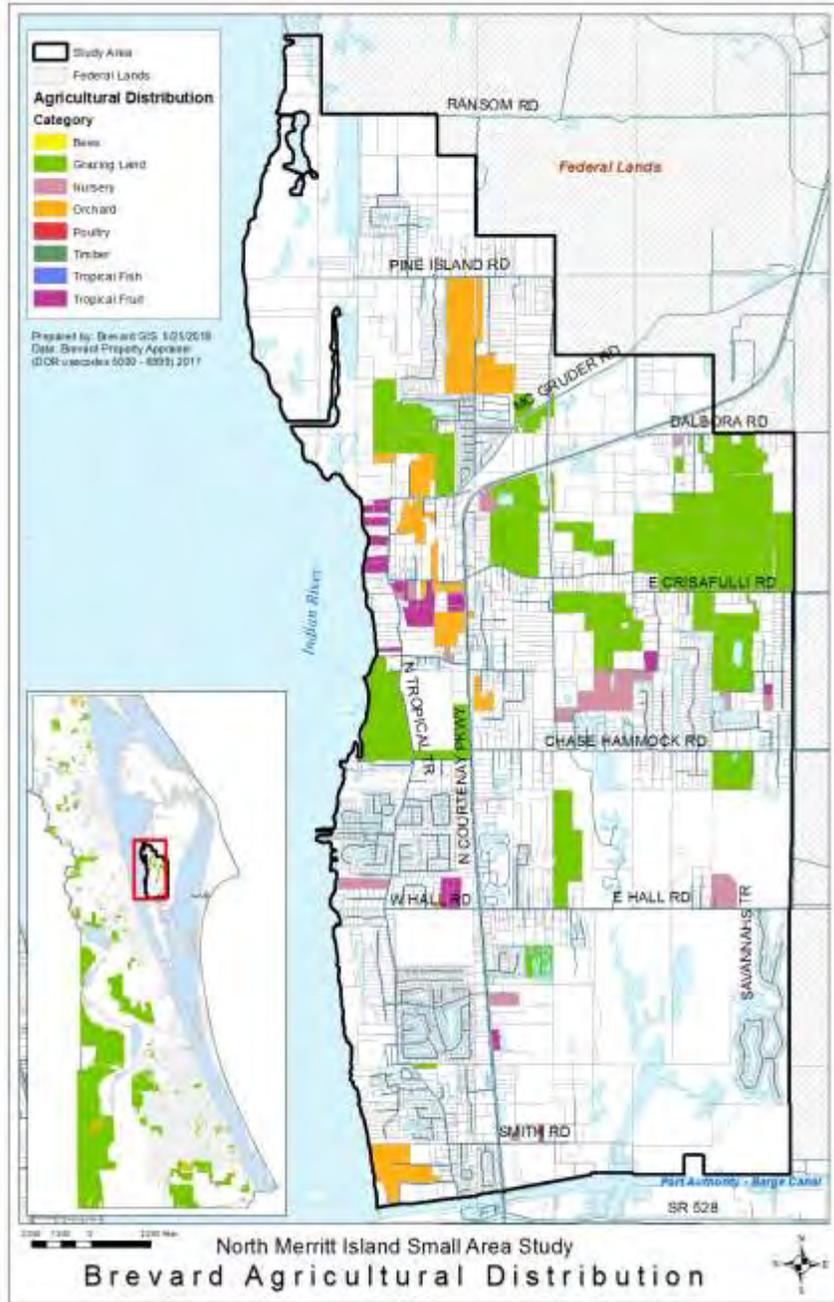


Data Source(s): HAZUS (2011), Brevard County (2013)

Map 6 Wildfire Risk Zones

Agricultural Infestations and Disease

Infestation or disease in agriculture occurs when biological entities such as insects, rodents, coyotes, pigs, bacteria or viruses significantly increase in a given area, affecting crops to the point where human and animal health is threatened, valuable crops may be damaged or significant environmental resources may be lost. Examples of common Brevard infestations are caused by mosquitos, citrus greening, southern pine beetle, Florida Dampwood Termites, rats or noxious plants like Brazilian Pepper, etc. Coordination with the University of Florida IFAS Brevard County Extension is the first step in mitigating agricultural infestations and disease.



Map 7 Agricultural Distribution

Hazardous Materials

Hazardous materials are materials that if released, can pose a threat to human health or the environment. Hazardous material releases can cause acute or chronic health effects, damage to property, expensive cleanup/contractor costs, serious injury and even death. Hazardous materials are stored and transported throughout the East Central Florida area in various quantities. The storage of hazardous materials ranges from residential storage of household products to bulk storage of large volumes for industrial purposes. Hazardous materials are transported by various methods such as railcars, barges and trucks. For purposes of this study, only those locations where the bulk storage of hazardous materials is present will be addressed because the amount of bulk storage material affects its potential risk.

The release of a hazardous material during handling would most likely be the initial responsibility of the facility or carrier. If the release could not be contained by the facility or carrier, then resources would need to be mobilized to remediate the release. Immediate action must be taken to respond to the release to preserve health and safety and reduce the impact to the neighboring community and the environment. Hazardous material releases in highly populated areas could result in evacuation or "shelter-in-place" situations.

Brevard County has many facilities and operations, both public and private, where significant quantities of hazardous materials are present. The space industry poses a unique challenge to Brevard County. The County also has several major roadways, railroad routes and marine port facilities that support transportation of large quantities of hazardous materials. As sources of hazardous materials releases, fixed-facilities and transportation routes are often in close proximity to populated areas, significant property development and very valuable environmental resources important to the human and economic well-being of the County. Due to the continuous presence of hazardous materials being transported or stored in and around Brevard County, hazardous materials events of varying magnitudes are considered highly likely future events.

Launch Anomaly

Brevard County, and the State of Florida, is an unquestioned leader nationally and internationally in the global aerospace industry. This plan accounts for the federal, state, local, and private partner collaboration required to ensure public safety, response, recovery, and protection of the residents and tourists within Brevard County.

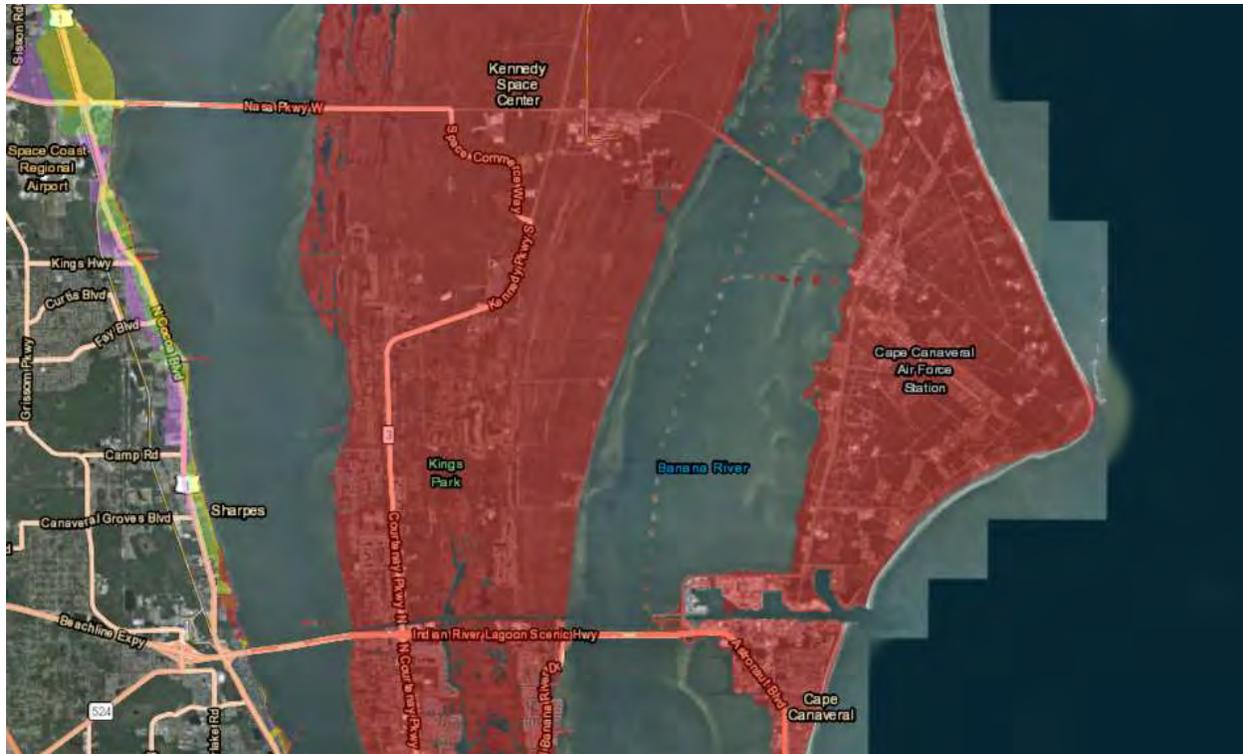
A launch anomaly provides the potential of hazardous materials and/or debris which may impact the Study Area. Although a launch mishap is rare, it may be startling, remain calm and shelter in place. Stay informed via radio, TV, and/or social media. Await an 'all-clear' to be issued by local public safety officials.

Brevard County Emergency Management activates in support of every space launch, and posts updates on Facebook and Twitter pages.

Evacuation Routes

North Merritt Island is in the Zone A (Red) evacuation zone pictured below. Evacuations in Zone A are mandatory when an Atlantic-approaching hurricane threatens Brevard County, which includes the barrier islands. All portions of the islands are included in an evacuation due to storm surge, which can affect causeway and bridge approaches, making it impossible for vehicles to access the area safely. In addition, emergency vehicles deem it is not safe for any vehicle to cross bridges when wind speed exceeds 40 MPH.

Zone A (Red) Evacuation Zone⁸ is depicted below.

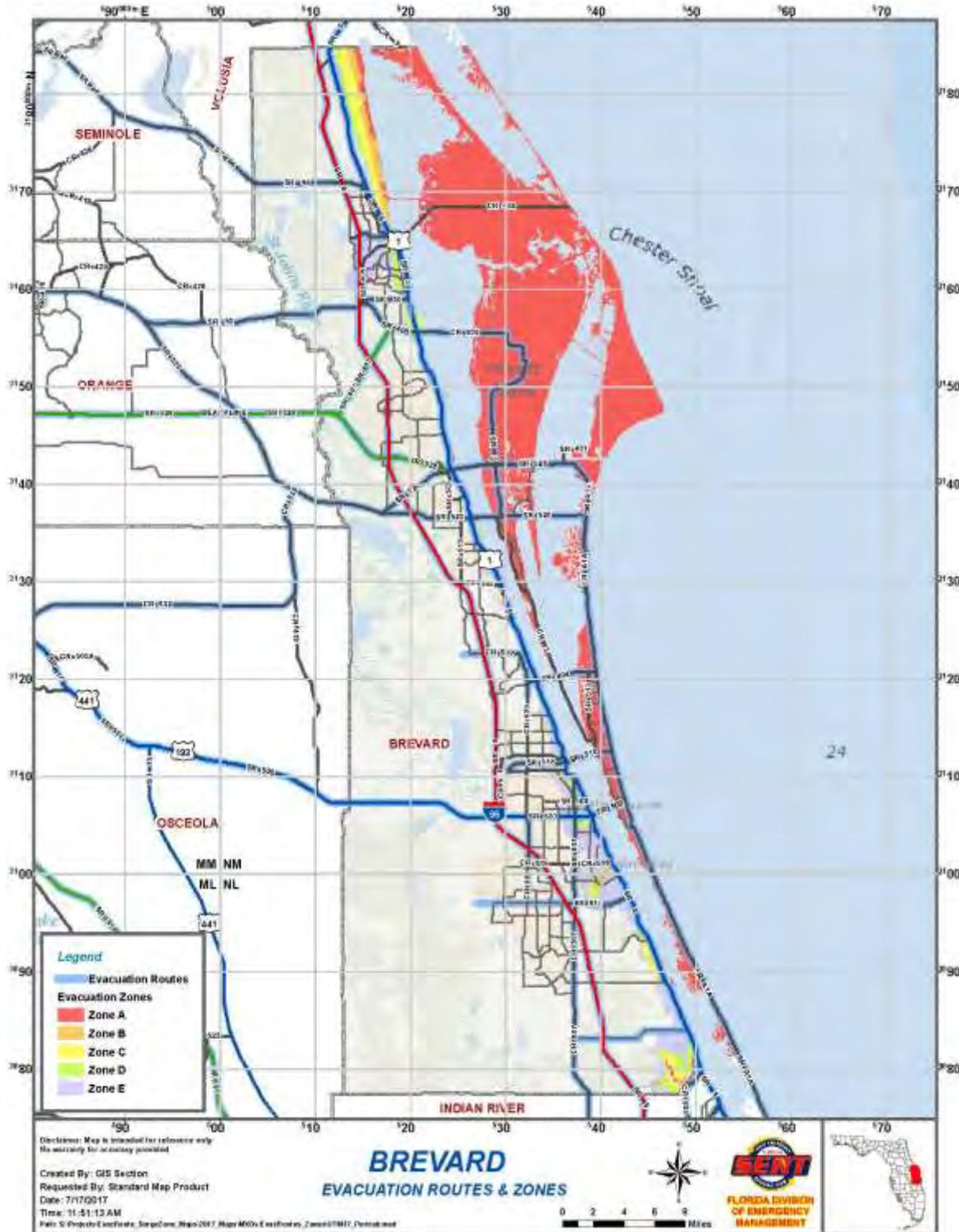


Map 8 Evacuation Zone A

8

<https://floridadisaster.maps.arcgis.com/home/webmap/viewer.html?webmap=06d4b60721a64884bfa942d0beb6d473&extent=-81.118,28.0415,-79.9685,28.533>

Evacuation routes for the North Merritt Island area include CR 405, SR 3, SR A1A, and SR 528 pictured below.



