

## EXECUTIVE SUMMARY

The purpose of this Floodplain Management Plan is to reduce or eliminate risk to people and property from flood hazards. Every community faces different hazards and every community has different resources to draw upon in combating problems. Planning is one of the best ways to develop a customized program that will mitigate the impacts of flood hazards while taking into account the unique character of a community. A well prepared floodplain management plan will ensure that all possible activities are reviewed and implemented so that the problem is addressed by the most appropriate and efficient solutions. It can also ensure that activities are coordinated with each other and with other goals and activities, preventing conflicts and reducing the costs of implementing each individual activity.

Collier County (the County) followed the planning process prescribed by the Federal Emergency Management Agency (FEMA), and this plan was developed under the guidance of a Floodplain Management Committee (FMPC) comprised of representatives of Collier County Departments, citizens and other stakeholders. The FMPC conducted a risk assessment that identified and profiled flood hazards that pose a risk to the County, assessed the County's vulnerability to these hazards, and examined the capabilities in place to mitigate them. The flood hazards profiled in this plan include:

- Climate Change and Sea Level Rise
- Coastal/Canal Bank Erosion
- Dam/Levee Failure
- Flood: 100/500 year
- Flood: Stormwater/Localized Flooding
- Hurricane and Tropical Storms (including Storm Surge)

Based on the risk assessment developed for each of the flood hazards identified above, the FMPC identified goals and objectives for reducing the County's vulnerability to the hazard. The goals and objectives are summarized as follows:

**Goal 1 – Reduce vulnerability and exposure to flood hazards in order to protect the health, safety and welfare of residents and guests.**

**Objective 1.1: Maintain a database of flood problems and hazards.**

**Objective 1.2: Maintain a database of repetitive loss claim history and mitigation activities.**

**Objective 1.3: Review the Growth Management Plan, Land Development Code, and Ordinances for compatibility with these goals and objectives, and revise where appropriate and financially feasible.**

**Objective 1.4: Develop more comprehensive evacuation plans.**

**Objective 1.5: Review the adequacy of emergency procedures for flood events and coastal storm surge through training and exercises.**

**Objective 1.6: Update FEMA designated flood zones based on the best available technical data and analysis.**

**Objective 1.7: Enforce code requirements of the National Flood Insurance Program.**

**Objective 1.8: Conduct site investigations, research exposure and hazard data, and evaluate proposed modifications to repair and mitigate stormwater management problems.**

**Objective 1.9: Develop projects to reduce deficiencies within the stormwater management system as part of the Annual Update and Inventory Report (AUIR) and budget development process.**

**Goal 2 – Encourage property owners, through education and outreach measures, to protect their homes and businesses from flood damage.**

**Objective 2.1: Educate property owners, including repetitive loss properties, on FEMA grant programs and other methods in order to mitigate possible flood damage.**

**Objective 2.2: Provide the current floodproofing and retrofitting information to property owners.**

**Objective 2.3: Effectively communicate flood risk to residents, businesses, contractors, realtors and prospective buyers.**

**Objective 2.4: Enhance community websites to provide comprehensive flood protection and flood preparedness information.**

**Goal 3 – Reduce the vulnerability of critical facilities and infrastructure from the effects of flood hazards.**

**Objective 3.1: Ensure protection standards for critical facilities meet Florida Building Code standards.**

**Objective 3.2: Work with appropriate personnel to prioritize critical and essential facilities in need of protection from potential flood damage**

**Objective 3.3: Implement flood mitigation measures or strategies, as necessary, to protect critical facilities.**

**Goal 4 – Protect natural resources by employing watershed-based approaches that balance environmental, economic and engineering considerations.**

**Objective 4.1: Maintain and enforce regulations to protect and restore wetlands and ecological functions for long-term environmental, economic and recreational values.**

**Objective 4.2: Continue beach re-nourishment and dune construction programs for the protection of marine habitat, environmentally sensitive lands and other coastal resources.**

**Objective 4.3: Pursue water management approaches and techniques that improve water quality and protect public health.**

**Objective 4.4: Preserve and maintain open space in flood prone areas to reduce flood damage to buildings and to provide recreational benefits.**

**Objective 4.5: Continue to protect aquifers and environmentally sensitive lands from encroachment of development by requiring buffers and other setbacks mechanisms.**

**Goal 5 – Minimize adverse impacts to surrounding areas and watershed functions.**

**Objective 5.1: Reduce stormwater runoff through adequate stormwater management, flood control, on-site retention and best management practices to mitigate impacts associated with incremental construction and redevelopment projects.**

**Objective 5.2: Evaluate funding mechanisms to increase stormwater capital improvement programs.**

**Objective 5.3: Ensure floodplain compensation is provided as established in the Growth Management Plan and Land Development Code.**

In order to meet the identified goals, this plan recommends 33 mitigation actions, which are summarized in the table that follows. Note: ID number does not indicate an order of priority. This plan has been formally adopted by the County, the City of Marco Island, and the City of Naples and will be updated every five years at a minimum.

**Summary of Mitigation Actions**

<b>ID</b>	<b>Action</b>	<b>Related to Goal</b>	<b>Address Current Development</b>	<b>Address Future Development</b>	<b>Continued Compliance with NFIP</b>	<b>Mitigation Category</b>	<b>Prioritized in Collier County LMS?</b>
<b>Existing Mitigation Actions Carried Forward from 2008 Plan</b>							
1	Review amendments to the Growth Management Plan and the Land Development Code (LDC) to incorporate smart growth criteria.	1, 4, 5	N	Y	Y	Prevention, Property Protection, Natural Resource Protection	
2	Prepare an amendment to the Code of Laws and Ordinances to establish a maximum allowable discharge rate in accordance with the Belle Meade Stormwater Master Plan.	1, 5	N	Y	Y	Prevention	
3	Annually prepare and schedule FMP progress report by April of each year and recommended FMPC activity to the BCC each year.	1	N	N	Y	Prevention	
4	The Flood Damage Prevention Ordinance will be evaluated for amending as needed, but no less than biennially.	1, 3	Y	Y	Y	Prevention, Property Protection	
5	Coordinate roadway stormwater maintenance programs to address stormwater flooding problems.	1, 3, 5	Y	Y	Y	Prevention, Property Protection, Structural Projects	
6	Continue support of the Coastal Zone Management program.	4	Y	Y	N	Natural Resource Protection	
7	Annually recommended Conservation Collier land	4	N	Y	Y	Natural Resource Protection	

ID	Action	Related to Goal	Address Current Development	Address Future Development	Continued Compliance with NFIP	Mitigation Category	Prioritized in Collier County LMS?
	acquisition areas, and recommend land use amendment petitions to the BCC throughout the year. Prepare an acquisition report in July of each year.						
8	Continue to implement policies requiring BMPs for erosion and sediment controls to comply with NPDES permit requirements.	4, 5	Y	Y	N	Prevention, Natural Resource Protection	
9	Create a grant program for enhancing the efficiencies of existing stormwater management systems and seek alternative funding sources to bring existing systems to higher standards.	5	Y	Y	Y	Prevention, Structural Projects	
10	Continue to annually fulfill all training and reporting requirements to be certified as a “Storm Ready” community.	1, 2	N	N	N	Emergency Services, Public Information and Outreach	
11	Continue stormwater management and water quality programs to address BMP opportunities throughout the County. Annually complete outreach schedule and provide status report in January of each year.	4, 5	Y	Y	N	Prevention, Natural Resource Protection	
12	Continue development of an Interlocal Agreement between the County and BCB/SFWMD to fund the preliminary engineering and design study to divert water from the Main Golden Gate Canal.	1, 5	Y	Y	Y	Prevention, Structural Projects	
13	Prepare a grant application to enhance the efficiencies of existing	1, 5	Y	Y	Y	Prevention, Structural Projects	

ID	Action	Related to Goal	Address Current Development	Address Future Development	Continued Compliance with NFIP	Mitigation Category	Prioritized in Collier County LMS?
	stormwater management systems by seeking alternative funding sources to bring existing channels to higher functional standards.						
14	Annually prepare a budget to fully implement the Stormwater Capital Improvement Plan.	1, 5	Y	Y	Y	Prevention, Structural Projects	
15	Prepare a map showing the location of existing mobile homes within the SFHA. The map will be updated annually by January of each year.	1, 2	Y	N	Y	Property Protection, Public Information and Outreach	
16	Prepare a public information meeting schedule annually and coordinate public information meetings for the FMPC.	1, 2	Y	N	Y	Public Information and Outreach	
17	Enhance the County floodplain management website and hold meetings with federal/state/local organizations and agencies to identify flood hazard information and enhance flood hazard awareness.	1, 2	Y	N	Y	Public Information and Outreach	
18	Coordinate with the local real estate boards to hold all hazards educational meetings and will prepare a grant application to coordinate the preparation of "All Hazard" educational brochures for distribution to prospective clients.	1, 2	Y	N	Y	Public Information and Outreach	
19	Annually visit each library branch containing the floodplain and flood insurance information by December of each year and	1, 2	Y	N	Y	Public Information and Outreach	

ID	Action	Related to Goal	Address Current Development	Address Future Development	Continued Compliance with NFIP	Mitigation Category	Prioritized in Collier County LMS?
	update/replace materials as needed by the following February and report in April of the following year.						
20	Coordinate with other County departments to develop a program for addressing all technical assistance questions from the general public.	1, 2	Y	N	Y	Public Information and Outreach	
<b>New Mitigation Actions</b>							
21	Develop a Program for Public Information (PPI) involving Collier County, Marco Island, Naples and Everglades City	2	Y	N	Y	Public Information and Outreach	
22	Provide flood insurance information to residents and local business owners	2	Y	N	Y	Public Information and Outreach	
23	Construction of the Belle Meade Diversion project (reduction of flow from the Golden Gate Canal)	1, 5	Y	Y	Y	Prevention, Structural Projects	
24	Develop a professional landscaper certification program	2, 4	Y	Y	Y	Public Information and Outreach	
25	Utilize pollutant screening baskets in catch basins	4	Y	Y	N	Prevention, Natural Resource Protection	
26	Develop a Low Impact Development (LID) Manual	1, 4, 5	N	Y	Y	Prevention, Natural Resource Protection	
27	Construction of the Southwestern Protection Levee as part of the Picayune Strand Restoration Project	4	Y	Y	Y	Prevention, Natural Resource Protection	

ID	Action	Related to Goal	Address Current Development	Address Future Development	Continued Compliance with NFIP	Mitigation Category	Prioritized in Collier County LMS?
28	Identify and prioritize critical facilities at risk to flooding	3	Y	Y	Y	Property Protection, Emergency Services	
	Provide education/outreach for the Flood Watch Program (BCB Tool)	2	Y	N	Y	Public Information and Outreach	
29	Maintain the localized flooding “bubble map”	1	Y	Y	Y	Property Protection	
30	Review the LDC and investigate impacts to the floodplain/recommend improvements to the LDC manual as appropriate	1, 4	Y	Y	Y	Prevention, Property Protection	
31	Collect LiDAR data	1, 3	Y	Y	Y	Prevention, Property Protection	
32	Provide education/outreach for non-point source pollution prevention	2, 4	Y	N	Y	Public Information and Outreach	

This plan fulfills the requirements of Section 104 of the Disaster Mitigation Act of 2000 and qualifies for CRS credit. The following table provides the 10-step CRS planning credit activity checklist and the section/page number within this plan that describes the completion of each planning step in more detail.

**CRS Planning Credit Activity Checklist**

<b>CRS Step</b>	<b>Section/Page</b>
<b>1. Organize to prepare the plan.</b>	
a. Involvement of office responsible for community planning	Section 3.1
b. Planning committee of department staff	Section 3.1
c. Process formally created by the community's governing board	Section 3.2.1
<b>2. Involve the public.</b>	
a. Planning process conducted through a planning committee	Section 3.1 / Table 3-1
b. Public meetings held at the beginning of the planning process	Section 3.2.1 / Table 3-5
c. Public meeting held on draft plan	Section 3.2.1 / Table 3-5
d. Other public information activities to encourage input	Section 3.2.1 / Table 3-6
<b>3. Coordinate with other agencies.</b>	
a. Review of existing studies and plans	Section 3.2.1
b. Coordinating with communities and other agencies	Section 3.2.1/Appendix A
<b>4. Assess the hazard.</b>	
a. Plan includes an assessment of the flood hazard with:	Sections 4.1 – 4.2
(1) A map of known flood hazards	Sections 4.1 – 4.2
(2) A description of known flood hazard	Sections 4.1 – 4.2
(3) A discussion of past floods	Sections 4.1 – 4.2
b. Plan includes assessment of less frequent floods	Sections 4.1 – 4.2
c. Plan includes assessment of areas likely to flood	Section 4.2.7
d. The plan describes other natural hazards	---
<b>5. Assess the problem.</b>	
a. Summary of each hazard identified in the hazard assessment and their community impact	Section 4.3
b. Description of the impact of the hazards on:	Section 4.3
(1) Life, safety, health, procedures for warning and evacuation	Section 4.3
(2) Public health including health hazards to floodwaters/mold	Section 4.2.4
(3) Critical facilities and infrastructure	Section 4.3
(4) The community's economy and tax base	Section 1.3.5
(5) Number and type of affected buildings	Section 4.3
c. Review of all damaged buildings/flood insurance claims	Section 4.3
d. Areas that provide natural floodplain functions	Section 4.3 / Appendix B
e. Development/redevelopment/Population Trends	Section 1.3.6
f. Impact of future flooding conditions outline in Step 4, item c	Section 4.3
<b>6. Set goals.</b>	
Section 5.2	
<b>7. Review possible activities.</b>	
a. Preventive activities	Section 5.3 / Appendix B
b. Floodplain Management Regulatory/current & future conditions	Section 5.3 / Appendix B



CRS Step	Section/Page
c. Property protection activities	Section 5.3 / Appendix B
d. Natural resource protection activities	Section 5.3 / Appendix B
e. Emergency services activities	Section 5.3 / Appendix B
f. Structural projects	Section 5.3 / Appendix B
g. Public information activities	Section 5.3 / Appendix B
<b>8. Draft an action plan.</b>	
a. Actions must be prioritized	Sections 5.4 – 5.5 / Appendix B
(1) Recommendations for activities from two of the six categories	Sections 5.4 – 5.5 / Appendix B
(2) Recommendations for activities from three of the six categories	Sections 5.4 – 5.5 / Appendix B
(3) Recommendations for activities from four of the six categories	Sections 5.4 – 5.5 / Appendix B
(4) Recommendations for activities from five of the six categories	Sections 5.4 – 5.5 / Appendix B
b. Post-disaster mitigation policies and procedures	Sections 5.4 – 5.5 / Appendix B
c. Action items for mitigation of other hazards	Sections 5.4 – 5.5 / Appendix B
<b>9. Adopt the plan.</b>	
Section 6	
<b>10. Implement, evaluate and revise.</b>	
a. Procedures to monitor and recommend revisions	Sections 7.1.1 – 7.2.2
b. Same planning committee or successor committee that qualifies under Section 511.a.2 (a) does the evaluation	Section 7.1.1

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# 1 INTRODUCTION

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## 1.1 Purpose

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As defined by FEMA, “hazard mitigation” means any sustained action taken to reduce or eliminate the long-term risk to life and property from a hazard event. Hazard mitigation planning is the process through which hazards are identified, likely impacts determined, mitigation goals set, and appropriate mitigation strategies determined, prioritized, and implemented. The purpose of this plan is to identify, assess and mitigate flood risk in order to better protect the people and property of Collier County from the effects of flood hazards. This plan documents Collier County’s hazard mitigation planning process and identifies relevant flood hazards and vulnerabilities and strategies the County will use to decrease vulnerability and increase resiliency and sustainability.

This Plan was developed in a joint and cooperative venture by members of a Floodplain Management Planning Committee (FMPC) which included representatives of Collier County, City of Everglades City, City of Marco Island, City of Naples, federal and state agencies, citizens and other stakeholders. This Plan will ensure the involved communities’ continued eligibility for federal disaster assistance including the Federal Emergency Management Agency (FEMA) Hazard Mitigation Grant Program (HMGP), Pre-Disaster Mitigation Program (PDM), and the Flood Mitigation Assistance Program (FMA). This Plan has been prepared in compliance with Section 322 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act (Stafford Act or the Act), 42 U.S. C. 5165, enacted under Section 104 of the Disaster Mitigation Act of 2000, (DMA 2000) Public Law 106-390 of October 30, 2000, as implemented at CFR 201.6 and 201.7 dated October 2007.

## 1.2 Background and Scope

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Collier County, the City of Marco Island and the City of Naples currently participate in the National Flood Insurance Program’s (NFIP) Community Rating System (CRS). All three communities qualify for a Class 6 Rating. The CRS recognizes and encourages community floodplain management activities that exceed the minimum standards. Under the CRS, flood insurance premium rates are adjusted to reflect the reduced flood risk resulting from community activities that (1) reduce flood losses, (2) facilitate accurate insurance ratings, and (3) promote the awareness of flood insurance. Through participation in the NFIP and a Class 6 rating with the CRS, owners of properties within Special Flood Hazard Areas (SFHAs) in the participating communities are entitled to a 20% discount on their flood insurance premiums. In addition, homeowners in non-SFHAs receive a 10% discount on flood insurance premiums.

As part of the qualification for a Class 6 Rating and having 10 or more repetitive loss properties, Collier County is required to prepare and maintain a Floodplain Management Plan (FMP). This FMP will serve as that plan and will be incorporated into the Collier County Local Mitigation Strategy (LMS). It is the goal of the FMPC to continue to work to make improvements to this plan and to strive to improve the Class Rating for the County, Marco Island and Naples so that the highest reduction in flood insurance premium rates can be available to property owners.

## 1.3 Community Profile

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### 1.3.1 Overview of the Community

According to the U.S. Census Bureau, Collier County has a total area of 2,305 square miles, of which 1,998 square miles is land and 307 square miles (13.3%) is water. It is the largest county in Florida by land area

and fourth-largest by total area. The southeastern portion of the county lies within the Big Cypress National Preserve, and the northernmost portion of Everglades City National Park extends into the southern coastal part of the county. The County is bordered on the north by Lee and Hendry Counties; south by Monroe County; and east by Broward and Miami-Dade Counties.

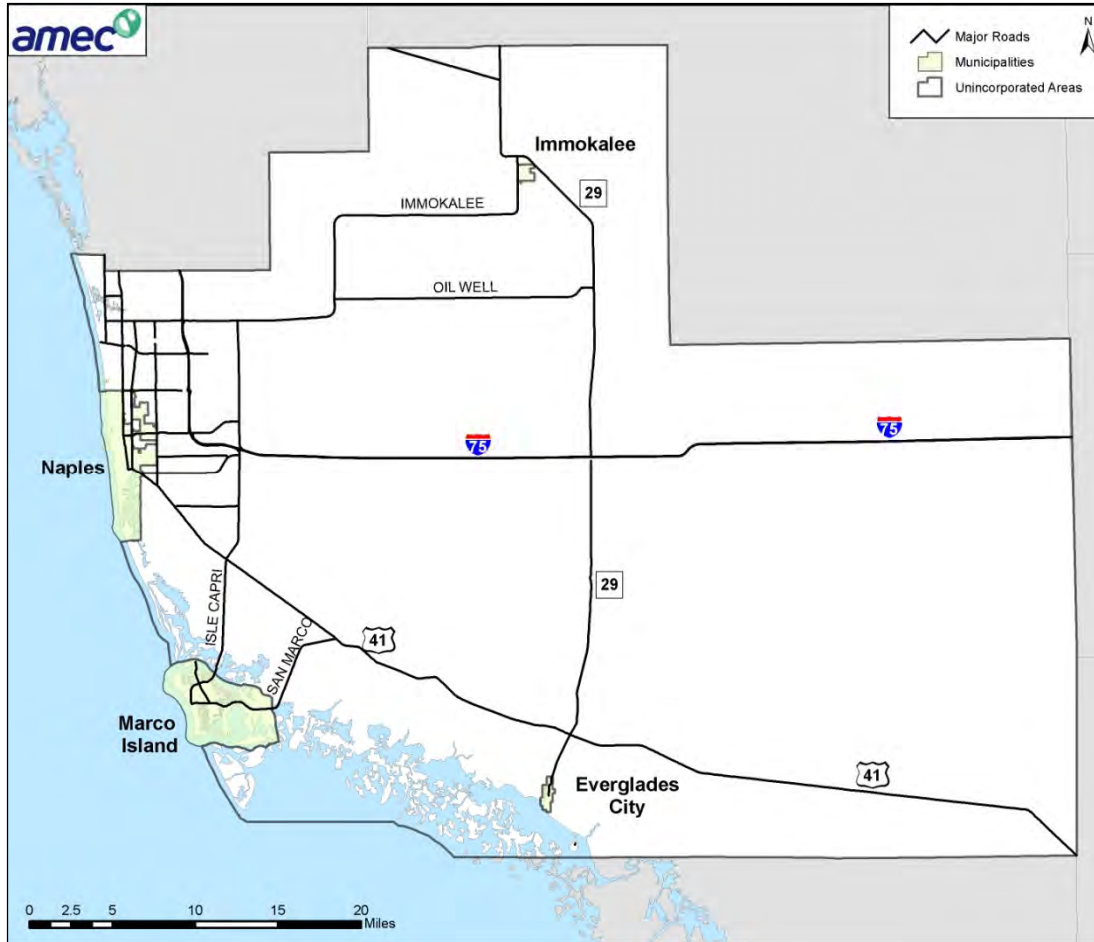
The City of Marco Island encompasses approximately 22.8 square miles in total area of which about 10.7 square miles, or 46.9%, is water. Marco Island is the largest barrier island within southwest Florida.

The City of Naples encompasses approximately 15.93 square miles in total area of which about 2.0 square miles, or 16%, of the city is comprised of bays, waterways, channels and other critically important surface water bodies.

An overview of Collier County is shown in Figures 1-1 and 1-2 below.



**Figure 1-1 - Collier County Location Map**



**Figure 1-2 – Collier County Base Map**

### 1.3.2 Topography and Climate

The topography of Collier County is extremely flat and the western side of the County is facing the Gulf of Mexico. Much of the coastal development is reclaimed mangrove swamp that was cleared and dredged to form subdivisions. From Gordon Pass to the south there are isolated communities like Marco Island, Goodland, Everglades City, and Chokoloskee. Much of Marco Island is a dredged and filled subdivision, and the other areas seem to have been built on old shell mounds or coastal barriers.

Original ground elevation in Collier County was close to sea level along the coast, but most of the coastal bulkheads and coastal subdivision roads are set to a top elevation 5.5 NGVD and the roads through those subdivisions have a minimum elevation of 5.5 NGVD. The topography rises, in general, about a foot a mile as you get farther from the coast. Much of Airport Road is elevation 9 to 11 at about 3 to 4 miles from the coast. Golden Gate City is at elevation 12 to 14 about 8 miles from the coast. The first five miles of Golden Gate Boulevard running east from route 951 are at about elevation 13 and the land rises to the northeast until it hits the top of the Immokalee Rise at about elevation 40 just north of Immokalee.

There are local anomalies like sand ridges and sloughs, which are higher and lower than the surrounding land. The Coastal Ridge sits between Airport Road and the coast and parallels the coast for about three miles. It contains subdivisions like Pine Ridge and High Point. Parts of the Coastal Ridge rise to about elevation 15. Figure 1-3 illustrates the HUC-12 drainage basins in Collier County.

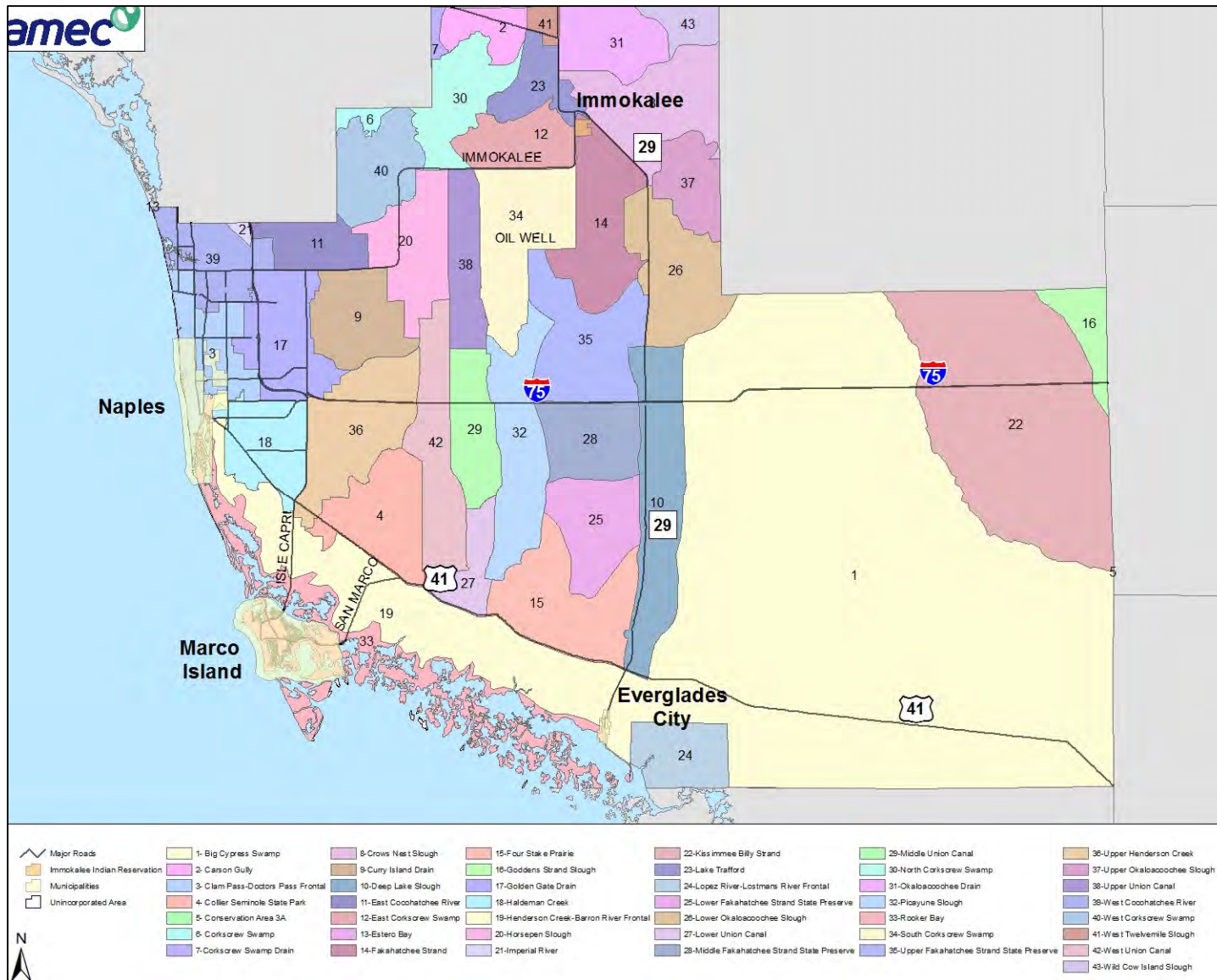


Figure 1-3 - Collier County HUC-12 Drainage Basins

Collier County receives about 53.5 inches of rain per year with a very wet year bringing over 70 inches and a very dry year bringing less than 40 inches. About 37 inches of that 53.5 inches falls during a 4 month “wet season”, usually June, July, August, and September. Rainfalls of a couple of inches in an hour are not uncommon. The standard 25-year one-day design storm used for computerized (or manual) design of local projects drops 9 inches of rain in that 24 hour day with about 3.5 inches coming during a one-hour period. The three-day version of that storm drops about 12 inches with only three inches falling during the first two days. The 100-year 3-day design storm drops about 15 inches of rain in a similar pattern to the 25-year 3-day storm. Many local storm events cover only a few square miles and drop more water than the design storms, but since the storms are so localized, the impact is reduced by the lateral dispersion of the runoff onto the flat topography.

### **1.3.3 Cultural, Historic and Natural Resources**

#### **Historic and Archaeological Resources**

##### ***Ochopee Post Office***

This is the smallest of all the United States Posts Offices and is still a significant and functioning reminder of the early tomato farming communities in Ochopee. The structure first existed as a storage shed housing irrigation pipes and farming equipment. The shed became a Post Office in 1953 after a fire destroyed the first Post Office and much of the town. It was subsequently moved to its present location in order to continue to serve as a Post Office. Today, this wood frame structure remains in its near original state. This site is located on the south side of U.S. 41 and approximately 1,000 feet east of Caldwell Road.

##### ***The Atlantic Coastline Depot***

The first trains arrived in 1927 at The Naples Depot while it was still under construction. The station served the railroad until 1971 when service was discontinued. The depot is located at 1051 5th Avenue South.

##### ***Palm Cottage***

Built as winter home of Henry Watterson, editor of the Louisville Courier-Journal. One of the few remaining tabby-built buildings in Florida it was constructed in 1899. Tabby is a primitive form of concrete made from local materials. Palm cottage is now the headquarters for the Collier County Historical Society and is located at 137 12th Ave South in Naples.

##### ***Robert’s Ranch***

This ranch exemplifies the cultural, economic, and historic growth of the ranching industry in Collier County. It was built in 1914 and was the first ranch in Immokalee. The two-story bungalow dwelling is of primary importance since it became the center of the home extension activities in the area, a program sponsored by the U.S. Department of Agriculture. Today, the ranch style dwelling retains its original nine room floor plan with beaded wall and ceiling paneling and much of the original furnishings. The outbuildings are also very accurate examples of the type of accessory buildings found on farms of the 1920’s. The ranch is located in Immokalee and on the southeast corner of Roberts Avenue and SR-29.

##### ***Smallwood’s Store***

This store was established in 1906 and is now one of the oldest buildings in Collier County. The building was elevated approximately 6 feet on pilings in 1924 to prevent flood damage. The store and trading post served the Seminole Indians, settlers and the early pioneers of Chokoloskee and Collier County. Currently the wood frame structure still rests upon pilings and remains in its original state with 95 percent of the initial stock and artifacts intact. The store has also been listed on the National Register of Historic Places. The store is located on the south end of Mamie Street.

### ***The Olde Marco Inn***

Captain Bill Collier built the Marco Hotel on a 10-acre plot to house fishermen. Construction of the hotel was completed by 1885. In 1896 the Colliers allowed Frank Hamilton Cushing, leader of the Pepper-Hearst Expedition, to use the summer parlor to dry out ancient Indian artifacts uncovered in the muck near the hotel. Collier sold the hotel to a New York syndicate that had the financial backing of George E. Ruppert, part-owner of the New York Yankees, and others. Marion and Wilhelm Blomeier became owners in 1969, enclosed the porch and renovated the interior with antique tin pieces tiling the ceiling of the hallway and bar. A group of Minnesota bankers purchased the Inn and added two adjacent buildings in 2003 and 2004 with 52 condo units.

### ***JT's Island Store in Chokoloskee***

The original structure was a small office built by Collier in the 1920's and was located behind the Rod & Gun Club in Everglades City. It was moved to Chokoloskee in 1956 after the causeway was built. As a store, it was operated by a number of local families (Brown, Hamilton, Weeks, Kelley, and Wells). It was renamed JT's in 1989 when purchased by John and Fran Tiffit who expanded the general store to include a small restaurant. It was sold again in 2001 and operated as a full restaurant and added a gift shop. The store was designated as a county historic structure in 2008 by the Board of County Commissioners.

### ***Bula Baptist Mission***

The Bula Baptist Mission was built in the 1940's for the Black families in the community, many of whom worked for the Lee Tidewater Cypress Company in their logging operation from 1943 to 1957. The mission was designated as a county historic structure in 2008 by the Board of County Commissioners.

### ***Nehrling Gardens***

In 1921 Dr. Henry Nehrling established his tropical garden that is now located within the Naples Zoo site, initially growing orchids, bromeliads, and other tropical plants. By 1925 he had increased his collection to more than 3,000 different species. In 1952 the old Nehrling Gardens site was purchased by Julius Fleischmann and was opened to the public in 1954 as a commercial tourist attraction under Fleischmann's interest and guidance. Collier County purchased the property in 2005 and currently leases it to Naples Zoo, Inc. The garden was designated as a county historic site in 2007 by the Board of County Commissioners.

### ***Hart Cottage***

The Hart Cottage was designed by Bert Brosmith of a group of architects who formed the Sarasota School of Architects" and it was his first commission in Florida. The style of the home is comparable with The Sarasota School of Architecture, sometimes called "Sarasota Modern," and is a regional style of post-war architecture that emerged on Florida's Central West Coast; the combination of a clear modernist approach that is specific and unique to Florida. The cottage was designated as a county historic site in 2006 by the Board of County Commissioners.

### **Parks, Preserve and Conservation**

Approximately 40% of County land within the 100-Year Floodplain (excluding the federal parks and preserves) are conservation land. Another 5.3% of the non-federal lands within the floodplain are Deed Restricted lands that will provide open space and natural benefits. Another 11% of the non-federal portions of the County in conservation lands are not in the 100-Year Floodplain, with an additional 1.5% of Deed Restricted lands that are not in the floodplain. Additionally there are 639,800 acres of federal conservation lands, all of which are in the 100-Year Floodplain. These conservation and deed restricted open space areas are largely wetlands and contribute to recharge, surface water storage, and listed species habitat.

Corkscrew Sanctuary, located in Collier County, is the site of one of the first conservation preserves in the nation. This privately maintained preserve consists of approximately 9,924 acres, and hosts some of the

oldest natural stands of hardwood cypress, wood stork, and other rich components of the natural environment. The Florida Panther National Wildlife Refuge is another private conservation preserve in Collier County and contains approximately 22,868 acres. Collier County is also the site of the 110,000 acre Rookery Bay National Estuarine Research Reserve. The Corkscrew Regional Ecosystem Watershed (CREW) Lands are located in Lee and Collier Counties. The Collier Soil and Water Conservation District manage a 212.40 acre parcel as a Regional Offsite Mitigation Area (ROMA) and eight individual Golden Gate Estate lots totaling 9.14 acres. These and other private and State conservation preserve areas have provided statements that the use of their lands are to be maintained as open space for the continued natural beneficial function of Collier County. These open space land total approximately 777,491.4 acres.

The County Park and Recreation Department account for 62 parks consisting of 1,695.77 acres. These park areas are classified as: Neighborhood (13 facilities); Community (24 facilities); and Regional (25 facilities). These parks are located primarily in the urbanized areas of the County and provide open space and recreational uses.