Map 9 Evacuation Routes & Zones

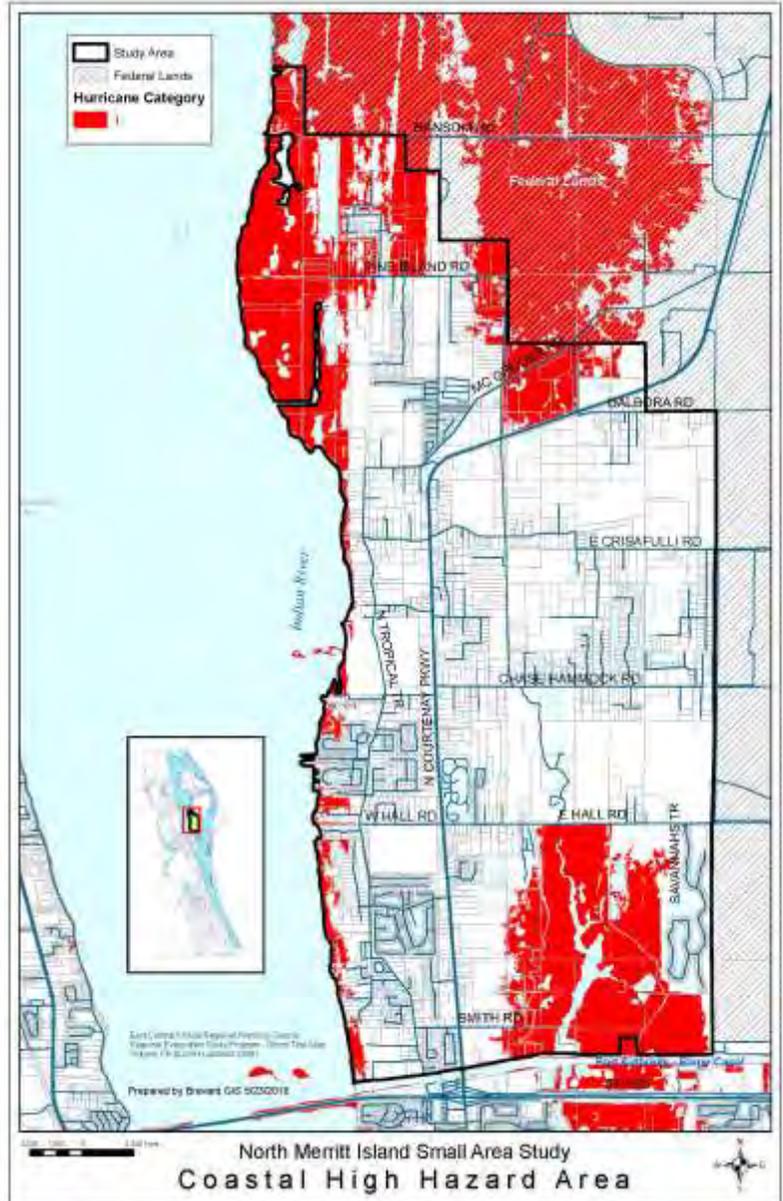
ENVIRONMENTAL AND ECOLOGICAL FACTORS

Storm Surge / Coastal High Hazard Area

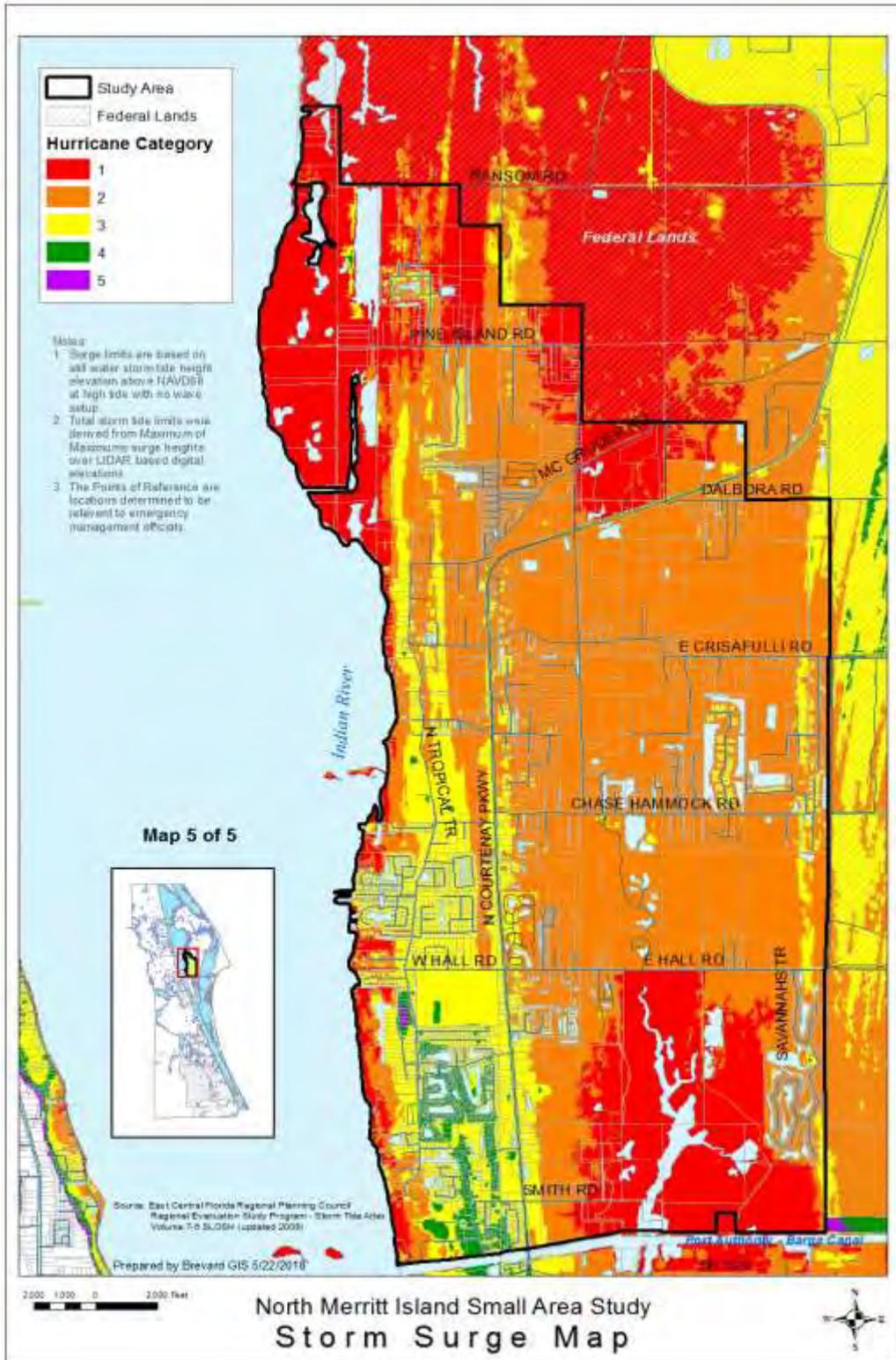
Brevard County has lands designated as Coastal High Hazard Areas (CHHA's), as defined as areas below the elevation of the Category 1 storm surge elevation as established by a Sea, Lake and Overland Surges from Hurricanes (SLOSH) computerized storm surge model. Within the designated Coastal High Hazard Areas, the County does not support or finance new local transportation corridors nor locates sewer and water transmission lines except where there are no other cost-feasible alternatives. If County utility lines are relocated for any purpose, they are relocated outside of the Coastal High Hazard Area, except where there is no cost-feasible alternative.

Public facilities, except recreational facilities, will not be located by Brevard County within the Coastal High Hazard Area, except where there are no cost effective alternatives. The County limits densities within the Coastal High Hazard Area and directs development in other areas. The County will continue to implement the Transfer of Development Rights program, which has been established to transfer density from transfer districts within the coastal high hazard area to receiving districts outside of the Coastal High Hazard Area.

In 2015, the State Legislature amended Chapter 163.3178(1) (f) to enumerate requirements of a redevelopment component in the Coastal Management Element. The County is currently in the process of amending the Coastal Management Element, Chapter 10, of the Comprehensive Plan, to address how to eliminate inappropriate and unsafe development in the Coastal High Hazard Areas when opportunities arise.



Map 10 Coastal High Hazard Area



Map 11 Storm Surge Map

The storm surge map (above) was created as part of the Statewide Regionals Evacuation Study (SRES) Tide Atlas series published in 2010. This map identifies those areas subject to potential storm surge flooding from the five categories of hurricane on the Saffir Simpson Hurricane Wind Scale as determined by NOAA's numerical storm surge model, SLOSH. SLOSH stands for Sea, Lake and Overland Surges from Hurricane. The red areas that flood from the surge of a Cat 1 hurricane are identical to the Coastal High Hazard Zone Map on Pg. 35. The complete storm surge map series Map 1 of 5, Map 2 of 5, Map 3 of 5, Map 4 of 5, and Map 5 of 5 can be found in the Appendix section of this report.

FEMA Flood Zones and Flood Hazard Areas

The majority of the lands included within the Study Area are classified by the Federal Emergency Management Agency (FEMA) as Special Flood Hazard Area (colloquially referred to as "flood zone") under the National Flood Insurance Program (NFIP). These "AE" zones lie within the 1-percent annual chance frequency flood plain, formerly known as the 100-year flood plain, and are subject to partial or complete inundation based upon that statistical probability. The FEMA Flood Insurance Rate Map (FIRM) depicts the Special Flood Hazard Area and, along with the technical supporting data contained in the FEMA Flood Insurance Study (FIS), has been adopted by the Board of County Commissioners as a condition for participation in the NFIP. This participation affords the availability of NFIP flood insurance coverage for citizens of Unincorporated Brevard County.

When the 1989 FEMA FIS was published, the Special Flood Hazard Area within the Study Area was confined to lands around the headwaters of Sykes Creek south of Hall Road, and to the immediate shoreline areas of the Indian River lagoon. The remaining land within the Study Area was depicted by FEMA as lying outside the Special Flood Hazard Area. If for no other reason, the 1989 FIS, while employing best data available at the time, was acknowledged to be limited in scope and failed to accurately represent flood threats within the Study Area. These limitations were particularly notable where land uses had changed from historically rural, agricultural areas to those with greater density and more intense uses and impervious areas. In addition, the 1989 FIS incorporated only limited topographic data for analysis of potential flooding conditions within the Study Area.

When the revised FEMA FIS was published in 2014, the Special Flood Hazard Area was greatly expanded and now encompasses substantial areas north of Hall Road and east of North Courtenay Parkway formerly depicted as outside the "flood zone". It also includes a sizeable north-to-south drainage slough west of North Courtenay Parkway which was previously unidentified. The primary basis for these changes was the incorporation of Light Detection and Ranging (LiDAR) topographic survey data. This highly accurate data provided a truer representation of at-risk areas and facilitated more accurate flood modeling within the Study Area.

A product of the enhanced flood modeling incorporated into the 2014 FIS is the addition of more and accurate land profiles within the Study Area, known as "transects". The 1989 FIS identified only four transects in the Study Area and provided only limited numeric data in table form; specifically, the anticipated flood water elevation and associated wave height at a given transect. The 2014 FIS (a) identified more transects within the Study Area; (b) depicted the transects as true land profiles, which may be envisioned as "slices" through portions of the Study Area; and (c) provided additional data for each transect, including existing ground elevations, areas subject to wave heights between 1.5 and 3 feet, areas subject to high velocity wave action, and areas determined to be above anticipated flood water elevations.

The LiDAR data and FEMA FIS revision both illustrate the principal reason for flooding potential within the Study Area. From the east bank of the Indian River lagoon, the land elevation rises to a slight, but discernable, elevated ridge. Progressing east, the land elevation then falls, in essence forming a depressed "bowl" area between this first ridge and similarly elevated ridges along the west bank of the Banana River lagoon outside the Study Area. This "bowl" spans the entire north-to-south length of the Study Area. Elevation changes are minimal along its entire length, and the southern end forms the headwaters of Sykes Creek. Thus, contained between two elevated areas and with a limited receiving water body to the south, this entire "bowl" is subject to flooding ranging from nuisance street floods from typical, seasonal rain events, to severe and prolonged inundation from the impact of tropical systems. The 2014 FEMA FIRM

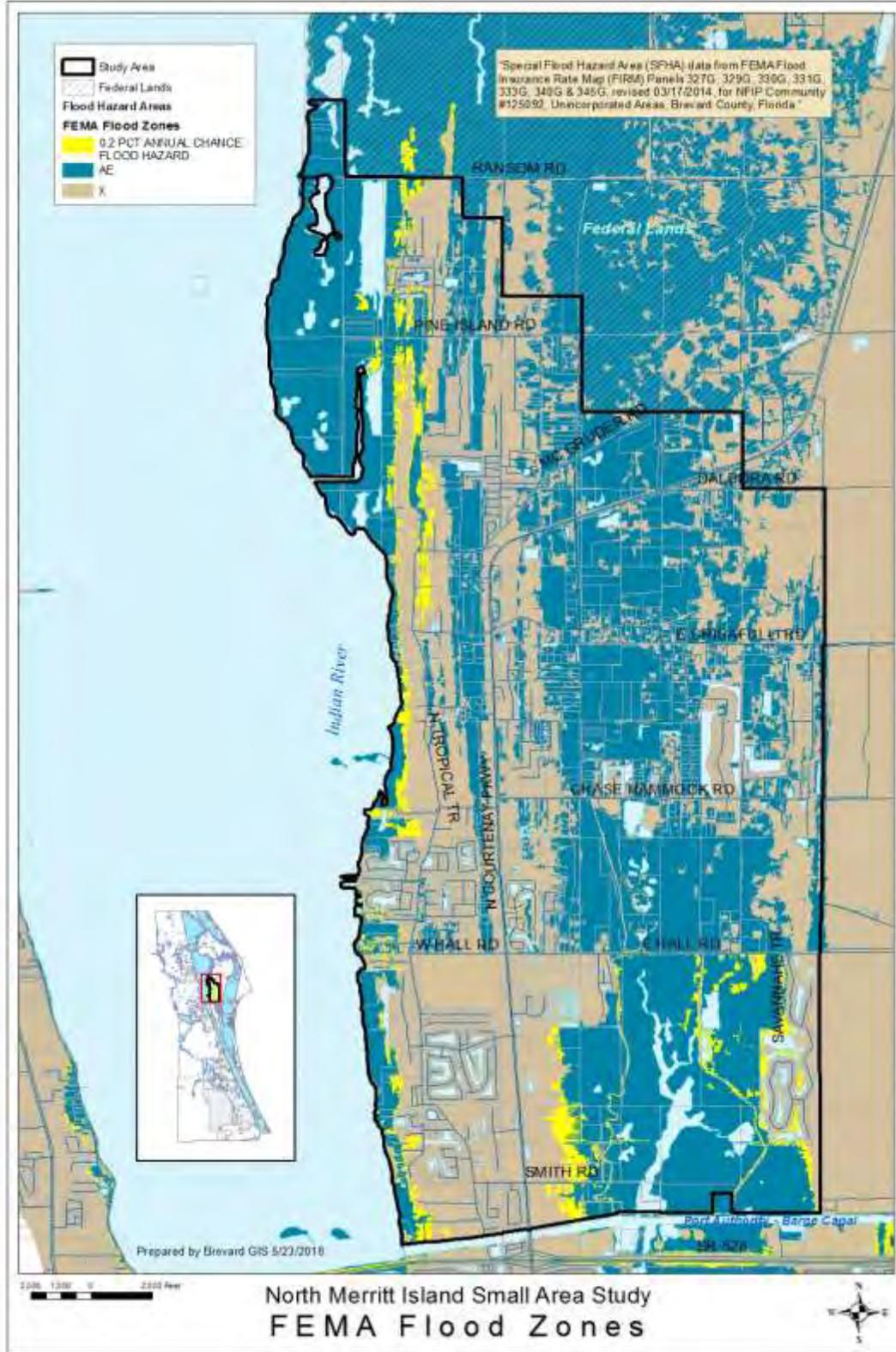
depicts this increased recognition of flooding potential in its expansion of the Special Flood Hazard Area from the previous 1989 FIRM.

Efforts toward flood mitigation within the Study Area are hampered by the lack of additional outfalls to alternative receiving water bodies. Furthermore, when raised water levels within the receiving water bodies, seasonal rains and tropical systems, they become too high to accept any additional water by gravity flow from the "bowl". In essence, the water has no way to flow out thus, inundates property within the "bowl" and persists until the water level in the receiving bodies lower enough to accept additional water from the "bowl".

Another challenge is land use changes from historic agricultural lands to residential areas, which serve to put more real property at risk. The traditional mitigation approach of filling land for development to elevate areas above anticipated flood levels may only result in diverting flood waters to adjacent properties. Within the "bowl", this merely serves to increase the level and duration of inundation for those adjacent properties.

A third challenge is identifying funding sources for suitable infrastructure capable of mitigating flooding in the Study Area. Engineering solutions to address flooding conditions would prove to be formidable, expensive and unreliable. Given the topographic condition of the "bowl", some drainage solutions may propose pumping storm water out of the area. However, reliance on pumped systems has historically proven to be both less than effective and fiscally unsustainable. A suitable benefit-to-cost ratio for truly effective flood mitigation may be unattainable.

Proposals for future land use changes and development within the Study Area should utilize best available data as the basis for decisions regarding the suitability of such changes and development. These should include consideration of the associated need for increased critical facilities and public infrastructure in harm's way to serve the increased density or intensity of land uses. This Study concludes that the 2014 FEMA FIRM and FIS contain appropriate data for such consideration and recommends that they be utilized in any future decision making process for development within the Study Area.



Map 12 FEMA Flood Zones

Wetlands

North Merritt Island (NMI) is adjacent to the following surface waters:

- The Indian River Lagoon (IRL) along the western shoreline; designated by the State as a Class II waterbody;
- The Banana River along the eastern shoreline; designated by the State as a Class II waterbody and Outstanding Florida Water; and
- Sykes Creek, trending north from the Barge Canal to Hall Road; designated by the State as an Aquatic Preserve and Outstanding Florida Water.

The locations of the natural wetlands of NMI tend to occur in the same locations as the flood zones and hydric soils; which all correspond to the lower elevations. The National Wetlands Inventory map depicts the following wetlands types on NMI:

- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Estuarine and Marine Wetland
- Estuarine and Marine Deepwater
- Lake
- Freshwater Pond

Extending out from Sykes Creek, the St. Johns River Water Management District 2009 Land Cover and Land Use Classification (LCLU) System maps a large saltmarsh interspersed with saltwater ponds, mixed scrub-shrub wetland, and cabbage palm hammocks. Moving further out from Sykes Creek, the wetland classifications transition to mangrove swamps, wetland forested mixed, mixed scrub-shrub wetland, mixed wetland hardwoods, small freshwater marshes, and larger areas of cabbage palm hammocks. The wetland system continues north, generally following Judson Road. Wetlands extend further north and are abundant throughout the Federal property to the north.

The wetlands on the western portion of NMI tend to occur along or near the shoreline, and consist primarily of saltwater marshes, cabbage palm hammocks, wet prairies, wetland forested mixed, mixed scrub-shrub wetland, and mangrove swamps. There is an NWI-mapped freshwater forested/shrub wetland system on the west side of North Courtenay Parkway, extending north and south of Hall Road.

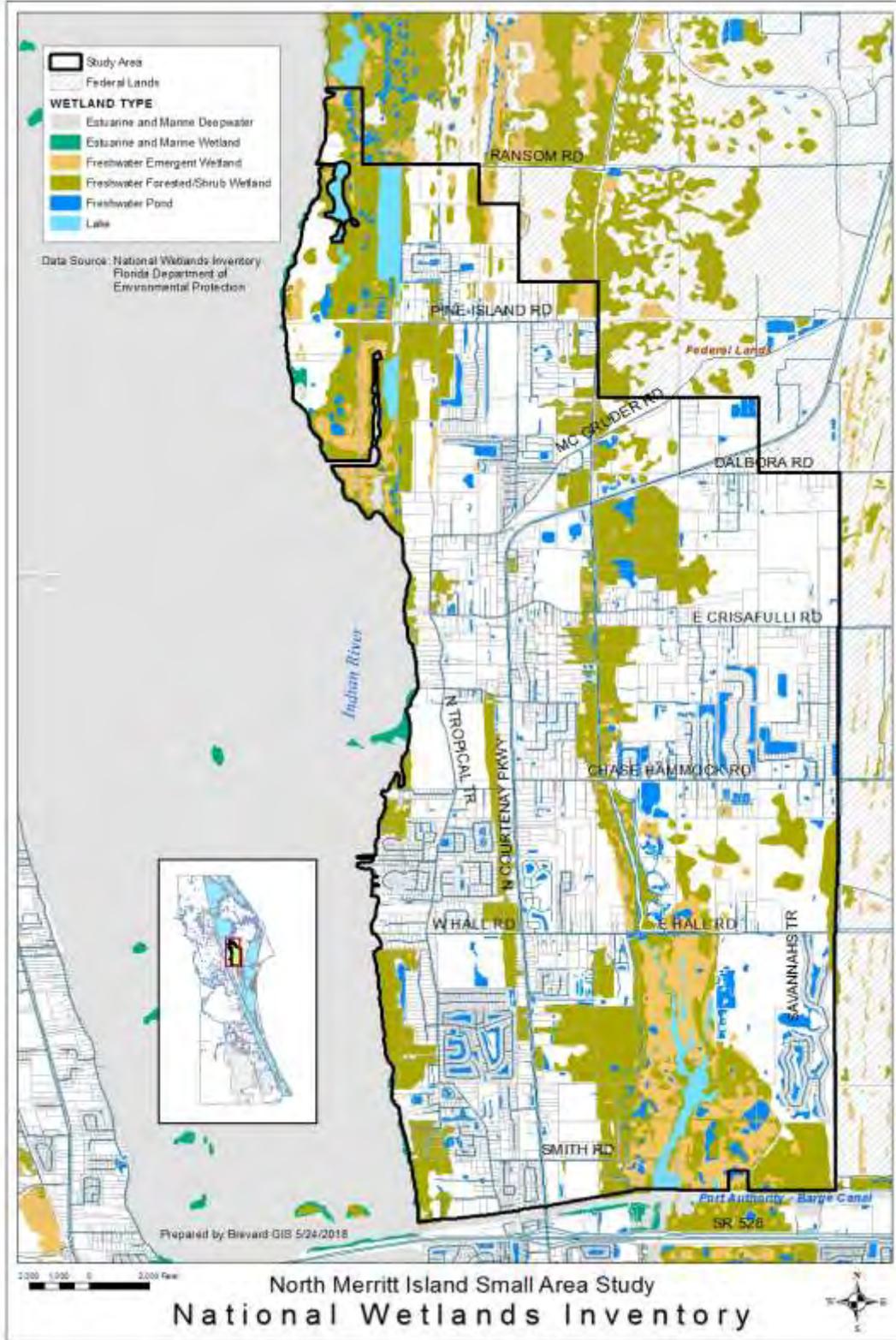
East of the Sykes Creek wetland system, and within the NMI Small Area Study Area, are mapped freshwater forested/shrub wetlands and wetland forested mixed. The wetlands on the eastern portion of NMI, outside of the NMI Small Area Study area, consist primarily of mixed scrub-shrub wetlands, wet prairies, freshwater marshes, and cabbage palm savannah.

Sykes Creek and most of the immediately adjacent wetlands are owned by Brevard County and are in public conservation. However; further east, west, and north of Sykes Creek are large, privately-owned undeveloped parcels containing wetlands. The parcels primarily have residential Future Land Use (FLU) designations, with Community Commercial FLU along North Courtenay Parkway. There are also privately-owned undeveloped parcels containing wetlands on the west side of North Courtenay Parkway, along the IRL shoreline. These parcels have residential FLU designations.

Development of all parcels must meet the criteria established in the Wetlands Protection ordinance (Chapter 62, Article X, Division 4). Sections 62-3694(c) (1) and (2) establish a residential density of one dwelling per five acres (1:5) within wetlands. Alternatively, the limitation of 1:5 within wetlands may be applied as a maximum percentage limiting wetland impacts to not more than 1.8% of the total non-commercial and non-industrial acreage on a cumulative basis.

Section 62-3694(c) (3) contains criteria for commercial and industrial development within wetlands. The intent is to limit wetland impacts to established commercial corridors through the establishment of Mitigation Qualified Roadways (MQRs) in order to discourage development sprawl. North Courtenay Parkway is the only Mitigation Qualified Roadway in the North Merritt Island area. Wetlands proposed to be

impacted on commercial/industrial parcels adjacent to MQRs shall be assessed using methodologies established in the countywide Wetlands Study, prepared BKI, Inc. Consulting Ecologists, to determine if they meet the criteria of High Functioning Wetlands or Landscape Level Wetlands. Impacts to High Functioning and Landscape Level Wetlands shall be prohibited unless the proposed impacts are found to be in the public interest. Public interest is determined by the Board of County Commissioners.



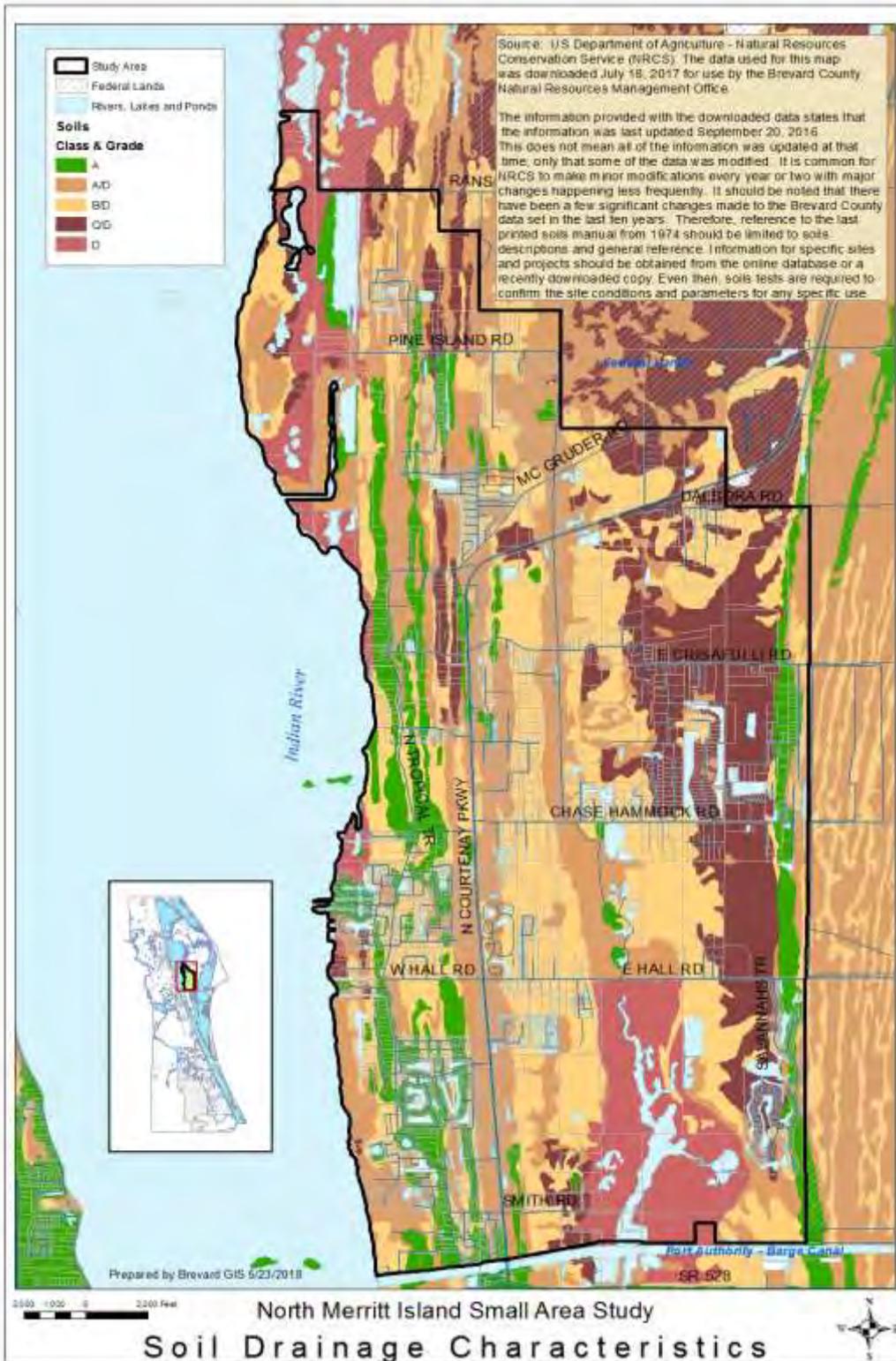
Map 13 National Wetlands Inventory

Soils

Soils can be grouped by their drainage characteristics. Soils which infiltrate water quickly and easily are classed as type A with lower "grades" for decreasing infiltration capacity, down to type D. Few of the soils on NMI are A soils. Generally soils, including most on NMI, have two classes; one for areas where the water table is lower and a lower grade for locations of higher water table. Some are A/D, but the majorities are B/D, C/D, or D.

The abundant low soil grades in the study area generally indicate poor for drainage and infiltration conditions except at the higher elevations. It is also evident from the various maps that the wetlands, flood plains, areas inundated at 1 and 2 feet of lagoon rise, and the poorest soils all follow similar patterns with the most adversely affected areas following the low lying central area between the north-south running ridges.

The combination of lower elevation and poorer soils combine to increase the likelihood of flooding and the presence of wetlands. Increases in lagoon levels or groundwater elevations due to higher rainfall amounts contribute to the decreased capacity of the dual graded soils to accommodate stormwater runoff with the associated increased probability of flooding.