The City of Marco Island has successfully acquired numerous sites for new and expanded recreational opportunities such as “the Glon” property (Veteran’s Park), strategic lots and parcels along a 1.5 mile pathway corridor, and a waterfront lot at the Factory Bay Bridge. Significant park renovations/enhancement projects at Winterberry and Mackle parks have either been completed or in final design stages, with identified capital improvement funding. And most importantly the City has established a fully functioning Park and Recreation Department. The City has an inventory of over 100 acres of total community parkland.

Existing public recreation facilities within the City of Naples include seven neighborhood and linear parks, 13 mini-parks, four community parks, two natural resource areas, the Naples Pier, and the City Dock. The Collier County School Board provides recreation facilities within the City limits at four schools. Collier County provides facilities at Bayview Park and at Gulfview Middle School. In addition, there are approximately 9.1 miles of beaches. The City maintains an additional one-hundred-one 101 acres of open space parkway area, including beach ends and access points, street islands and medians, cul-de-sacs and rights-of-way.

### **Wetlands**

Collier County includes large areas of environmentally sensitive lands that are predominantly wetlands. Because of the unique setting, large portions of these areas were purchased by state, federal, and private conservation groups. Approximately 92% of the conservation lands are wetlands. Naturally managed conservation lands contribute flood storage capacity, conveyance, and wind buffering protection to nearby and inland developments. Preservation of these wetlands and conservation lands are essential for maintenance of existing quality of life. The large parks and preserves were never developed and the only buildings are for park administration or natural resource interpretation. There are also deed restricted parcels that have not been developed or have been restored to natural conditions. Many of these are preserved as compensation for permitted wetland impacts.

### **1.3.4 History**

Southwest Florida remained virtually uninhabited until after the Civil War when handfults of farmers and squatters began making their way south. Early pioneers fished and hunted for a living, raised crops of cabbage, peppers, tomatoes and pineapples, dug clams, made charcoal, sold bird plumes, and trapped otters and alligators for their pelts and hides. Trading posts at Everglades City became important gathering places for the few isolated settlers and Indians.

Cattle ranching is one of Collier County's oldest industries. By the early 1900's, ranchers were grazing herds of scrub cattle on the open prairies around Immokalee. Modern development began in the 1920s and by the end of the decade, railroads and the Tamiami Trail had pierced the rugged wilderness to begin unlocking the area's enormous agricultural and resort potential. Railroads improved the access to market and helped raise the County's beef cattle industry to national importance by the end of World War II.

Collier County's creation in 1923 and its early economic growth were closely tied to Memphis-born millionaire, Barron Gift Collier. Collier introduced paved roads, electric power, telegraphs and countless new businesses and homeowners to Florida's last frontier. Florida's first commercial oil well was drilled in Sunniland in 1943, and Collier County's cypress logging industry flourished well into the 1950's.

World War II introduced hundreds of aircraft servicemen to Naples and Collier County when the U.S. Army Air Field (now Naples Airport) was activated in 1943 to train combat pilots. Several hundred men and 53 aircraft were assigned to the Naples base. Many veterans returned after the war as prospective home buyers and businessmen.

In the short span of thirty years, the number of County residents swelled from 6,488 in 1950, to a phenomenal 85,000 by 1980. The County seat was transferred from Everglades City to East Naples in 1962, and signaled a new era of sustained growth in agriculture, tourism, and real estate that have made Collier County one of the fastest developing areas in the nation.

### 1.3.5 Economy

According to the U.S. Census Bureau, the median household income for Collier County from 2009-2013 was \$55,843. 14.1% of the population is considered to be living below the poverty level. Table 1-1 shows employment and unemployment rates along with industry employment by major classification for the County. Major employers for Collier County are listed in Table 1-2.

**Table 1-1 - Employment and Occupation Statistics for Collier County**

<b>Employment Status</b>	<b>Percentage</b>
In Labor Force	53.9
Employed	48.4
Unemployed	5.4
Not in Labor Force	46.1
<b>Occupation</b>	
Management, business, science and arts	29.3
Service	25.1
Sales and office	26.9
Natural resources, construction and maintenance	11.9
Production, transportation and material moving	6.9

Source: U.S. Census Bureau, 2009-2013 American Community Survey 5-Year Estimates

**Table 1-2- Major Employers in Collier County, FL**

<b>Corporation/Organization</b>	<b># of Employees</b>
Naples Community Hospital	4,000
Ritz-Carlton Naples	1,110
Garquilo Inc.	1,110
Arthrex Inc.	1,056
Collier County's Sherriff's Office	1,029

Source: ReferenceUSA, 2010.



According to 2009-2013 5-Year American Community Survey completed by the U.S. Census Bureau, the median household income for the City of Marco Island is \$69,676. 7.1% of the population is considered to be living below the poverty level. Table 1-3 shows employment and unemployment rates along with industry employment by major classification for the City.

**Table 1-3 - Employment and Occupation Statistics for Marco Island**

<b>Employment Status</b>	<b>Percentage</b>
In Labor Force	38.4
Employed	36.2
Unemployed	2.2
Not in Labor Force	61.6
<b>Occupation</b>	
Management, business, science and arts	42.6
Service	23.1
Sales and office	21.9
Natural resources, construction and maintenance	6.4
Production, transportation and material moving	6.0

Source: U.S. Census Bureau, 2009-2013 American Community Survey 5-Year Estimates

According to the U.S. Census Bureau, the median household income for Naples from 2009-2013 was \$78,614. 8.5% of the population is considered to be living below the poverty level. Table 1-4 shows employment and unemployment rates along with industry employment by major classification for the City.

**Table 1-4 - Employment and Occupation Statistics for Naples**

<b>Employment Status</b>	<b>Percentage</b>
In Labor Force	38.1
Employed	35.9
Unemployed	2.1
Not in Labor Force	61.9
<b>Occupation</b>	
Management, business, science and arts	48.7
Service	12.7
Sales and office	31.5
Natural resources, construction and maintenance	3.4
Production, transportation and material moving	3.7

Source: U.S. Census Bureau, 2009-2013 American Community Survey 5-Year Estimates

### 1.3.6 Population

**Table 1-5 - Population Estimates for Collier County**

<b>Permanent Population (2010*)</b>	
Unincorporated Collier County	301,860
City of Everglades City	412
City of Marco Island	16,607
City of Naples	19,849
Collier County Total	338,728
<b>Peak Season Population (2010**)</b>	

Unincorporated Area	365,869
Countywide	410,297
Number of Dwelling Units (2010*)	197,298
Number of Golf Courses (Public & Private)	91
Federal & State Lands: Parks, Preserves, Refuges (acres)	821,620

\*2010 Census Estimates

\*\*2010 Staff Estimates

**Table 1-6 - Collier County Demographic and Social Characteristics, 2010**

Demographic	Percentage
<b>Gender/Age</b>	
Male	49.3
Female	50.7
Median Age	45.3
Under 5 Years	5.2
65 Years and Over	26.4
<b>Race/Ethnicity</b>	
White	85.4
Asian	1.5
Black or African American	7.1
American Indian/Alaska Native	0.6
Hispanic or Latino	25.9
<b>Education</b>	
High School Graduate or Higher	85.1
Bachelor's Degree or Higher	31.4

Source: U.S. Census Bureau, 2010, [www.census.gov](http://www.census.gov)

<sup>1</sup>Hispanics may be of any race, so also are included in applicable race categories.

### 1.3.7 Growth and Development Trends

The County's permanent population projections are shown in Table 1-7. The population in Collier County is estimated to have increased since 2010, likely due to an increase in baby boomers looking for second homes, retirees moving to Florida, people taking advantage of lower housing prices and a slightly stronger job outlook. The population of Collier County is projected to increase by 32% between 2010 and 2040 (medium projection).

**Table 1-7 – Permanent Population Projections for Collier County, Florida**

Countywide Projection	2015	2020	2025	2030	2035	2040
Low	326,000	344,900	358,800	366,600	368,700	368,300
Medium	346,800	383,200	417,200	447,000	472,700	497,700
High	367,600	421,500	475,600	527,500	576,700	627,100

Source: Bureau of Economic Research, March 2013

## **1.4 Plan Organization**

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The Collier County Floodplain Management Plan is organized as follows:

- Chapter 2: Plan Update
- Chapter 3: Planning Process
- Chapter 4: Flood Risk Assessment
- Chapter 5: Mitigation Strategy
- Chapter 6: Plan Adoption
- Chapter 7: Plan Implementation and Maintenance
- Appendix A: Planning Process
- Appendix B: Mitigation Strategy
- Appendix C: References

## 2 PLAN UPDATE

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**Requirements §201.6(d)(3): A local jurisdiction must review and revise its plan to reflect changes in development, progress in local mitigation efforts, and changes in priorities, and resubmit it for approval within 5 years in order to continue to be eligible for mitigation project grant funding.**

The 2008 Collier County Floodplain Management Plan contained a risk assessment of identified hazards for the County and a mitigation strategy to address the risk and vulnerability from these hazards. Since approval of the plan by FEMA, much progress has been made by the County on implementation of the mitigation strategy. This chapter includes an overview of the approach to updating the plan, identifies new analyses and information included in this plan update, and highlights key mitigation successes.

### 2.1 What's New in the Plan

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This FMP update involved a comprehensive review, reorganization and update of each section of the 2008 plan and includes an assessment of the success of the County in evaluating, monitoring and implementing the mitigation strategy outlined in the initial plan. Only the information and data still valid from the 2008 plan was carried forward as applicable into this FMP update.

Also to be noted, Section 7.0 Implementation and Maintenance of this plan update identifies key requirements for updating future plans:

- Consider changes in vulnerability due to action implementation;
- Document success stories where mitigation efforts have proven effective;
- Document areas where mitigation actions were not effective;
- Document any new hazards that may arise or were previously overlooked;
- Incorporate new data or studies on hazards and risks;
- Incorporate new capabilities or changes in capabilities;
- Incorporate growth and development-related changes to inventories; and
- Incorporate new action recommendations or changes in action prioritization.

These requirements and others as detailed throughout this plan were also addressed during this plan update process. New information and analyses contained in this plan update include the following:

- Increased flood risk analysis based on the new DFIRM and the most recent Collier County Assessor's Data.
- The Climate Change hazard, with a focus on sea level rise and storm surge, was included as a separate hazard. An in-depth literature search was completed and the SLR and storm surge impacts to the County were analyzed.
- GIS was used, to the extent data allowed, to analyze all priority hazards as part of the vulnerability assessment. This involved utilizing mapped hazard data, combined with the County parcel data.
- New research and discussion on cultural, historic, and natural resources of the County.

- Populations at risk to identified hazards were identified utilizing GIS and 2010 Census data. Assets at risk were identified by property type, and values of properties included based on data from the Collier County Tax Assessor's Database. The discussion on growth and development trends was enhanced utilizing 2010 Census data.
- Hazard impacts to future development were analyzed through the development of future development maps and tables by property type based on the County assessor's data.
- Critical facilities were geocoded and analyzed for all mapped priority hazards. Maps of critical facilities at risk to identified hazards were included in this Update.
- Enhanced public outreach and agency coordination efforts were conducted throughout the plan update process in order to meet the more rigorous requirements of CRS, in addition to DMA requirements.

## **2.2 2008 FMP Mitigation Strategy Status and Successes**

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In the 2008 mitigation strategy for Collier County, the FMPC put forward the following goals, objectives and policies:

### **Goal 1: Reduce flood exposure and maximize flood protection efforts.**

**Objective 1.1:** Reduce the number of repetitive loss properties within the County.

- Policy 1.1.1: Reduce repetitive loss in Federal Emergency Management Agency (FEMA) designated flood zones through land acquisition and/or engineered stormwater solutions, when appropriate and financially feasible.
- Policy 1.1.2: Promote use of repetitive loss mitigation financial incentive programs for planned stormwater system design and for existing stormwater system retrofit. (Lead Agency = CDES)
- Policy 1.1.3: Provide flood awareness and technical information to property owners.
- Policy 1.1.4: Maintain a database of flood problems and hazards, mitigation and repetitive loss claim history.
- Policy 1.1.5: Conduct site investigations, research exposure and hazard data, and evaluate proposed modifications to repair and mitigate stormwater drainage problems.
- Policy 1.1.6: Provide FEMA grant and loan program information.

**Objective 1.2:** Protect environmentally sensitive lands and aquifers to maximize their survivability from known flood hazards where appropriate and financially feasible.

**Objective 1.3:** Review the Growth Management Plan, Land Development Code, and Ordinances for compatibility with these goals and objectives, and revise where appropriate and financially feasible.

**Objective 1.4:** Develop comprehensive coastal storm surge and inland flooding evacuation plans.

**Objective 1.5:** Protect dune systems and coastal/marine habitat areas by prohibiting private and commercial development and promote restoration and other activities to restore damaged dune systems.

**Objective 1.6:** Continue acquisition of Conservation Lands within the floodplain to assist with mitigation of flood events —by maintaining natural systems with no manipulation.

**Objective 1.7:** Encourage land and water uses compatible with the protection of environmentally sensitive lands and coastal resources.

**Objective 1.8:** Review the adequacy and completeness of emergency procedures that address catastrophic flood events.

**Objective 1.9:** Develop a policy that addresses incremental surface water impacts throughout the County.

**Objective 1.10:** Minimize impacts from flooding in FEMA designated special flood hazard areas (i.e. flood zones starting with the letters —V| or —A|) where financially feasible.

- Policy 1.10.1: Provide flood protection information and assistance to property and business owners, residents, contractors, realtors, and prospective buyers in FEMA designated flood zones and other areas in the County.
- Policy 1.10.2: Review existing development regulations to minimize flooding impacts to other properties.
- Policy 1.10.3: Provide technical information regarding flood proofing and retrofitting of property/structures in FEMA designated special flood hazard areas and other areas of the County to minimize substantial flood damage.
- Policy 1.10.4: Review proposed construction/development projects to minimize or eliminate flood risk, where financially feasible, without introducing additional flooding impacts to other properties.
- Policy 1.10.5: Assign high priority to proposed storm water capital projects that protect critical facilities.
- Policy 1.10.6: Incorporate wind/flood proofing and target hardening hazard mitigation measures when rehabilitating existing public facilities.

**Objective 1.11:** Update FEMA designated flood zones based on the best available technical data and analysis.

- Policy 1.11.1: Continue to define flood hazard areas.
- Policy 1.11.2: Continue to evaluate specific cases of shallow flooding, recommend solutions to identified problems, and provide assistance to property owners.
- Policy 1.11.3: Continue active participation in the National Flood Insurance Program Community Rating System.
- Policy 1.11.4: Review, on a continual basis, the storm water systems for deficiencies and recommend revisions to FEMA designated flood zones, as necessary.
- Policy 1.11.5: Coordinate with other departments/agencies that have flood exposure data and information.
- Policy 1.11.6: When appropriate, provide property owners with information on removing property from FEMA designated special flood hazard areas.

**Objective 1.12:** Enforce the building requirements, adopted by Collier County, of the National Flood Insurance Program and not allow variances that are feasibly avoidable.

**Goal 2: Minimize flood hazards and protect water quality county-wide by employing watershed-based approaches that balance environmental, economic and engineering considerations.**

**Objective 2.1:** Protect and restore wetland ecological functions for long-term environmental, economic and recreational values.

**Objective 2.2:** Protect and enhance water sources and public utilities from flooding.

**Objective 2.3:** Provide a publicly maintained storm water conveyance system with a 10-year/24-hour design storm capacity for the Golden Gate Estates and Urban areas of the County, with selected portions of the urban area having a 25-year/72-hour design storm capacity where practical and financially feasible.

**Objective 2.4:** Implement an adequately funded stormwater capital improvement program, including the use of Board of County Commissioner initiated special taxing districts to correct existing deficiencies in the stormwater system.

**Objective 2.5:** Annually, as part of the Annual Update and Inventory Report (AUIR) and budget development process, review the publicly maintained storm water conveyance system and develop projects to eliminate or reduce deficiencies within a reasonable time frame.

**Objective 2.6:** Evaluate possible mitigation of coastal storm surge and/or tide surge by increasing interconnecting water surge retention bays and lagoons where practical.

**Objective 2.7:** All stormwater system facilities are to be properly constructed, operated, maintained, and periodically inspected and certified by a Florida professional engineer to verify the systems are operating as designed.

**Objective 2.8:** Require adequate storm drainage, flood control, on-site retention and pollution abatement facilities to be constructed to mitigate impacts associated with construction and renovation projects.

**Objective 2.9:** Pursue water management approaches and techniques that reduce the effects of storm water runoff to protect water quality and public health.

- Policy 2.9.1: Implement best management practices (BMPs) as required under the National Pollution Discharge Elimination System (NPDES) where such BMP's have been accepted or are in practice in Collier County.
- Policy 2.9.2: Review storm water pollution abatement BMPs to not increase flood risk.

**Objective 2.10:** Surface, stormwater and watershed projects shall incorporate:

1. Open space and natural resource areas management to minimize flood hazards.
  2. Utilize landscape in its natural condition.
  3. Observe all planned and retrofit activities:
    - a. Avoidance
    - b. Minimization
    - c. Mitigation of destruction of natural landscape and stormwater function within the basin and sub-basin
    - d. Mitigation not allowed to leave basin or County.
- Policy 2.10.1: Manage, restore and/or enhance habitat areas, linkages and corridor segments, where practical and financially feasible.
  - Policy 2.10.2: Identify, protect, and, where practical and financially feasible, restore major wetland and flowway systems to function as important components of the floodplain conveyance system.
  - Policy 2.10.3: Identify, acquire, and, where practical and financially feasible, construct improvements on lands adjacent to major wetland and flowway systems to restore storage and conveyance capacity that has been negatively impacted by development.

### Past Mitigation Actions Update

The 2008 mitigation strategy contained 30 separate mitigation actions benefiting one or more communities within the County. Of these 30 actions, 3 have been completed, 19 are ongoing, and 8 have not yet been started due to a variety of reasons such changes in priorities, lack of funding, or changes to the projects themselves. Twenty of these projects are still considered viable, and will be carried forward in this plan. More detail on these projects can be found in Chapter 5. The status of the 2008 mitigation actions are shown in Table 2-1 below.

**Table 2-1 - 2008 Actions and Status Summary**

Action Description	Status			Action in 2014 FMP Update	Progress
	Complete	Ongoing	Not yet Started		
<b>Preventative Activities</b>					
i. The Collier County Planning Commission (CCPC) will review amendments to the Growth Management Plan (GMP) and the Land Development Code (LDC) to incorporate smart growth criteria.		✓		✓	On-going coordination as needed.
ii. The CCPC will review an amendment to the LDC for the development of a Special Flood Hazard Area (SFHA) Overlay: clearly identify SFHA on zoning maps and reflect specific floodplain regulations for these areas.	✓				A GIS layer of the Special Flood Hazard Area has been prepared for the zoning map and will not require an LDC amendment. Action Item is complete.
iii. The Engineering and Environmental Services Department (EESD) will prepare an amendment to the Code of Laws and Ordinances to establish a maximum allowable discharge rate in accordance with the Belle Meade Stormwater Master Plan.			✓	✓	No action.
iv. The EESD will annually prepare and schedule FMP progress report by April of each year and recommended FMPC activity to the BCC each year.		✓		✓	On-going, required annually.
v. The Flood Damage Prevention Ordinance will be evaluated for amending as needed, but no less than biennially.		✓		✓	Staff's work effort towards adoption of the State's 2010 Florida Building Code compliant "model" ordinance is in draft form.
vi. The Building Department will annually review the building code and provide the FMPC will amendments that make the County more resistant to flood damage.		✓			On-going review conducted of the still relatively new 2010 Florida Building Code. No amendments recommended to FMPC.



Action Description	Status			Action in 2014 FMP Update	Progress
	Complete	Ongoing	Not yet Started		
vii. The Stormwater Management Department (SMD) Director and the Road Maintenance Department Director will coordinate roadway stormwater maintenance programs to address stormwater flooding problems.		✓		✓	On-going, required annually. Completed with annual budget approval.
viii. Continue support of the Coastal Zone Management program.		✓		✓	On-going, required annually. Presentation given to FMPC on 3-3-14.
<b>Property Protection Activities</b>					
i. The Development Services Advisory Committee (DSAC) will review an amendment to the Code of Laws and Ordinances to provide a local government funded loan assistance program for retrofitting repetitive loss properties.			✓		No longer being proposed by staff.
ii. The EESD will review an amendment to the Code of Laws and Ordinances to provide a local government funded program to participate in FEMA grant programs for acquisition of repetitive loss properties.			✓		No longer being proposed by staff.
iii. The EESD will establish a program to annually contact repetitive loss property owners to determine their interest in placing their properties on a potential purchase list.			✓		No longer being proposed by staff.
iv. The CCPC will review an amendment to the LDC to add a “one-foot” freeboard elevation above the Base Flood Elevation (BFE) for all new and substantially improved or damaged structures within the SFHA.			✓		No longer being proposed by staff.
<b>Natural Resource Protection</b>					
i. Annually recommended Conservation Collier land acquisition areas, and recommend land use amendment petitions to the BCC throughout the year. Prepare an acquisition report in July of each year.		✓		✓	On-going program completed annually. No new purchases currently planned.

Action Description	Status			Action in 2014 FMP Update	Progress
	Complete	Ongoing	Not yet Started		
ii. Continue to implement policies requiring BMPs for erosion and sediment controls to comply with NPDES permit requirements.		✓		✓	Ongoing work performed by the Engineering Services field inspectors.
iii. The DSAC will create a grant program for enhancing the efficiencies of existing stormwater management systems and seek alternative funding sources to bring existing systems to higher standards.		✓		✓	On-going as grant opportunities become available.
<b>Emergency Services</b>					
i. The Emergency Management Department will continue to annually fulfill all training and reporting requirements to be certified as a “Storm Ready” community.		✓		✓	On-going, certification to be complete annually.
ii. The CCPC will review amendments to the GMP and the LDC to require new and substantially improved critical facilities to be designed to withstand a 500-Year design storm flooding impact.			✓		No longer being proposed by staff.
iii. The SMD will continue is stormwater management and water quality programs to address BMP opportunities throughout the County. Annually complete outreach schedule and provide status report in January of each year.		✓		✓	On-going, required annually.
<b>Structural Projects</b>					
i. Continue development of an Interlocal Agreement between the County and BCB/SFWMD to fund the preliminary engineering and design study to divert water from the Main Golden Gate Canal.			✓	✓	Proposed for completion in 2016 as a possible follow-up component of the Watershed Management Plan.
ii. The Engineering and Environmental Services Department Director will coordinate County review and comments with the South Florida Water Management District for the design and construction of the stormwater pump stations (designed to handle up to the 1-percent annual	✓				No reviews being provided by County. Action Item is complete.

Action Description	Status			Action in 2014 FMP Update	Progress
	Complete	Ongoing	Not yet Started		
chance storm event for portions of northern Golden Gate Estates) associated with the Picayune Restoration Project.					
iii. The SMD will prepare a grant application to enhance the efficiencies of existing stormwater management systems by seeking alternative funding sources to bring existing channels to higher functional standards.		✓		✓	A \$290K grant was received from the SFWMD for installation of culverts in Northern Golden Gate Estates supporting Action Item No. 5(f)(iii). There are currently five (5) stormwater system projects included on the LMS Prioritized Listing of Mitigation Action Items that could be submitted for federal grants when they become available.
iv. The SMD will annually prepare a budget to fully implement the Stormwater Capital Improvement Plan.		✓		✓	Completed with annual budget approval.
v. The Engineering and Environmental Services Department Director and the Stormwater Management Department Director will develop a policy for the County's use of slotted storm sewer for all new and replacement projects.			✓		No longer being proposed by staff.
vi. The EESD and SMD will develop a policy for the placement of cross drains beneath roads within the northern Golden Gate Estates area.	✓				Policy not recommended by FMPC or DSAC. Action Item is complete. In 2013 a SFWMD grant was obtained to locate cross drains in 42 locations during the dry season of 2013/14.
<b>Public Information</b>					
i. The EESD and Graphics Department will prepare a map showing the location of existing mobile homes within the SFHA. The map will be updated annually by January of each year.		✓		✓	A mobile home park location map was prepared in 2009. Update to be prepared in 2014 as part of the FMP updating for the expanded Special Flood Hazard Area.
ii. The CPD will prepare a public information meeting schedule annually and coordinate public information meetings for the FMPC.		✓		✓	On-going, required annually.
iii. The EESD and CPD will enhance the County floodplain management website and hold meetings with federal/state/local organizations and agencies to identify flood hazard		✓		✓	In November 2013, a new "Flood Information" web site was created to fulfill many of the web site CRS criteria. The "Floodplain Management Planning" web site is now linked to the "Flood Information" web pages. "Agencies" public

Action Description	Status			Action in 2014 FMP Update	Progress
	Complete	Ongoing	Not yet Started		
information and enhance flood hazard awareness.					meeting was not held in 2013 since FMP update delayed until 2014.
iv. The Emergency Management Department will coordinate with the local real estate boards to hold all hazards educational meetings and will prepare a grant application to coordinate the preparation of “All Hazard” educational brochures for distribution to prospective clients.		✓		✓	The “All Hazards Guide” was published and fully funded by the Emergency Management Department without the requirement of grant applications for funding. Copies are distributed widely throughout the County, including NABOR.
v. The EESD will annually visit each library branch containing the floodplain and flood insurance information by December of each year and update/replace materials as needed by the following February and report in April of the following year.		✓		✓	Completed annual visit and ordered replacement items from FEMA, January 2014.
vi. The EESD will coordinate with other County departments to develop a program for addressing all technical assistance questions from the general public.		✓		✓	Presented the results of the implemented program in 2013 to the FMPC March 2014.

## 3 PLANNING PROCESS

**Requirement §201.6(b): An open public involvement process is essential to the development of an effective plan. In order to develop a more comprehensive approach to reducing the effects of natural disasters, the planning process shall include:**

- 1) An opportunity for the public to comment on the plan during the drafting stage and prior to plan approval;
- 2) An opportunity for neighboring communities, local and regional agencies involved in hazard mitigation activities, and agencies that have the authority to regulate development, as well as businesses, academia, and other private and nonprofit interests to be involved in the planning process; and
- 3) Review and incorporation, if appropriate, of existing plans, studies, reports, and technical information.

**Requirement §201.6(c)(1): The plan shall include the following:**

- 1) Documentation of the planning process used to develop the plan, including how it was prepared, who was involved in the process, and how the public was involved.

This Floodplain Management Plan was developed under the guidance of a Floodplain Management Committee (FMPC). The Committee's representatives included representatives of Collier County, City of Everglades City, City of Marco Island, City of Naples, federal and state agencies, citizens and other stakeholders.

Information in this plan will be used to help guide and coordinate mitigation activities and decisions for local land use policy in the future. Proactive mitigation planning will help reduce the cost of disaster response and recovery to communities and their residents by protecting critical community facilities, reducing liability exposure, and minimizing overall community impacts and disruptions. This plan identifies activities that can be undertaken by both the public and the private sectors to reduce safety hazards, health hazards, and property damage caused by floods.

### 3.1 Local Government Participation

The DMA planning regulations and guidance stress that each local government seeking FEMA approval of their mitigation plan must participate in the planning effort in the following ways:

- Participate in the process as part of the FMPC;
- Detail where within the planning area the risk differs from that facing the entire area;
- Identify potential mitigation actions; and
- Formally adopt the plan.

For the Collier County FMPC, "participation" meant the following:

- Providing facilities for meetings;
- Attending and participating in the FMPC meetings;
- Completing and returning the AMEC Data Collection Guide;
- Collecting and providing other requested data (as available);
- Managing administrative details;
- Making decisions on plan process and content;
- Identifying mitigation actions for the plan;

- Reviewing and providing comments on plan drafts;
- Informing the public, local officials, and other interested parties about the planning process and providing opportunity for them to comment on the plan;
- Coordinating, and participating in the public input process; and
- Coordinating the formal adoption of the plan by the County Commission.

The FMPC met all of the above stated participation requirements. The FMPC included key representatives from County and City Departments/Divisions as well as citizen volunteers. The participants comprising the Collier County FMPC included the following:

1. Gary McAlpin – Collier County Planning and Zoning Department - Growth Management Division
2. Robert Wiley, P.E., CFM – Collier County Planning and Zoning Department - Growth Management Division
3. Caroline Cilek, AICP, CFM – Collier County Planning and Zoning Department - Growth Management Division
4. Jerry Kurtz, P.E. – Collier County Stormwater Planning Department – Growth Management Division
5. Craig Pajer – Collier County Planning and Project Management Department - Public Utilities Division
6. Mike Sheffield – Collier County Communication and Customer Relations Department – County Manager’s Office
7. Dan Summers – Collier County Bureau of Emergency Services – Administrative Services Division
8. Jon Walsh, P.E. – Collier County Plan Review and Inspection Department – Growth Management Division
9. Rick Zyvoloski (Alternate)– Collier County Emergency Management Department – Administrative Services Division
10. Christa Carrera, CFM – City of Naples Building Department
11. Raquel Pines – City of Everglades City Accounting Department
12. Chris Sparacino, CFM – City of Marco Island Growth Management Department
13. Kenneth Bills – Citizen Volunteer
14. Phillip Brougham – Citizen Volunteer
15. Joseph Gagnier – Citizen Volunteer
16. Lisa Koehler – Citizen Volunteer
17. Clarence Tears – Citizen Volunteer
18. Dennis Vasey – Citizen Volunteer
19. James Hale – Citizen Volunteer

Table 3-1 details the FMPC meeting dates and the FMPC members in attendance. A more detailed summary of FMPC meeting dates including topics discussed and meeting locations follows in Table 3-4. Meeting sign-in sheets have been included in Appendix A.

**Table 3-1 - FMPC Meeting Attendance Record**

Member Name	Affiliation	Meeting Date				
		07/16/14	09/30/14	11/19/14	11/20/14	12/16/14
Gary McAlpin	Collier County	✓	✓	✓	✓	
Robert Wiley	Collier County	✓	✓	✓	✓	
Caroline Cilek	Collier County	✓	✓	✓	✓	
Jerry Kurtz	Collier County	✓	✓	✓	✓	
Craig Pajer	Collier County	✓	✓			
Mike Sheffield	Collier County	✓				
Dan Summers	Collier County		✓			
John Walsh	Collier County	✓	✓			

Member Name	Affiliation	Meeting Date				
		07/16/14	09/30/14	11/19/14	11/20/14	12/16/14
Rick Zivoloski	Collier County	✓	✓	✓	✓	
Christa Carrera	City of Naples	✓	✓	✓	✓	
Raquel Pines	City of Everglades City		✓	✓	✓	
Chris Sparacino	City of Marco Island	✓	✓	✓	✓	
Kenneth Bills	Citizen Volunteer	✓	✓			
Phillip Brougham	Citizen Volunteer	✓	✓			
Joseph Gagnier	Citizen Volunteer	✓	✓			
Lisa Koehler	Citizen Volunteer		✓			
Clarence Tears	Citizen Volunteer		✓			
Dennis Vasey	Citizen Volunteer		✓			
James Hale	Citizen Volunteer	✓				

Based on the area of expertise of each County and City representatives participating on the FMPC, Table 3-2 demonstrates each member’s expertise in the six mitigation categories (Prevention, Property Protection, Natural Resource Protection, Emergency Services, Structural Flood Control Projects and Public Information). The Collier County Planning and Zoning Department Growth Management Division which is responsible for community land use and comprehensive planning was an active participant on the FMPC and provided data and information to support development of the plan.

**Table 3-2 - Staff Capability with Six Mitigation Categories**

Community Department	Prevention	Property Protection	Natural Resource Protection	Emergency Services	Structural Flood Control Projects	Public Information	Other
Collier County Planning & Zoning	✓	✓	✓		✓	✓	
Collier County Emergency Management	✓	✓	✓	✓	✓	✓	
Collier County Emergency Services	✓	✓	✓	✓	✓	✓	
Collier County Planning and Project Management	✓	✓	✓		✓	✓	
Collier County Stormwater Planning	✓	✓	✓		✓	✓	
Collier County Plan Review and Inspection	✓	✓	✓		✓	✓	
Collier County Communication and Customer Relations						✓	
Marco Island Growth Management	✓	✓	✓	✓	✓	✓	
City of Naples Building Department	✓	✓	✓	✓	✓	✓	

This Section 3 and Appendix A provide additional information and documentation of the planning process that was implemented for the development of this FMP.

### 3.2 The 10-Step Planning Process

The planning process for preparing the Collier Floodplain Management Plan was based on DMA planning requirements and FEMA’s associated guidance. This guidance is structured around a four-phase process:

- 1) Planning Process;
- 2) Risk Assessment;
- 3) Mitigation Strategy; and
- 4) Plan Maintenance.

Into this process, Collier County integrated a more detailed 10-step planning process used for FEMA’s CRS and Flood Mitigation Assistance programs. Thus, the modified 10-step process used for this plan meets the requirements of six major programs: FEMA’s Hazard Mitigation Grant Program; Pre-Disaster Mitigation Program; Community Rating System; Flood Mitigation Assistance Program; Severe Repetitive Loss Program; and new flood control projects authorized by the U.S. Army Corps of Engineers.

Table 3-3 shows how the 10-step CRS planning process aligns with the four phases of hazard mitigation planning pursuant to the Disaster Mitigation Act of 2000.

**Table 3-3 - Mitigation Planning and CRS 10-Step Process Reference Table**

DMA Process	CRS Process
<b>Phase I – Planning Process</b>	
§201.6(c)(1)	Step 1. Organize to Prepare the Plan
§201.6(b)(1)	Step 2. Involve the Public
§201.6(b)(2) & (3)	Step 3. Coordinate
<b>Phase II – Risk Assessment</b>	
§201.6(c)(2)(i)	Step 4. Assess the Hazard
§201.6(c)(2)(ii) & (iii)	Step 5. Assess the Problem
<b>Phase III – Mitigation Strategy</b>	
§201.6(c)(3)(i)	Step 6. Set Goals
§201.6(c)(3)(ii)	Step 7. Review Possible Activities
§201.6(c)(3)(iii)	Step 8. Draft an Action Plan
<b>Phase IV – Plan Maintenance</b>	
§201.6(c)(5)	Step 9. Adopt the Plan
§201.6(c)(4)	Step 10. Implement, Evaluate and Revise the Plan

The development of this FMP involved a comprehensive review of all flood hazards specific to Collier County. Also to be noted, this plan provides an analysis of climate change impacts to the County.