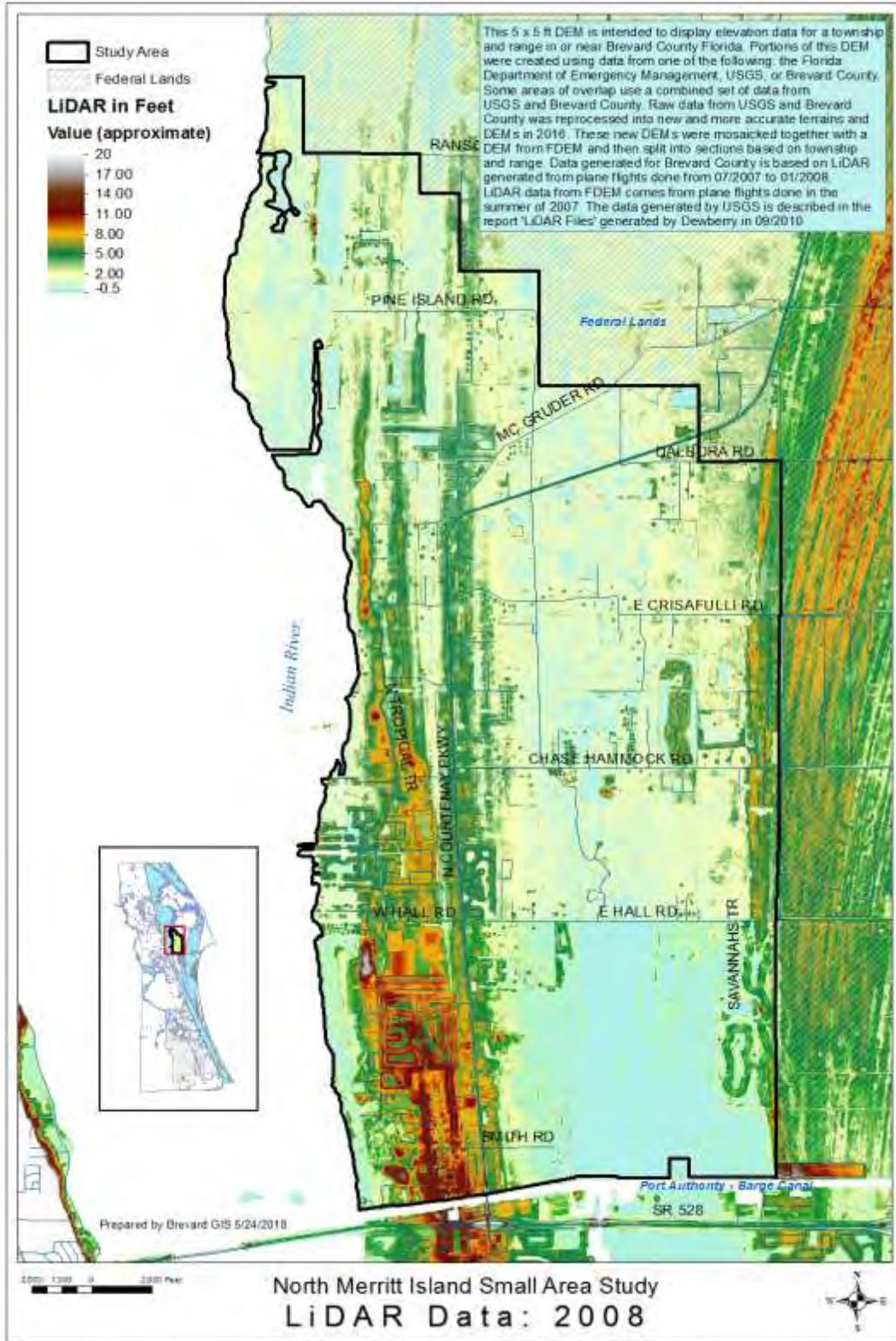
Map 14 Soil Drainage Characteristics

Elevation (Topography)/ LiDAR

The land surface on North Merritt Island (NMI) varies in elevation between a maximum of 15 feet and 0 feet in the North American Vertical Datum of 1988 (NAVD88), excluding the ponds and canals which can extend to -12 feet. The two ridge systems run north-south and lie near the west side of the island slightly west of N Courtenay (State Rd 3) and along the east side of the island, almost entirely on property controlled by the federal government. A broad low lying area between the ridges and a narrow area to along the western edge of the island make up the remainder of the island. The elevations of the western ridge are generally greater near the southern end of the island and trend lower to the north with the reverse being true of the low lying area in the middle and the eastern ridge.

NMI LiDAR was collected in 2007 and made available to the County in 2009. LiDAR is a method of collecting elevation information from an aircraft or ground vehicle and has been found to be quite accurate in Brevard County and in NMI, even in areas with heavier trees and brush. As can be seen from the attached map it is quite detailed and is very useful for planning and evaluation purposes.

When comparing older information (plans, surveys, etc.) with more recent information, it is important that the same datum, basis for measurement, is used or that the information is adjusted to the current datum. The datum used in elevations can be thought of as your zero point. There are three datum used in Brevard County: sea level (of various flavors), National Geographic Vertical Datum 1929 (NGVD29), and NAVD88. The most commonly used are the last two, with the NAVD88 being the most current and what most surveyors and engineers are using in their plans and drawings. The difference between the two elevations is approximately 1.4 feet for NMI with the NAVD88 elevation being the smaller number ($\text{NAVD88} + 1.4 = \text{NGVD29}$ – approximately). One way to visualize the datum difference is to imagine you're standing next to a step stool 1.4 feet high. If you're 5.5 feet tall (from the floor) you could be said to be 4.0 feet tall in the step stool datum. The top of your head didn't move, just where you measured from.



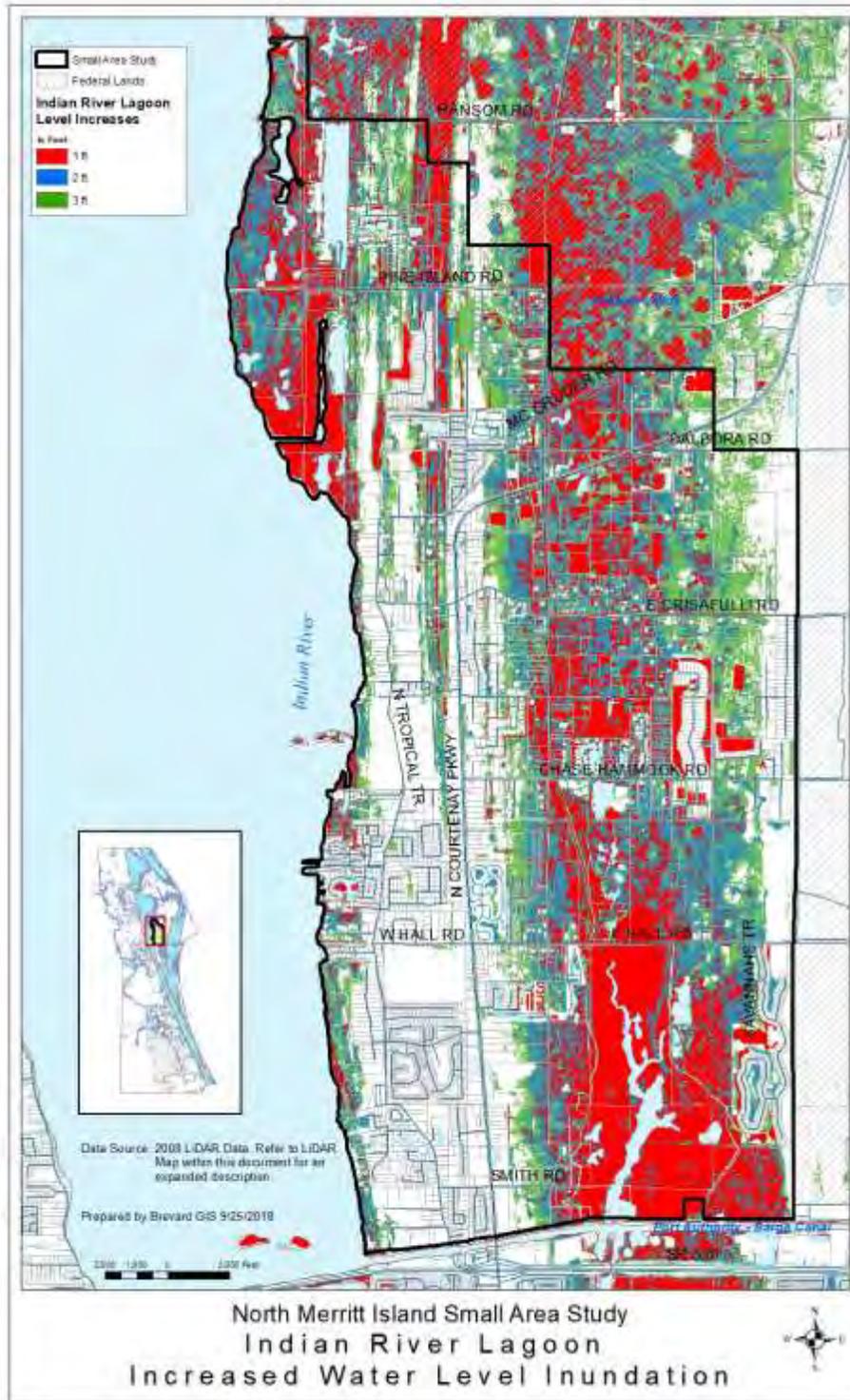
Map 15 2008 LiDAR Data

Lagoon Levels

The elevations of the lagoon tend to be around 0 during the wet season with lower levels generally occurring during the dry season. The lagoon levels near NMI are influenced by seasonal average sea level (not tides), rainfall, and wind. During storm events the lagoon water level commonly increases by 1 to 3 feet with much higher storm surges possible. Elevated levels are unlikely to directly flood the center low lying areas of North Merritt Island however, in the event of an extended period of high water in the lagoon the ground water levels would increase and backwater inundation would cause the water levels in the entire "bowl" of the island to rise.

The attached maps show the areas affected under various scenarios from 1 foot to 3 feet of extended lagoon level increases. These are still-water elevations without accounting for the effects of wind or rainfall. Wind driven wave action and rainfall would increase the extent of flooding shown in each scenario.

Increases in lagoon level also inhibit the discharge of stormwater from the NMI drainage systems by decreasing the difference in elevation between the system and the lagoon. High lagoon level can also impact drainage by potential filling the stormwater systems with lagoon and/or groundwater reducing the amount of storage available in the system. These impacts can greatly increase the extent and duration of flooding from storm events.



NMI Drainage Map 16 Increased IRL Water Level Inundation

Stormwater

The North Merritt Island (NMI) drainage basin is located in the east central area of unincorporated Brevard County, north of State Road 528, south of the Kennedy Space Center and west of Kars Park (NASA property). Approximately 9,000 acres of stormwater runoff from residential and agricultural land on NMI drains to two major outfall locations: 1) north through the Judson and Pine Island Rd. drainage ditches into the North Indian River Lagoon, and 2) south to the Barge Canal and ultimately Sykes Creek. A limited portion of drainage from the eastern fringes of the NMI Small Area of Study (SAS) drain east through NASA's Kars Park property via three drainage ditches extending from East Crisafulli Rd., Chase Hammock Rd., and Hall Rd. The remaining areas, on the west side of State Road 3 (SR3), discharge to the North Indian River Lagoon (NIRL) via the W. Hall Rd. outfall pipe under N. Tropical Tr., a small drainage ditch located east and north of Sam's House, and an indistinguishable area to the west through a drainage ditch located west of Florida Inland Navigation District (BV-11) property.

The NMI topography mimics a bowl shape signature with the center inland portion of the island at Joseph's Ct. consisting of the lowest (or near lowest) elevations ranging from 0 to 4 ft. (+/-) NAVD 88; whereas, the higher western ridge, generally extends north to south along N. Tropical Tr. and ranges in elevations between 4 and 9 ft. (+/-) NAVD88). The east ridge, eastward of the NMI SAS, lies within the NASA's Kars Park property. The extensive drainage ditch system throughout NMI has less than a few inches of drop to either of the receiving water bodies, NIRL and the Banana River via Sykes Creek and the Barge Canal, making recovery from most storm events extremely slow. The direction of flow throughout the Judson drainage ditch is dynamic and dependent upon multiple factors including the seasonal high water elevations, driving wind direction, tailwater conditions within the NIRL and Barge Canal, and the amount of storage available within the drainage system. However, for drainage east of SR3, the divide in flow is generally near the junction of Chase Hammock Road and Judson Road. Areas to the north tend to drain through the Judson Rd. and Pine Island Rd. drainage ditch system and ultimately to the NIRL. Areas to the south tend to drain through a series of drainage ditches and wetland marsh areas paralleling Pioneer Trail at Kings Lake Park into two creeks that skirt the Sykes Creek Mosquito Impoundment on both sides, and under normal circumstances discharge into the Barge Canal. Under normal conditions (dry events), stormwater runoff from the east central and northern extents flows into the Pine Island Conservation Area Stormwater Management System (PICA SWMS) via gravity flow to provide stormwater treatment prior to discharging in the NIRL.

One of the major concerns is the increased frequency and intensity of the storm events. These events combine to increase the normal and seasonal high water levels within the Indian River Lagoon, due to more frequent and/or back to back rain events. They reduce the available flood storage within wetlands, wet detention ponds, drainage ditch systems, and the Sykes Creek Mosquito Impoundment. They also decrease the rate of discharge from these storage and conveyance systems that discharge to the North Indian River Lagoon and Sykes Creek.

Stormwater Projects, Infrastructure, and Mobile Pumps

In the mid-1990's, Brevard County developed a Master Drainage Plan to reduce the flooding issues on NMI. The first of multiple projects included the Lake George Water Quality Enhancement Project, located within King's Park on the south side of Chase Hammock Road, completed in 2010. A new drainage ditch conveyance system, construction of a wet detention pond and associated weir, and the installation of a large box culvert under Chase Hammock Rd. and culverts with flash boards under Hall Road were some of the flood control and water quality improvement components designed to divert and manage stormwater runoff as well as restore historical flow patterns. The Lake George Project also reduces the conveyance burden on the Judson Rd. drainage ditch system by moving water south through a secondary conveyance system towards the Barge Canal.

Prior to the construction of the PICA SWMS, the Pine Island drainage ditch conveyed stormwater runoff from a substantial portion of the NMI drainage basin with minimal engineered flood storage and water quality

treatment prior to discharging to the NIRL. There was no connectivity to the large borrow pits located north and south of the Pine Island ditch. These pits were converted to stormwater management detention ponds by the Brevard County Stormwater Management Program. Construction of Phase 1 of the PICA SWMS, completed in December 2012, included the expansion and perimeter berm build-up of the north pond (81-acres), construction of a pump house station with a single 24-inch pump having an optimal design flow rate of 15,000 gpm, fabrication of a diversion weir to force water into the settling basin to be conveyed to the north pond via hydraulic pumps and/or two 30-inch gravity pipes with back-flow prevention devices (i.e. Flapgates and Tideflex®), and an outfall weir to the downstream end of the Pine Island drainage ditch, ultimately discharging to the NIRL. Phase 2 involved the expansion of the south pond (26-acres) and perimeter berm build-up, installation of an additional 24-inch pump and a 30-inch pump, each having an optimal design flow rate of 15,000 gpm and 32,000 gpm, respectively, and the construction of a second separate outfall to the NIRL via Sams Creek for the south pond. Phase 2 was completed in December 2014. The first 24-inch pump flows to the north pond. The 30" pump flows to the south pond. The second 24-inch pump has the ability to discharge to either the north or south pond via a butterfly valve. The Pine Island Rd. and Judson Rd. drainage ditch systems convey stormwater runoff to the PICA SWMS for flood storage and water quality treatment via gravity flow and/or pumps. Depending on the water level and conditions, stormwater may also overflow the diversion weir, by-passing the system, and discharge directly to the river.

Between 2010 and 2014, more than \$4.5 million in drainage improvements were completed. Construction of another \$3 million of flood control measures are expected to be underway by 2019. State and Federal agencies, including the Environmental Protection Agency, Florida Department of Environmental Protection and St. Johns River Water Management District, have contributed more than \$1.5 million in cost-share funds between 2010 and 2014 towards NMI Stormwater construction projects.

In emergency situations the Mosquito Control pump at Hall Rd. is used to displace flood waters into the Sykes Creek Mosquito Impoundment. During Hurricane Irma and the six weeks of rain that followed a 24" mobile pump was added at Hall Rd. to move more flood waters into the impoundment. A second 24-inch mobile pump was brought in an attempt to alleviate residential flooding. Additionally, a supplemental 12-inch mobile pump was installed at PICA SWMS. All seven pumps, including the three permanent pumps at PICA SWMS, ran nearly continuously, with exception of refueling and maintenance, for 8+ weeks.

The Hall Rd. Pump Station is a major pending and fully funded stormwater project and includes the construction of a permanent pump station on E. Hall Rd., north of the Mosquito Impoundment. The construction entails the installation of two 25,000 gallon per minute hydraulic pumps, and an additional culvert under Hall Rd. to enhance conveyance and pump performance. These pumps will replace the existing mobile pumps currently used by Public Works during heavy rainfall events. Construction plans are 90% complete, 3 of the 4 required permits have been obtained, and drainage easements are currently being pursued as needed. Once ready for bidding, construction will be timed for the next available dry season, likely November 2019.

W. Crisafulli/Church Rd. Drainage Improvements, currently in preliminary engineering design, is a partially funded project to reduce recurring flooding on the west side of SR 3. The conceptual design involves tying into an existing outfall to the south and west to reduce flooding and improve the recovery time.

Additional drainage improvements recommended for the west side of SR 3 but not yet funded include: 1) upsizing the outfall pipe at W. Hall Rd. and N. Tropical Tr. to reduce flooding within the Horseshoe Bend area; 2) Creating a second emergency discharge location from the north impoundment at PICA SWMS; and, 3) Increasing gravity discharge capacity of the PICA SWMS diversion weir system by adding an additional pipe.

Flooding

Recurring and prolonged flooding has been documented on NMI by the County since Tropical Storm Gordon in November 1994 (7.83-inches of rainfall at Melbourne Airport), shortly after the inception of Brevard County Stormwater Utility. In October 2005, Hurricane Wilma dropped over 6 inches of rain in 24 hours causing flooding to multiple access roads for several days, impassable for standard vehicles. Citrus Groves ran pumps for 24 hours a day for multiple days to remove water in an effort to save their crops;

however, staff observations and reports indicate the water level within the drainage ditches were so high, water moved in a circular pattern over dikes with no beneficial results from running the grove pumps.

Tropical Storm Fay in 2008 brought an all-time record of 16.93 inches of rainfall to North Merritt Island over a four day period. Several homes had interior flood damage (based upon residential survey responses received in late 2008). Sections of five major roads were impassable and many agricultural properties and private residential lots were inaccessible for 14 days or longer. Water levels threatened and enveloped more than 50 homes and lots (>1-acre) where many residents keep horses and other livestock. The survey after the storm indicated that at least 30 barns, sheds, and similar non-residential structures also received flood damage. Properties containing citrus groves and other agricultural lands were submerged and inaccessible, and the use of agricultural pumps, once again, proved highly ineffective. This time, recovery to pre-storm water level conditions did not occur until more than 21 days following the event despite the use of the MC and portable pumps.



Tropical Storm Fay, 2008 – W. Crisifulli Rd., E. Crisifulli Rd., Porcher Rd., and Church Rd.
 Source: Darlene Hunt

Hurricane Irma impacted Brevard County on September 11th with substantial heavy rains initiating on September 8th and subsequent rainfall through October 25th, 2017 for a total of 30.6 inches in 47 days resulting in one of the most prolonged flooding events to the area in modern history. The difference with this storm was the duration of the event and the resulting complete saturation of the soils during the nearly continuous rainfall received through late October, thereby, increasing the runoff volume and reducing, if not eliminating, any potential storage capacity. Several residents reported 3-4 inches of standing water inside their homes, with a few experiencing a second interior flooding episode following the heavy rains on October 2, 2017. Much of NMI experienced road flooding of 3-6 inches, most completely recovering within the first 24-48 hours following the storm with the exception of Crisafulli Rd., East and West, Joseph's Ct., and Church Rd. Significant yard flooding was prevalent basin wide.



Hurricane Irma, 2017 - E. Crisifulli Rd., Church Rd., and W. Crisifulli Rd.
 Source: Darlene Hunt

Staff Gauge Monitoring

In 2013, sixteen new staff gauges were set by Brevard County Mapping and Surveying at critical locations within the NMI drainage basin to monitor the stormwater management system as well as the continually changing tailwater conditions within the NIRL and the Barge Canal. Since December 2014, three (3) staff gauges have been added to the area. This data informs staff where best to operate portable pumps. All of the staff gauges were set in reference to the latest vertical control datum, North American Vertical Datum of 1988 (NAVD 88).



Source: Brevard County Public Works

Maintenance

Ditch maintenance on Pine Island Road (from the 90 degree bend to PICA SWMS) was completed in March 2013. To further improved stormwater runoff conveyance to PICA SMWS, additional ditch maintenance will be completed in early 2018 from the 90 degree bend to State Road 3. Additional phased ditch improvements, if funding allows, includes excavating sediment with the Judson Road drainage ditch from SR3 southward to E. Crisafulli Rd. to improve the capacity of the conveyance system.

Mosquito Impoundment

The Mosquito Impoundment is an essential tool in the flood recovery process for the NMI drainage basin as it provides needed storage for flood waters pumped from the north by the mosquito pump and the two mobile pumps on E. Hall Rd. during significant storm events. When water levels rise within the Barge Canal following long periods of rain, especially during October when seasonal high water occurs in the lagoon,

the water in the two creeks running parallel to the impoundment can and will backflow to the north, potentially exacerbating flooding problems from Chase Hammock Rd. and E. Crisafulli Rd.

The Mosquito Impoundment provides temporary storage for stormwater runoff pumped in from the north until the Barge Canal water levels lower enough to allow for natural gravity flow to resume. The previously referenced flashboards under Hall Rd. serve to prevent backflow from the Barge Canal into ditches and wetland marsh areas to the north. If not controlled, this backflow would worsen flooding conditions in the east central area of NMI.

Septic

The Florida Department of Health (DOH) regulates onsite sewage treatment and disposal systems (OSTDS), commonly known as septic systems. Permitting and inspections of all OSTDS are handled by the County Health Department's Environmental Health Section. All parcels where sewer systems are not available as defined in Section 381.0065(2) (a), Florida Statutes, may apply to the department to install a septic system. All septic systems must be installed meeting all requirements of Section 381.0065, Florida Statutes (F.S.) and Chapter 64E-6, Florida Administrative Code (F.A.C.).

Where sewer is not available and vacant parcels in the study area are developed, an OSTDS Construction Permit must be obtained. New construction permits are required to meet all current regulations, including separation between the bottom of the system drainfield and the estimated wet season water table, setbacks to surface water, potable wells and non-potable wells. If the current state regulations cannot be met and the property owner is denied a permit, the owner may apply for a variance from the rule or statute requirements. Variances are processed through the Department of Health Central Office.

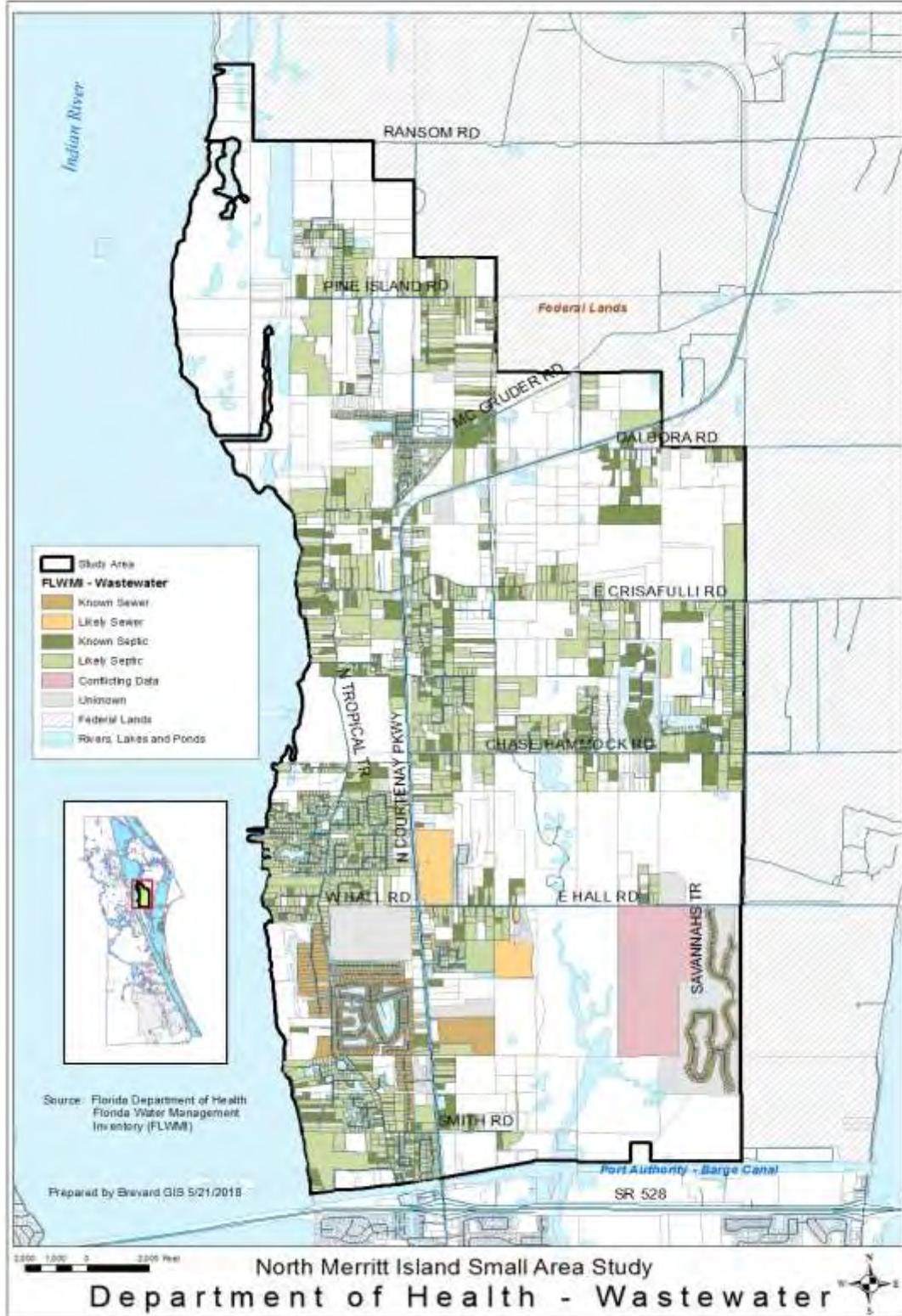
Property owners of parcels in the study area who are modifying existing buildings on their property (for example, adding a bedroom to an existing residence) and wish to continue use of their existing septic system, must apply for an OSTDS Modification Construction Permit and, in some cases, will be required to meet current regulations. The existing septic system is required to be evaluated by a licensed plumber, certified environmental health professional, or registered septic tank contractor in order to be permitted.

Property owners of parcels in the study area with a failing septic system that needs repair must apply for an OSTDS Construction Permit and meet the requirements listed in 64E-6.015, F.A.C. Repairs may be permitted to meet lesser setbacks and separations based on the year the original septic system was installed. The existing setbacks must be maintained if they are greater than the repair minimums defined by current rule.

If site conditions pose challenges to meeting the regulations, property owners may choose to apply for an aerobic treatment unit (ATU) or performance based treatment system (PBTs). ATU and PBTs are designed to produce cleaner effluent than standard septic systems, and can be permitted in certain situations to overcome limiting site conditions where a conventional OSTDS cannot be permitted.

The Soils map included on page 47 of this study shows the diversity of soil types in the area. The soils and estimated wet season water table indicators found during site evaluations assist the Department in determining the requirements for elevations of septic system installations. Septic systems in areas with higher wet season water table indicators may be required to be installed above native grade, sometimes creating a mounded system. Some soils in the study area are restrictive and are not suitable for septic systems. These restrictive layers can either be removed and replaced with suitable soils or the system can be elevated above them. Many property owners choose to fill their entire lot to avoid a visible septic system mound.

The Florida Department of Health's Florida Water Management Inventory (FLWMI) has identified 2,046 parcels possibly served by septic systems in the study area. The FLWMI map of the study area below was created from the most recent data received on 11/22/2017. The map shows parcels with known septic systems, likely septic systems, known sewer, and likely sewer. More information about the FLWMI can be found by visiting: <http://www.floridahealth.gov/environmental-health/onsite-sewage/research/flwmi/index.html>



Map 17 Department of Health - Wastewater

This study area is included in the proposed temporary OSTDS moratorium on the installation of new OSTDS that are not capable of reducing total nitrogen in effluent by at least 65%. This proposed moratorium will affect the installation of OSTDS for new construction or renovation of existing structures.

A 2018 DOH proposed rule change to Chapter 64E-6, (F.A.C.) will allow in-ground nitrogen reduction biofilters, which include nitrogen-reducing media layer in drainfields. If the rule proposal is approved, it will provide more options to the systems available which can meet the 65% total nitrogen reduction requirement. Another 2018 Department rule proposal includes recognizing in the F.A.C. regulations, aerobic treatment units (ATUs) certified to the National Sanitation Foundation (NSF) Standard 245. For technology screening purposes, NSF 245 certified ATUs are 50% nitrogen-reducing units. NSF 245 ATUs must first meet NSF Standard 40 and as such, are already available for use in Florida. NSF 245 ATUs when disposing to a drainfield with a 24-inch separation to the estimated seasonal high water table is expected to meet the 65% nitrogen reduction requirement.

ATU, of which nitrogen-reducing (NSF 245) treatment units are a subset, and PBTS, engineer-designed to specific performance standards that can include nitrogen reduction require, at minimum, semiannual maintenance inspections completed in conjunction with a service contract with a department approved maintenance entity, an annual inspection from the department, and an Onsite Sewage Treatment and Disposal System Operating Permit from the department. The operating permits are required to be renewed on an annual or biennial basis depending on type. Some ATU and PBTS also require monitoring of effluent quality. The department is required to take enforcement actions for violations of these requirements.

CITIZEN'S COMMITTEE RECOMMENDATIONS

The following Recommendations have been grouped according to type within the following categories:

- Community & Quality of Life
- Planning & Land Use
- Transportation & Infrastructure
- Utilities & Natural Resources
- Safety & Emergency Management

The Recommendations below are not ranked in order of priority, but are numbered for reference purposes only. Recommendations #7, #8 and #3 were selected as the top three recommendations by the Citizen's Committee.

Community & Quality of Life

Recommendation 1: Brevard County should budget funding a community center at Mitchell Ellington Park for previously planned and designed site.

STAFF RESPONSE, PARKS & RECREATION: The Parks' bond referendum funding for the construction of this Community Center was defeated in 2010-11. There is no funding currently available for the center's construction and the required operation and maintenance. If directed by the Board, Parks staff could consider resubmitting the Community Center in the "Unfunded CIP" budget for FY2019-.

Recommendation 2: Brevard County in partnership with other agencies should purchase riverfront land across from the FIND site on the west side of NMI for a public park with boat launching access.

STAFF RESPONSE, PARKS & RECREATION: There is currently no funding available for the land acquisition and/or necessary operations and maintenance costs.

Planning & Land Use

Recommendation 3: For all parcels ≥ 2.5 acres in size with the Residential 1 (Res 1) Future Land Use designation and Agricultural Residential (AU) Zoning classification, Brevard County should amend the Future Land Use Map to Residential 1:2.5 (Res 1:2.5).

STAFF RESPONSE, PLANNING & DEVELOPMENT: If so directed by the Board of County Commissioners to implement this recommendation, County staff would initiate a large scale Comprehensive Plan Amendment (LSCPA) to modify the Future Land Use Map (FLUM) of the parcels of land greater than 2 ½ acres with a Future Land Use (FLU) designation of Residential 1 (RES 1) with a Zoning designation of Agricultural Residential (AU). This Future Land Use change from Residential 1 to Residential 1:2.5 (RES 1:2.5) would apply to 2,486.14 acres, which could potentially reduce the number of dwelling units that can be built in the Study Area by a maximum of 1,492 dwelling units.