### 3.2.1 Phase I – Planning Process

#### Planning Step 1: Organize to Prepare the Plan

With Collier County’s commitment to participate in the DMA planning process and the CRS, County officials worked to establish the framework and organization for development of the plan. An initial meeting was held with key community representatives to discuss the organizational aspects of the plan development process.

Invitations to participate on the FMPC were extended to County and City officials, citizens, and federal, state, and local stakeholders that might have an interest in participating in the planning process. The list of initial invitees is included in Appendix A. The following local stakeholders were invited to participate on the FMPC:

**Collier County**  
 County Manager  
 Planning and Zoning Department



Emergency Management Department  
Bureau of Emergency Services  
Stormwater Planning Department  
Planning and Project Management Department  
Plan Review and Inspection Department  
Communication and Customer Relations Department

***Neighboring Communities***

City of Everglades City  
City of Marco Island  
City of Naples  
Seminole Tribe of Florida (Immokalee Reservation)  
City of Fort Myers  
Lee County  
Hendry County

***Other Government and Stakeholder Representatives***

Florida Division of Emergency Management - NFIP Program Manager  
Florida Hazard Mitigation Officer & NFIP Coordinator  
Florida Community Rating System Coordinator  
Florida Department of Environmental Protection  
Southwest Florida Water Management District  
Southwest Florida Regional Planning Council  
ISO CRS Specialist  
FEMA Region IV  
US Army Corps of Engineers  
American Red Cross, Southern Gulf Region  
National Weather Service  
Collier County Public Schools  
Florida Panther National Wildlife Refuge  
Florida Fish and Wildlife Conservation Commission  
Rookery Bay National Estuarine Research Reserve  
Florida Southwestern State College  
Hodges University  
Ave Maria University  
Collier County Building Industry Association  
Collier County Extension

The planning process officially began with a kick-off meeting held on July 16, 2014 at 10:00 am in the Collier County Growth Management Division offices, followed by a public kick-off meeting held the same day at 5:15 pm in the same location. The meetings covered the scope of work and an introduction to the DMA, CRS, and FMA requirements. Two public notices were posted in the local newspaper (Naples Daily News) inviting members of the public to attend this kickoff meeting.

During the planning process, the FMPC communicated through face-to-face meetings, email and telephone conversations. Draft documents were posted on the County's website so that the FMPC members could

easily access and review them. The formal FMPC meetings followed the CRS Planning Steps. Agendas and sign in sheets for the FMPC meetings are included in Appendix A. The meeting dates and topics discussed are summarized below in Table 3-4. All FMPC meetings were open to the public.

**Table 3-4 - Summary of FMPC Meeting Dates**

Meeting Type	Meeting Topic	Meeting Date	Meeting Location
FMPC #1 (Kick-off)	1) Introduction to DMA, CRS and the planning process	July 16, 2014	Collier County Growth Management Division Office
	2) Organize resources: the role of the FMPC, planning for public involvement, and coordinating with other agencies and stakeholders		
	3) Introduction to hazard identification		
FMPC #2	1) Review/discussion of Flood Risk Assessment (Assess the Hazard)	September 30, 2014	Collier County Growth Management Division Office
	2) Review/discussion of Vulnerability Assessment (Assess the Problem)		
FMPC #3	1) Review of existing Goals from 2008 FMP	November 19, 2014	Collier County Government Center Risk Management Training Room
	2) Development of new Goals for 2014 FMP		
FMPC #4	1) Review/status of existing Mitigation Strategies from 2008 FMP	November 20, 2014	Collier County Government Center Risk Management Training Room
	2) Development of new/updated Mitigation Strategies for 2014 FMP		
FMPC #5	1) Review "Draft" Floodplain Management Plan	December 16, 2014	Collier County Government Center Risk Management Training Room
	2) Solicit comments and feedback from the FMPC		

**Planning Step 2: Involve the Public**

Early discussions with the FMPC established the initial plan for public involvement. The FMPC agreed to an approach using established public information mechanisms and resources within the community. Public involvement activities for this plan update included press releases, stakeholder and public meetings, public surveys, and the collection of public and stakeholder comments on the draft plan. The formal public meetings for this project are summarized in Table 3-5.

**Table 3-5 - Summary of Public Meeting Dates**

Meeting Type	Meeting Topic	Meeting Date	Meeting Locations
Public Meeting #1	1) Introduction to DMA, CRS and the planning process	July 16, 2014	Collier County Growth Management Division Office
	2) Introduction to hazard identification		

Meeting Type	Meeting Topic	Meeting Date	Meeting Locations
Public Meeting #2	1) Review complete “Draft” Floodplain Management Plan	December 16, 2014	Collier County Government Center Risk Management Training Room
	2) Solicit comments and feedback from the public		

Public outreach for the plan development began during the initial plan development process with an informational press release placed in the local paper inviting the public to the first public meeting held on July 16, 2014. The final public meeting held on December 16, 2014 was also advertised in the local newspaper. Documentation to support the public outreach efforts can be found in Appendix A.

*Involving the Public beyond Attending Public Meetings*

The plan development process included additional public outreach activities beyond the formal public meetings as summarized below in Table 3-6. The FMPC found nine different ways to involve the public beyond attending public meetings. Documentation to support the additional public outreach efforts can be found in Appendix A.

**Table 3-6 - Public Outreach Efforts**

Event	Message	Date
Naples Daily News	Article on lowering flood insurance rates for Collier County	July 16, 2014
Collier County CCTV	1 <sup>st</sup> Public Meeting recorded and aired live	July 16, 2014
Collier County CCTV	1 <sup>st</sup> Public Meeting re-aired	July 22, 2014
Collier County Website	FMPC Meeting Dates, Meeting Agendas and Meeting Minutes posted for public information	On-going since June 2014
Collier County Website	Draft Risk/Vulnerability Assessment posted for public comment	September 30, 2014
Collier County Website	Public Survey posted requesting public input into floodplain management plan planning process	November 6, 2014
Naples Daily News	TBD	TBD
Collier County Website	Complete Draft Floodplain Management Plan posted for public comment	TBD
Collier County CCTV	2 <sup>nd</sup> Public Meeting recorded and aired live	TBD

The Collier County public survey which requested public input into the floodplain management plan planning process and the identification of mitigation activities that could lessen the risk and impact of future flood hazard events is shown in Figure 3-1. A summary of the completed survey results has been included in Appendix A.



**Figure 3-1 - Collier County Public Survey**

**Planning Step 3: Coordinate**

Early in the planning process, the FMPC determined that the risk assessment, mitigation strategy development, and plan approval would be greatly enhanced by inviting other local, state and federal agencies and organizations to participate in the process. Representatives from the following agencies were invited to participate on the FMPC:

- Florida Division of Emergency Management - NFIP Program Manager
- Florida Hazard Mitigation Officer & NFIP Coordinator
- Florida Community Rating System Coordinator
- Florida Department of Environmental Protection
- Southwest Florida Water Management District
- Southwest Florida Regional Planning Council
- ISO CRS Specialist
- FEMA Region IV
- US Army Corps of Engineers
- American Red Cross, Southern Gulf Region
- National Weather Service
- Collier County Public Schools
- Florida Panther National Wildlife Refuge
- Florida Fish and Wildlife Conservation Commission
- Rookery Bay National Estuarine Research Reserve
- Florida Southwestern State College
- Hodges University
- Ave Maria University
- Collier County Building Industry Association

- Collier County Extension

Coordination involved contacting these agencies through a variety of mechanisms and informing them on how to participate in the plan development process. Coordination with these groups included, holding face-to-face meetings, sending outreach letters, some with follow up phone calls; and making phone calls alone to out of area agencies. All of these groups and agencies were solicited asking for their assistance and input and telling them how to become involved in the plan development process. A copy of each coordination letter can be found in Appendix A.

#### ***Coordination with Other Community Planning Efforts and Hazard Mitigation Activities***

Coordination with other community planning efforts is also paramount to the success of this plan. Mitigation planning involves identifying existing policies, tools, and actions that will reduce a community's risk and vulnerability to hazards. Collier County uses a variety of comprehensive planning mechanisms, such as a Growth Management Plan and land development regulations and ordinances to guide growth and development. Integrating existing planning efforts and mitigation policies and action strategies into this plan establishes a credible and comprehensive plan that ties into and supports other community programs. The development of this plan incorporated information from the following existing plans, studies, reports, and initiatives as well as other relevant data from neighboring communities and other jurisdictions.

- Collier County Floodplain Management Plan, 2008
- Collier County Local Mitigation Strategy, 2010
- Collier County Repetitive Loss Areas Analysis, 2013
- Collier County Watershed Management Plan, 2011
- Collier County Growth Management Plan, 2014
- Collier County Comprehensive Emergency Management Plan, 2012
- Collier County Flood Insurance Study, 2012
- Collier County 2014 Tax Assessor Data
- Collier County Flood Damage Prevention Ordinance
- Collier County Land Development Code
- Collier County Building Code Ordinance
- Collier County Community Rating System Annual Reports
- City of Marco Island Building Code Ordinance
- City of Marco Island Comprehensive Plan, 2009
- City of Marco Island Post-Disaster Recovery Plan, 2001
- City of Naples Building Code Ordinance
- City of Naples Comprehensive Plan (no date provided)
- City of Naples Stormwater Master Plan, 2007
- State of Florida Hazard Mitigation Plan, August 2013
- State of Florida Critical Erosion Report, June 2012

These and other documents were reviewed and considered, as appropriate, during the collection of data to support Planning Steps 4 and 5, which include the hazard identification, vulnerability assessment, and capability assessment. Data from these plans and ordinances were incorporated into the risk assessment and hazard vulnerability sections of the plan as appropriate. The data was also used in determining the capability of the community in being able to implement certain mitigation strategies. The Capability Assessment can be found in Section 4.4.

### **3.2.2 Phase II – Risk Assessment**

#### **Planning Steps 4 and 5: Identify/Assess the Hazard and Assess the Problem**

The FMPC completed a comprehensive effort to identify, document, and profile all flood hazards that have, or could have, an impact on the planning area including an evaluation of climate change and sea level rise. Data collection worksheets were developed and used in this effort to aid in determining hazards and vulnerabilities and where the risk varies across the planning area. Geographic information systems (GIS) were used to display, analyze, and quantify hazards and vulnerabilities. A draft of the risk and vulnerability assessment was posted on the County's website for FMPC and public review and comment.

The FMPC also conducted a capability assessment to review and document the planning area's current capabilities to mitigate risk from and vulnerability to hazards. By collecting information about existing government programs, policies, regulations, ordinances, and emergency plans, the FMPC could assess those activities and measures already in place that contribute to mitigating some of the risks and vulnerabilities identified. A more detailed description of the risk assessment process and the results are included in Section 4 Risk Assessment.

### **3.2.3 Phase III – Mitigation Strategy**

#### **Planning Steps 6 and 7: Set Goals and Review Possible Activities**

AMEC facilitated brainstorming and discussion sessions with the FMPC that described the purpose and process of developing planning goals and objectives, a comprehensive range of mitigation alternatives, and a method of selecting and defending recommended mitigation actions using a series of selection criteria. This information is included in Section 5 Mitigation Strategy. Additional documentation on the process the FMPC used to develop the goals and strategy has been included in Appendix B.

#### **Planning Step 8: Draft an Action Plan**

A complete first draft of the plan was prepared based on input from the FMPC regarding the draft risk assessment and the goals and activities identified in Planning Steps 6 and 7. This complete draft was posted for FMPC and public review and comment on the County's website. Other agencies were invited to comment on this draft as well. FMPC, public and agency comments were integrated into the final draft for the FDEM and FEMA Region IV to review and approve, contingent upon final adoption by Collier County, the City of Marco Island and the City of Naples.

### **3.2.4 Phase IV – Plan Maintenance**

#### **Planning Step 9: Adopt the Plan**

In order to secure buy-in and officially implement the plan, the plan was reviewed and adopted by the County, the City of Marco Island and the City of Naples on the date(s) included in the corresponding resolution in Section 6 Plan Adoption.

#### **Planning Step 10: Implement, Evaluate and Revise the Plan**

Implementation and maintenance of the plan is critical to the overall success of hazard mitigation planning. Up to this point in the planning process, all of the FMPC's efforts have been directed at researching data, coordinating input from participating entities, and developing appropriate mitigation actions. Section 7 Plan Implementation and Maintenance provides an overview of the overall strategy for plan implementation and maintenance and outlines the method and schedule for monitoring, updating, and evaluating the plan. The Section also discusses incorporating the plan into existing planning mechanisms and how to address continued public involvement.

## 4 FLOOD RISK ASSESSMENT

**Requirement §201.6(c)(2): [The plan shall include] A risk assessment that provides the factual basis for activities proposed in the strategy to reduce losses from identified hazards. Local risk assessments must provide sufficient information to enable the jurisdiction to identify and prioritize appropriate mitigation actions to reduce losses from identified hazards.**

This section describes the Risk Assessment process for the development of the Collier County Floodplain Management Plan. It describes how the County met the following requirements from the 10-step planning process:

- Planning Step 4: Assess the Hazard
- Planning Step 5: Assess the Problem

As defined by FEMA, risk is a combination of hazard, vulnerability, and exposure. “It is the impact that a hazard would have on people, services, facilities, and structures in a community and refers to the likelihood of a hazard event resulting in an adverse condition that causes injury or damage.”

This flood risk assessment covers the entire geographical area of Collier County, FL Unincorporated Areas, City of Everglades City, City of Marco Island and City of Naples. The risk assessment process identifies and profiles relevant hazards and assesses the exposure of lives, property, and infrastructure to these hazards. The process allows for a better understanding of a jurisdiction’s potential risk to natural hazards and provides a framework for developing and prioritizing mitigation actions to reduce risk from future hazard events. This risk assessment followed the methodology described in the FEMA publication *Understanding Your Risks—Identifying Hazards and Estimating Losses* (FEMA 386-2, 2002), which breaks the assessment down to a four-step process:

- 1) Identify Hazards;
- 2) Profile Hazard Events;
- 3) Inventory Assets; and
- 4) Estimate Losses.

Data collected through this process has been incorporated into the following sections of this chapter:

**Section 4.1: Hazard Identification** identifies the natural flood hazards that threaten the planning area.

**Section 4.2: Hazard Profiles** discusses the threat to the planning area and describes previous occurrences of flood hazard events and the likelihood of future occurrences.

**Section 4.3: Vulnerability Assessment** assesses the planning area’s exposure to natural flood hazards; considering assets at risk, critical facilities, and future development trends.

**Section 4.4: Capability Assessment** inventories existing mitigation activities and policies, regulations, and plans that pertain to mitigation and can affect net vulnerability.

## 4.1 Hazard Identification

**Requirement §201.6(c)(2)(i): [The risk assessment shall include a] description of the type...of all natural hazards that can affect the jurisdiction.**

Collier County’s FMPC conducted a hazard identification study to determine the natural flood hazards that threaten the planning area.

### 4.1.1 Results and Methodology

Using existing flood hazard data and input gained through planning meetings, the FMPC agreed upon a list of natural flood hazards that could affect Collier County. Flood hazard data from the Collier County Local Mitigation Strategy (LMS), FEMA, the Florida Division of Emergency Management (FDEM), the National Oceanic and Atmospheric Administration (NOAA), the National Hurricane Center (NHC), National Climatic Data Center (NCDC), the Spatial Hazards Events and Losses Database for the United States (SHELDUS™) and many other sources were examined to assess the significance of these hazards to the planning area. Significance was measured in general terms and focused on key criteria such as frequency and resulting damage, which includes deaths and injuries, as well as property and economic damage.

The flood hazards identified in Table 4-1 were evaluated as part of this plan. Only the more significant hazards with the potential to cause significant human and/or monetary losses in the future have a more detailed hazard profile and are analyzed further in Section 4.3 Vulnerability Assessment.

**Table 4-1 - Flood Hazard Summary**

Hazard	Frequency of Occurrence	Spatial Extent	Potential Magnitude	Significance
Climate Change and Sea Level Rise	Highly Likely	Limited	Negligible	Low
Coastal/Canal Bank Erosion	Highly Likely	Limited	Negligible	Medium
Dam/Levee Failure	Unlikely	Limited	Negligible	Low
Flood: 100-/500-year	Occasional	Extensive	Catastrophic	High
Flood: Stormwater/Localized Flooding	Highly Likely	Limited	Negligible	Medium
Hurricane and Tropical Storms (including Storm Surge)	Likely	Extensive	Catastrophic	High
<p><b>Guidelines:</b></p> <p><b>Frequency of Occurrence:</b>            Highly Likely: Nearly 100% probability within the next year.            Likely: Between 10 and 100% probability within the next year.            Occasional: Between 1 and 9% probability within the next year.            Unlikely: Less than 1% probability within the next year.</p> <p><b>Potential Magnitude:</b>            Catastrophic: More than 50% of the area affected.            Critical: 26 to 50% of the area affected.            Limited: 10 to 25% of the area affected.            Negligible: Less than 10% of the area affected.</p> <p><b>Spatial Extent:</b>            Limited: Less than 10% of planning area.            Moderate: 10-50% of planning area.            Extensive: 51-100% of planning area.</p> <p><b>Significance:</b>            Low            Medium            High</p>				

Source: AMEC Data Collection Guide



The following hazard was evaluated by the FMPC and determined to be a non-prevalent hazard that should not be included in the plan. Following is a brief description of the hazard and the reason for its exclusion:

**Tsunamis** - Defined as a long-term (generally 15 to 60 minutes) wave caused by a large scale movement of the sea floor due to volcanic eruption, marine earthquake or landslide. Barely noticeable at sea, the wave velocity may be as high as 400 knots so that it travels great distances and in shoal water reaches heights up to 15 meters. According to a 2009 report by the USGS titled *Regional Assessment of Tsunami Potential in the Gulf of Mexico*, there are no significant earthquake sources within the Gulf of Mexico that are likely to generate tsunamis. Tsunami propagation from significant earthquake sources outside the Gulf of Mexico, such as the northern Panama Convergence Zone, Northern South America, Cayman Trough, the Puerto Rico trench, or the Gibraltar area shows that wave amplitude is greatly attenuated by the narrow and shallow passages into the gulf, and as a result, these tsunami sources do not constitute a tsunami hazard to the Gulf of Mexico coast.

#### 4.1.2 Disaster Declaration History

The FMPC researched past events that resulted in a federal and/or state emergency or disaster declaration in the planning area for Collier County in order to identify known flood hazards. Federal and/or state disaster declarations may be granted when the Governor certifies that the combined local, county and state resources are insufficient and that the situation is beyond their recovery capabilities. When the local government’s capacity has been surpassed, a state disaster declaration may be issued, allowing for the provision of state assistance. Should the disaster be so severe that both the local and state government capacities are exceeded, a federal emergency or disaster declaration may be issued allowing for the provision of federal assistance.

Details on major federal disaster declarations were obtained by the FMPC from FEMA and compiled chronologically in Tables 4-2 and 4-3. Table 4-2 displays flood related major disaster declarations that the state of Florida has received since 1960. This table reflects the vulnerability and historic patterns of flood hazards for Florida.

**Table 4-2 - FEMA Major Disaster Declarations for Florida, 1960–2014**

Hazard Type	Disaster #	Date
Severe Weather	97	3/23/1960
Hurricane Donna	106	9/12/1960
Abnormally High Tides	141	12/17/1962
Hurricane Cleo	175	9/8/1964
Hurricane Dora	176	9/10/1964
Hurricane Betsy	209 <sup>1</sup>	9/14/1965
Hurricane Gladys	252	11/7/1968
Heavy Rains, Flooding	289	7/3/1970
Tropical Storm Agnes	337	6/23/1972
Severe Storms, Flooding	387	5/26/1973
Flooding	479	8/22/1975
High Winds, Heavy Rains, Flooding	484	9/26/1975
Severe Winter Weather	526	1/31/1977
Severe Storms, Tornadoes, Flooding	586	5/15/1979
Hurricane Frederic	600	9/13/1979

Hazard Type	Disaster #	Date
Severe storms, flooding	607	9/29/1979
Severe storms, flooding	664	7/7/1982
Hurricane Elena	743	9/12/1985
Hurricane Kate	756	12/3/1985
Flooding, Severe Storm	862	4/3/1990
Flooding, Severe Storm	952	8/14/1992
Hurricane Andrew	955 <sup>1</sup>	8/24/1992
Flooding, Severe Storm, Tornadoes	966	10/8/1992
Tornadoes, Flooding, High Winds, Tides, Freezing	982 <sup>1</sup>	3/13/1993
Severe Storm, Flooding, Tropical Storm Alberto	1035	7/10/1994
Tropical Storm Gordon, Heavy Rain, Tornadoes, Flooding	1043	11/28/1994
Hurricane Erin	1062	8/10/1995
Hurricane Opal	1069 <sup>1</sup>	10/4/1995
Severe Storm, Flooding	1074	10/27/1995
Severe Storms/Flooding	1141	10/15/1996
Severe Thunderstorms, Tornadoes and Flooding	1204	2/12/1998
Hurricane Earl	1241	9/4/1998
Hurricane Georges	1249	9/28/1998
Tropical Storm Mitch	1259	11/6/1998
Hurricane Floyd	1300	9/22/1999
Hurricane Irene	1306 <sup>1</sup>	10/20/1999
Tropical Storm	1344	10/3/2000
Heavy Rains And Flooding	1345	10/4/2000
Tropical Storm Allison	1381	6/17/2001
Tropical Storm Gabrielle	1393 <sup>1</sup>	9/28/2001
Severe Storms and Flooding	1481	7/29/2003
Hurricane Charley and Tropical Storm Bonnie	1539 <sup>1</sup>	8/13/2004
Hurricane Frances	1545 <sup>1</sup>	9/4/2004
Hurricane Ivan	1551 <sup>1</sup>	9/16/2004
Hurricane Jeanne	1561 <sup>1</sup>	9/26/2004
Hurricane Dennis	1595	7/10/2005
Hurricane Katrina	1602 <sup>1</sup>	8/28/2005
Hurricane Wilma	1609 <sup>1</sup>	10/24/2005
Severe Storms and Tornadoes	1679	2/3/2007
Severe Storms, Tornadoes, and Flooding	1680	2/8/2007
Tropical Storm Fay	1785 <sup>1</sup>	8/24/2008
Hurricane Gustav	1806	10/27/2008
Severe Storms, Flooding, Tornadoes, and Straight-line Winds	1831	4/21/2009
Severe Storms, Flooding, Tornadoes, and Straight-line Winds	1840	5/27/2009
Tropical Storm Debby	4068 <sup>1</sup>	7/3/2012

Hazard Type	Disaster #	Date
Hurricane Isaac	4084 <sup>1</sup>	10/18/2012
Severe Storms and Flooding	4138	8/2/2013
Severe Storms, Tornadoes, Straight-line Winds, and Flooding	4177	5/6/2014

Source: FEMA

<sup>1</sup>Disaster Declaration includes Collier County.

A review of the major disaster declaration for Florida indicates that Collier County was included in 15 of the flood related federal disaster declarations between 1960 and 2014. Individual Assistance dollars provide money and services to people in presidentially declared disaster areas. Public Assistance dollars are made available for communities to quickly respond to and recover from major disasters. Total dollars obligated shown in Table 4-3 below is inclusive of all counties included in the disaster declaration.

**Table 4-3 - FEMA Major Disaster Declarations for Collier County, 1960-2014**

Hazard Type	Disaster #	Date	Individual Assistance Dollars Obligated <sup>1</sup>	Public Assistance Dollars Obligated <sup>1</sup>
Hurricane Betsy	DR-209	09/14/1965	N/A	N/A
Hurricane Andrew	DR-955	08/24/1992	N/A	N/A
Tornadoes, Flooding, High Winds, Tides, Freezing	DR-982	03/13/1993	N/A	N/A
Hurricane Opal	DR-1069	10/04/1995	N/A	N/A
Hurricane Irene	DR-1306	10/20/1999	\$0	\$106,549,390
Tropical Storm Gabrielle	DR-1393	09/28/2001	\$0	\$23,166,643
Hurricane Charley and Tropical Storm Bonnie	DR-1539	08/13/2004	\$208,970,754	\$613,860,477
Hurricane Frances	DR-1545	09/04/2004	\$411,862,738	\$668,719,258
Hurricane Ivan	DR-1551	09/16/2004	\$164,517,308	\$695,634,604
Hurricane Jeanne	DR-1561	09/26/2004	\$398,624,417	\$521,268,932
Hurricane Katrina	DR-1602	08/28/2005	\$0	\$194,338,468
Hurricane Wilma	DR-1609	10/24/2005	\$342,257,844	\$1,479,851,236
Tropical Storm Fay	DR-1785	08/24/2008	\$19,216,130	\$101,015,840
Tropical Storm Debby	DR-4068	07/03/2012	\$27,800,267	\$0
Hurricane Isaac	DR-4084	10/18/2012	\$0	\$13,559,332
<b>Total:</b>			<b>\$1,573,249,458</b>	<b>\$4,417,964,180</b>

Source: FEMA, FDEM

<sup>1</sup>Dollar values are for all Counties included in the disaster declaration.

N/A = no data available

## 4.2 Hazard Profiles

**Requirement §201.6(c)(2)(i): [The risk assessment shall include a] description of the...location and extent of all natural hazards that can affect the jurisdiction. The plan shall include information on previous occurrences of hazard events and on the probability of future hazard events.**

The hazards identified in Section 4.1 Hazard Identification, are profiled individually in this section. Information provided by members of the FMPC has been integrated into this section with information from other data sources.

Each hazard is profiled in the following format:

### **Hazard/Problem Description**

This section provides a description of the hazard followed by details specific to the Collier County planning area. Where available, this section also includes information on the hazard extent, seasonal patterns, speed of onset/duration, magnitude and any secondary effects.

### **Past Occurrences**

This section contains information on historical events, including the extent or location of the hazard within or near the Collier County planning area.

### **Frequency/Likelihood of Future Occurrence**

This section gauges the likelihood of future occurrences based on past events and existing data. The frequency is determined by dividing the number of events observed by the number of years on record and multiplying by 100. This provides the percent chance of the event happening in any given year (e.g. 10 hurricanes or tropical storms over a 30-year period equates to a 33 percent chance of experiencing a hurricane or tropical storm in any given year). The likelihood of future occurrences is categorized into one of the classifications as follows:

- **Highly Likely** – Near 100 percent chance of occurrence within the next year
- **Likely** – Between 10 and 100 percent chance of occurrence within the next year (recurrence interval of 10 years or less)
- **Occasional** – Between 1 and 9 percent chance of occurrence within the next year (recurrence interval of 11 to 100 years)
- **Unlikely** – Less than 1 percent chance or occurrence within the next 100 years (recurrence interval of greater than every 100 years).

Those hazards determined to be of high or medium significance were characterized as priority hazards that required further evaluation in Section 4.3 Vulnerability Assessment. Significance was determined by frequency of the hazard and resulting damage, including deaths/injuries and property, crop and economic damage. Hazards occurring infrequently or having little to no impact on the Collier County planning area were determined to be of low significance and not considered a priority hazard. These criteria allowed the FMPC to prioritize hazards of greatest significance and focus resources where they are most needed.

The National Oceanic and Atmospheric Administration’s National Climatic Data Center (NCDC) has been tracking severe weather since 1950. Their Storm Events Database contains an archive of destructive storm or weather data and information which includes local, intense and damaging events. This database contains 67 flood related severe weather events that occurred in Collier County between January 1950 and May 2014. Table 4-4 summarizes these events.

**Table 4-4 - NCDC Severe Weather Reports for Collier County, 1950-2014**

Type	# of Events	Property Loss	Deaths	Injuries
Flash Flood	6	\$460,000.00	0	0
Flood	4	\$0.00	0	0
Coastal Flood	1	\$70,000.00	0	0
Heavy Rain	6	\$60,000.00	0	0
Hurricane/Typhoon	6	\$2,500,000.00	1	0
Storm Surge/Tide	3	\$6,060,000.00	0	0
Tropical Depression	0	\$0.00	0	0
Tropical Storm	11	\$395,000.00	0	0
Waterspout	30	0.00	0	0
<b>Total:</b>	<b>67</b>	<b>\$9,545,000.00</b>	<b>1</b>	<b>0</b>

Source: National Climatic Data Center Storm Events Database  
 Note: Losses reflect totals for all impacted areas within Collier County.

The FMPC supplemented NCDC data with data from SHELDUS™ (Spatial Hazard Events and Losses Database for the United States). SHELDUS™ is a county-level data set for the United States that tracks 18 types of natural hazard events along with associated property and crop losses, injuries, and fatalities for the period 1960-present. Produced by the Hazards Research Lab at the University of South Carolina, this database combines information from several sources (including the NCDC). With the release of SHELDUS 13.1, the database includes every loss causing and/or deadly event between 1960 through present. For events that covered multiple counties, the dollar losses, deaths, and injuries were equally divided among the affected counties (e.g., if four counties were affected, then a quarter of the dollar losses, injuries, and deaths were attributed to each county).

SHELDUS™ contains information on 46 severe weather events that occurred in Collier County between 1960 and 2014. Table 4-5 summarizes these events.

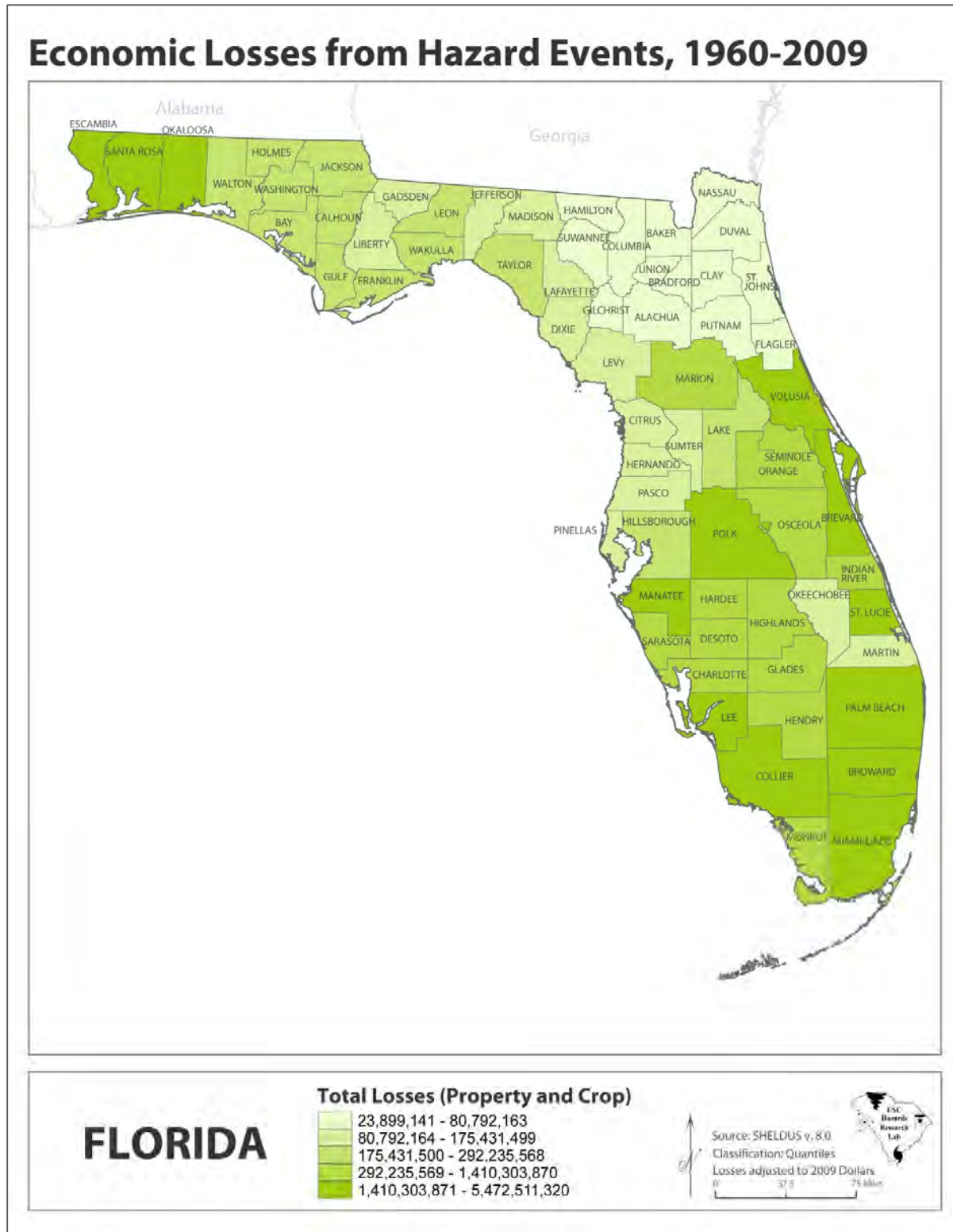
**Table 4-5 - SHELDUS Severe Weather Reports for Southern Florida, 1960-2014**

Type	# of Events	Property Loss	Crop Loss	Deaths	Injuries
Coastal	4	\$64,919.00	\$0.00	4	1
Flooding	10	\$7,671,554.00	\$56,566,005.00	0	0
Hurricane/Tropical Storm	25	\$13,527,475,180.00	\$443,030,549.00	4	56
Severe Storm/Thunder Storm	7	\$111,628.00	\$0.00	0	4
<b>Total:</b>	<b>46</b>	<b>\$13,535,323,281.00</b>	<b>\$499,596,554.00</b>	<b>8</b>	<b>61</b>

Source: Hazards & Vulnerability Research Institute (2014). The Spatial Hazard Events and Losses Database for the United States, Version 13.1 [Online Database]. Columbia, SC: University of South Carolina. Available from <http://www.sheldus.org>  
 Note: Losses have been adjusted for inflation to 2013 dollars.

The figure below reflects economic losses from hazard events contained within the SHELDUS data set for the entire State of Florida from 1960 - 2009. Collier County ranks among the highest in the State for total property and crop losses. However, as previously noted, SHELDUS loss data is divided equally among the

affected counties for each event. The economic losses shown for Collier County should be considered accordingly.



Source: SHELUDS v8.0

The following sections provide profiles of the natural flood hazards that the FMPC identified in Table 4-1 Flood Hazard Summary.