2,486 acres @ 1 unit per acre = 2,486 dwelling units
 2,486 acres @ 1 unit per 2.5 acres = 994 dwelling units

 Potential Maximum Reduction = 1,492 dwelling units

A Future Land Use change is a large scale amendment which is typically processed via one of the two amendment cycles per year. The application period for the two amendment cycles close on June 30th and December 31st. The LSCPA process takes approximately 6 months to complete. Parcels proposed for Future Land Use designation amendment are depicted on the map found in **Appendix B**.

Transportation & Infrastructure

Recommendation 4: Brevard County should budget funding and review grant opportunities for the funding of planned pedestrian trails and bicycle paths and maintenance.

STAFF RESPONSE, PUBLIC WORKS: The Brevard County Planning, Public Works, and Parks and Recreation Departments, along with the Space Coast Transportation Planning Organization (TPO), are consistently looking at ways to improve bicycle and pedestrian infrastructure within North Merritt Island and improve network connectivity and access. New funding sources are currently being identified and projects are being proposed for currently available grants opportunities.

As a part of the 2015 updates to the Office of Greenways & Trails Land Trails Opportunities Map, the Space Coast TPO pursued the rerouting of the unbuilt portion of the East Coast Greenway through North Merritt Island, depicting connections between existing and planned trails on statewide trails maps. The designation of NMI trails as part of a larger, regional network of trails makes these projects eligible for additional funding sources. In 2015, the East Coast Greenway was also designated as a part of the Florida Department of Transportation's Shared-Use Nonmotorized (SUN) Trail Network, making this corridor eligible for an annual \$25 million appropriation.

Space Coast Transportation Planning Organization (TPO) will be funding a Feasibility Study in FY21 at which time TPO will administer the project through their Unified Planning Work Program (UPWP). Funding for the next phases of the East Coast Greenway through North Merritt Island will be determined by the results of the Feasibility Study.

Recommendation 5: Brevard County should re-sign Sea Ray Drive to be one-way, eastbound only, like it was originally designed when S.R. 528 was a toll road. Sea Ray Drive traffic should travel only eastbound, entering the corridor at North Courtenay Parkway and exiting only at North Banana River Drive, eliminating the westbound connection of Sea Ray Drive with S.R. 3.

STAFF RESPONSE, PUBLIC WORKS: Two current FDOT projects will impact this intersection – the widening of SR 528 and improvements that may result from the SR3 Courtenay Parkway Corridor Study. County staff has advised FDOT's project managers and MIRA staff of the recommendation for engineering improvements within the area and consideration of any transportation improvements should be done in coordination with FDOT.

Sea Ray Drive is approximately 2.6 miles in length. Restricting the roadway to one-way traffic would force those accessing parcels at the west end to go almost 5 miles out of the way to get back to the point of origin to continue heading west on SR 528, south on SR 3 or north on SR 3. Additionally, Sea Ray Drive and parcels at the east end would be restricted from being accessed from North Banana River Drive.

It should be noted that the bridge on Sea Ray Drive was extensively damaged during Hurricane Irma and was deemed unsafe until repairs could be made. At this time, vehicles are unable to traverse the entire length of Sea Ray Drive. There are potential future access issues associated with converting this roadway to a one-way segment.

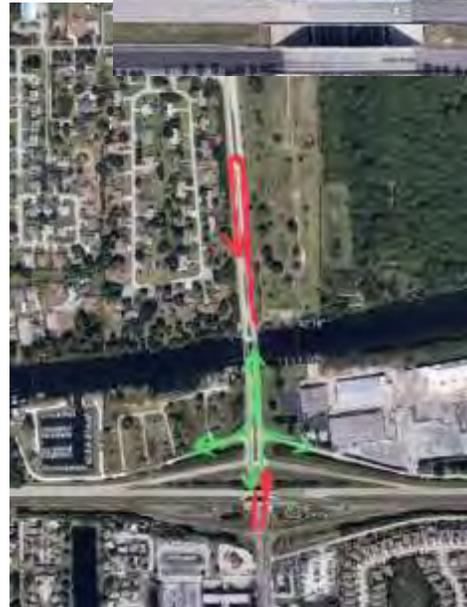
Recommendation 6: Brevard County should request that FDOT review the intersection of North Courtenay Parkway (SR 3) / the Beachline (SR 528) / Sea Ray Drive / Marine Harbor Drive, to include ways to allow full-access at Sea Ray Drive/Marine Harbor Drive, to reduce or eliminate the need for the U-turn located on SR 3 north of the Barge Canal.

STAFF RESPONSE, PUBLIC WORKS: Just north of the Barge canal, lies a traffic signal which does not lie at an intersection, but only accommodates U-turns, which result from restricted turning movements at one limited-access unsignalized intersection, just outside of the Study Area. The intersection of S.R. 3 and Sea Ray Drive (east of S.R. 3) / Marine Harbor Drive (west of S.R. 3) is not full access, with left turning movements prohibited. This intersection's turning restrictions are in place to reduce conflicts with the S.R. 3 / S.R. 528 interchange, which lies only 160 feet to south, and the Barge Canal bridge, which lies less than 300 feet to the north. Because these two intersections are so close in proximity, they cannot both be signalized, with the interchange's northern intersection signalized and the smaller Sea Ray Drive / Marine Harbor Drive / S.R. 3 intersection left unsignalized.

Currently, traffic traveling westbound on Sea Ray Drive cannot make a left onto North Courtenay Parkway (S.R. 3). Westbound vehicles must turn north on S.R. 3, cross the Barge Canal, and make a U-turn approximately 650 feet south of the intersection of Grant/Smith Road and S.R. 3. Both the U-turn signal and the intersection of Grant/Smith Road with S.R. 3 are signalized.

Additionally, vehicles headed west on Marine Harbor Drive (directly across S.R. 3 from Sea Ray Drive) are also not provided full access from S.R. 3 and similarly have to head north across the Barge Canal, to the U-turn, to then head south, crossing the Barge Canal once more to gain access to Marine Harbor Drive and the Port Authority's Marina and new residential units.

While the signalized U-turn allows vehicles that are exiting Sea Ray Drive to continue south on SR 3, it also allows vehicles traveling north on SR 3 to access Marine Harbor Drive. A large number of these vehicles are towing a boat trailer. The turning radius required by these vehicles to complete a U-turn maneuver cannot be accommodated further north at the intersection of SR 3 and Grant Road/Smith Road, necessitating the separate and specialized wide-radius U-turn signal that remains in place today. FDOT's recommendation for improvements at the Sea Ray Drive connection in the SR 528 widening project will determine the feasibility of removing this signal.



Utilities & Natural Resources

Recommendation 7: Brevard County should significantly improve the current Federal Emergency Management Agency (FEMA) stormwater model for North Merritt Island. This stormwater model could then be used to demonstrate whether proposed development would pose any adverse flooding impact on neighbors or streets.

STAFF RESPONSE, NATURAL RESOURCES MANAGEMENT: NMI Drainage Study Description, Cost Estimate, and Schedule (8/15/2018)

The current stormwater model for North Merritt Island is useful for approximating flood plain elevations and the areal extent of flooding; however, the model is based on large-scale overview data and lacks fine-scale site details and groundwater interactions with the surface water stormwater and wetland systems. The existing model is not an ideal diagnostic tool for determining the impacts of small changes to the NMI stormwater system, such as smaller residential and commercial development.

Including additional details from undeveloped areas and existing subdivision stormwater systems would significantly improve the precision of the model for commercial projects and small subdivisions. Additional surveying and data collection is necessary to include the details for smaller channels and culverts as well as flow obstructions. Groundwater modeling would account for the impacts of high and low water tables on the stormwater systems.

Additional precision in the model would also allow the county to plan and evaluate proposed improvements and select more cost-effective projects with better final results. Furthermore, updates to the current model could incorporate software updates that allow the floodplains of multiple events to be easily mapped and shown. The additional mapping tools would enable the County, residents, and developers to more easily visualize the extent of flooding under various rainfall scenarios and the impacts of projects on those extents.

Increasing the accuracy of the drainage model would also assist developers and their engineering consultants in enhancing subdivision and commercial development designs as it would allow them to make changes to their on-site stormwater management system to adequately accommodate the required stormwater runoff volume needed to eliminate additional drainage impacts to other properties within the basin. This advance effort would create the opportunity for the developers to address potential impacts from their projects early during plan formulation, ahead of full permitting, to avoid the need for adjustments and extensive modifications late in the design and permitting process. A more detailed drainage model for NMI would also provide documentation in the event of disputes regarding the impact of a project.

The estimated cost to upgrade the Federal Emergency Management Agency (FEMA) flood model to the level of detail needed for the 13,100 acre NMI drainage study area is \$450,000 (\$150,000 for surveying and mapping and \$300,000 for the stormwater modeling). Since the proposed services exceed \$200,000 per policy BCC-26 for Consultant's Competitive Negotiation Act (CCNA), Request for Qualifications (RFQ) will be required; whereas, the advertisement and negotiation process may take up to 6 months. The anticipated schedule to complete the survey inventory is 9-12 months, which could initiate as early as mid-September 2018, and the drainage model and final report will require an estimated additional 9 months for a total estimated schedule of 18-21 months for submittal of the final report and drainage model. The stormwater inventory surveying tasks will be conducted by Brevard County Surveying and Mapping to obtain additional infrastructure data not previously captured in the FEMA model. Information from existing and permitted as-built surveys for numerous subdivisions, parks, Road and Bridge roadway projects, and Stormwater Capital Improvement Projects (CIP) will be included within the stormwater inventory for the NMI drainage model. The upgraded two-dimensional surface and groundwater stormwater model would include various storm event simulations: the mean annual; 10 year, 24-hour; 25-year, 24-hour; and 100-year, 24-hour in addition to multiple scenarios for variable tailwater conditions within the Indian

River Lagoon and likewise, for seasonal high and low groundwater table elevation changes. The model would reflect future phased CIPs (i.e. the Hall Road Pump Station, the W. Hall Road Pipe Capacity Improvements, and the W. Crisafulli/Church Rd. Drainage Improvements) in addition to simulating the current conditions and stormwater infrastructure. The information and results would be documented in a final report and pertinent Geographic Information System (GIS) files. The flood plains for the various recurrence interval storms would be delineated by the drainage model results.

The use of the updated stormwater model to ensure development does not negatively impact other properties; infrastructure or the public would assist County staff with the application of existing county codes and ordinances and would assist developers with demonstrating compliance with existing county codes and ordinances. The use of the model for demonstration of project impacts could contribute to significantly improved stormwater management on North Merritt Island without requiring revisions to county ordinances. Therefore, the use of the model for development and project planning could commence once the upgraded model is reviewed and accepted by the County.

Recommendation 8: Brevard County should create a Special Area of Stormwater Concerns (SASC) within the boundary of the North Merritt Island Small Area Study to require development to meet specific stormwater standards tailored for addressing the drainage challenges and deficiencies within the SASC. These standards could include, but would not be limited to volume limitations, increased discharge rate limitations, higher degrees of stormwater treatment, improving downstream infrastructure, individual lot detention, and lot fill limitations.

STAFF RESPONSE, NATURAL RESOURCES MANAGEMENT: The existing stormwater model is more than adequate for broad area analysis. However, as noted in the staff response to Recommendation 1, additional detail is necessary to allow evaluation of smaller individual projects for impacts on surrounding properties. Adoption of tailored standards applied within a Special Area of Stormwater Concerns (SASC) with support of an updated model as recommended above, could aid in avoiding harmful cumulative flood, drainage and water quality impacts. Code or comprehensive plan changes could be implemented by the Board instead of creating a SASC for NMI, but those changes would affect areas outside the scope of this study.

Recommendation 9: Brevard County should require the repair of existing septic drain fields meet the State standard.

STAFF RESPONSE, DEPARTMENT OF HEALTH, ENVIRONMENTAL HEALTH SERVICES: The Florida Department of Health (DOH) issues repair permits in accordance with Chapter 64E-6, Florida Administrative Code and Florida Statutes. Depending on lot subdivision and original installation date, some systems can be repaired with drainfield installations meeting a six-inch separation from the water table in contrast to today's 24-inch separation requirement for new system installations. If directed by the Board, a stricter local ordinance could be pursued that would require repaired systems to meet a separation of the drainfield from the water table greater than 6 inches.

Recommendation 10: Brevard County should adopt a local ordinance requiring any newly constructed septic systems to reduce nitrogen by 65% minimum by utilizing a nitrogen-reducing system as a requirement for a construction permit.

STAFF RESPONSE, DEPARTMENT OF HEALTH, ENVIRONMENTAL HEALTH SERVICES: For new systems Brevard County can enact an ordinance requiring an engineer-designed performance-based treatment system (PBTS), NSF245-certified (nitrogen reducing) aerobic treatment system (ATU) or other nitrogen reducing technology that is approved for use in Florida. If the County were to enact such an ordinance, it is recommended that the ordinance clearly state the Florida Department of Health (DOH)-approved nitrogen-reducing options that meet the performance standards required by the ordinance. It is also recommended that the ordinance differentiate between nitrogen reduction from the unit installed, and nitrogen reduction in the drainfield. For example, a NSF 245-certified ATU, per certification test, can achieve at least a 50% nitrogen reduction. Together with

an estimated 30% nitrogen reduction of the remaining nitrogen in the drainfield, such a unit can be estimated to achieve a total nitrogen reduction of 65%. Please note it is Brevard County's responsibility to seek advice from their legal counsel, when determining the lawfulness of potential County-initiated ordinances. While not part of the recommendation, similar considerations would apply to more stringent local considerations for repairs (when not triggered under a periodic evaluation program) or modifications.

DOH is working to incorporate in-ground nitrogen-reducing biofilters, as evaluated in the FOSNRSS project, into the Florida Administrative Code (FAC), Chapter 64E-6. The Department plans to develop design and review criteria for in-tank nitrogen-removing biofilters -evaluated during FOSNRS to facilitate their permitting as performance based treatment systems as already allowed by Part IV of Chapter 64E-6 of the FAC to meet current State Standards.

Recommendation 11: Brevard County should continue to seek Hazard Mitigation Grant Funds to purchase flood-prone properties in North Merritt Island and use the drainage model to prioritize affected properties for potential acquisition.

STAFF RESPONSE, NATURAL RESOURCES MANAGEMENT: Hazard Mitigation Grants are highly competitive federal grants that require the County to document that the benefits of the project exceed the costs. The primary benefit from acquiring privately owned flood-prone property is the owner's avoidance of future flood damages. This must be documented with proof of prior flood damages. Often, property owners do not adequately document their damages, save their receipts, and share this private information with County staff. Staff developed an on-line survey for capturing flood damages and has promoted the survey in affected neighborhoods after storms for the last decade; however documentation of damages is still inadequate for many flood prone properties. Damage to public infrastructure and costs of emergency response also need to be documented. Brevard County offices should foster interagency collaboration prior to storm events to identify all information needs, both during and after an event, to support grant funding and damage reimbursement requests through state and federal agencies. This includes the dates and times of roadway closures, extent of flooding, depth of flooding, and other damages. Information should continue to be collected from affected residents via community outreach meetings, site visits, and web based surveys. Any agency on location should collect as much information as feasible on flooding extent, duration, and damages to assist in gathering sufficient documentation for the County to successfully complete for Hazard Mitigation Grants to acquire flood-prone properties and/or construct drainage improvements to reduce flood risk on NMI.

Recommendation 12: Brevard County should continue to seek opportunities for enhancements to stormwater storage and treatment in North Merritt Island, including the acquisition of sites and partnerships with other agencies.

STAFF RESPONSE, NATURAL RESOURCES MANAGEMENT:

West Crisafulli Road / Church Road Drainage Improvements: This watershed management project is intended to divert stormwater runoff from W. Crisafulli Rd southward towards Church St through a water quality treatment system on the Florida Inland Navigation District (FIND) Dredge Material Management Area (DMMA) BV-11 site. The system will discharge to an existing outfall into the Indian River Lagoon, to the west, to relieve recurring flooding problems on the west side of North Courtenay Parkway. The Natural Resources Management and Public Works Departments are contributing funds to this project. FIND has verbally agreed to a land use agreement allowing the County to use a portion of the referenced DMMA property. The Task Order by Mead and Hunt, Inc. has been executed and the engineering design is underway. Further coordination with FIND is expected to help in expediting the construction of the water quality treatment component of the improvements.

Hall Road Pump Station Project: The Hall Road Pump Station Project (also referenced as NASA Drainage Improvement) involves the installation of two 25,000 gallon per minute hydraulic,

electric pumps at the Mosquito Impoundment on Hall Road to alleviate the duration of recurring flooding in this area. Adding the flexibility to switch to diesel in the event of power outages during emergencies has also been included in the project. The bid documents and construction plans are finalized, and drainage easement acquisitions are nearing execution. The County expects to bid the project in summer 2019, and initiate construction in November 2019.

Pine Island Phase 3 Emergency Outfall Weir: This phase will include the installation of an emergency outfall weir in the northwest corner of the north detention system to redirect stormwater discharge to a secondary outfall to alleviate the burden on the Pine Island drainage ditch and improve gravity flow from the system. As implied, the new outfall weir will be used during heavy rain events, and the primary, existing outfall will be blocked temporarily to force water through the emergency weir. During normal operations, the main, existing outfall will be utilized to enhance water quality prior to discharging to the Indian River Lagoon.

Safety & Emergency Management

Recommendation 13: Brevard County Fire and Rescue should evaluate the potential for a more centrally located station, to be implemented when the building needs to be either renovated or reconstructed, to bring response time down.

STAFF RESPONSE, EMERGENCY MANAGEMENT: Brevard County Emergency Management reviews all plans annually to meet the Level of Service (LOS) standards, with key plans receiving additional State and/or Federal reviews on a pre-identified cycle. Brevard County Emergency Management continuously works to grow the existing volunteer program by identifying new partners to engage, seeking additional opportunities for volunteers to serve, and sharing that information with our local emergency management community.

ACHIEVEMENTS

During the course of the study, many of the original Citizen's Committee Recommendations have been achieved by various Brevard County Departments or the Board of County Commissioners, and those memorialized here.

Achievement 1: Brevard County should budget funding a manatee observation deck at Manatee Cove Park.

STAFF RESPONSE, PARKS & RECREATION: The Eagle Scout completed the manatee observation deck at Manatee Cove.

Achievement 2: Brevard County should complete the process of permitting the commercial outfitters for kayak and associated rentals.

STAFF RESPONSE, PARKS & RECREATION: On December 15, 2015, the Board of County Commissioners approved the Eco-Tour Commercial Permit Process, recommending two different permitting processes – a General Permit that will allow operation in 22 County Parks and a Restricted Use Permit with a lottery selection process offered for Manatee Cove Park and Pine Island Conservation Area, both within North Merritt Island.

Achievement 3: Brevard County should preserve and maintain the historic sites within the study area.

STAFF RESPONSE, ENVIRONMENTALLY ENDANGERED LANDS (EEL) PROGRAM: The Brevard County Historical Commission recognizes the John H. Sams Homestead, located at the Pine Island Conservation Area, within their Historical Landmark Guide. Educational Staff consists of one full time Sanctuary Steward and two part time naturalists. Volunteer workforce consists of 48 enlisted volunteers, 13 of which form the Board of the Pine Island Preservation Society, a 501 (c) (3) entity

designed to assist the educational and public outreach programs of the Central Region's Management and Education Center (Sams House).

The Environmentally Endangered Lands Program, which is overseen by Parks and Recreation, annually reviews and submits budget to the Brevard County Board of County Commissioners. The process proceeds on a timed schedule annually to meet BOCC requirements. Historical preservation is not a primary function of the EEL Program. The Program's primary function is the preservation of biodiversity. In some cases, as is the case with Sams House, the EEL Program acquires historical resources when purchasing conservation lands. In these situations, the Program will manage the historical resources as appropriate within the context of the site specific management plan.

Achievement 4: Brevard County should ask MIRA to include the NMI corridor, up to N. Tropical Trail in its jurisdiction.

STAFF RESPONSE, MIRA: The Merritt Island Redevelopment Agency (MIRA) completed a Redevelopment Plan Update in 2013, including a "Findings of Necessity" study to assess boundary expansion. As a result, the CRA's boundaries were expanded to include the Barge Canal/SR 528 corridor as a specific targeted area.

Due to the residential nature and lack of anticipated land use change of North Merritt Island north of the Barge Canal, inclusion of the NMI SR3 corridor was determined to be outside of the MIRA goals and objectives and the area was not recommended for inclusion within the CRA. CRA Master Plans are required to be updated every 5 to 10 years, but because stakeholders recommend that North Merritt Island maintain its rural character, future inclusion into MIRA is not likely.

Achievement 5: Brevard County should meet with the Legislative Delegation to re-institute the law that was repealed regarding septic inspection, Senate Bill 550.

STAFF RESPONSE, NATURAL RESOURCES MANAGEMENT: After careful consideration, the Brevard County Board of County Commission sent letters to our Legislators in November 2010 supporting efforts to delay or repeal the implementation of Senate Bill 550, in effect since June 4, 2010, noting the unnecessary and unfair burden on Brevard County citizens and encouraging the Florida Legislature to explore more reasonable solutions to address water quality. Recipients included Governor Charlie Crist, one Senator and the Senate President, five Representatives and the House Speaker-Designate, and the State Surgeon General. Ultimately, the requirements for septic inspection within Senate Bill 550 were repealed the following year.

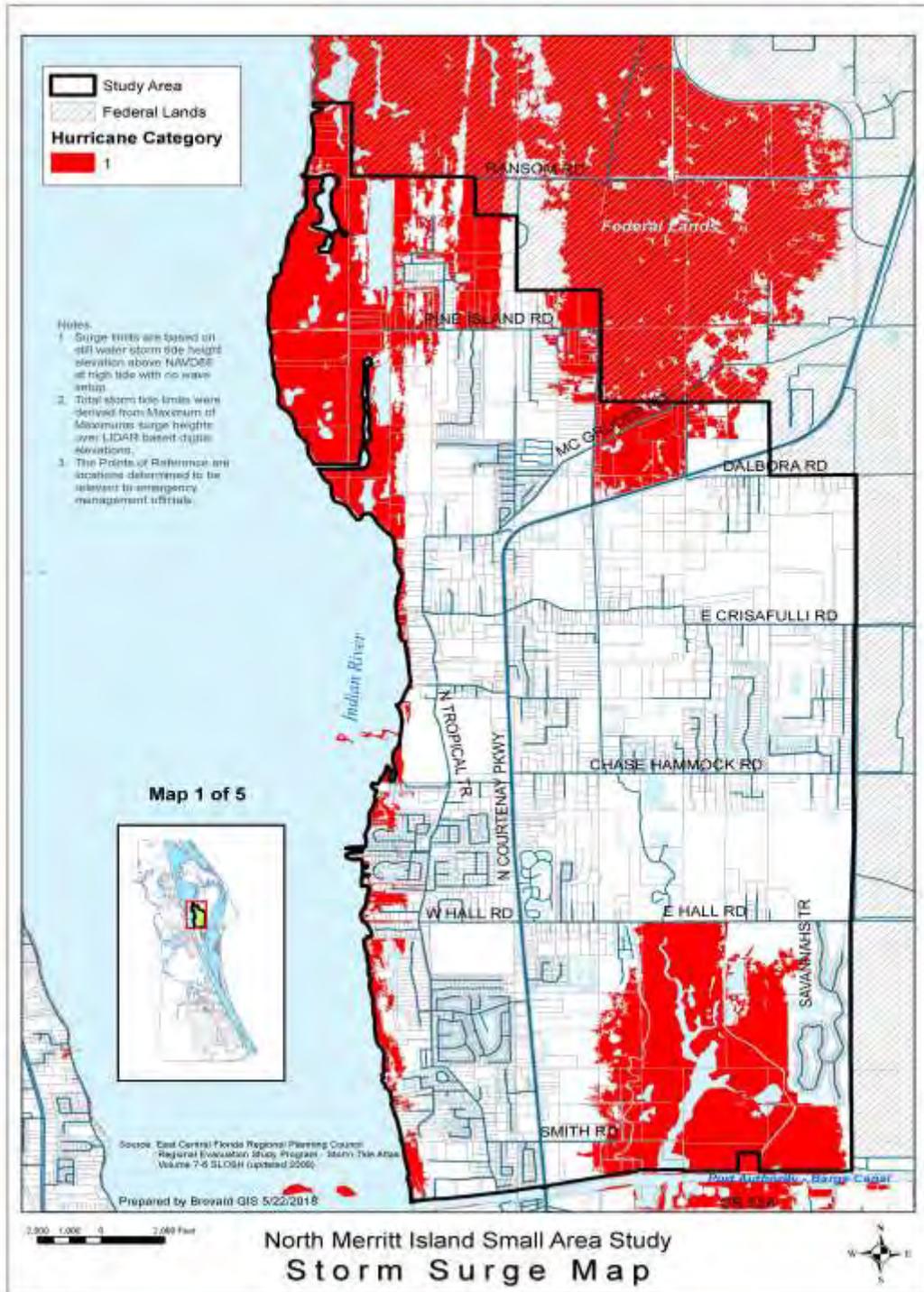
The Board of County Commissioners reviews legislative items and develops an annual Legislative Program. The 2016 Legislative Program was approved September 3, 2015 and includes the following priority related to septic systems: "Support revenue allocation for voluntary upgrade of existing onsite sewage treatment systems to Performance based Advanced Wastewater systems or connection to centralized sewer."

Achievement 6: The Small Area Study committee recommends to the Board of County Commissioners that the cargo rail will have a negative impact the Comprehensive Plan for NMI.

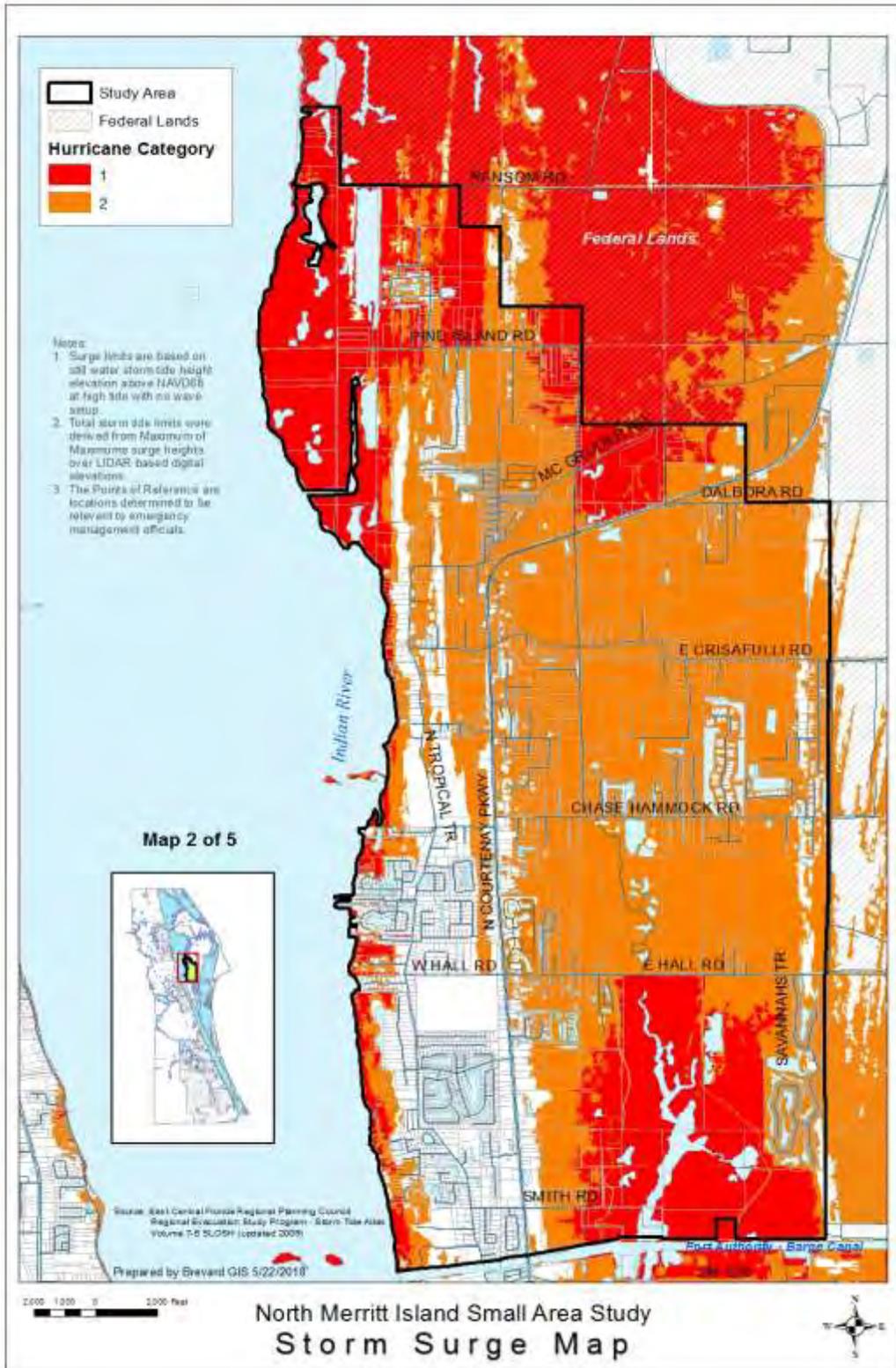
STAFF RESPONSE, COUNTY COMMISSION AND PORT AUTHORITY: On September 3, 2016, the Board of County Commissioners unanimously approved the adoption of a resolution opposing the planned Canaveral Port Authority (CPA) Cargo Rail Expansion Project's proposed route through North Merritt Island and urging CPA Commissioners to explore alternative routes. In January 2018, the Port Canaveral Commission elected to no longer pursue the mainline rail connection from the Port to the F.E.C. rail line along US-1. Subsequently, the application to the Lead Federal Agency, the Surface Transportation Board (STB) was cancelled.