#### **4.2.1 Climate Change and Sea Level Rise**

##### **Hazard/Problem Description**

Climate change refers to a change in the state of the climate that can be identified (e.g., by using statistical tests) by changes in the mean and/or the variability of its properties, and that persists for an extended period, typically decades or longer. Climate change may be due to natural internal processes or external forcings such as modulations of the solar cycles, volcanic eruptions, and persistent anthropogenic changes in the composition of the atmosphere or in land use (IPCC, 2014). Climate change is a natural occurrence in which the earth has warmed and cooled periodically over geologic time. The recent and rapid warming of the earth over the past century has been cause for concern, as this warming is very likely due to the accumulation of human-caused greenhouse gases, such as CO<sub>2</sub>, in the atmosphere (IPCC, 2007). This warming is occurring almost everywhere in the world which suggests a global cause rather than changes in localized weather patterns.

Due to sea-level rise projected throughout the 21st century and beyond, coastal systems and low-lying areas will increasingly experience adverse impacts such as submergence, coastal flooding, and coastal erosion. The population and assets projected to be exposed to coastal risks as well as human pressures on coastal ecosystems will increase significantly in the coming decades due to population growth, economic development, and urbanization (IPCC, 2014). Southwest Florida is particularly vulnerable to the effects of climate change and sea level rise, due to its populous coastal counties, subtropical environment, porous geology and low topography. Seawalls cannot block seawater from infiltrating the porous limestone underground, and saltwater has already contaminated freshwater aquifers.

Climate change has the potential to alter the nature and frequency of flood hazards that the County already experiences such as hurricane storm surge, coastal erosion, and stormwater drainage. Sea level rise may also place additional stress on gravity flow stormwater and septic systems due to saltwater corrosion and rising groundwater conditions. An elevated storm surge due to sea level rise could produce a cascade of consequences affecting things such as land use, infrastructure, facilities, waterway navigation, the local economy, public health and safety, drinking water supplies, and ecosystems.

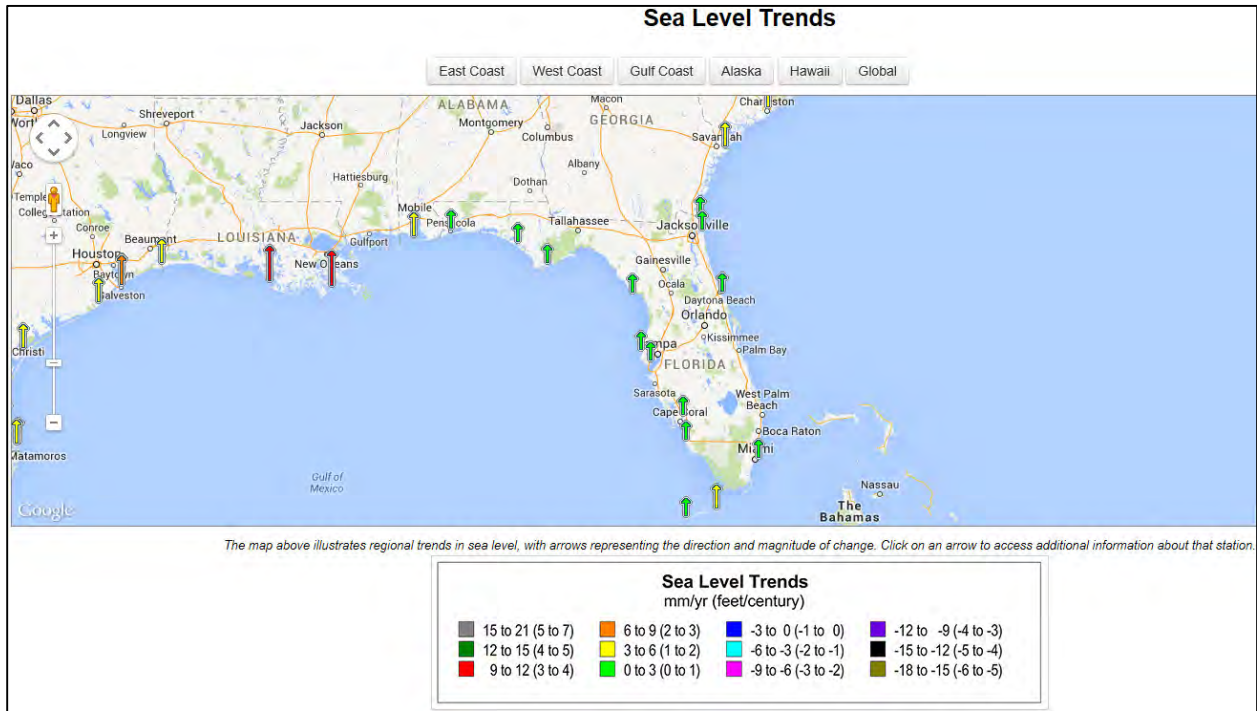
The potential for climate change influences on each flood hazard summarized in this plan is noted within each of the hazard's "Frequency/Likelihood of Future Occurrence" discussion section.

##### **Past Occurrences**

There are generally two separate mechanics involved in global sea level rise. The first is directly attributed to global temperature increases, which warm the oceans waters and cause them to expand. The second is attributed to the melting of ice over land which simply adds water to the oceans. Global sea level rise is likely caused by a combination of these two mechanics and can be exasperated on the local level by factors such as erosion and subsidence. The rate of sea level rise has varied throughout geologic history, and studies have shown that global temperature and sea level are strongly correlated.

Historic trends in local MSL are best determined from tide gauge records. The Center for Operational Oceanographic Products and Services (CO-OPS) has been measuring sea level for over 150 years, with tide stations operating on all U.S. coasts. Changes in Mean Sea Level (MSL), either a sea level rise or sea level fall, have been computed at 128 long-term water level stations using a minimum span of 30 years of observations at each location. These measurements have been averaged by month to remove the effect of

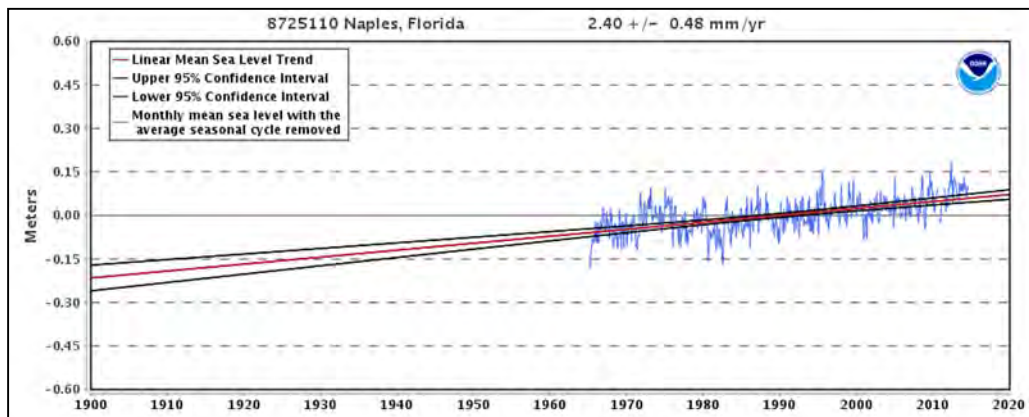
higher frequency phenomena (e.g. storm surge) in order to compute an accurate linear sea level trend. Figure 4-1 illustrates regional trends in sea level from NOAA. Note the dominance of green symbols along the Florida coast.



Source: <http://tidesandcurrents.noaa.gov/sltrends/sltrends.shtml>

**Figure 4-1 – Gulf/Atlantic Coast Sea Level Trends**

Figure 4-2 shows the monthly mean sea level at NOAA’s Naples, FL station without the regular seasonal fluctuations due to coastal ocean temperatures, salinities, winds, atmospheric pressures, and ocean currents. The mean sea level trend is 2.40 millimeters/year with a 95% confidence interval of +/- 0.48 mm/yr based on monthly mean sea level data from 1965 to 2013 which is equivalent to a change of 0.79 feet in 100 years.

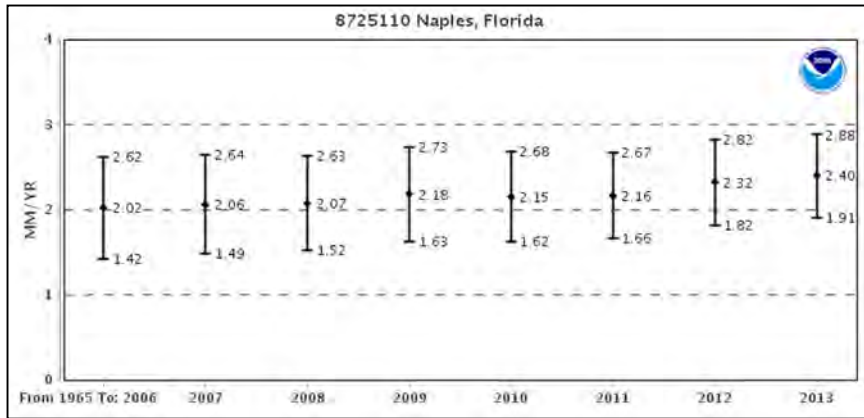


Source: <http://tidesandcurrents.noaa.gov/sltrends/sltrends.shtml>

**Figure 4-2 - Mean Sea Level Trend for Naples, Florida**



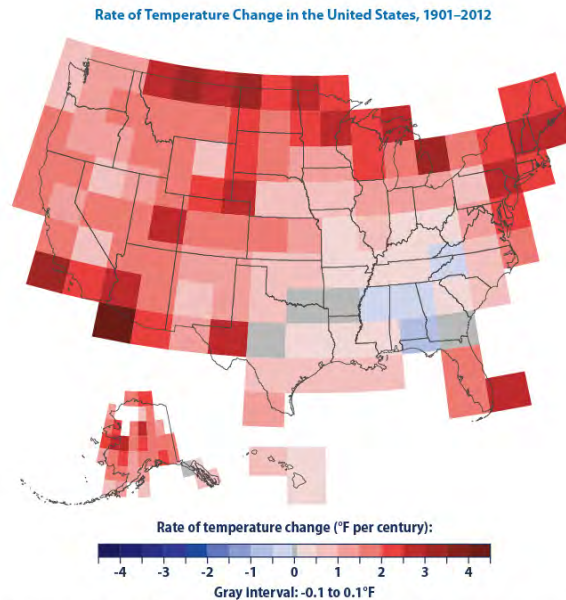
As more data are collected at water level stations, the linear mean sea level trends can be recalculated each year. Figure 4-3 compares linear mean sea level trends and 95% confidence intervals calculated from the beginning of the Naples, FL station record to recent years. The values do not indicate the trend in each year, but the trend of the entire data period up to that year.



Source: <http://tidesandcurrents.noaa.gov/sltrends/sltrends.shtml>

**Figure 4-3 - Previous Mean Sea Level Trends for Naples, Florida**

Since 1901, the average surface temperature across the contiguous 48 states has risen at an average rate of 0.14°F per decade (1.4°F per century). Average temperatures have risen more quickly since the late 1970s (0.36 to 0.55°F per decade). Seven of the top 10 warmest years on record for the contiguous 48 states have occurred since 1998, and 2012 was the warmest year on record. Figure 4-4 below, based on data from NOAA and prepared by the EPA, shows how annual average air temperatures have changed in different parts of the United States since 1901. Current science is projecting that the southeastern United States could experience a general increase in average temperatures anywhere from 4.5°F to 9°F in the coming century (Karl et al, 111).



Data source: NOAA (National Oceanic and Atmospheric Administration). 2013. National Climatic Data Center. Accessed April 2013. [www.ncdc.noaa.gov/oa/ncdc.html](http://www.ncdc.noaa.gov/oa/ncdc.html).

For more information, visit U.S. EPA's "Climate Change Indicators in the United States" at [www.epa.gov/climatechange/indicators](http://www.epa.gov/climatechange/indicators).

**Figure 4-4 - Rate of Temperature Change in the United States, 1901-2012**

**Frequency/Likelihood of Future Occurrence**

**Highly Likely** - Understanding trends in sea level, as well as the relationship between global and local sea level, provides critical information about the impacts of the Earth's climate on our oceans and atmosphere. Changes in sea level are directly linked to a number of atmospheric and oceanic processes. Changes in global temperatures, hydrologic cycles, coverage of glaciers and ice sheets, and storm frequency and intensity are examples of known effects of a changing climate, all of which are directly related to, and captured in, long-term sea level records. Sea levels provide an important key to understanding the impact of climate change along our coasts. By combining local rates of relative sea level change for a specific area based on observations with projections of global sea level rise, communities can plan for the impacts of sea level rise (NOAA, 2014).

The U.S. Army Corps of Engineers (USACE) has provided guidance to evaluate designs over a project's life cycle in order to account for the rise of global mean sea level (USACE, 2011). The USACE guidance is based on original guidance by the National Research Council (NRC, 1987). The 1987 NRC report recommended that feasibility studies for coastal projects consider the high probability of accelerating global mean sea level (GMSL) rise and provided three different acceleration scenarios through the year 2100. The 1987 NRC report described these three scenarios using the following equation:

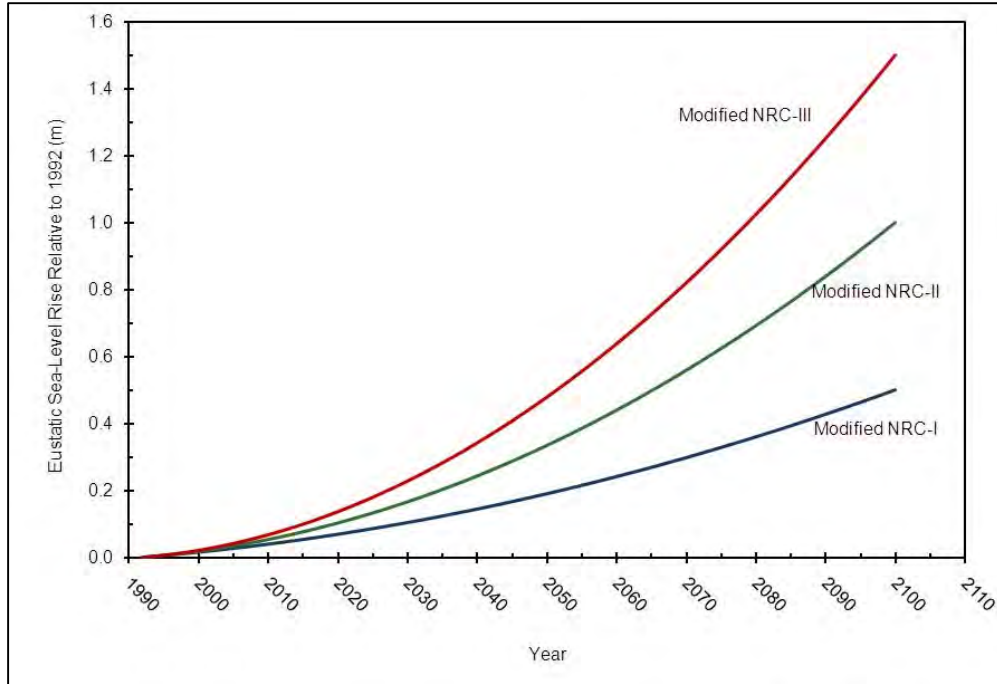
$$E(t) = 0.0012\text{mm/yr} * t + bt^2 \quad \text{[Equation 1]}$$

in which *t* represents years, starting in 1986, *b* is a constant, and *E(t)* is the eustatic sea-level change, in meters, as a function of *t*. The NRC committee recommended “projections be updated approximately every decade to incorporate additional data.”

As shown in Equation 2, the USACE guidance adjusted Equation 1 to include the historic GMSL change rate of 1.7 mm/year as presented by the IPCC (IPCC, 2007) and the start date of 1992 (which corresponds to the midpoint of the National Tidal Datum Epoch of 1983-2001), instead of 1986 (the start date for Equation 1), which resulted in updated values for the variable *b* being equal to 2.71E-5 for modified NRC Curve I, 7.00E-5 for modified NRC Curve II, and 1.13E-4 for modified NRC Curve III. The three updated GMSL rise acceleration scenarios are depicted in Figure 4-5.

$$E(t) = 0.0017\text{mm/yr} * t + bt^2 \quad \text{[Equation 2]}$$

Based on the USACE guidance and data from the nearest open Gulf tide gauge to Collier County with at least 40 years of record, a projected sea level rise to be used for future planning decisions can be calculated. As shown previously in Figure 4-3, sea level trends through 2013 at the Naples, FL station range from 1.91 mm/yr to 2.88 mm/yr with a mean of 2.40 mm/year.



Source: USACE, 2011

**Figure 4-5 - Scenarios for Global Mean Sea Level Rise**

Using the three acceleration scenarios and the low, mean and high sea level trends recorded at the Naples, FL station, Table 4-6 details the entire range of sea level rise projections for Collier County.

**Table 4-6 - Projected Sea Level Rise for Collier County**

	Sea Level Trend (m/yr)	t (years)	b	t <sup>2</sup>	Project Rise (m)	Projected Rise (ft)
<b>Low</b>	0.00191	47	0.0000271	2209	0.150	0.491
<b>Mean</b>	0.0024	47	0.0000271	2209	0.173	0.566
<b>High</b>	0.00288	47	0.0000271	2209	0.195	0.640
	Sea Level Trend (m/yr)	t (years)	b	t <sup>2</sup>	Project Rise (m)	Projected Rise (ft)
<b>Low</b>	0.00191	47	0.00007	2209	0.244	0.802
<b>Mean</b>	0.0024	47	0.00007	2209	0.267	0.877
<b>High</b>	0.00288	47	0.00007	2209	0.290	0.951
	Sea Level Trend (m/yr)	t (years)	b	t <sup>2</sup>	Project Rise (m)	Projected Rise (ft)
<b>Low</b>	0.00191	47	0.000113	2209	0.339	1.113
<b>Mean</b>	0.0024	47	0.000113	2209	0.362	1.189
<b>High</b>	0.00288	47	0.000113	2209	0.385	1.263

As shown in Table 4-6, sea level rise projections for Collier County range from 0.49 feet to 1.26 feet. The Collier County FMPC has elected to use the moderate acceleration scenario and the mean seal level trend for Naples, FL (highlighted in the table above). Therefore, Collier County should consider a projected 0.88 feet of seal level rise through 2060 for future planning purposes (detailed equation is shown below).

$$\text{Moderate Scenario: } E(t) = .00240 \text{ m/year} * 47\text{yr} + 7.00\text{E-}5 * (47\text{yr})^2 = 0.267 \text{ m (0.88 ft.)}$$

## 4.2.2 Coastal/Canal Bank Erosion

### Hazard/Problem Description

#### *Coastal Erosion*

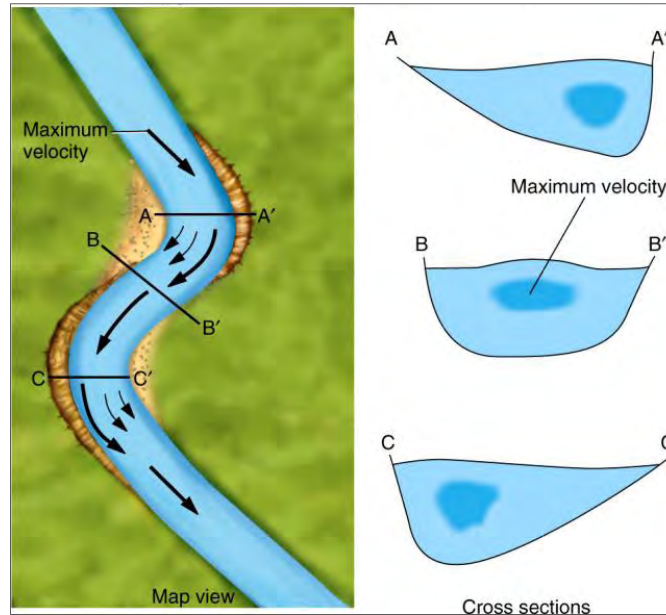
Coastal erosion is a process whereby large storms, flooding, strong wave action, sea level rise, and human activities, such as inappropriate land use, alterations, and shore protection structures, wears away the beaches and bluffs along the coast. Erosion undermines and often destroys homes, businesses, and public infrastructure and can have long-term economic and social consequences. According to NOAA, coastal erosion is responsible for approximately \$500 million per year in coastal property loss in the United States, including damage to structures and loss of land. To mitigate coastal erosion, the federal government spends an average of \$150 million every year on beach nourishment and other shoreline erosion control measures.

Coastal erosion has both natural causes and causes related to human activities. Gradual coastal erosion/replenishment results naturally from the impacts of tidal longshore currents. Severe coastal erosion can occur over a very short period of time when the state is impacted by hurricanes, tropical storms and other weather systems. Sand is moved parallel to most beaches in Florida by longshore drift and currents. Sand is continually removed by longshore currents in some areas but it is also continually replaced by sand carried in by the same type of currents. Structures such as piers or sea walls, jetties, and navigational inlets may interrupt the movement of sand. Sand can become “trapped” in one place by these types of structures. The currents will, of course, continue to flow, though depleted of sand trapped elsewhere. With significant amounts of sand trapped in the system, the continuing motion of currents (now deficient in sand) results in erosion. In this way, human construction activities that result in the unnatural trapping of sand have the potential to result in significant coastal erosion.

Erosion rates and potential impacts are highly localized. Severe storms can remove wide beaches, along with substantial dunes, in a single event. In undeveloped areas, these high recession rates are not likely to cause significant concern, but in some heavily populated locations, one or two feet of erosion may be considered catastrophic (NOAA, 2014).

#### *Canal Bank Erosion*

Streams/canals erode by a combination of direct stream processes, like down cutting and lateral erosion, and indirect processes, like mass-wasting accompanied by transportation. When the channel bends, water on the outside of the bend (the cut-bank) flows faster and water on the inside of the bend (the point) flows slower as shown in Figure 4-6. This distribution of velocity results in erosion occurring on the outside of the bend and deposition occurring on the inside of the bend.



**Figure 4-6- Stream Meanders**

Stream bank erosion is a natural process, but acceleration of this natural process leads to a disproportionate sediment supply, stream channel instability, land loss, habitat loss and other adverse effects. Stream bank erosion processes, although complex, are driven by two major components: stream bank characteristics (erodibility) and hydraulic/gravitational forces. Many land use activities can affect both of these components and lead to accelerated bank erosion. The vegetation rooting characteristics can protect banks from fluvial entrainment and collapse, and also provide internal bank strength. When riparian vegetation is changed from woody species to annual grasses and/or flowering plants, the internal strength is weakened, causing acceleration of mass wasting processes. Stream bank aggradation or degradation is often a response to stream channel instability. Since bank erosion is often a symptom of a larger, more complex problem, the long-term solutions often involve much more than just bank stabilization. Numerous studies have demonstrated that stream bank erosion contributes a large portion of the annual sediment yield.

Determining the cause of accelerated streambank erosion is the first step in solving the problem. When a stream is straightened or widened, streambank erosion increases. Accelerated streambank erosion is part of the process as the stream seeks to re-establish a stable size and pattern. Damaging or removing streamside vegetation to the point where it no longer provides for bank stability can cause a dramatic increase in bank erosion. A degrading streambed results in higher and often unstable, eroding banks. When land use changes occur in a watershed, such as clearing land for agriculture or development, runoff increases. With this increase in runoff the stream channel will adjust to accommodate the additional flow, increasing streambank erosion if appropriate erosion protection methods are not installed. Addressing the problem of streambank erosion requires an understanding of both stream dynamics and the management of streamside vegetation.

### **Past Occurrences**

A report updated in June 2014 by the Florida Department of Environmental Protection (DEP), Division of Water Resource Management, titled “Critically Eroded Beaches in Florida” inventoried critically eroded areas along the Atlantic and Gulf coasts. The following definition was used to identify critically eroded areas:

*Critically eroded area is a segment of the shoreline where natural processes or human activity have caused or contributed to erosion and recession of the beach or dune system to such a degree that upland development, recreational interests, wildlife habitat, or important cultural resources are threatened or lost. Critically eroded areas may also include peripheral segments or gaps between identified critically eroded areas which, although they may be stable or slightly erosional now, their inclusion is necessary for continuity of management of the coastal system or for the design integrity of adjacent beach management projects.*

In some areas the erosion processes are not particularly significant except to the extent that adjacent public or private interests may be threatened. Whether erosion is deemed critical is determined by the existence of a threat to interests in need of protection. Lacking any threat an erosion condition is not a critical problem.

According to the Florida DEP report, there are eight critically eroded beach areas (14.8 miles), three non-critically eroded beach areas (5.1 miles), and one critically eroded inlet shoreline area (0.8 mile) in Collier County.

In northern Collier County, a 0.4-mile beach segment north of Wiggins Pass (R14-R16.3) is critically eroded threatening sea turtle and gopher tortoise habitat. A 1.6-mile beach segment (R22.3-R30.5) is critically eroded threatening development interests in Vanderbilt Beach. This area has a beach restoration project and numerous bulkheads.

The City of Naples has two segments that are critically eroded threatening development interests north and south of Doctors Pass. North of Doctors Pass (R45-R57.5) is a 2.4-mile critically eroded segment with the northern 1.1 mile included for the design integrity of the beach restoration project. Between Doctors Pass and Gordon Pass (R57.8-R89) is a 5.6-mile critically eroded segment. These areas of Naples have continuous beach restoration projects. Numerous bulkheads and revetments also exist throughout Naples. Groins exist north of Gordon Pass.

South of Gordon Pass (R90-R111) is a 3.9-mile stretch that is non-critically eroded along the northern half of Keewaydin Island. Between Little Marco Pass and Capri Pass, Sea Oat Island has 0.9 mile of beach that is non-critically eroded.

Marco Island has three areas that are critically eroded threatening development interests. Along Hideaway Beach, the north shore of Marco Island (H3-H11) fronting on Big Marco Pass has 0.8 mile of inlet shoreline that is critically eroded. The central gulf beach of Marco Island (R134.5R139) has 0.8 mile that is critically eroded and the southern stretch of beach (R143-R148) has 0.9 mile that is critically eroded. All three critically eroded areas on Marco Island have beach restoration projects, and the northern segment also has a rock groin field along Hideaway Beach.

Erosion on the two southern barrier islands in Collier County has progressed into the backshore mangrove forest resulting in the loss of beach wildlife habitat. Following Hurricane Wilma (2005), a 1.6-mile segment of Kice Island (V23-V31.4) is critically eroded. South of Morgan Pass, Morgan Island has a 1.5-mile segment (V33.8-V41.8) that is critically eroded and a 0.3mile segment (V41.8-V43.5) that is non-critically eroded.

June, 2014

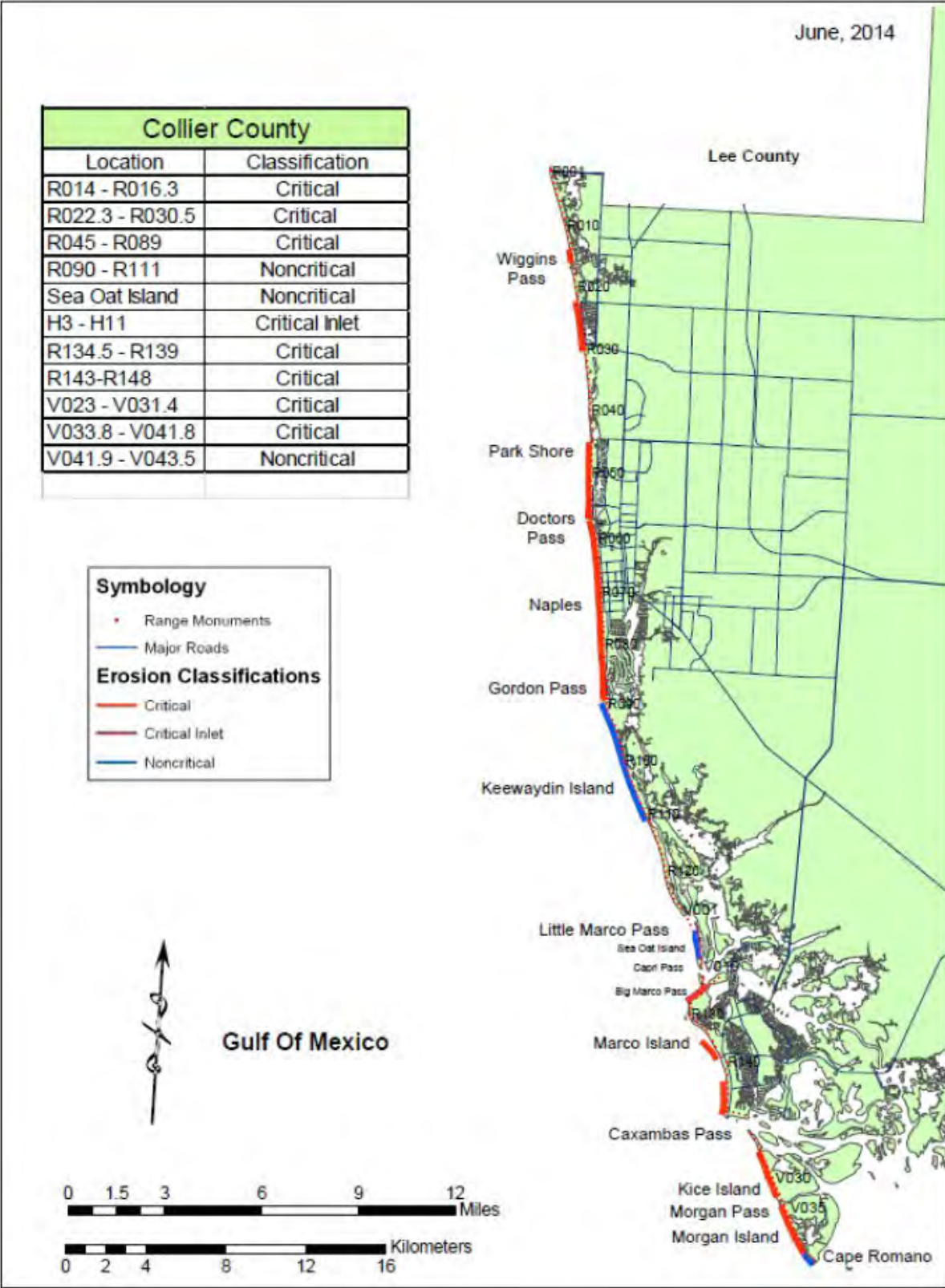
Collier County	
Location	Classification
R014 - R016.3	Critical
R022.3 - R030.5	Critical
R045 - R089	Critical
R090 - R111	Noncritical
Sea Oat Island	Noncritical
H3 - H11	Critical Inlet
R134.5 - R139	Critical
R143-R148	Critical
V023 - V031.4	Critical
V033.8 - V041.8	Critical
V041.9 - V043.5	Noncritical

**Symbology**

- Range Monuments
- Major Roads

**Erosion Classifications**

- Critical
- Critical Inlet
- Noncritical



Source: Florida Department of Environmental Protection, Division of Water Resource Management, Bureau of Beaches and Coastal Systems, *Critically Eroded Beaches in Florida*, Updated June 2014

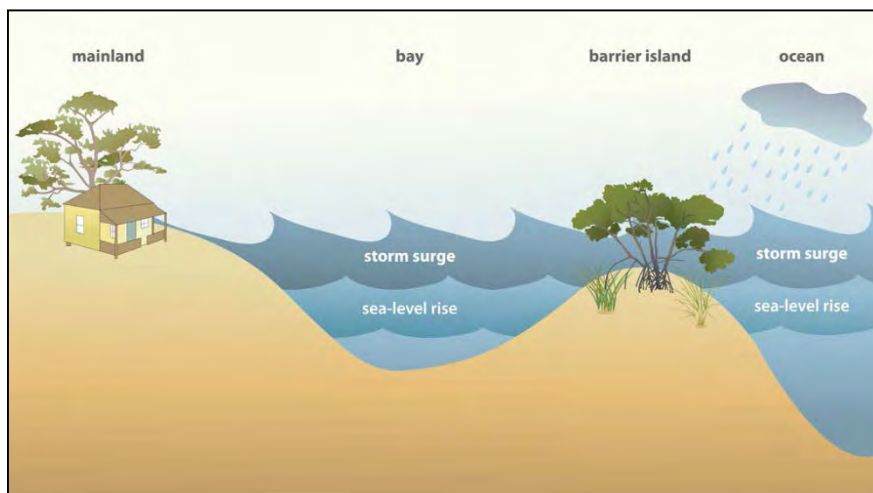
### Frequency/Likelihood of Future Occurrence

**Highly Likely** - In general, the low dune elevations along the Gulf of Mexico make this region more vulnerable to erosion hazards during hurricanes. Average dune elevations along the shores of the Gulf of Mexico are just 2.4 meters high, making approximately 71% of these beaches very likely to experience extreme erosion due to overwash in the direct landfall of a category 1 storm. In the Gulf of Mexico, waves play a large role in elevating shoreline water levels. During a category 1 hurricane in the Gulf of Mexico, the contribution of waves to storm-induced extreme water levels is nearly twice that of surge. The United States Geological Survey (USGS) completed a national assessment of hurricane-induced coastal erosion hazards in 2013 which provides the following key findings for the Gulf of Mexico:

- For a category 1 hurricane landfall, 99% of sandy beaches along the U.S. Gulf of Mexico coast are very likely (P>90%) to experience dune erosion, 71% are very likely to overwash, and 27% are very likely to inundate.
- For category 5 hurricane landfall, 98% of the U.S. Gulf of Mexico beaches are very likely to experience overwash and associated erosion, and 89% are very likely to be vulnerable to erosion due to inundation.
- During a category 1 hurricane landfall in the Gulf of Mexico, waves increase water levels at the shoreline, on average, by 170% above surge alone. The predicted wave-driven component of shoreline water levels was 2.8 meters, high enough to erode the Gulf-coast averaged dune toe elevation (1.1 meters) as well as overwash the average dune crest (2.4 meters), even without surge.
- Hurricanes are not required for significant coastal change in the Gulf region. Waves and storm surge associated with tropical storms and winter cold fronts provide sufficient energy to put low-elevation beaches and dunes at risk to erosion.

### Climate Change and Coastal/Canal Bank Erosion

Sea-level rise will raise all tide levels, from low tide to storm surge. Wave action at higher tide levels may cause erosion of sandy beaches. The combined effects of wind and waves could damage dunes, leaving the beachfront more vulnerable (UF/IFAS Extension, 2013). According to the existing Flood Insurance Study for Collier County effective May 16, 2012, the existing dunes in many areas along the Collier County shoreline are insufficient to sustain wave attack associated with the 1-percent-annual-chance flood. The 2012 FIS Report and DFIRM maps can be viewed at <http://msc.fema.gov/portal>.



**Figure 4-7 - Seal Level Rise and Coastal Erosion of Dunes**

Credits: Jane Hawkey, IAN Image Library ([ian.umces.edu/imagelibrary/](http://ian.umces.edu/imagelibrary/))



According to the Center of Ocean Solutions, there has been a dramatic increase in coastal erosion over the last two decades and this is expected to continue as sea level rises and storm frequency and severity increase. Rather than occurring over the same time scale with sea level rise, erosion of beaches and coastal cliffs is expected to occur in large bursts during storm events as a result of increased wave height and storm intensity. Because of these large events, scientific models predict that shoreline erosion may outpace sea level rise by 50 to 200 fold. Erosion will have significant effects on coastal habitats, which can lead to social and economic impacts on coastal communities. With the reduction of coastal habitats and the ecological services they provide, coastal communities will experience more frequent and destructive flooding, compromised water supplies and smaller or fewer beaches. According to the U.S. EPA, a 1-foot rise would erode most Florida beaches 100-200 feet unless measures were taken to hold back the sea. A 3-foot rise would require the state to spend \$4 to 8 billion just to replace the sand that would be lost to beach erosion.

### **4.2.3 Dam/Levee Failure**

#### **Hazard/Problem Description**

##### ***Dam Failure***

A dam is a barrier constructed across a watercourse that stores, controls, or diverts water. Dams are usually constructed of earth, rock, or concrete. The water impounded behind a dam is referred to as the reservoir and is measured in acre-feet. One acre-foot is the volume of water that covers one acre of land to a depth of one foot. Dams can benefit farm land, provide recreation areas, generate electrical power, and help control erosion and flooding issues.

A dam failure is the collapse or breach of a dam that causes downstream flooding. Dam failures may be caused by natural events, human-caused events, or a combination. Due to the lack of advance warning, failures resulting from natural events, such as hurricanes, earthquakes, or landslides, may be particularly severe. Prolonged rainfall and subsequent flooding is the most common cause of dam failure.

Dam failures usually occur when the spillway capacity is inadequate and water overtops the dam or when internal erosion in dam foundation occurs (also known as piping). If internal erosion or overtopping cause a full structural breach, a high-velocity, debris-laden wall of water is released and rushes downstream, damaging or destroying anything in its path. Overtopping is the primary cause of earthen dam failure in the United States.

Dam failures can result from any one or a combination of the following:

- Prolonged periods of rainfall and flooding;
- Inadequate spillway capacity, resulting in excess overtopping flows;
- Internal erosion caused by embankment or foundation leakage or piping;
- Improper maintenance, including failure to remove trees, repair internal seepage problems, replace lost material from the cross-section of the dam and abutments, or maintain gates, valves, and other operational components;
- Improper design, including the use of improper construction materials and construction practices;
- Negligent operation, including the failure to remove or open gates or valves during high flow periods;
- Failure of upstream dams on the same waterway; and
- High winds, which can cause significant wave action and result in substantial erosion.

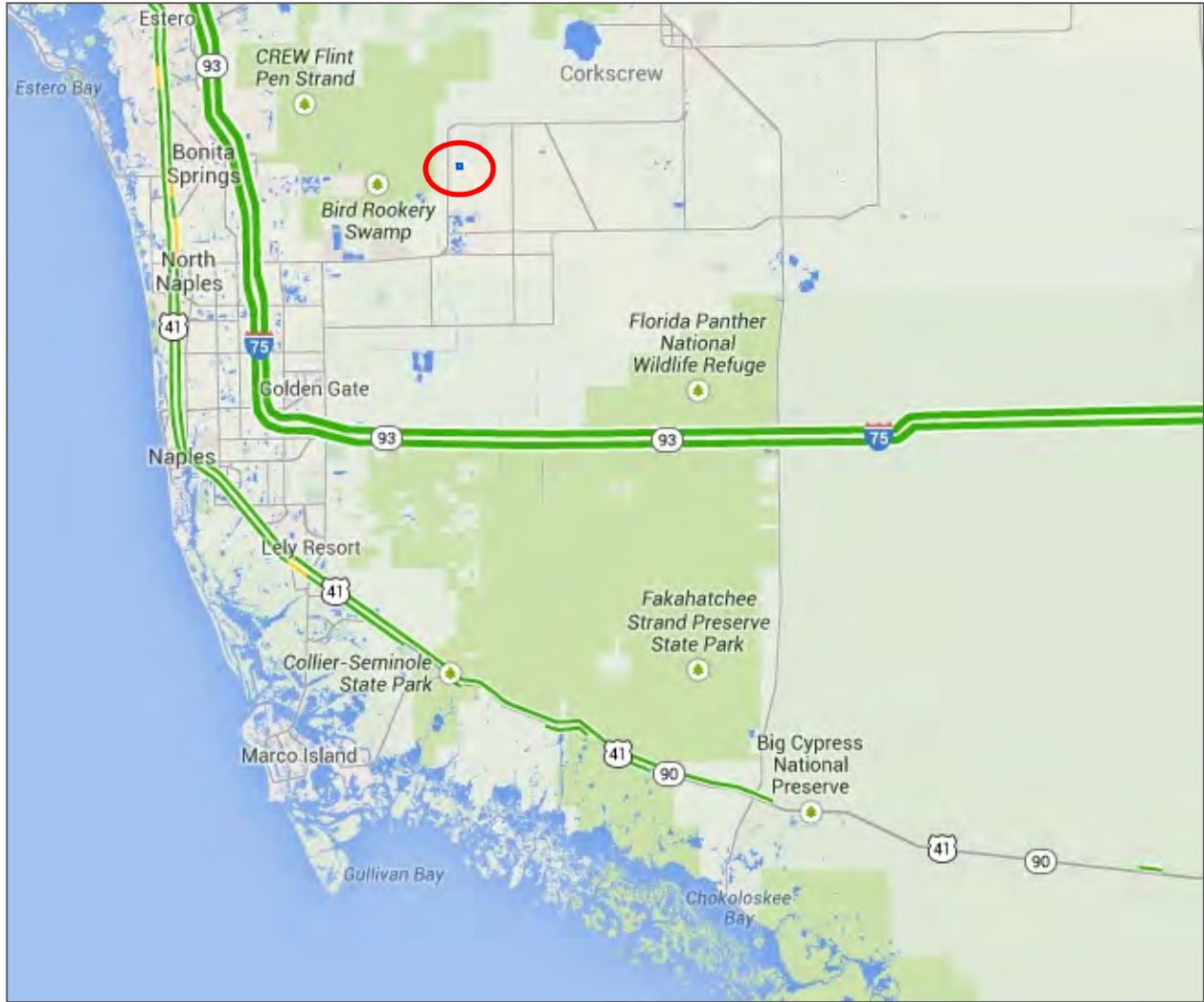
Water released by a failed dam generates tremendous energy and can cause a flood that is catastrophic to life and property. A catastrophic dam failure could challenge local response capabilities and require evacuations to save lives. Impacts to life safety will depend on the warning time and the resources available to notify and evacuate the public. Major casualties and loss of life could result, as well as water quality and health issues. Potentially catastrophic effects to roads, bridges, and homes are also of major concern. Associated water quality and health concerns could also be issues. Factors that influence the potential severity of a full or partial dam failure are the amount of water impounded; the density, type, and value of development and infrastructure located downstream; and the speed of failure.

The National Inventory of Dams (NID) is a database of dams in the United States which was developed and is maintained by the USACE. Congress authorized the USACE to inventory dams as part of the 1972 National Dam Inspection Act. Several subsequent acts have authorized maintenance of the NID and provided funding. The USACE collaborates with FEMA and state regulatory offices to collect data on dams. The goal of the NID is to include all dams in the United States which meet at least one of the following criteria:

1. High hazard classification - loss of at least one human life is likely if the dam fails
2. Significant hazard classification - possible loss of human life and likely significant property or environmental destruction
3. Low hazard or undetermined classification – dams equal or exceed 25 feet in height and exceed 15 acre-feet in storage
4. Low hazard or undetermined classification – dams equal or exceed 50 acre-feet storage and exceed 6 feet in height

Low hazard dams which do not meet the criteria specified in number 3 or 4 are not included in the NID even if they are regulated according to state criteria. In some states, the number of these dams is several times the number of dams included in the NID.

Figure 4-8 reflects all dams included in the NID that are located in and around Collier County. As shown, there is only one dam located within the jurisdictional boundaries of Collier County which is the State Road 846 Land Trust earthen dam. Table 4-7 provides details for this dam as provided in the NID.



Source: U.S. Army Corps of Engineers, National Inventory of Dams

**Figure 4-8 - National Inventory of Dams for Collier County**

**Table 4-7 - National Inventory of Dams, Collier County**

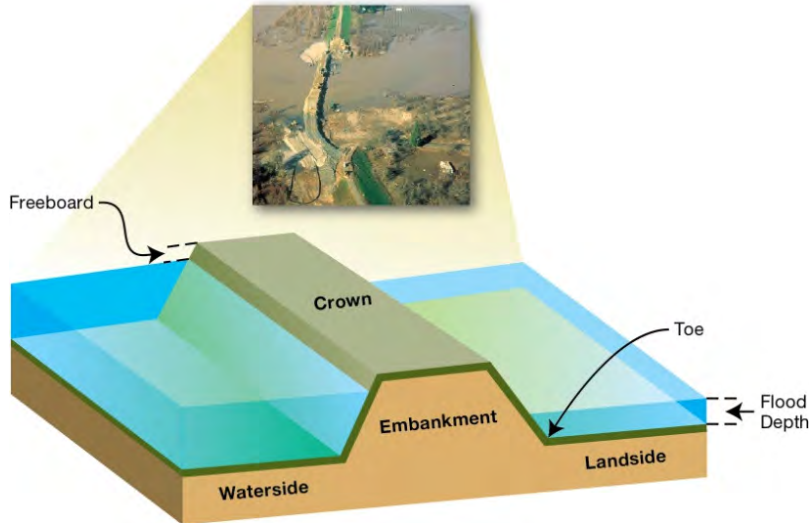
Dam Name	NIDID	Owner	Height (Ft.)	NID Storage (acre-feet)	Dam Type	River
St. Road 846 Land Trust IMP	FL75010	St. Road 846 Land Trust	9	350	Earthen	Cocohatchee

Source: U.S. Army Corps of Engineers, National Inventory of Dams

**Levee Failure**

FEMA defines a levee as “a man-made structure, usually an earthen embankment, designed and constructed in accordance with sound engineering practices to contain, control, or divert the flow of water in order to reduce the risk from temporary flooding.” Levee systems consist of levees, floodwalls, and associated structures, such as closure and drainage devices, which are constructed and operated in accordance with sound engineering practices. Levees often have “interior drainage” systems that work in conjunction with the levees to take water from the landward side to the water side. An interior drainage system may include culverts, canals, ditches, storm sewers, and/or pumps.

Levees and floodwalls are constructed from the earth, compacted soil or artificial materials, such as concrete or steel. To protect against erosion and scouring, earthen levees can be covered with grass and gravel or hard surfaces like stone, asphalt, or concrete. Levees and floodwalls are typically built parallel to a waterway, most often a river, in order to reduce the risk of flooding to the area behind it. Figure 4-9 below shows the components of a typical levee.

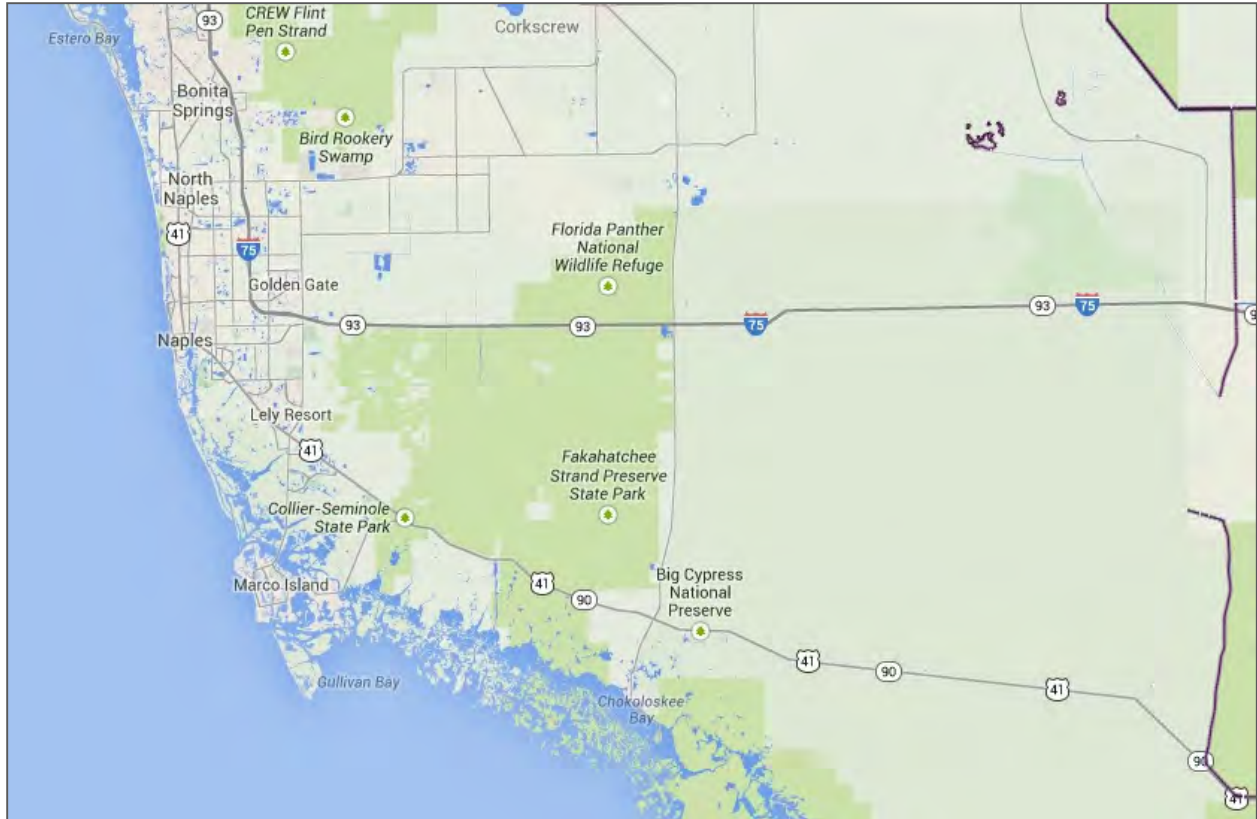


Source: FEMA, *What is a Levee Fact Sheet*, August 2011

**Figure 4-9 - Components of a Typical Levee**

Levees provide strong flood protection, but they are not failsafe. Levees are designed to protect against a specific flood level and could be overtopped during severe weather events. Levees reduce, not eliminate, the risk to individuals and structures behind them. A levee system failure or overtopping can create severe flooding and high water velocities. It is important to remember that no levee provides protection from events for which it was not designed, and proper operation and maintenance are necessary to reduce the probability of failure.

Figure 4-10 below reflects all levees included in the U.S. Army Corps of Engineers National Levee Database (NLD) that are located in or around Collier County. Levee centerlines are indicated in purple. Table 4-8 details all levees located in Collier County as included in the NLD.



Source: U.S. Army Corps of Engineers National Levee Database

**Figure 4-10 - National Levee Database for Collier County**

**Table 4-8 - National Levee Database, Collier County Planning Area**

County(ies)	System Name	Sponsor	Length (mi)	Inspection Rating	Leveed Area Type
Broward, Collier, Hendry	East Big Cypress Seminole IR	SFWMD	26.1	Minimally Acceptable	Agricultural
Broward, Collier, Miami-Dade, Monroe	L-29	SFWMD	45.4	Unacceptable	Agricultural

**Past Occurrences**

There are no past reported dam breaches or levee failures within Collier County.

**Frequency/Likelihood of Future Occurrence**

*Unlikely* –There are no high or significant hazard dams that could impact Collier County. Since no occurrences of levee failure have happened and there are no significant levees in the County, future levee failure is unlikely.

**Climate Change and Dam/Levee Failure**

Given the fact that there are no high or significant hazard dams or levees that would affect the County, climate change is unlikely to change the risk of the County to dam and/or levee failure. However, future levees and sea walls may need to be built to combat the effects of sea level rise and storm surge which would affect future risk.

#### **4.2.4 Flood: 100-/500-year**

##### **Hazard/Problem Description**

Flooding is defined by the rising and overflowing of a body of water onto normally dry land. Flooding can result from an overflow of inland or tidal waters or an unusual accumulation or runoff of surface waters from any source. Flooding within Collier County can be attributed to tidal flooding resulting from hurricanes and tropical storms and heavy rainfall that overburdens the drainage system within the community.

Certain health hazards are also common to flood events. While such problems are often not reported, three general types of health hazards accompany floods. The first comes from the water itself. Floodwaters carry anything that was on the ground that the upstream runoff picked up, including dirt, oil, animal waste, and lawn, farm and industrial chemicals. Pastures and areas where farm animals are kept or their wastes are stored can contribute polluted waters to the receiving streams.

Floodwaters also saturate the ground, which leads to infiltration into sanitary sewer lines. When wastewater treatment plants are flooded, there is nowhere for the sewage to flow. Infiltration and lack of treatment can lead to overloaded sewer lines that can back up into low-lying areas and homes. Even when it is diluted by flood waters, raw sewage can be a breeding ground for bacteria such as e.coli and other disease causing agents.

The second type of health problem arises after most of the water has gone. Stagnant pools can become breeding grounds for mosquitoes, and wet areas of a building that have not been properly cleaned breed mold and mildew. A building that is not thoroughly cleaned becomes a health hazard, especially for small children and the elderly.

Another health hazard occurs when ducts in a forced air system are not properly cleaned after inundation. When the furnace or air conditioner is turned on, the sediments left in the ducts are circulated throughout the building and breathed in by the occupants. If the county water system loses pressure, a boil order may be issued to protect people and animals from contaminated water.

The third problem is the long-term psychological impact of having been through a flood and seeing one's home damaged and personal belongings destroyed. The cost and labor needed to repair a flood-damaged home puts a severe strain on people, especially the unprepared and uninsured. There is also a long-term problem for those who know that their homes can be flooded again. The resulting stress on floodplain residents takes its toll in the form of aggravated physical and mental health problems.

##### **Sources and Types of Flooding**

According to the 2012 Flood Insurance Study (FIS) for Collier County, flooding results from two major sources in the County. Coastal areas are subject to inundation from ocean surges, whereas inland areas become flooded when rainfall accumulates in low, flat areas. Rainfall occurs primarily during thunderstorms in the summer months, with additional rainfall resulting from the passage of hurricanes. A transition region near the coast is vulnerable to both rainfall and ocean surge flooding. Coastal lands typically lie below an elevation of 9 feet, North American Vertical Datum of 1988 (NAVD88), and are subject to flooding from hurricanes and tropical storms.

The general topography of Collier County is extremely flat, with land slopes on the order of 1 foot per mile to 0.5 foot per mile in the interior regions. There are no major natural streams, such as those found in areas of steeper topography. Instead, flow occurs over wide, flat areas, in sloughs, and through manmade canal systems. Natural well-drained drainage channels are apparent only close to the coast. The lack of steep

slopes precludes rapid runoff; therefore, water accumulates in ponded areas and slowly infiltrates the groundwater system or sluggishly drains over the land.

**Coastal (Tidal) Flooding:** All lands bordering the coast along the Gulf of Mexico are prone to tidal affects/flooding. Coastal land such as sand bars, barrier islands and deltas provide a buffer zone to help protect human life and real property relative to the sea much as flood plains provide a buffer zone along rivers and other bodies of water. Coastal floods usually occur as a result of abnormally high tides or tidal waves, storm surge and heavy rains in combination with high tides, tropical storms and hurricanes.

**Overland Sheet Flow:** Because of the relative flatness of the topography of Collier County, historical flow has always been shallow overland sheet flow during the wet season. During the wet season, overland sheet flow enters the sloughs and man-made canal systems.

**Shallow Ponding:** Because much of the County is flat, whatever rainfall doesn't sheet flow from an area tends to pond and percolate into the ground, causing water tables to rise during the wet season to within a foot or less of the ground in most of Collier County, so there is little soil storage.

Flooding in Collier County is a factor of the amount and timing of rainfall and the tide cycle elevation. The same amount of rainfall occurring in March would not have the same flooding effect as if it occurred in September. During the —dryl season the water table elevation typically drops to several feet below natural ground elevations. This creates a large storage volume in the soil, lakes, canals, ditches and swales. However during the —wetl season the water table elevation is often very near the natural ground surface, lakes are filled, and ditches are flowing. The rainfall added to this —wetl season condition creates much more stormwater runoff that must be handled by the stormwater system facilities, creeks, rivers, and natural flowways.

While each 24-hour duration rainfall event is different, during a —wetl season (meaning an above average wet season rainfall amount) a 3 to 4 inch event will typically produce only limited yard and street flooding for a few hours; a 5 to 6 inch event will typically produce moderate to substantial yard, street and major roadway flooding with an occasional structure flooding; and a 7 inch or more event will typically produce extensive yard, street and major roadway flooding with increased probability of structure flooding.

### **Flooding and Floodplains**

In its common usage, the floodplain most often refers to that area that is inundated by the 100-year flood, the flood that has a 1% chance in any given year of being equaled or exceeded. A floodplain is the flat or nearly flat land adjacent to a stream or river that experiences occasional or periodic flooding. It includes the floodway, which consists of the stream channel and adjacent areas that carry flood flows, and the flood fringe, which are areas covered by the flood, but which do not experience a strong current. It should be noted that due to the nature of flooding in Collier County (coastal and ponding), no floodways were computed as part of the 2012 FIS.

The 100-year flood is the national minimum standard to which communities regulate their floodplains through the National Flood Insurance Program (NFIP). The 500-year flood is the flood that has a 0.2 percent chance of being equaled or exceeded in any given year. The potential for flooding can change and increase through various land use changes and changes to land surface, which result in a change to the floodplain. A change in environment can create localized flooding problems inside and outside of natural floodplains by altering or confining natural drainage channels. These changes are most often created by human activity.

Participation in the NFIP requires adoption and enforcement of a local floodplain management ordinance which is intended to prevent unsafe development in the floodplain, thereby reducing future flood damages.

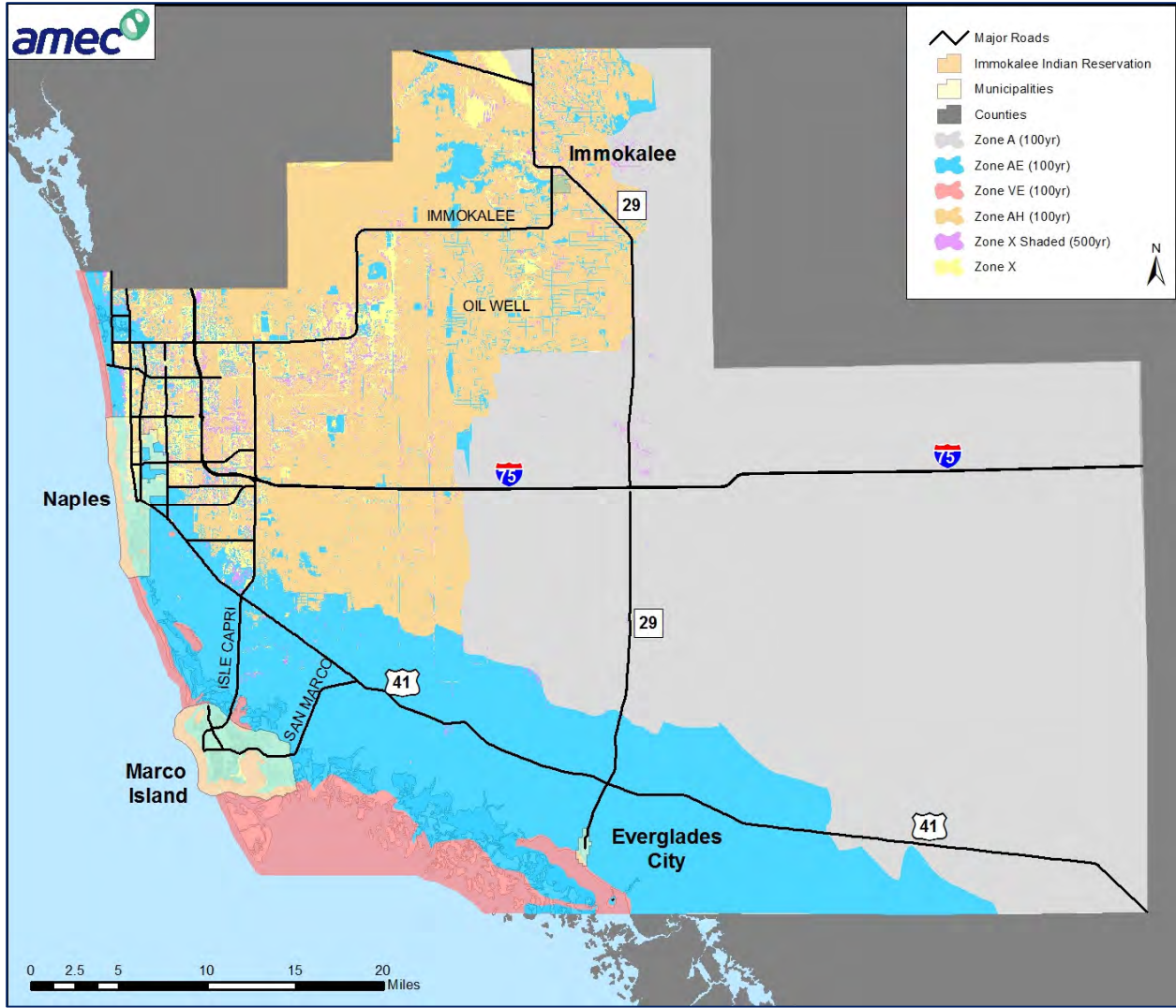
Participation in the NFIP allows for the federal government to make flood insurance available within the community as a financial protection against flood losses. Since floods have an annual probability of occurrence, have a known magnitude, depth and velocity for each event, and in most cases, have a map indicating where they will occur, they are in many ways often the most predictable and manageable hazard.

Regulated floodplains are illustrated on inundation maps called Digital Flood Insurance Rate Maps (DFIRMs). It is the official map for a community on which FEMA has delineated both the special flood hazard areas (SFHAs) and the risk premium zones applicable to the community. SFHAs represent the areas subject to inundation by the 1-percent-annual chance flood event. Structures located within the SFHA have a 26-percent chance of flooding during the life of a standard 30-year mortgage. Flood zones are geographic areas that FEMA has defined according to varying levels of flood risk and type of flooding. Flood prone areas were identified within Collier County using the most current FIS and associated DFIRMs developed by FEMA dated May 16, 2012. Collier County’s ordinance adoption date was January 24, 2012 with an effective date of March 30, 2012 for development application compliance, and May 16, 2012 for flood insurance compliance. Table 4-9 summarizes the flood insurance zones identified by the DFIRMs.

**Table 4-9 – Mapped Flood Insurance Zones within Collier County**

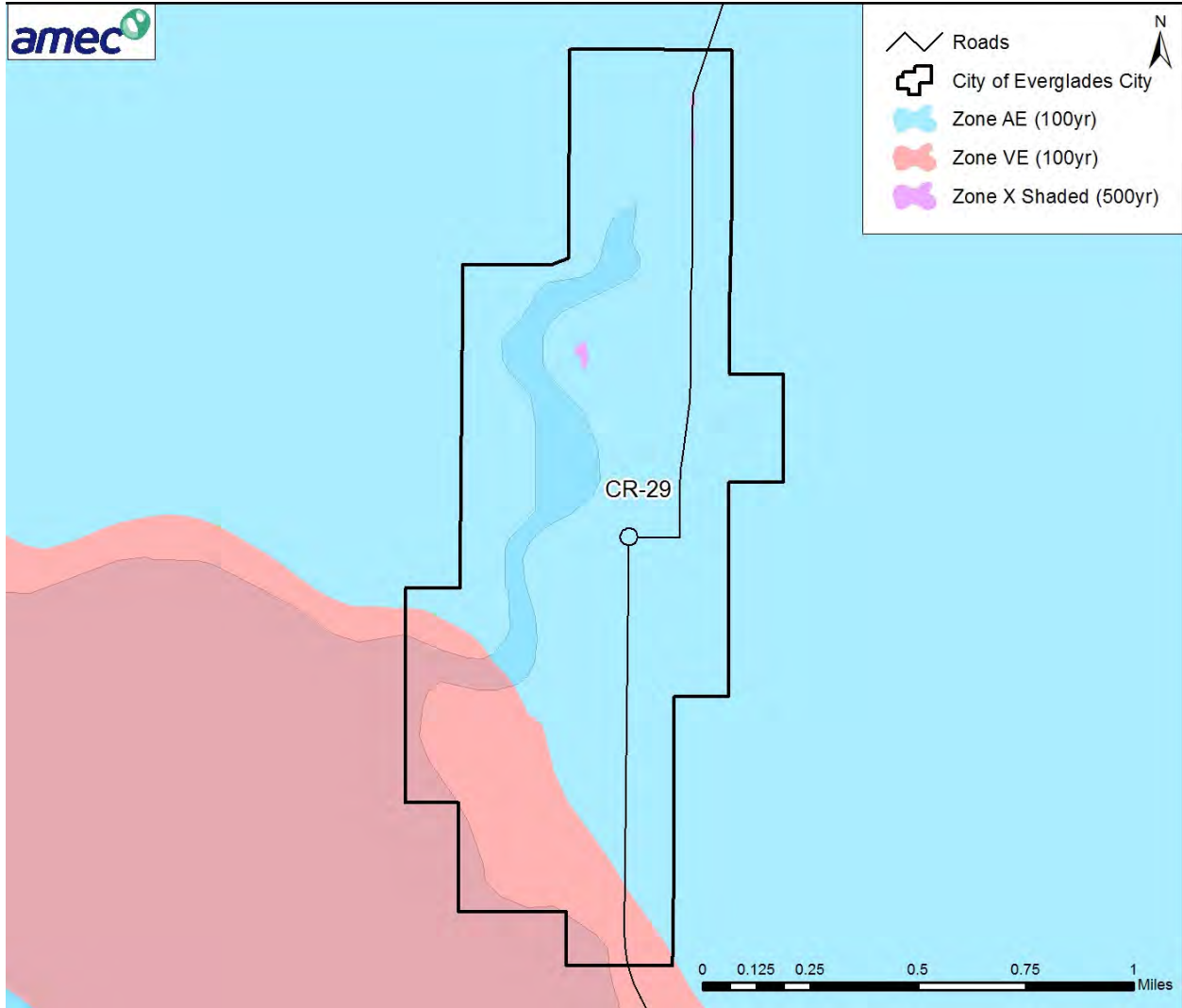
Zone	Description
<b>VE</b>	Also known as the coastal high hazard areas. They are areas subject to high velocity water including waves; they are defined by the 1% annual chance (base) flood limits (also known as the 100-year flood) and wave effects 3 feet or greater. The hazard zone is mapped with base flood elevations (BFEs) that reflect the combined influence of stillwater flood elevations, primary frontal dunes, and wave effects 3 feet or greater.
<b>AE</b>	AE Zones, also within the 100-year flood limits, are defined with BFEs that reflect the combined influence of stillwater flood elevations and wave effects less than 3 feet. The AE Zone generally extends from the landward VE zone limit to the limits of the 100-year flood from coastal sources, or until it reaches the confluence with riverine flood sources. The AE Zones also depict the SFHA due to riverine flood sources, but instead of being subdivided into separate zones of differing BFEs with possible wave effects added, they represent the flood profile determined by hydrologic and hydraulic investigations and have no wave effects.
<b>AH</b>	Areas subject to inundation by 1-percent-annual-chance shallow flooding (usually areas of ponding) where average depths are 1–3 feet. BFEs derived from detailed hydraulic analyses are shown in this zone.
<b>A</b>	Areas subject to inundation by the 1-percent-annual-chance flood event generally determined using approximate methodologies. Because detailed hydraulic analyses have not been performed, no Base Flood Elevations (BFEs) or flood depths are shown. Mandatory flood insurance purchase requirements and floodplain management standards apply.
<b>0.2% Annual Chance (shaded Zone X) or X-500</b>	Moderate risk areas within the 0.2-percent-annual-chance floodplain, areas of 1-percent-annual-chance flooding where average depths are less than 1 foot, areas of 1-percent-annual-chance flooding where the contributing drainage area is less than 1 square mile, and areas protected from the 1-percent-annual-chance flood by a levee. No BFEs or base flood depths are shown within these zones. (Zone X (shaded) is used on new and revised maps in place of Zone B.)
<b>Zone X (unshaded)</b>	Minimal risk areas outside the 1-percent and .2-percent-annual-chance floodplains. No BFEs or base flood depths are shown within these zones. (Zone X (unshaded) is used on new and revised maps in place of Zone C.)