APPENDICES

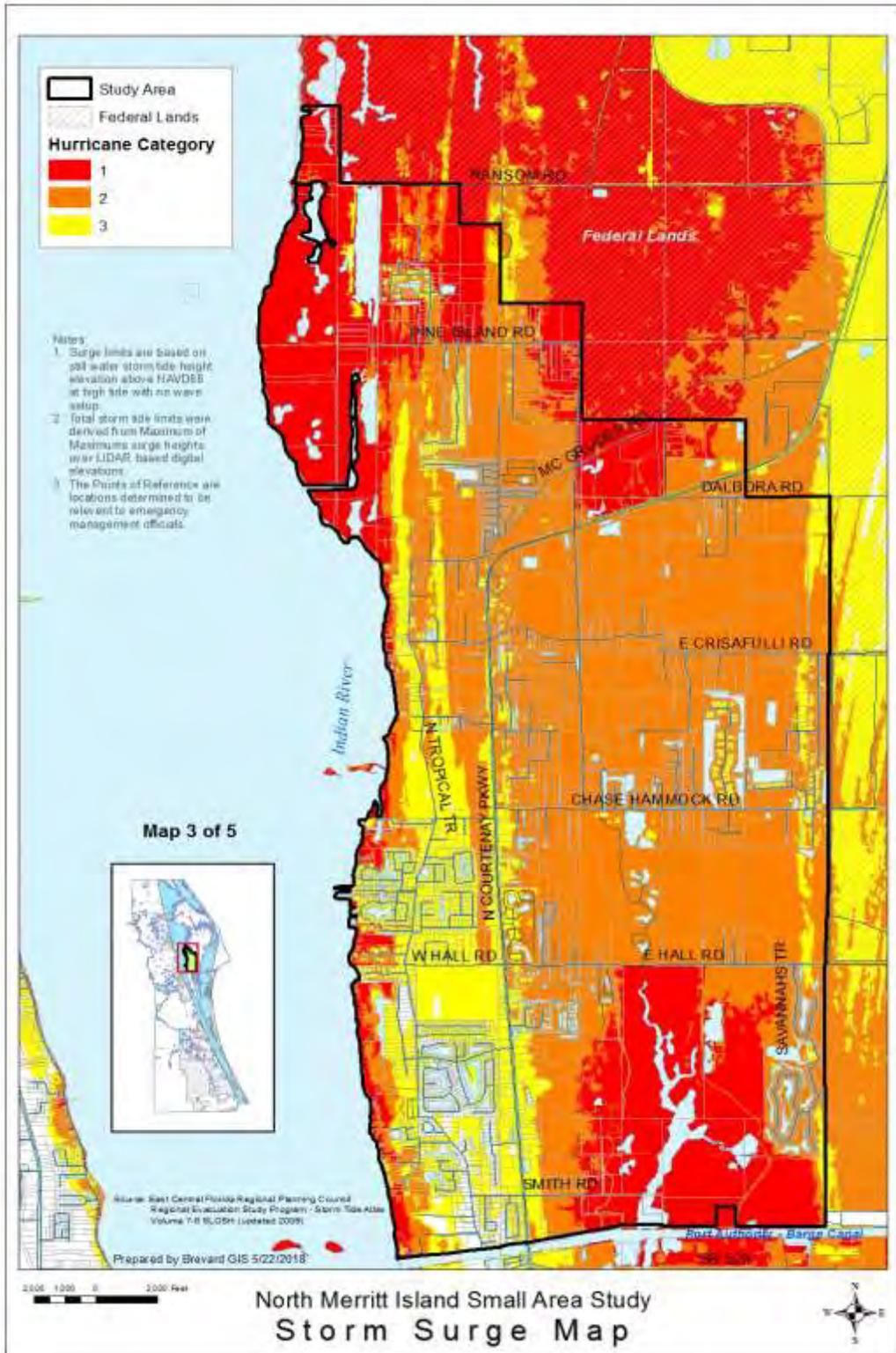
APPENDIX A



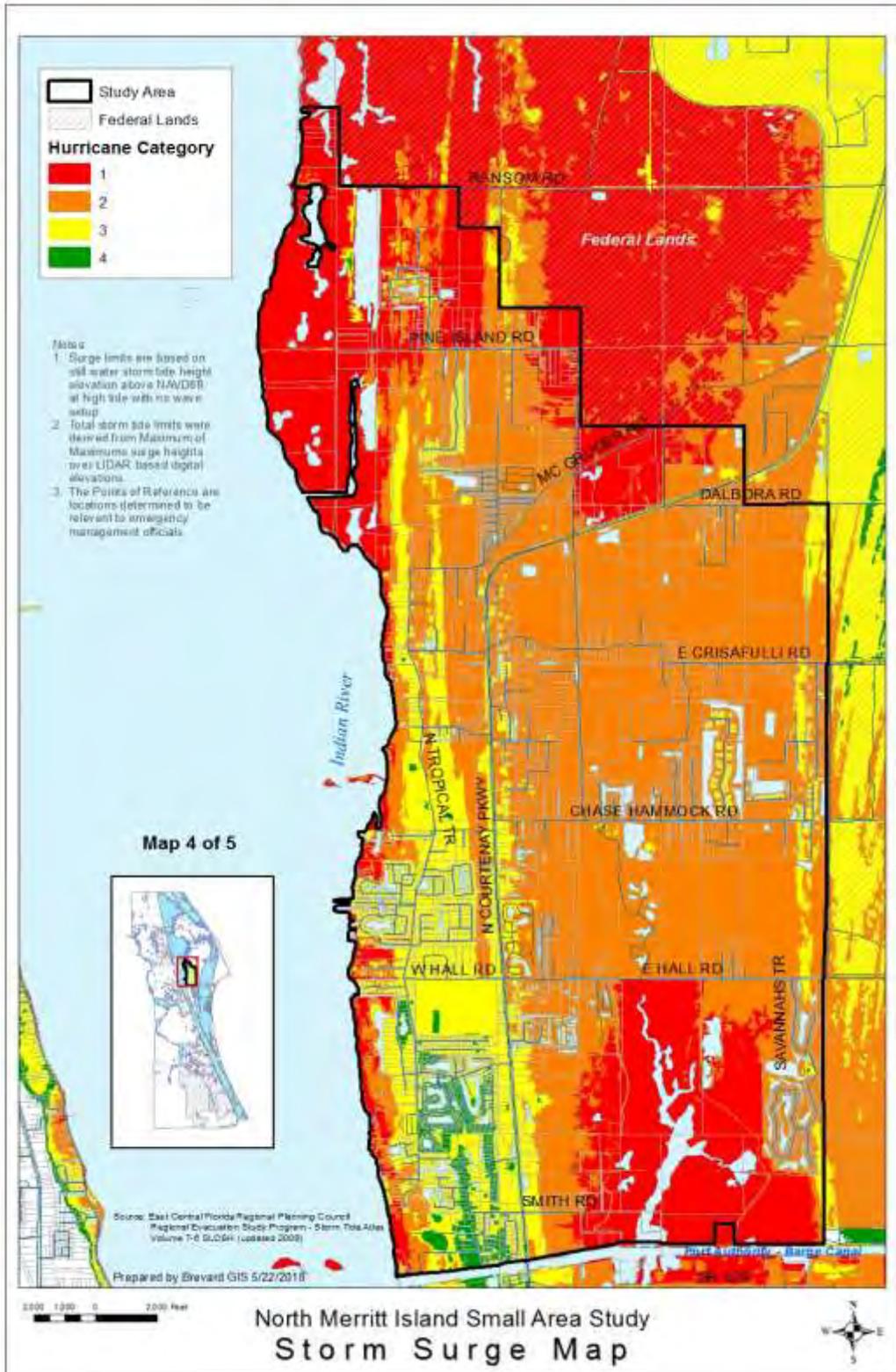
Map 18 Storm Surge Map Series 1 of 5



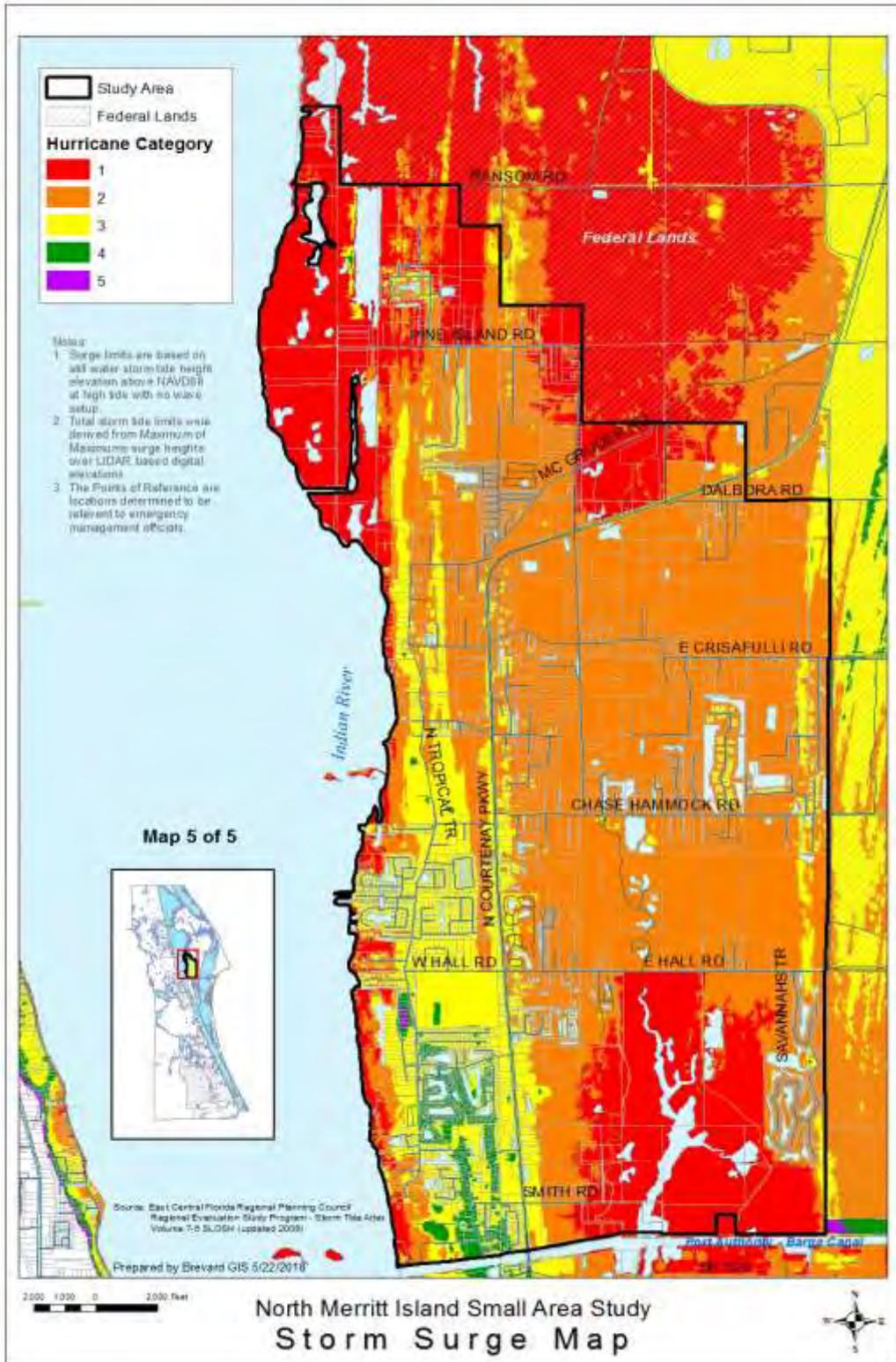
Map 19 Storm Surge Map Series 2 of 5



Map 24 Storm Surge Map Series 3 of 5

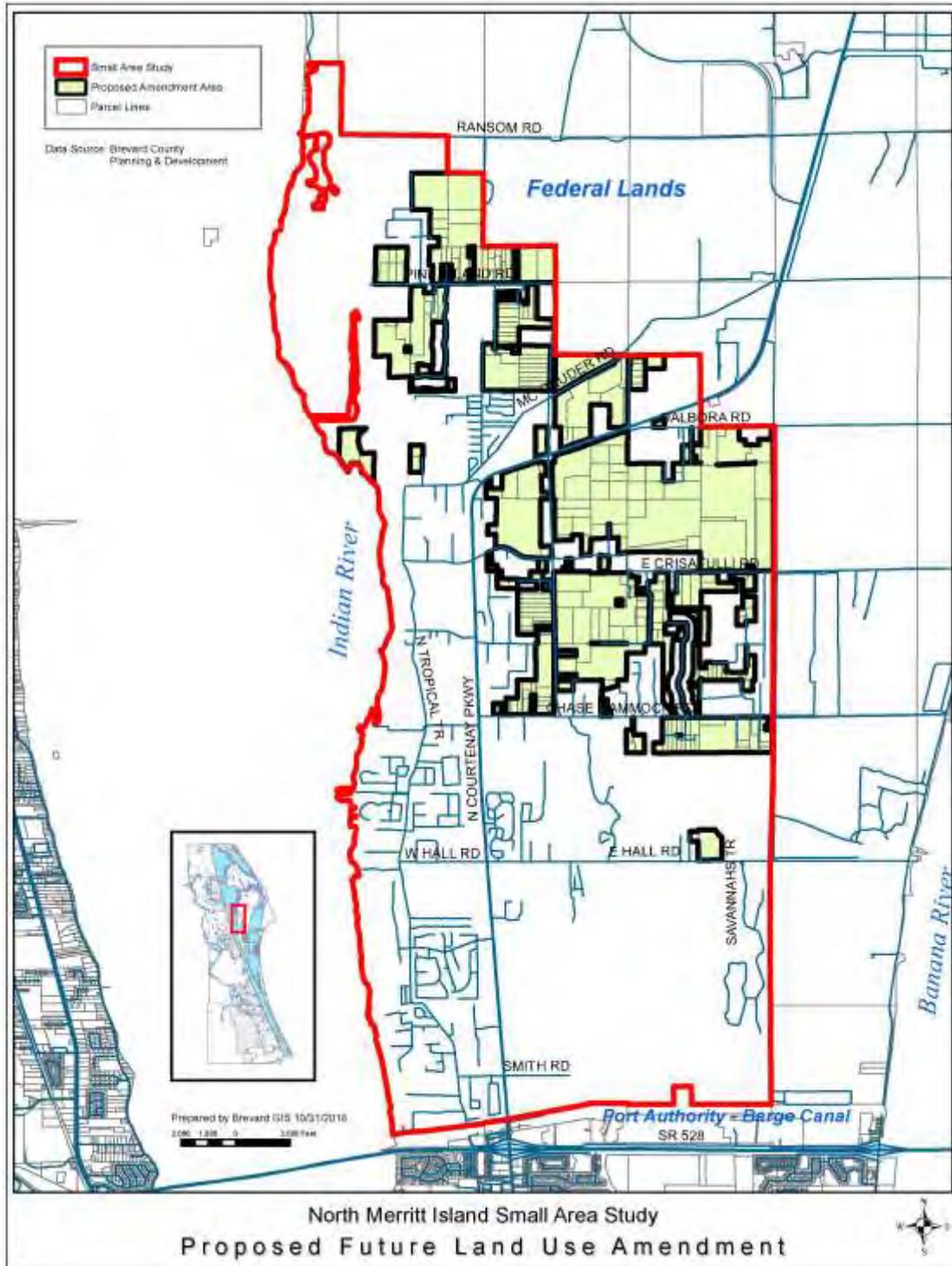


Map 21 Storm Surge Map Series 4 of 5



Map 22 Storm Surge Map Series 5 of 5

APPENDIX B



*THIS IS AN APPROXIMATION DUE TO ZONING CHANGES OCCURING AFTER MARCH 2018 AS NOTED IN TABLES 5 & 6.

Map 23 Proposed Future Land Use Amendment