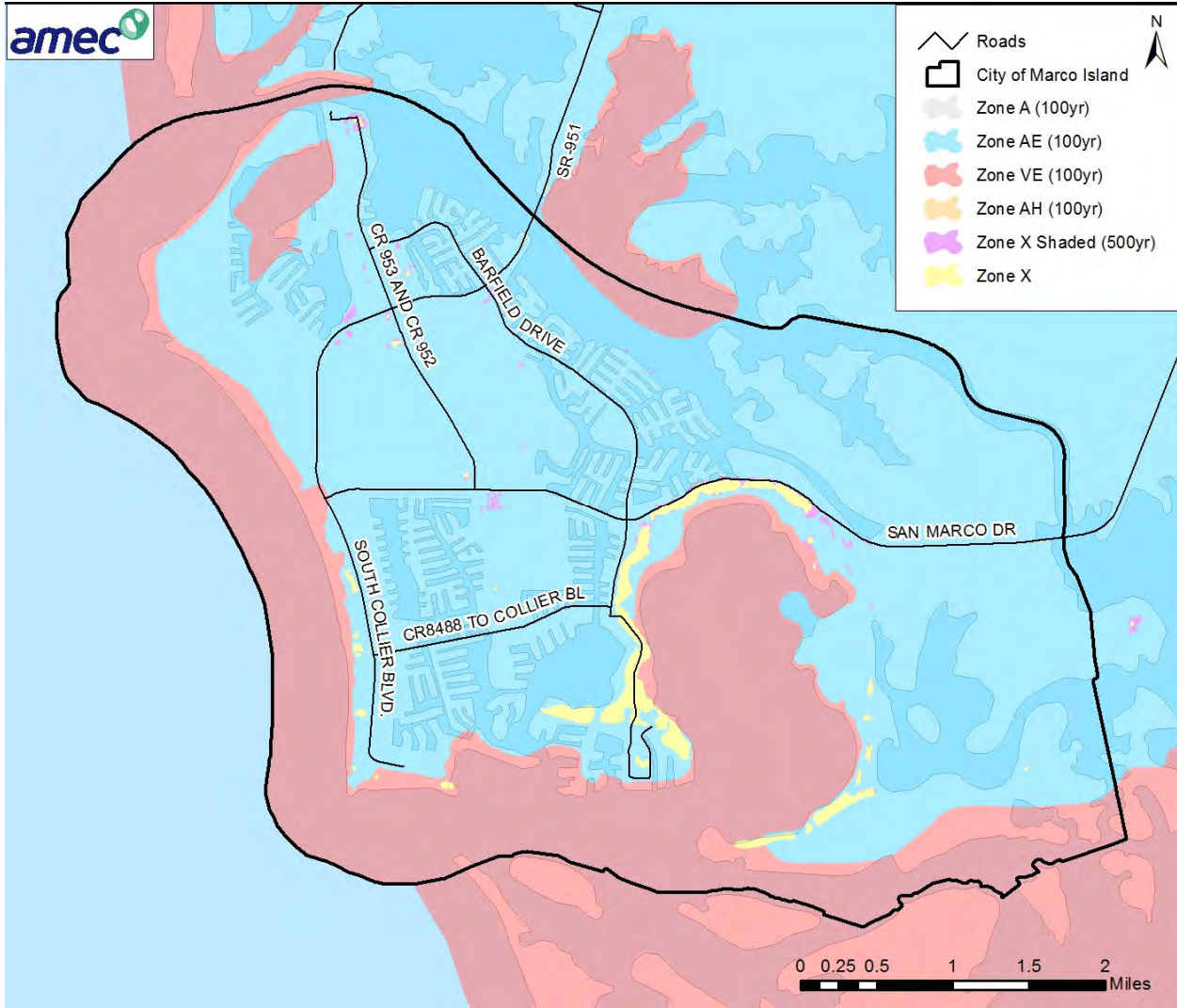
**Figure 4-11- Collier County DFIRM Flood Zones**

Figure 4-11 reflects the mapped flood insurance zones for Collier County. The coastal portions of the county are comprised of Zone VE and Zone AE SFHAs. The northwestern portion of the county is primarily Zone AH with small areas of Zone AE. The eastern portion of the county is primarily Zone A. A summary of acreage by flood zone is as follows: Zone VE (57,626 Acres); Zone AE (296,071 Acres); Zone AH (280,608 Acres); Zone A (660,494 Acres); Zone X 500-yr (19,980 Acres); and Zone X unshaded (37,236 Acres).



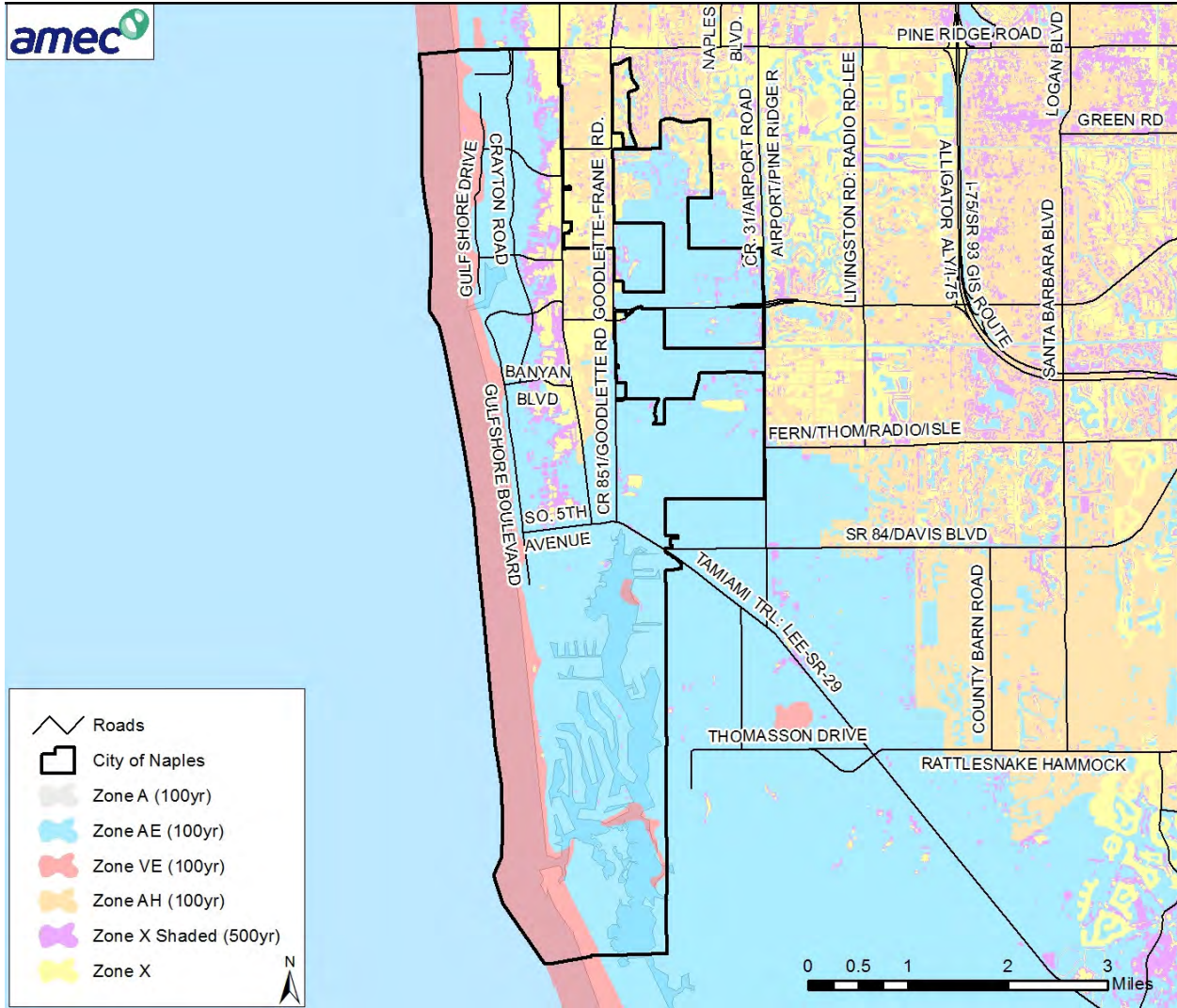
**Figure 4-12 - City of Everglades City DFIRM Flood Zones**

Figure 4-12 reflects the mapped flood insurance zones for the City of Everglades City. The southwestern portion of the City contains a Zone VE SFHA while the remainder of the City is covered by Zone AE with a small pocket of Zone X (500-yr). A summary of acreage by flood zone is as follows: Zone VE (148 Acres); Zone AE (608 Acres); and Zone X 500-yr (1 Acre).



**Figure 4-13 - City of Marco Island DFIRM Flood Zones**

Figure 4-13 reflects the mapped flood insurance zones for the City of Marco Island. The City of Marco Island is comprised primarily of Zone VE and Zone AE SFHAs with small areas of Zone X (500-yr and unshaded). A summary of acreage by flood zone is as follows: Zone VE (5,623 Acres); Zone AE (9,858 Acres); and Zone X 500-yr (51 Acres); and Zone X unshaded (236 Acres).



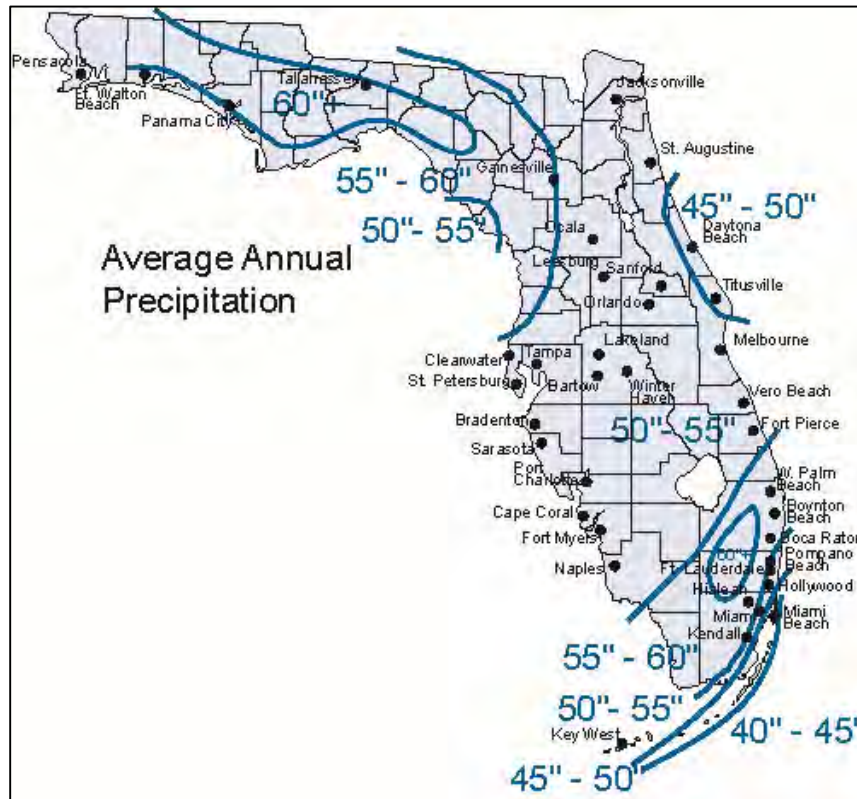
**Figure 4-14 - City of Naples DFIRM Flood Zones**

Figure 4-14 reflects the mapped flood insurance zones for the City of Naples. The City of Naples is comprised primarily of Zone VE and Zone AE SFHAs with areas of Zone AH and small areas of Zone X (500-yr and unshaded) in the north central portion of the City. A summary of acreage by flood zone is as follows: Zone VE (2,998 Acres); Zone AE (7,198 Acres); Zone AH (450 Acres); Zone X 500-yr (597 Acres); and Zone X unshaded (772 Acres).

The NFIP utilizes the 100-year flood as a basis for floodplain management. The FIS defines the probability of flooding as flood events of a magnitude which are expected to be equaled or exceeded once on the average during any 100 year period (recurrence intervals). Or considered another way, properties within a 100-year flood zone have a one percent probability of being equaled or exceeded during any given year. Mortgage lenders require that owners of properties with federally-backed mortgages located within SFHAs purchase and maintain flood insurance policies on their properties. Consequently, newer and recently purchased properties in the community are insured against flooding. Due to the risk of flooding from hurricanes, most property owners in the County, even if the property is not located in a SFHA, should be encouraged to purchase and maintain flood insurance policies.

### Past Occurrences

Collier County is located within a sub-tropical environment and is subject to intense thunderstorms and tropical cyclones (hurricanes). Roughly 80% of the 53.5" average annual rainfall occurs during the months of May through October, with approximately 65% of that occurring during the peak rainfall months of July through September. Flooding can occur in Collier County year-around but is most frequent during the summer months which often bring persistent thunderstorms, and in late summer the heavy rains associated with tropical storms and hurricanes are more prevalent. Past occurrences for tropical storms and hurricanes can be found in Section 4.2.6.



Source: Florida Climate Center, Florida State University

**Figure 4-15 - Average Annual Precipitation for Florida**

Table 4-10 shows the flood events from causes other than hurricanes or tropical storms reported by the NCDC since 1950 for Collier County. NCDC receives Storm Data from the National Weather Service. The National Weather service receives their information from a variety of sources, which include but are not limited to: county, state and federal emergency management officials, local law enforcement officials, skywarn spotters, NWS damage surveys, newspaper clipping services, the insurance industry and the general public, among others. The National Weather Service makes a best guess for damages using all available data at the time of the publication. Property and Crop damage should be considered as a broad estimate.

**Table 4-10 - NCDC Flooding in Collier County – January 1950 to May 2014**

Location	Date	Event Type	Injuries/Deaths	Damages
Naples	09/20/1999	Flash Flood	0/0	\$200,000
Immokalee	07/04/2000	Flash Flood	0/0	\$0
Marco	07/23/2001	Flash Flood	0/0	\$150,000
West Portion	09/29/2003	Flash Flood	0/0	\$100,000

Location	Date	Event Type	Injuries/Deaths	Damages
Immokalee	08/30/2006	Flash Flood	0/0	\$0
Marco	07/16/2008	Flash Flood	0/0	\$10,000
Coastal Collier	12/30/1997	Flood	0/0	\$0
Collier County	05/28/1998	Flood	0/0	\$0
Naples	09/07/2000	Flood	0/0	\$0
Naples	09/11/2000	Flood	0/0	\$0
Coastal Collier	06/26/2012	Coastal Flood	0/0	\$70,000
Marco	07/12/1998	Heavy Rain	0/0	\$0
Marco Is Arpt	07/20/1998	Heavy Rain	0/0	\$0
Naples	09/28/2001	Heavy Rain	0/0	\$0
Golden Gate	06/12/2005	Heavy Rain	0/0	\$0
Golden Gate	02/03/2006	Heavy Rain	0/0	\$60,000
Evans Pines	04/06/2008	Heavy Rain	0/0	\$0

Source: NCDC

Table 4-11 shows the flood events from causes other than hurricanes or tropical storms reported by SHELDUS from 1960 through present. SHELDUS™ applies conservative estimates to losses. Whenever losses are reported as a range (e.g., \$5,000 to \$50,000), SHELDUS™ selects the lower bound of the range (e.g., \$5,000). Losses for multi-county events are distributed equally across counties with the exception of fatalities and injuries. If details on the location of fatalities and injuries are provided in the original data, SHEDUS will reflect it. For events involving multiple hazards, losses were distributed equally across hazard types.

**Table 4-11 - SHELDUS Flooding Events in Southern Florida - 1960 to 2014**

Date	Hazard Type	Injuries/Fatalities	Crop Damage	Property Damage
05/1996	Coastal	1/1	\$0	\$0
09/1997	Coastal	0/2	\$0	\$0
06/1998	Coastal	0/1	\$0	\$0
08/2008	Coastal	0/0	\$0	\$64,919
10/1974	Flooding	0/0	\$656	\$65,629
06/1992	Flooding	0/0	\$7,547	\$754,736
09/1994	Flooding	0/0	\$0	\$1,455
10/1995	Flooding	0/0	\$56,557,802	\$76,429
09/1999	Flooding	0/0	\$0	\$279,660
07/2001	Flooding	0/0	\$0	\$197,309
09/2003	Flooding	0/0	\$0	\$126,607
07/2008	Flooding	0/0	\$0	\$10,819
06/2012	Flooding	0/0	\$0	\$71,025
08/2012	Flooding	0/0	\$0	\$6,087,885
02/1969	Severe Storm/Thunder Storm	0/0	\$0	\$15,632
03/1969	Severe Storm/Thunder Storm	0/0	\$0	\$9,309
06/1991	Severe Storm/Thunder Storm	0/0	\$0	\$85
07/1991	Severe Storm/Thunder Storm	4/0	\$0	\$17,104
07/1992	Severe Storm/Thunder Storm	0/0	\$0	\$83
08/1992	Severe Storm/Thunder Storm	0/0	\$0	\$83
02/2006	Severe Storm/Thunder Storm	0/0	\$0	\$69,332

Source: SHELDUS v13.1

The following provides details on flood events detailed in the NCDC database and from the Southwest Florida Water Management District.

**May 28, 1998** - Street flooding and overflowing canals resulted as a line of thunderstorms dumped near three inches of rain in the morning hours. The Collier County Government Center measured 2.73 inches between 7:30 and 11:45 am.

**July 20, 1998** – Rainfall was estimated at three inches in one half hour at Marco Island Airport.

**September 20, 1999** - Eight inches of rain fell during the afternoon of September 20 causing major street flooding which submerged six vehicles and caused minor flooding to 34 structures in Naples.

**July 23, 2001** - At least four residences and 20 vehicles were damaged by flood waters on Marco Island and in East Naples. 48-hour rainfall amounts of 4 to 10 inches of rain were measured over southwest Florida as a trough of low pressure stalled in the eastern Gulf of Mexico. Radar estimated 8-12 inches of rain fell over a 96-hour period in Marco Island. Strong onshore winds caused some minor tidal flooding of streets.

**September 28, 2001** – Between 3 and 5 inches of rain with local amounts of 8 inches caused street flooding in Naples.

**September 29, 2003** - Very heavy rainfall fell across southwest Florida with radar estimated amounts of 8 to 10 inches. Naples measured a record 6.99 inches. The resulting flood closed numerous roads in Collier County. Numerous cars were stalled. Houses and businesses including a shopping mall suffered minor flooding damage.

**July 16, 2008** - A combination of 6-8 inches of rain over a short period of time and high tide caused flooding on Marco Island. Coconuts, palm fronds, and plastic bags also clogged storm drains at some locations exacerbating the flooding. One towing company on Marco Island pulled out 35 to 40 cars alone. Water reached around 2 feet deep in some roadways and a few inches deep in some residences. Several roads were closed, including the main bridge connecting Marco Island to the mainland.

**June 26, 2012** – Persistent and strong southerly winds pushed water onshore over southern Collier County in the Everglades City area. Minor flooding occurred over several consecutive high tide cycles beginning on June 23rd, with the highest water levels occurring during the high tide cycle of the morning of June 26th. Streets in Everglades City were flooded, damaging roads and water pumps.

#### **Frequency/Likelihood of Future Occurrence**

**Occasional** - By definition of the 1-percent-annual-chance flood event, Collier County has a 1 percent chance of a 100-year or significant flood being equaled or exceeded in any given year.

#### **Climate Change and Flood: 100-/500-year**

With its populous coastal community and low topography, Collier County is particularly vulnerable to the effects of climate change and sea level rise. According to a 2009 report by the SFWMD titled *Climate Change and Water Management in South Florida*, average annual rainfall may increase or decrease slightly in the future but more frequent intense rainfall events are likely to occur with longer dry periods in between. Heavy rainfall poses a threat to homes, businesses, and water control structures. If flooding were to reach new extremes, the water management system already in place may not be adequate to provide the necessary levels of flood protection according to the 2009 SFWMD report. Flooding could also further degrade water quality due to increased runoff, the loss of positive pressure in sewer systems, damage to septic systems, and pollutants washed into water bodies.

#### 4.2.5 Flood: Stormwater/Localized Flooding

##### Hazard/Problem Description

Localized stormwater flooding occurs when heavy rainfall and an accumulation of runoff overburden the stormwater drainage system within the community. Collier County has a natural terrain that is extremely flat. From a high point near Immokalee the drainage pattern is south and southwesterly toward the coast with an average slope of one foot per mile.

A Primary and a Secondary canal system form the major surface water / stormwater drainage network in the County. The Secondary system consists of a network of ditches, canals, weirs and pump stations that collect and convey stormwater run-off from neighborhoods and public roadside drainage systems. It is linked to, and operates in close cooperation with the Primary system. The Primary system consists of canals and water level control structures that collect and convey stormwater run-off from the Secondary system, roadways and neighborhoods. The major canals within Collier County are shown in Figure 4-16.

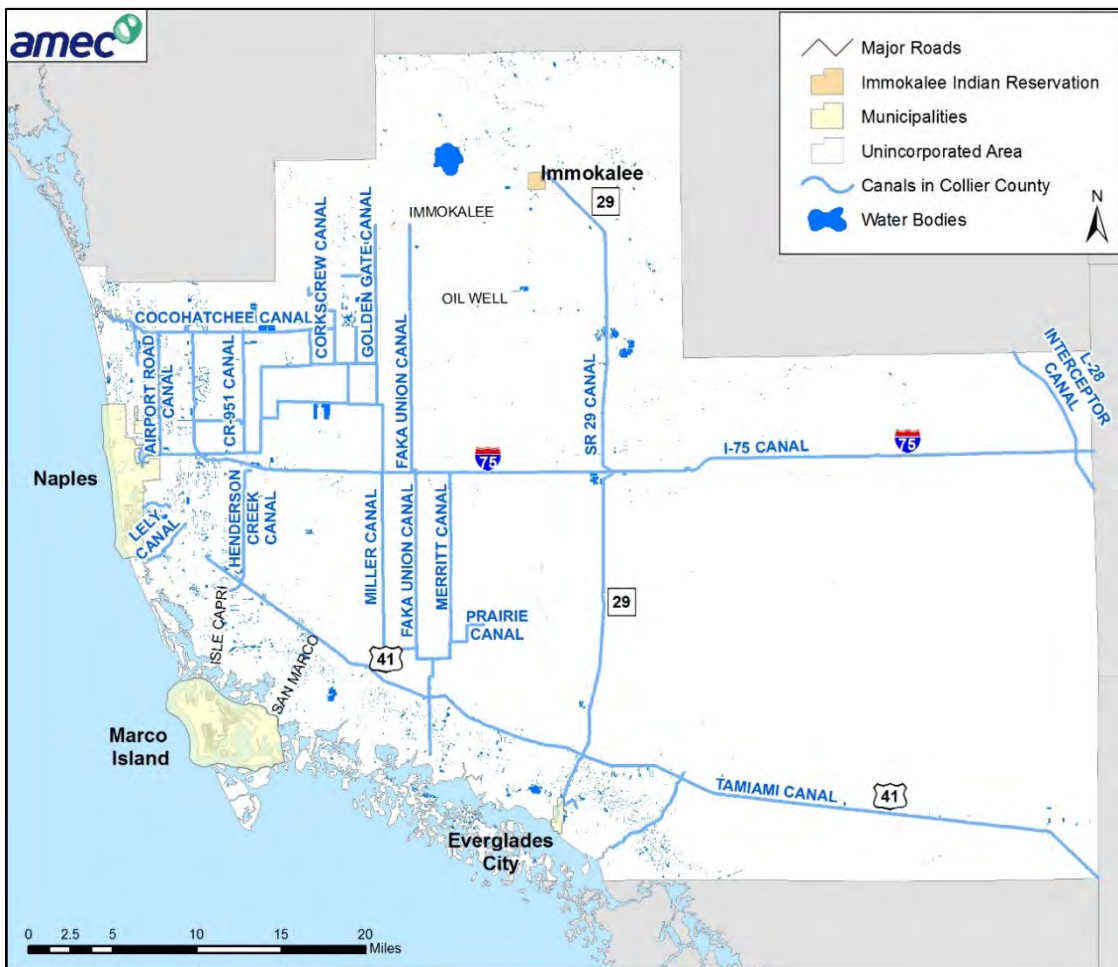


Figure 4-16 – Major Canals in Collier County

##### Past Occurrences

Figure 4-17 depicts a locator map for the areas of localized flooding within the unincorporated areas of Collier County identified by the FMPC. Figures 4-18 through 4-24 provide a more detailed view of each area.



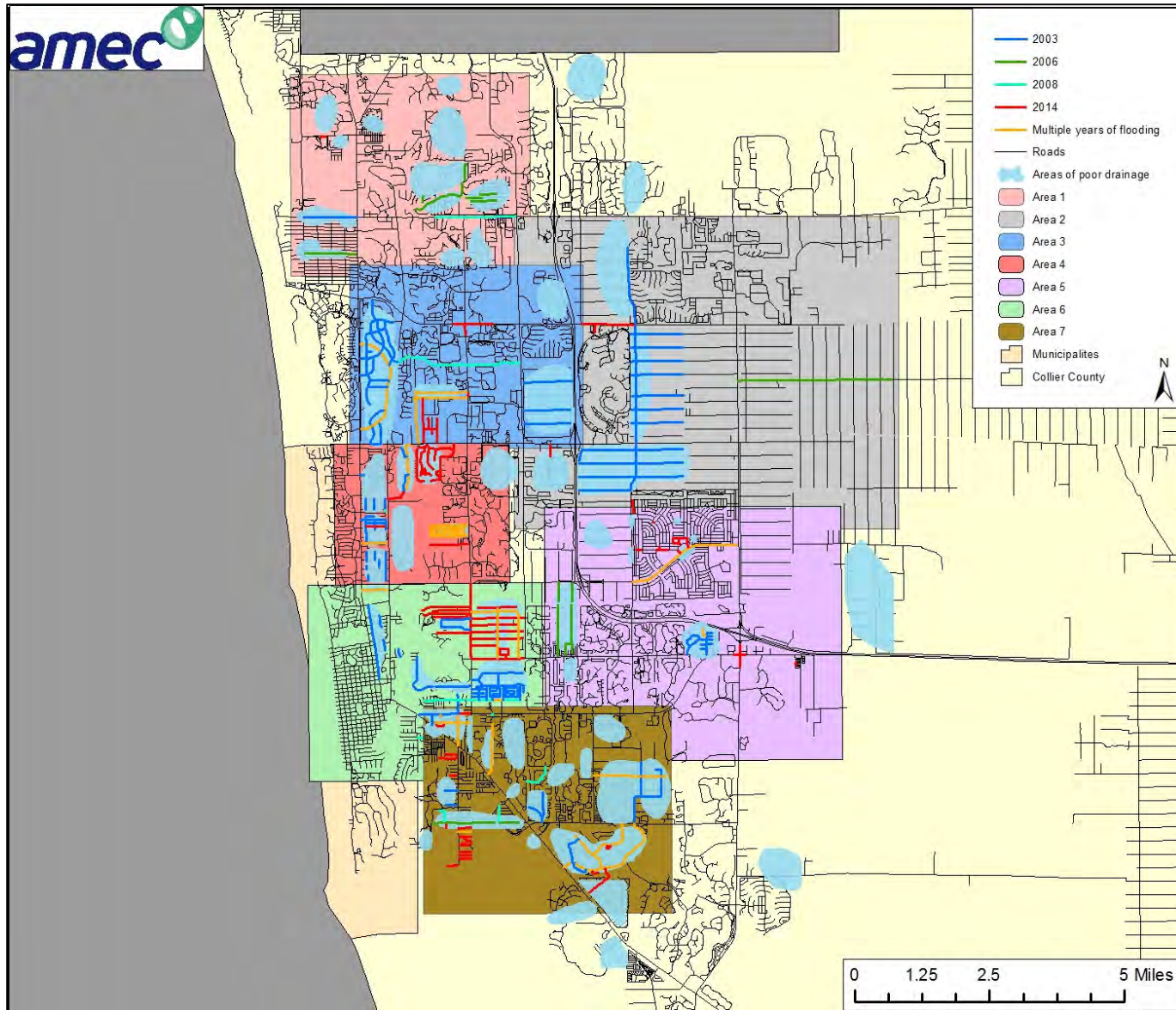


Figure 4-17 - Localized Flooding Locator Map for Collier County

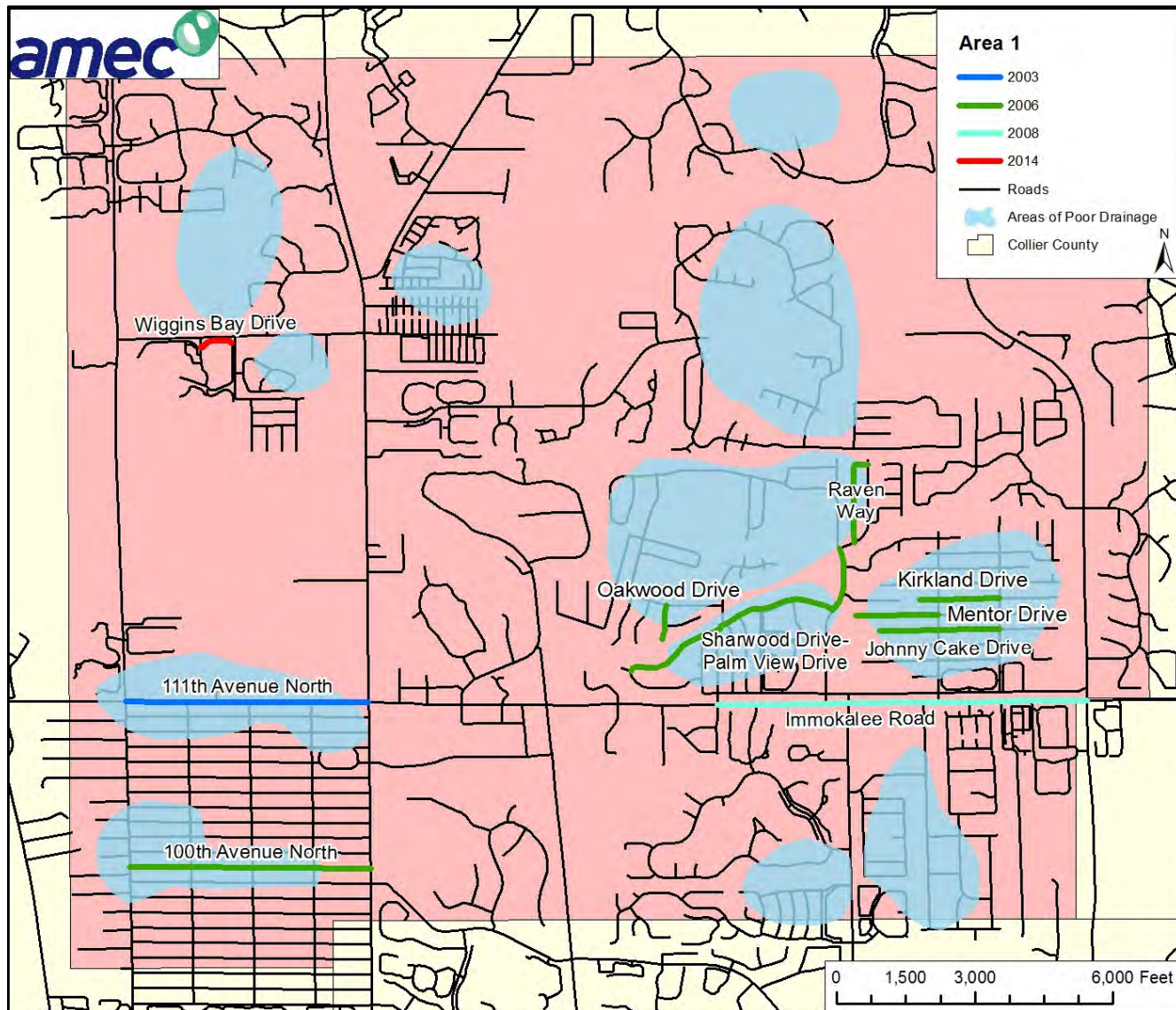


Figure 4-18 - Collier County Localized Flooding - Area 1

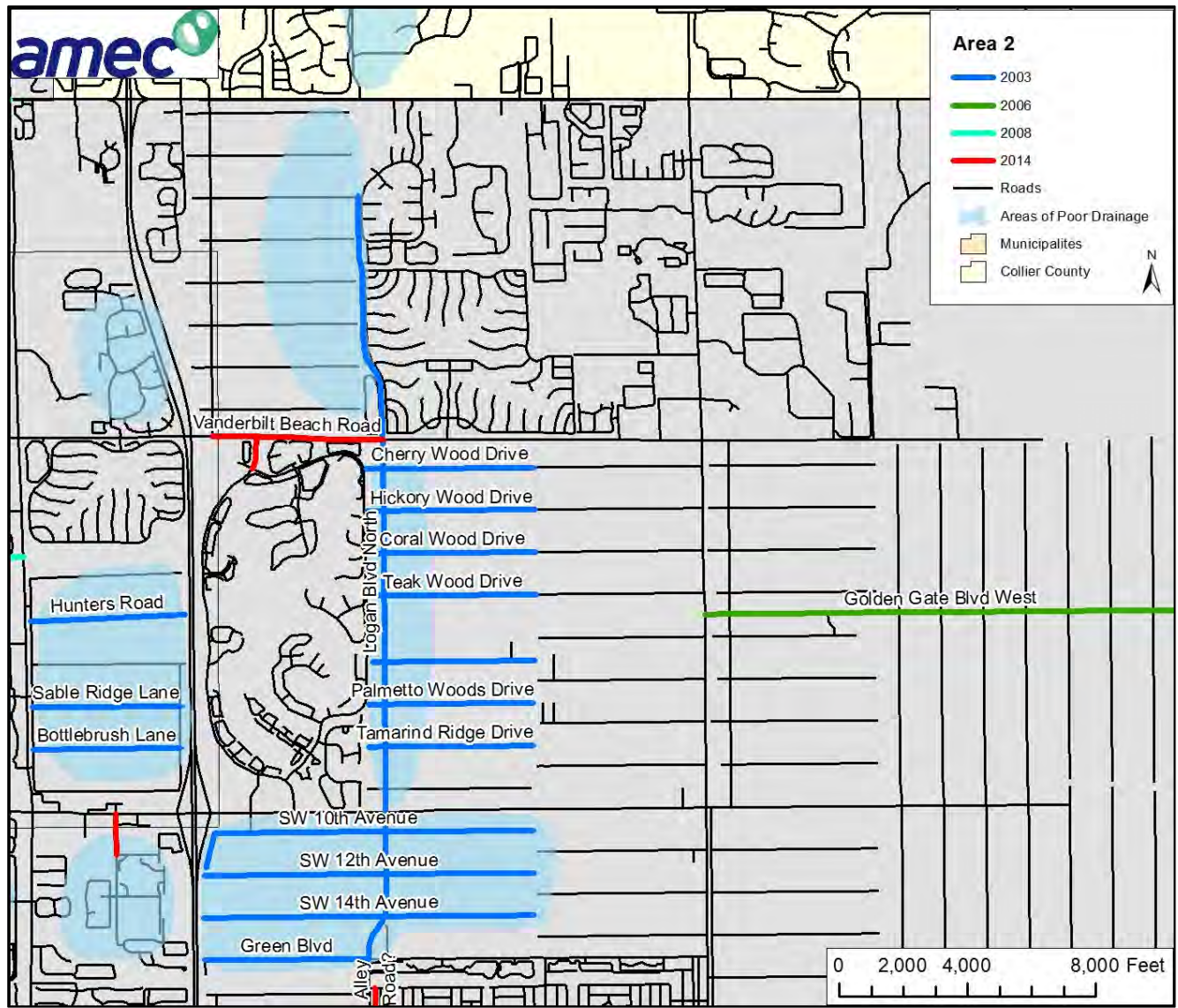


Figure 4-19 - Collier County Localized Flooding - Area 2

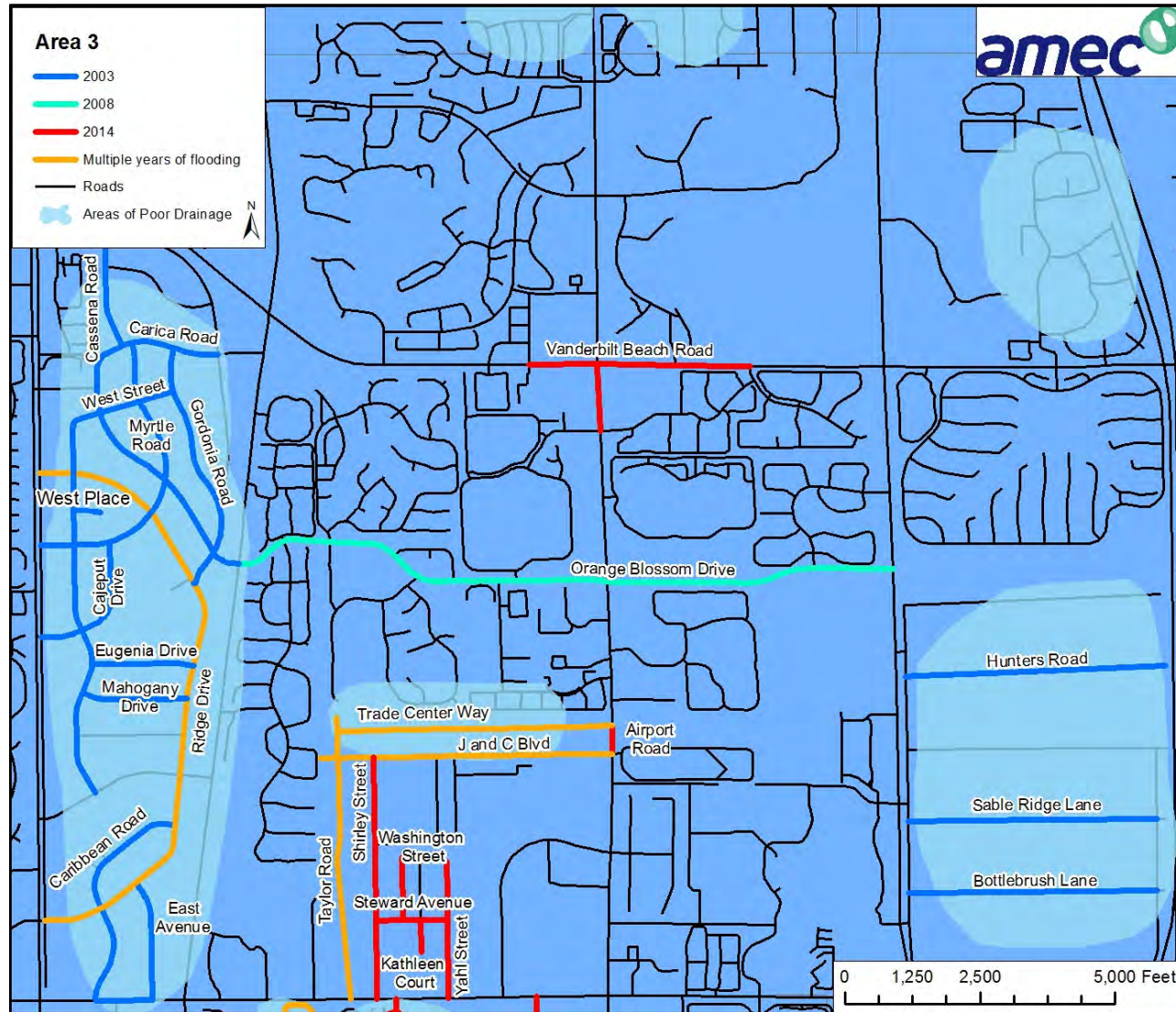


Figure 4-20 - Collier County Localized Flooding - Area 3

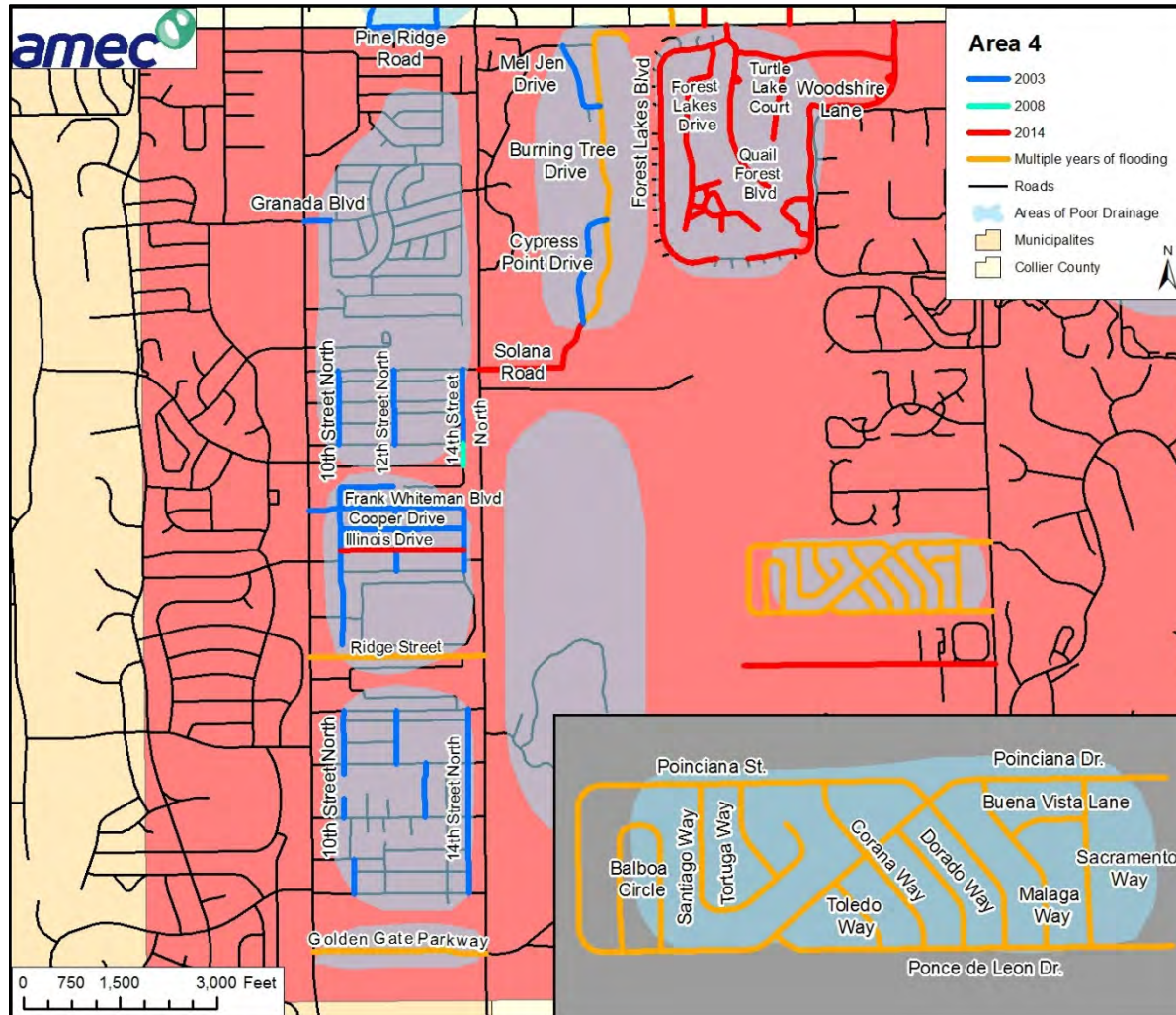


Figure 4-21 - Collier County Localized Flooding - Area 4

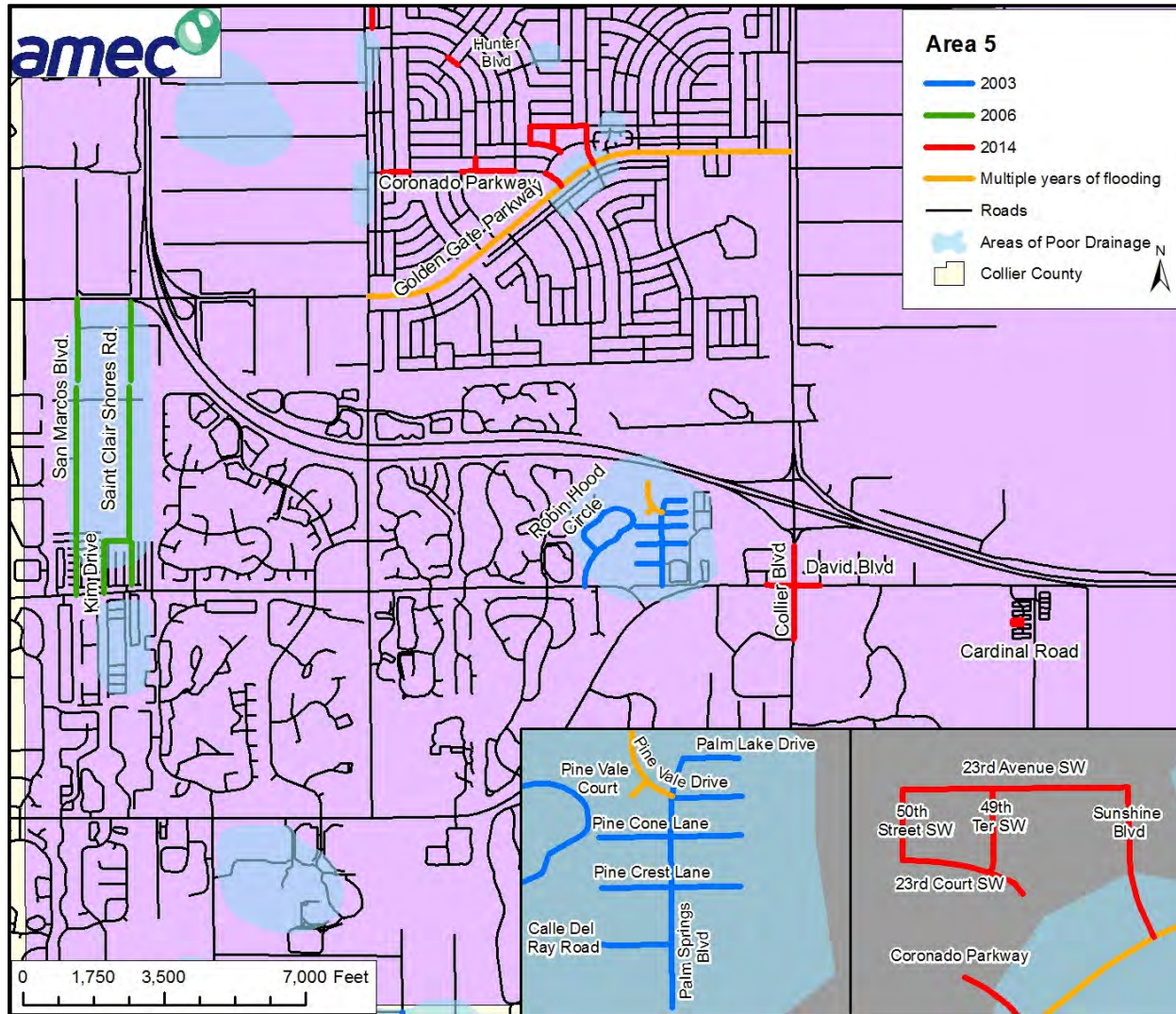


Figure 4-22 - Collier County Localized Flooding - Area 5

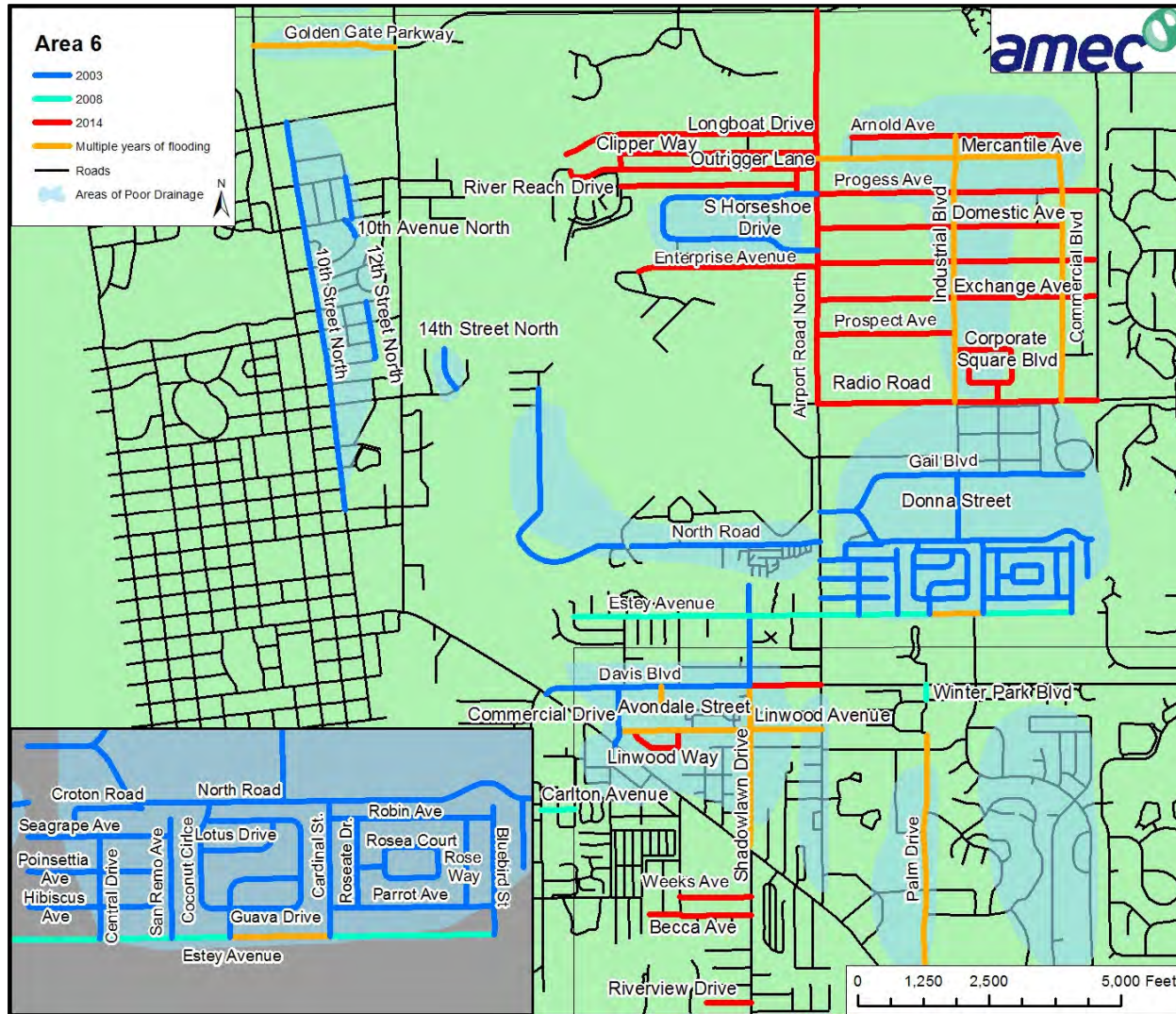


Figure 4-23 - Collier County Localized Flooding - Area 6

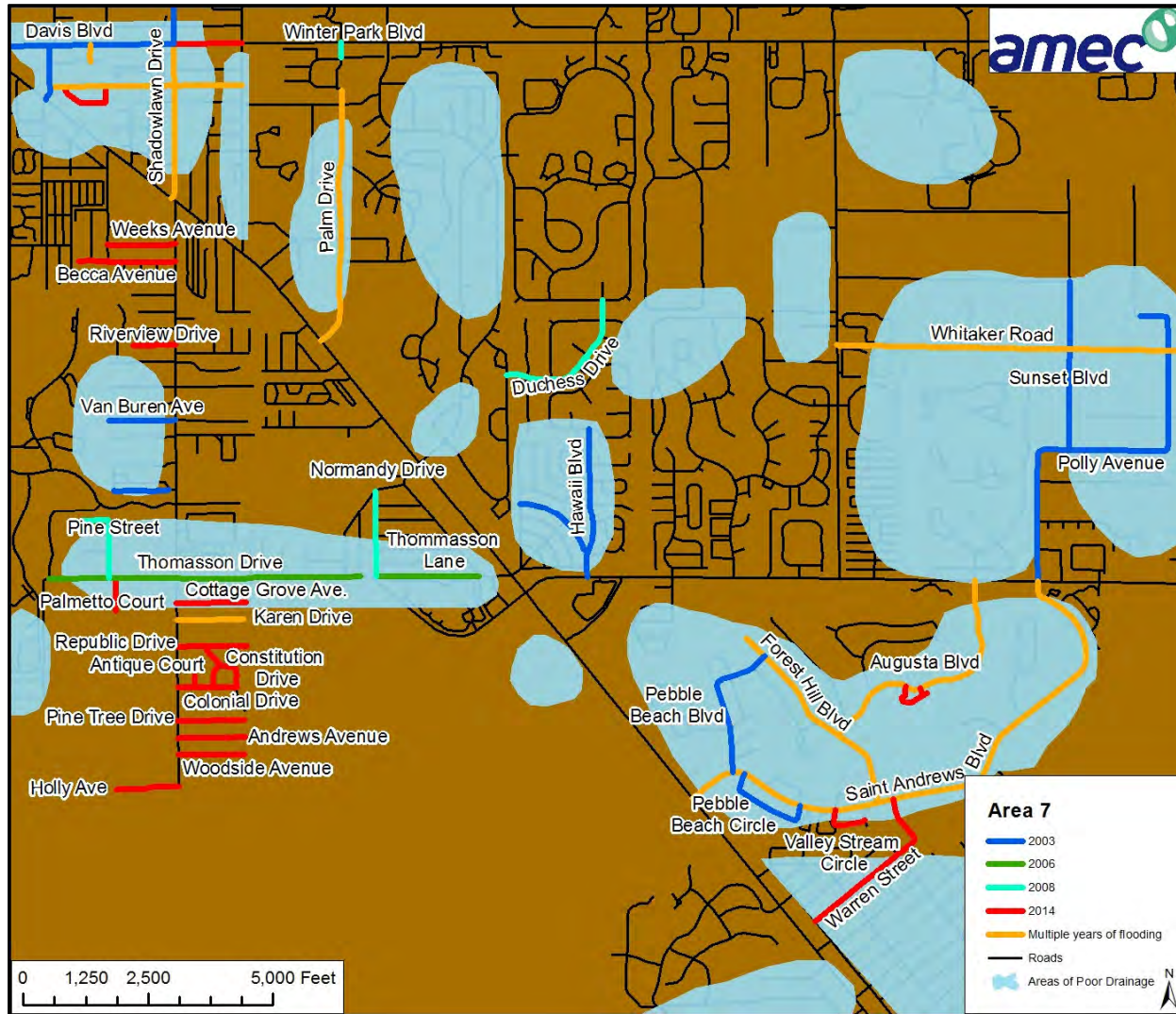


Figure 4-24 - Collier County Localized Flooding - Area 7



Figure 4-25 depicts the areas of localized flooding within the City of Marco Island identified by the FMPC. The areas of localized flooding include:

- S Collier Blvd. & Swallow Ave
- S Collier Blvd. & Winterberry Dr.
- S Collier Blvd. & San Marco Rd.
- S Barfield Dr. & Ludlow Rd.
- S Covewood St. & Dogwood Dr.
- Waterfall Ct.
- Clyburn St.
- Bermuda Rd., Tahiti Rd., Bayport Ave., Freeport Ave. & Kirkwood St.
- Lilac Ave. & Apple Ct.
- Buttonwood Ct.
- Fairlawn Ct.
- Ruppert Rd.
- Bald Eagle Dr. & Palm St

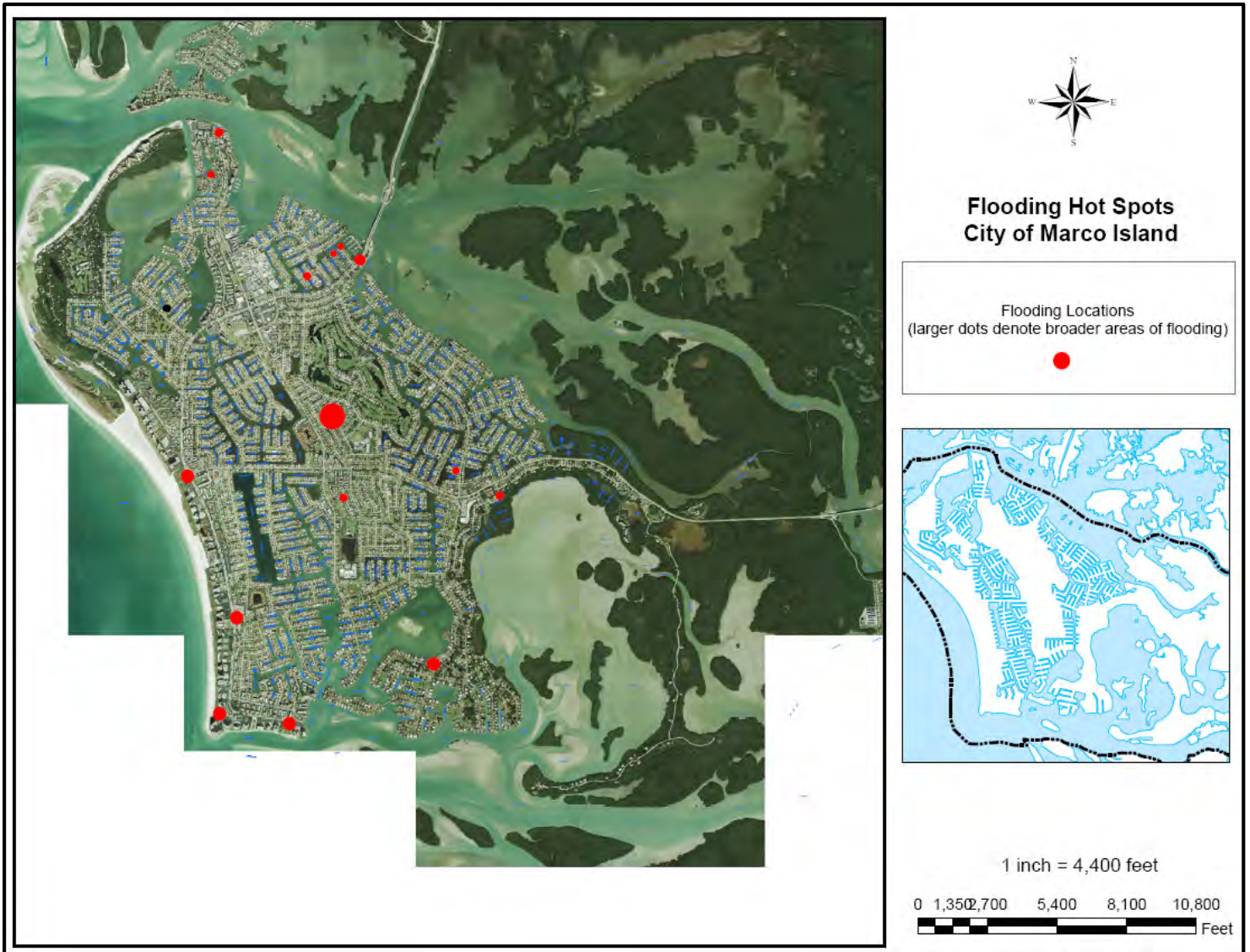


Figure 4-25 - Localized Flooding for City of Marco Island

Figure 4-26 depicts the areas of localized flooding within the City of Naples identified by the FMPC. The areas of localized flooding include:

- GCB at Central Ave
- GSB from 5th Ave South to 9th Ave South
- GSB from 12th Ave South to 17th Ave South
- GSB from 2nd Ave North to 4th Ave North
- GSB at Banyan Blvd
- Central Ave from 8th Street to Goodlette Frank Road
- 3rd Street North from 1st Ave North to 3 Ave North
- 6th Street North from 1st Ave North to 3rd Ave North
- Riviera Drive at Crayton Road
- Riviera Drive at Binnacle Drive
- Gordon Drive from 18th Ave South to 21st Ave South
- 10th Street North from 7th Ave North to 12th Ave North

Localized flooding may be caused by the following maintenance related issues:

**Clogged Inlets** – debris covering the catch basin inlets may contribute to an inadequate flow of stormwater into the system which may cause flooding near the structure. Debris and sediment accumulations within the catch basins and stormwater pipes may also reduce the efficiency of the system by reducing the carrying capacity.

**Blocked Drainage Outfalls** – debris blockage including sediment and vegetation or structural damage at drainage outfalls may prevent the system from discharging runoff which may lead to a back-up of stormwater within the system.

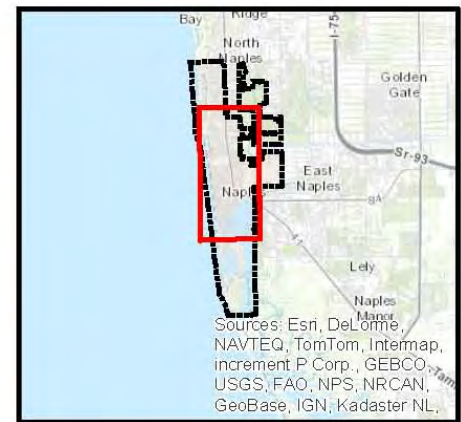
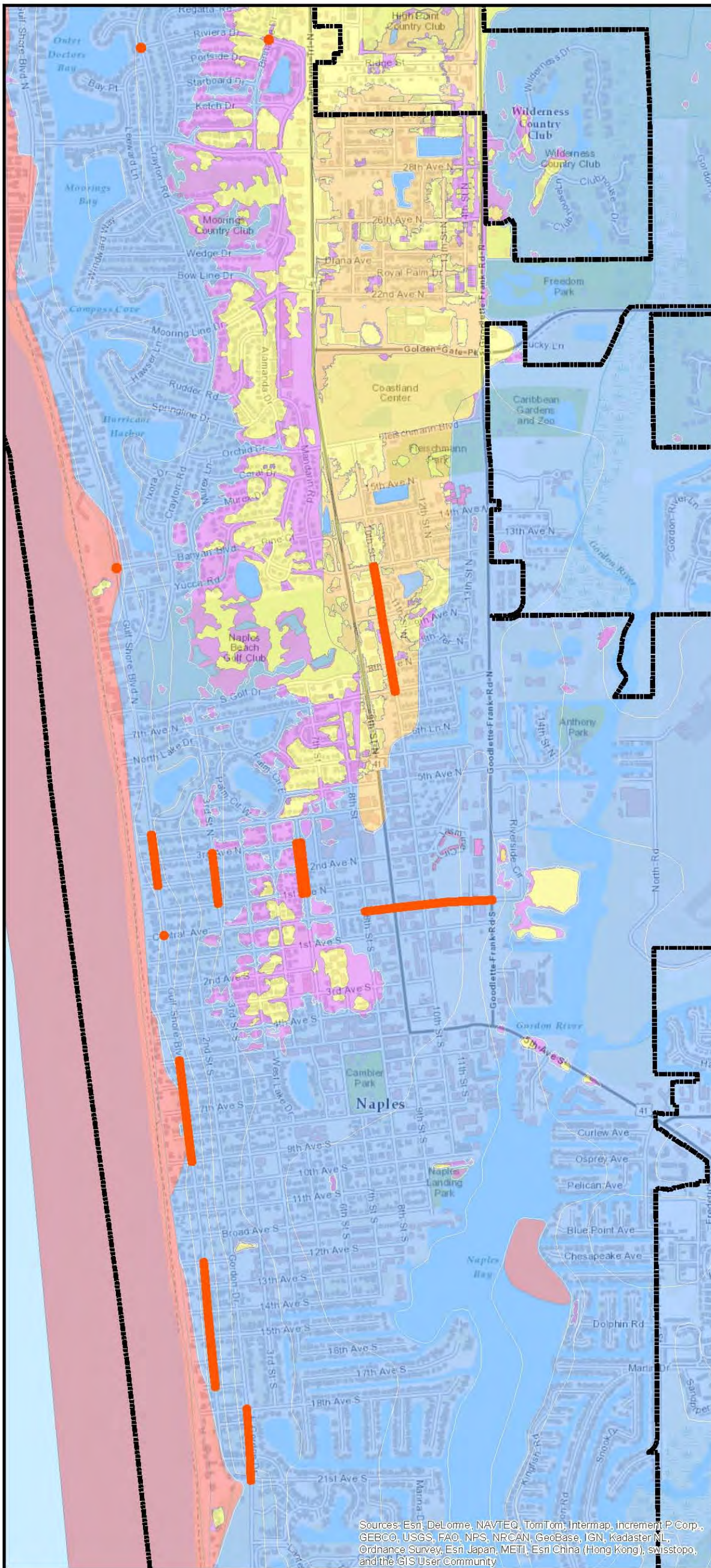
**Improper Grade** – poor grading around catch basin inlets may prevent stormwater from entering the catch basin as designed.

#### **Frequency/Likelihood of Future Occurrence**

**Highly Likely** - Due to the low elevations, a flat terrain, a consistent level of seasonally concentrated annual precipitation and the tidal influence on canal drainage resulting from heavy rainstorms, tropical storms, and hurricanes, it is highly likely that unmitigated properties will continue to experience localized flooding.

#### **Climate Change and Flood: Stormwater/Localized Flooding**

Climate change and sea level rise do have the potential to affect localized flooding in Collier County. The intensity of individual rainfall events is likely to increase which can overwhelm stormwater drainage systems. It is possible that average soil moisture and runoff could decline, however, due to increasing temperature, evapotranspiration rates and spacing between rainfall events.

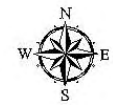


### Storm Water Flooding Hot Spots For The City of Naples, Florida

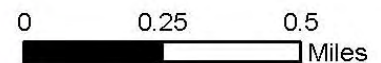
Date: 12/1/2014

#### Legend

- Flooding Areas
- City Limits
- FEMA Flood Zones**
- Flood Zone**
- X500
- A
- AE
- AH
- VE
- X



1 inch = 1,500 feet



Technology Services  
GIS Department  
295 Riverside Circle  
Naples, Florida 34102



Sources: Esri, DeLorme, NAVTEQ, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, and the GIS User Community

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Figure 4-26 – Localized Flooding for City of Naples

#### 4.2.6 Hurricane and Tropical Storm (including Storm Surge)

##### Hazard/Problem Description

A hurricane is a type of tropical cyclone or severe tropical storm that forms in the southern Atlantic Ocean, Caribbean Sea, Gulf of Mexico, and in the eastern Pacific Ocean. All Atlantic and Gulf of Mexico coastal areas are subject to hurricanes. The Atlantic hurricane season lasts from June to November, with the peak season from mid-August to late October.

While hurricanes pose the greatest threat to life and property, tropical storms and depressions also can be devastating. A tropical disturbance can grow to a more intense stage through an increase in sustained wind speeds. The progression of a tropical disturbance is described below.

- **Tropical Depression:** A tropical cyclone with maximum sustained winds of 38 mph (33 knots) or less.
- **Tropical Storm:** A tropical cyclone with maximum sustained winds of 39 to 73 mph (34 to 63 knots).
- **Hurricane:** A tropical cyclone with maximum sustained winds of 74 mph (64 knots) or higher. In the western North Pacific, hurricanes are called typhoons; similar storms in the Indian Ocean and South Pacific Ocean are called cyclones.
- **Major Hurricane:** A tropical cyclone with maximum sustained winds of 111 mph (96 knots) or higher, corresponding to a Category 3, 4 or 5 on the Saffir-Simpson Hurricane Wind Scale.

The Saffir-Simpson Hurricane Wind Scale classifies hurricanes by intensity into one of five categories as shown in Table 4-12. This scale estimates potential property damage. Hurricanes reaching Category 3 and higher are considered major hurricanes because of their potential for significant loss of life and damage. Category 1 and 2 storms are still dangerous, however, and require preventative measures.

**Table 4-12 – Saffir-Simpson Hurricane Wind Scale, 2012**

Category	Wind Speed (mph)	Potential Damage
1	74-95	<b>Very dangerous winds will produce some damage:</b> Well-constructed frame homes could have damage to roof, shingles, vinyl siding and gutters. Large branches of trees will snap and shallowly rooted trees may be toppled. Extensive damage to power lines and poles likely will result in power outages that could last a few to several days.
2	96-110	<b>Extremely dangerous winds will cause extensive damage:</b> Well-constructed frame homes could sustain major roof and siding damage. Many shallowly rooted trees will be snapped or uprooted and block numerous roads. Near-total power loss is expected with outages that could last from several days to weeks.
3	111-129	<b>Devastating damage will occur:</b> Well-built framed homes may incur major damage or removal of roof decking and gable ends. Many trees will be snapped or uprooted, blocking numerous roads. Electricity and water will be unavailable for several days to weeks after the storm passes.
4	130-156	<b>Catastrophic damage will occur:</b> Well-built framed homes can sustain severe damage with loss of most of the roof structure and/or some exterior walls. Most trees will

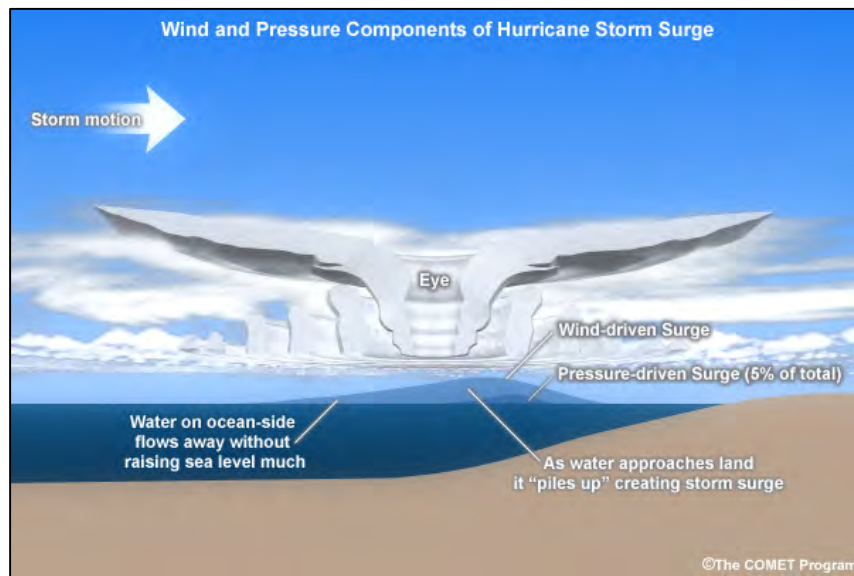
Category	Wind Speed (mph)	Potential Damage
		be snapped or uprooted and power poles downed. Fallen trees and power poles will isolate residential areas. Power outages will last weeks to possibly months. Most of the area will be uninhabitable for weeks or months.
5	≥ 157	<b>Catastrophic damage will occur:</b> A high percentage of framed homes will be destroyed, with total roof failure and wall collapse. Fallen trees and power poles will isolate residential areas. Power outages will last for weeks to possibly months. Most of the area will be uninhabitable for weeks or months.

Source: National Hurricane Center/NOAA

### Storm Surge

The greatest potential for loss of life related to a hurricane is from the storm surge. Storm surge is simply water that is pushed toward the shore by the force of the winds swirling around the storm as shown in Figure 4-27. This advancing surge combines with the normal tides to create the hurricane storm tide, which can increase the mean water level to heights impacting roads, homes and other critical infrastructure. In addition, wind driven waves are superimposed on the storm tide. This rise in water level can cause severe flooding in coastal areas, particularly when the storm tide coincides with the normal high tides.

The maximum potential storm surge for a particular location depends on a number of different factors. Storm surge is a very complex phenomenon because it is sensitive to the slightest changes in storm intensity, forward speed, size (radius of maximum winds-RMW), angle of approach to the coast, central pressure (minimal contribution in comparison to the wind), and the shape and characteristics of coastal features such as bays and estuaries. Other factors which can impact storm surge are the width and slope of the continental shelf. A shallow slope will potentially produce a greater storm surge than a steep shelf.



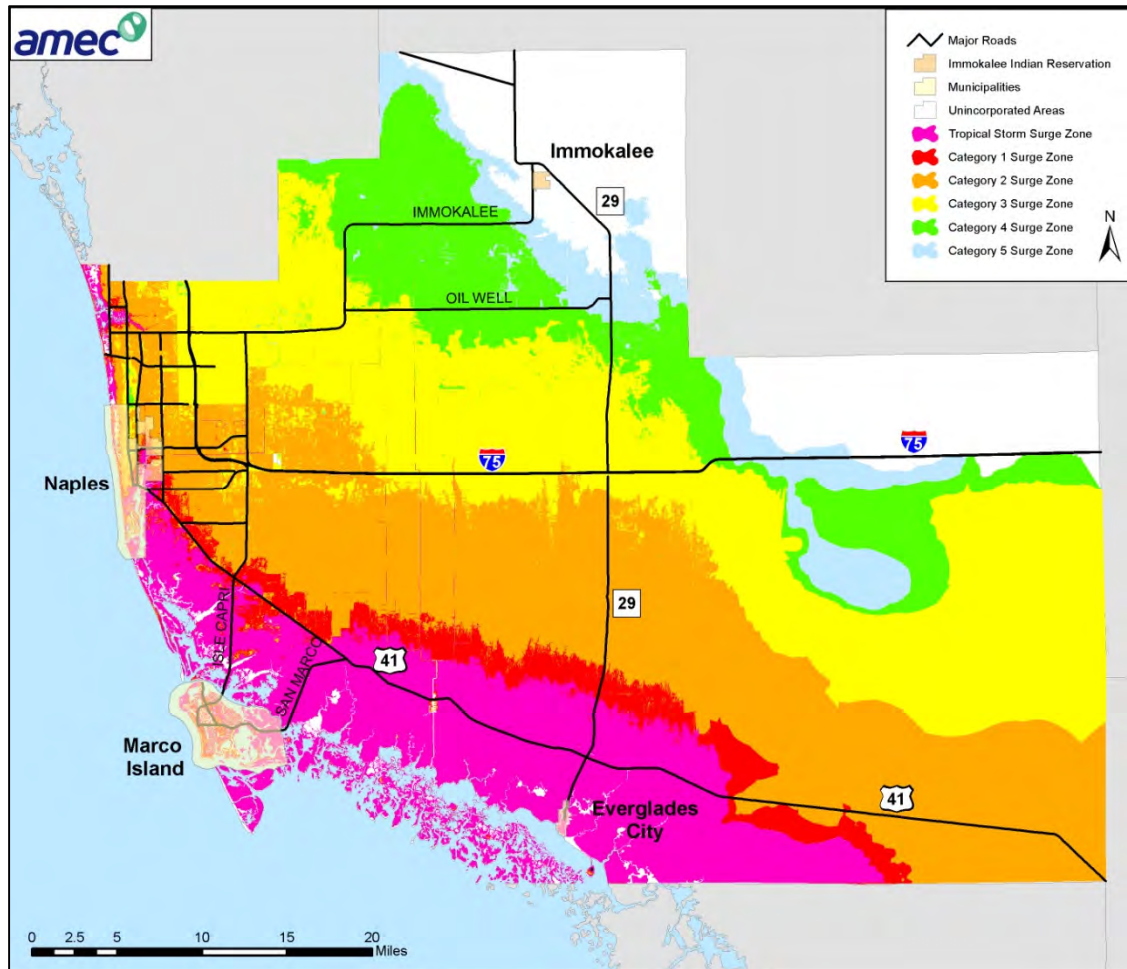
Source: NOAA/The COMET Program

**Figure 4-27 - Components of Hurricane Storm Surge**

### Storm Surge Mapping

The Sea, Lake and Overland Surges from Hurricanes (SLOSH) model is a computerized numerical model developed by the National Weather Service (NWS) to estimate storm surge heights resulting from historical, hypothetical, or predicted hurricanes by taking into account the atmospheric pressure, size, forward speed, and track data. These parameters are used to create a model of the wind field which drives the storm surge. The SLOSH model consists of a set of physics equations which are applied to a specific locale's shoreline, incorporating the unique bay and river configurations, water depths, bridges, roads, levees and other physical features.

Anticipated SLOSH model surge elevations for a tropical storm and category 1-5 hurricanes are shown for Collier County in Figure 4-28. The feature set depicting surge zones in this figure was created using a Surge Modeling application created for the Florida Statewide Regional Evacuation Update Study. The data was derived from National Hurricane Center SLOSH model runs on all the NOAA SLOSH basins throughout Florida. The runs create outputs for all different storm simulations from all points of the compass. Each direction has a MEOW (maximum envelope of water) for each category of storm (1-5), and all directions combined result in a MOMs (maximum of maximums) set of data. The MOMs are used in this surge model.



Source: Florida Division of Emergency Management (<http://www.floridadisaster.org>)

**Figure 4-28 – Storm Surge Zones for Collier County**

**Past Occurrences**

According to the 2012 Collier County Comprehensive Emergency Management Plan (CEMP), hurricanes/tropical storms provide the greatest flood threats to Collier County. A listing of all hurricanes/tropical storms that came within 75 nautical miles of Naples since 1851 is provided in Table 4-13. The coastal area of Collier County has been exposed to 81 hurricanes/tropical storms since 1851. (Source: <http://csc.noaa.gov/hurricanes>). Type and frequency are as follows:

Tropical Storm	26	(1 in 6.2 years)
CAT I Hurricane	18	(1 in 8.9 years)
CAT II Hurricane	9	(1 in 17.8 years)
CAT III Hurricane	13	(1 in 12.3 years)
CAT IV Hurricane	5	(1 in 32 years)
<u>CAT V Hurricane</u>	<u>10</u>	<u>(1 in 16 years)</u>
<b>TOTAL</b>	<b>81</b>	<b>(1 in 1.98 years)</b>

**Table 4-13 - Collier County Historical Hurricane Tracks**

Storm Name	Max Saffir-Simpson	Date
Not named 1859	TS	Oct. 16, 1859 to Oct. 18, 1859
Not named 1861	H1	Nov. 1, 1861 to Nov. 3, 1861
Not named 1865	H2	Oct. 18, 1865 to Oct. 25, 1865
Not named 1870	H2	Oct. 19, 1870 to Oct. 22, 1870
Not named 1873	H3	Sep. 26, 1873 to Oct. 10, 1873
Not named 1876	H3	Oct. 12, 1876 to Oct. 23, 1876
Not named 1878	TS	Jul. 1, 1878 to Jul. 3, 1878
Not named 1878	H2	Sep. 1, 1878 to Sep. 13, 1878
Not named 1888	H3	Aug. 14, 1888 to Aug. 24, 1888
Not named 1888	TS	Sep. 6, 1888 to Sep. 13, 1888
Not named 1889	TS	Oct. 5, 1889 to Oct. 11, 1889
Not named 1891	H3	Aug. 18, 1891 to Aug. 25, 1891
Not named 1891	TS	Oct. 4, 1891 to Oct. 10, 1891
Not named 1891	ET	Oct. 7, 1891 to Oct. 16, 1891
Not named 1892	TS	Jun. 9, 1892 to Jun. 16, 1892
Not named 1894	H3	Sep. 18, 1894 to Oct. 1, 1894
Not named 1895	TS	Oct. 13, 1895 to Oct. 17, 1895
Not named 1896	H2	Oct. 7, 1896 to Oct. 16, 1896
Not named 1897	TS	Sep. 20, 1897 to Sep. 25, 1897
Not named 1899	H2	Jul. 28, 1899 to Aug. 2, 1899
Not named 1901	H1	Aug. 2, 1901 to Aug. 18, 1901
Not named 1903	H1	Sep. 9, 1903 to Sep. 16, 1903
Not named 1904	H1	Oct. 12, 1904 to Oct. 21, 1904
Not named 1906	H2	Jun. 14, 1906 to Jun. 23, 1906
Not named 1906	H3	Oct. 8, 1906 to Oct. 23, 1906
Not named 1907	TS	Sep. 18, 1907 to Sep. 23, 1907
Not named 1909	TS	Jun. 26, 1909 to Jul. 4, 1909
Not named 1909	TS	Aug. 28, 1909 to Aug. 31, 1909

Storm Name	Max Saffir-Simpson	Date
Not named 1909	TS	Sep. 24, 1909 to Sep. 29, 1909
Not named 1910	H4	Oct. 9, 1910 to Oct. 23, 1910
Not named 1911	H1	Aug. 8, 1911 to Aug. 14, 1911
Not named 1916	ET	May. 13, 1916 to May. 18, 1916
Not named 1916	H2	Aug. 21, 1916 to Aug. 26, 1916
Not named 1916	TS	Nov. 11, 1916 to Nov. 16, 1916
Not named 1921	ET	Oct. 15, 1921 to Oct. 24, 1921
Not named 1924	H5	Oct. 14, 1924 to Oct. 23, 1924
Not named 1925	ET	Nov. 27, 1925 to Dec. 5, 1925
Not named 1926	H4	Sep. 11, 1926 to Sep. 22, 1926
Not named 1928	H1	Aug. 7, 1928 to Aug. 17, 1928
Not named 1929	H4	Sep. 22, 1929 to Oct. 4, 1929
Not named 1932	H1	Aug. 26, 1932 to Sep. 4, 1932
Not named 1934	TS	May. 27, 1934 to May. 31, 1934
Not named 1935	H5	Aug. 29, 1935 to Sep. 10, 1935
Not named 1935	H1	Oct. 30, 1935 to Nov. 8, 1935
Not named 1936	TS	Jun. 12, 1936 to Jun. 17, 1936
Not named 1936	H1	Jul. 27, 1936 to Aug. 1, 1936
Not named 1941	H3	Oct. 3, 1941 to Oct. 14, 1941
Not named 1944	H3	Oct. 12, 1944 to Oct. 23, 1944
Not named 1945	TS	Sep. 3, 1945 to Sep. 6, 1945
Not named 1945	H4	Sep. 12, 1945 to Sep. 20, 1945
Not named 1947	H5	Sep. 4, 1947 to Sep. 21, 1947
Not named 1947	H1	Oct. 9, 1947 to Oct. 16, 1947
Not named 1948	H3	Sep. 18, 1948 to Sep. 25, 1948
King 1950	H3	Oct. 13, 1950 to Oct. 19, 1950
How 1951	H2	Sep. 28, 1951 to Oct. 8, 1951
Not named 1952	ET	Feb. 2, 1952 to Feb. 5, 1952
Not named 1953	TS	Aug. 28, 1953 to Sep. 3, 1953
Hazel 1953	TS	Oct. 7, 1953 to Oct. 12, 1953
Judith 1959	H1	Oct. 17, 1959 to Oct. 21, 1959
Donna 1960	H5	Aug. 29, 1960 to Sep. 14, 1960
Florence 1960	TS	Sep. 17, 1960 to Sep. 27, 1960
Isbell 1964	H3	Oct. 8, 1964 to Oct. 17, 1964
Betsy 1965	H5	Aug. 27, 1965 to Sep. 13, 1965
Alma 1966	H3	Jun. 4, 1966 to Jun. 14, 1966
Abby 1968	H1	Jun. 1, 1968 to Jun. 13, 1968
Brenda 1968	H1	Jun. 17, 1968 to Jun. 26, 1968
Unnamed 1968	TD	Sep. 25, 1968 to Sep. 29, 1968
Gerda 1969	H3	Sep. 6, 1969 to Sep. 10, 1969
Jenny 1969	TS	Oct. 1, 1969 to Oct. 6, 1969
Unnamed 1971	TD	Aug. 12, 1971 to Aug. 16, 1971
Unnamed 1971	TD	Aug. 28, 1971 to Sep. 1, 1971
Dawn 1972	H1	Sep. 5, 1972 to Sep. 14, 1972
Unnamed 1976	TD	Jun. 11, 1976 to Jun. 12, 1976



Storm Name	Max Saffir-Simpson	Date
Dottie 1976	TS	Aug. 18, 1976 to Aug. 21, 1976
Dennis 1981	H1	Aug. 7, 1981 to Aug. 22, 1981
Bob 1985	H1	Jul. 21, 1985 to Jul. 26, 1985
Marco 1990	TS	Oct. 9, 1990 to Oct. 13, 1990
Ana 1991	TS	Jun. 29, 1991 to Jul. 5, 1991
Andrew 1992	H5	Aug. 16, 1992 to Aug. 28, 1992
Gordon 1994	H1	Nov. 8, 1994 to Nov. 21, 1994
Mitch 1998	H5	Oct. 22, 1998 to Nov. 9, 1998
Harvey 1999	TS	Sep. 19, 1999 to Sep. 22, 1999
Irene 1999	H2	Oct. 12, 1999 to Oct. 19, 1999
Charley 2004	H4	Aug. 9, 2004 to Aug. 15, 2004
Ivan 2004	H5	Sep. 2, 2004 to Sep. 24, 2004
Katrina 2005	H5	Aug. 23, 2005 to Aug. 31, 2005
Wilma 2005	H5	Oct. 15, 2005 to Oct. 26, 2005
Ernesto 2006	H1	Aug. 24, 2006 to Sep. 4, 2006
Fay 2008	TS	Aug. 15, 2008 to Aug. 28, 2008

Source: NOAA, Collier County 2012 CEMP

The following is a description of past occurrences of hurricanes and tropical storms as provided by the 2012 Collier County CEMP:

***Hurricane Donna (Cat 3) - 1960*** - was the last hurricane to affect Collier County to any great degree. It was a paralleling storm that hugged the coast from Everglades City to Bonita Shores. At the time of the hurricane, the County's population was approximately 15,600 including Everglades City and Naples. Storm surge with Donna occurred inland to the intersection of 6th Avenue South and 9th Street in the City of Naples.

***Hurricane Isbell (Cat 2) - 1964*** - entered the S.W. Florida coast just north of Cape Sable. There was little, if any, flooding associated with this storm over the populated area of the County.

***Hurricane Alma (Cat 2) - 1966*** - remained off the west coast of Florida until it made landfall south of Tallahassee. Its closest point of approach was 49 miles WSW of Naples. There are no reports of significant damage to Collier County.

***Tropical Storm Abby - 1968*** - was a paralleling storm off the Collier County coast. It had maximum winds of 57 knots and made landfall near Charlotte Harbor. No reports of significant flood damage to Collier County.

***Tropical Storm Jenny - 1969*** - had a similar track to Abby. It had maximum winds of 37 knots and made landfall near Sanibel Island. No reports of significant flood damage to Collier County.

***"No-Name" (Subtropical Storm) - 1974*** - the development of this subtropical storm followed by several days the development of a tropical storm near Vera Cruz, Mexico. As the tropical depression weakened, a new center formed in the eastern Gulf of Mexico and moved rapidly northeastward to the Tampa Bay area. Sustained winds of 30-40 knots with gusts to 55 knots were reported in the Naples area. Tides of 2-4 feet above normal occurred from Everglades City to Tampa Bay. Total rainfall ranged from 20 inches near Tampa to 10 inches elsewhere. There were three drownings in Florida and damage was estimated at \$10,000,000 in western Florida.

***Tropical Storm Dennis - 1981*** - made landfall near Cape Sable and exited the peninsula near Daytona Beach. No flood damage to Collier County. Maximum winds 35 knots.

***Hurricane Alberto (Cat 1) - 1982*** - was a near miss for Collier County. It formed off the Yucatan Peninsula and began moving NE toward Collier County before turning west and dissipating. Only minor damage reported in Collier County.

***No-Name Storm (Subtropical storm) - 1982*** - developed in the Central Gulf of Mexico and passed substantially to our north making landfall near Cedar Key. There was a considerable amount of beach erosion along the coast from the Lee County line to Marco Island. There were no residential structures destroyed or substantially damaged. Several bulkheads and rock revetments experienced minor damage in Naples and Marco Island. Several man-made dune structures seaward of the Coastal Construction Control Line (Collier County) received minor damage at Vanderbilt Beach and Marco Island. Damage was estimated to be \$100,000.

***Tropical Storm Bob - 1985*** - had maximum sustained winds of 40 knots as it made landfall near Lely Barefoot Beach in North Naples. There was widespread flooding throughout the area with rainfall amounts ranging from 7.7" at Naples, 11.6" at Marco Island, 14.5" at Everglades City, to over 22" at the Golden Gate Landfill. Although the sustained winds were only 40 knots, there were several gusts reaching hurricane limits. There were over 1,000 insurance claims filed, only 100 of them were for flood damages, the others were the result of wind and water damage. The Ritz Carlton was under construction at the time and most of the drywall had to be replaced.

***Tropical Storm Keith - 1988*** - formed south of Jamaica moved northwestward to the Yucatan Peninsula, before recurring to the northeast. It made landfall near Sarasota. In spite of the storm occurring at lunar high tide, there was little flood damage except to La Playa Inn on Vanderbilt Beach where 17 rooms, kitchen and dining room received some water damage. There was extensive erosion along the Naples beaches and the Naples Pier received about \$500,000 in damages.

***Tropical Storm Marco - 1990*** - formed in the Florida Straits, south of Key West and moved north before reaching land at Cedar Key. Little damage was reported in Collier County even though the storm passed 43 miles to the west of Naples at time of astronomical high tide.

***Hurricane Andrew (Cat 5) - 1992*** - intensified into a major hurricane east of the Bahamas and made landfall near Homestead, Florida. The storm traversed the peninsula with the eye-wall remaining south of Everglades City and Marco Island before recurving towards Louisiana. Some coastal flooding occurred after the storm passed to our east because of strong onshore winds and high tides. Storm surge values were generally between 6-7 feet NAVD along the south coast from Goodland to Chokoloskee Island.

***Tropical Storm Jerry - 1995*** - formed in the western Bahamas and moved northward entering the east coast of Florida north of Palm Beach. As it moved northwestward a feeder band remained nearly stationary over southwest Collier County for nearly 18 hours. Twenty-four hour rainfall amounts ranged from 17 inches in East Naples to 6-7 inches in Immokalee. Widespread flooding occurred in East Naples, the City of Naples and Golden Gate from this 100-year storm. Within two days of this extraordinary event, sheet flow flooding from Hendry County and north Collier County created serious flooding problems along the Lee and Collier line in Bonita Springs as well as increased floodwaters in Golden Gate Estates and Immokalee.

**Hurricane Opal - 1995** - formed in the Bay of Campeche in late September. It moved northeastward and deepened into a Category 5 hurricane during the morning hours of October 4<sup>th</sup> and came ashore near Fort Walton Beach as a Category 3 during the early evening hours on October 4<sup>th</sup>. The associated feeder band, like T.S. Jerry two months prior, dumped several inches of rain on already super saturated areas of North Naples, Big Corkscrew Island and Immokalee. Sheet flow flooding remained over much of the area near Immokalee Rd (CR 846) until mid-November.

**Tropical Storm Gabrielle- Sept. 13-14, 2001**- Gabrielle formed a low pressure system that developed along a decaying frontal system near Bradenton. As it moved southward, away from the peninsula, it developed Tropical storm characteristics. On Thursday afternoon at 5:00PM, the National Hurricane Center placed all of southwest Florida under a Hurricane Watch. At that time, Gabrielle was 150 miles west southwest of Naples. As it began meandering to the Northeast it intensified into a Tropical Storm with winds of 60 knots. The closest point of approach to Naples (70nm west) occurred on Friday morning at 5:00AM. Although rainfall exceeded 8 inches at several locations throughout the County, precipitation amounts at the Government Center were near 2 inches for the 24 hours preceding the storm.

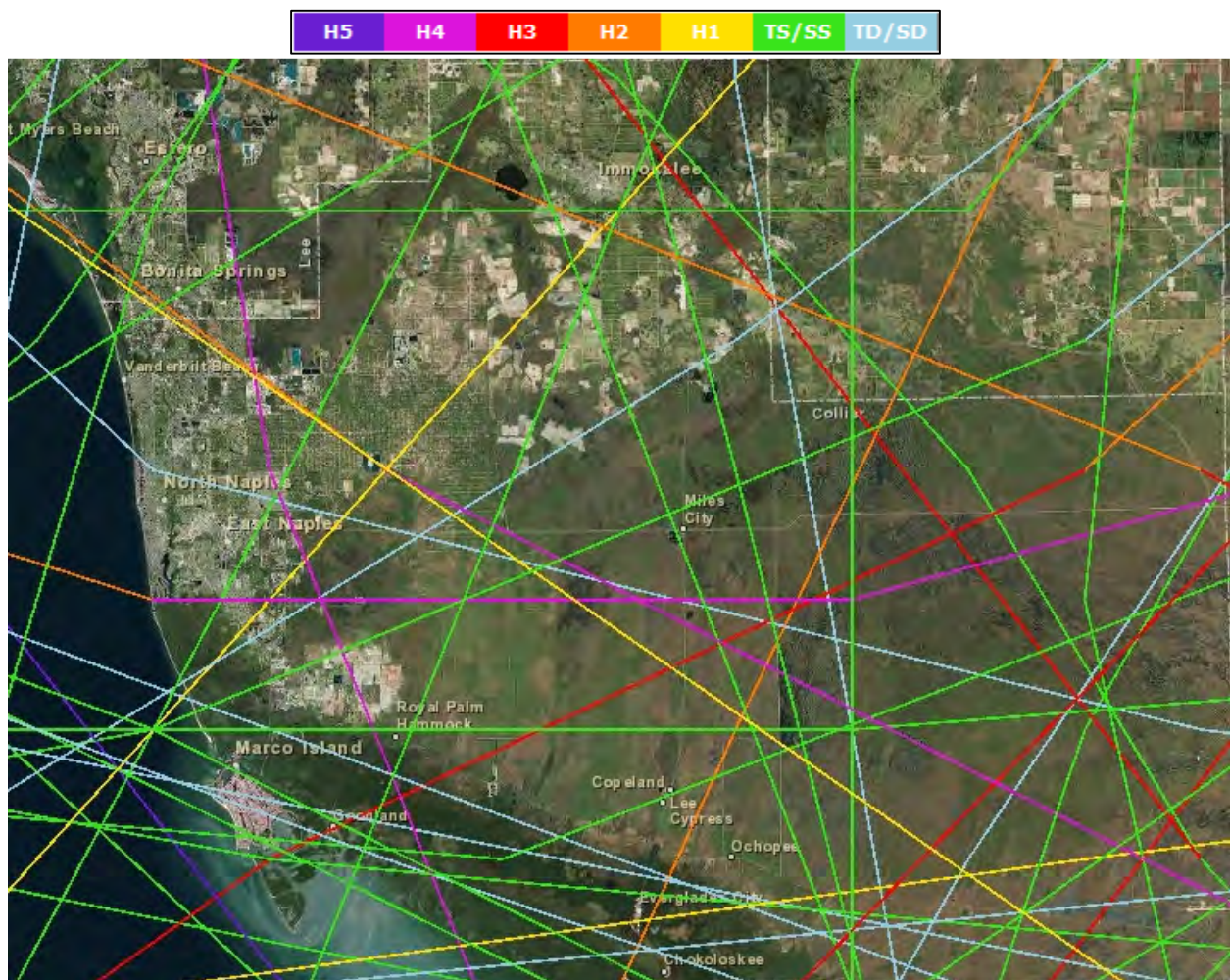
The National Weather Service issued a Coastal Flood Watch for Collier County on Thursday afternoon. Water heights along the shore from the Lee County line to Chokoloskee Island were generally 3-5 ft above normal. It was estimated that approximately 50-60 residences and businesses experienced flooding and most of these structures were built prior to 1978 (pre-FIRM). Water depths in homes and businesses ranged from 1 inch to 18 inches. The timing of flooding conditions occurred on Friday morning from approximately 7:30AM in North Naples to 9:30AM in Everglades City. Waters began to recede after noon throughout the coastal area.

**Hurricanes of 2004** – Hurricane Charley had the greatest direct impact on the residents of Collier County. Its effect on Collier County was that of an F-2 tornado since the hurricane wind field was so small. Only one to two feet of storm surge was reported, having no effect on the infrastructure. Personal property losses approximated \$1.5M, mainly lanais. Debris costs to government were approximately \$6.0M. No injuries were reported and the damaged area was around North Naples. The greatest general-population impacts of the storm were: loss of power and shortage of fuel for vehicles. Hurricanes Frances and Jeanne affected the northeast portions of the county slightly due mainly to the fact that we were on the dry-side of the hurricanes. One manufactured home in Immokalee sustained major damages from Hurricane Frances. No injuries were reported. No flooding problem was experienced in any of the three hurricanes.

**Hurricane Wilma – 15-25 October 2005** - Wilma formed and became an extremely intense hurricane over the northwestern Caribbean Sea. It had the all-time lowest central pressure for an Atlantic basin hurricane, and it devastated the northeastern Yucatan Peninsula. Wilma also inflicted extensive damage over southern Florida. Maximum sustained winds were estimated to be near 105 kt (category 3 intensity) when landfall of the center occurred in southwestern Florida near Cape Romano around 1030 UTC 24 October. Greatest storm surge for Collier County was measured in Everglades City at 5.67 feet caused by the unusually fast forward speed. The hurricane, continuing to accelerate and now moving at a forward speed of 20 to 25 kt, crossed the southern Florida peninsula in 4.5 hours, with the center emerging into the Atlantic just southeast of Jupiter around 1500 UTC. Because the hurricane moved quickly across the southern Florida peninsula, however, the rain amounts were not very large in Florida and storm totals ranged generally from 3 to 7 inches. Wilma produces one tornado in Collier. That tornado resulted in the only direct fatality from the Hurricane. Overall, 10 more indirect fatalities resulted from Wilma; mostly due to cleanup efforts.

**Tropical Storm Debby – June 23-24, 2012** - Debby originated from a broad area of low pressure that developed over the southern Gulf of Mexico during the third week of June. The low drifted slowly northward across the Gulf and finally strengthened to a tropical storm on the afternoon of June 23rd. At that time, the closest her wind-field was to Naples was 200 miles. That said, her biggest impact to Collier County was the three to three and a half foot of storm surge produced around Everglades City and three tornadoes, one of which affected East and North Naples communities. The storm surge produced resulted in about \$110K in road, water pump damages as well as the associated labor and equipment costs of repair.

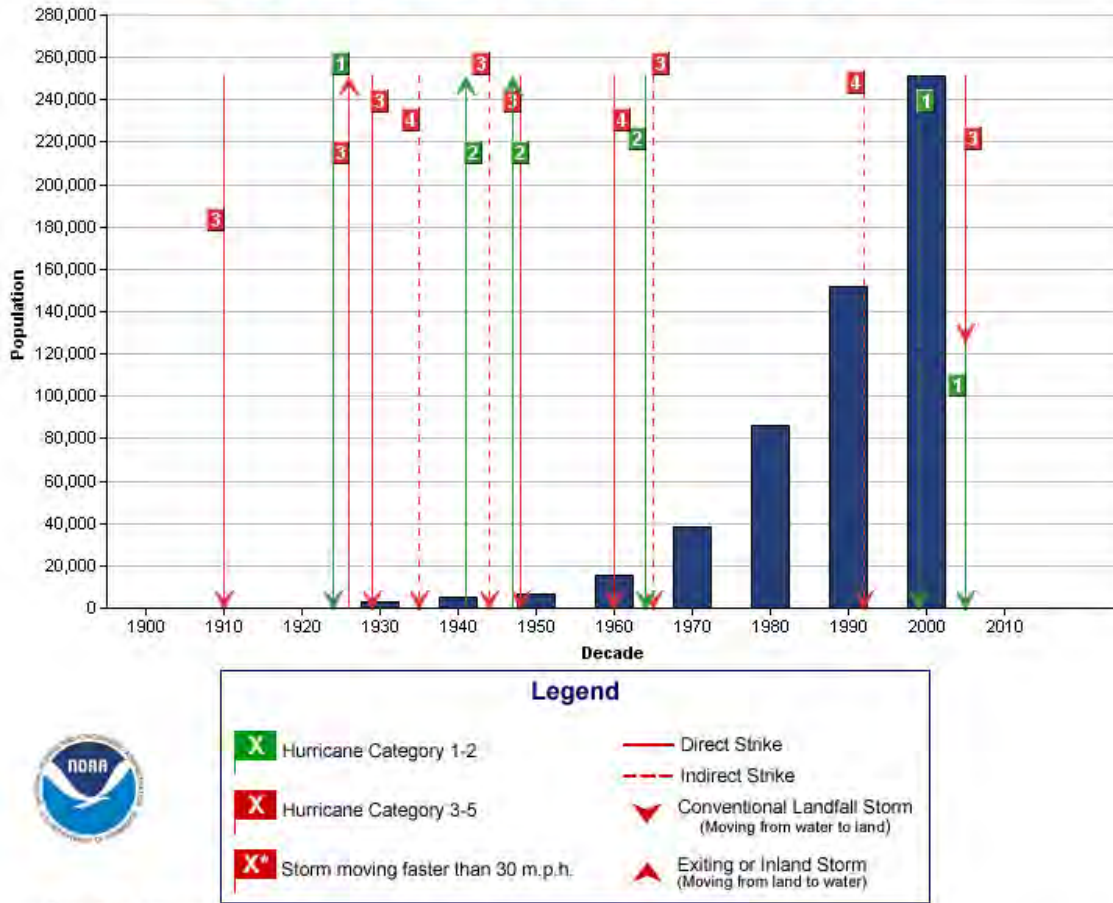
Figures 4-29 and 4-30 reflect past hurricane strike data for land falling major hurricanes in Collier County as provided by the National Hurricane Center.



Source: NOAA/National Hurricane Center

**Figure 4-29 – Historical Hurricane Tracks, Collier County**

### Hurricane Strikes vs Population for Collier, Florida



Hurricane Strike Data: National Hurricane Center  
 Population Data: U.S. Census Bureau  
 NOTE: Population values may be missing in some counties, particularly for earlier periods. This is most often attributable to the fact that the county had not yet been established.  
 NOTE: There may be discrepancies between the strike data shown in this chart and the HURDAT strike data used in the Historical Hurricanes Tracks Tool. The National Hurricane Center is currently updating the strike data used for these charts.  
 For more information visit [http://www.aoml.noaa.gov/hrd/data\\_sub/re\\_anal.html](http://www.aoml.noaa.gov/hrd/data_sub/re_anal.html)  
 NOTE: Population data is current as of 2000 U.S. Census. X-axis on graphs depict years through 2010 to illustrate storms that have occurred from 2000-2006.

**Figure 4-30 - Hurricane Strikes for Collier County**

Table 4-14 shows hurricane and tropical storm data reported by NCDC since 1950 for Collier County.

**Table 4-14 - NCDC Hurricane/Tropical Storm Data for Collier County, 1950-2014**

Location	Date	Event Type	Deaths/ Injuries	Property Damage	Crop Damage
Coastal Collier	09/25/1998	Hurricane	0	\$0	\$0
Coastal Collier	08/13/2004	Hurricane	0	\$2,500,000	\$0
Coastal Collier	09/04/2004	Hurricane	0	\$0	\$0
Inland Collier	09/04/2004	Hurricane	0	\$0	\$0
Inland Collier	07/08/2005	Hurricane	0	\$0	\$0
Coastal Collier	10/24/2005	Hurricane	1	\$0	\$0
Inland Collier	09/25/2008	Tropical Storm	0	\$0	\$0
Coastal Collier	11/04/1998	Tropical Storm	0	\$0	\$0
Inland Collier	11/04/1998	Tropical Storm	0	\$0	\$0
Coastal Collier	09/20/1999	Tropical Storm	0	\$325,000	\$0
Coastal Collier	09/16/2000	Tropical Storm	0	\$0	\$0
Coastal Collier	09/13/2001	Tropical Storm	0	\$50,000	\$0
Inland Collier	08/30/2006	Tropical Storm	0	\$0	\$0
Coastal Collier	08/30/2006	Tropical Storm	0	\$0	\$0
Inland Collier	08/18/2008	Tropical Storm	0	\$0	\$0
Coastal Collier	08/18/2008	Tropical Storm	0	\$20,000	\$0
Coastal Collier	08/26/2012	Tropical Storm	0	\$0	\$0
<b>Total:</b>				<b>\$2,895,000</b>	<b>\$0</b>

Source: NCDC

Table 4-15 shows SHELDTUS events related to hurricanes and tropical storms from 1960 through 2013.

**Table 4-15 - SHELDTUS Hurricane/Tropical Storm Data for Collier County - 1960 to 2013**

Date	Hazard Type	Injuries/Fatalities	Crop Damage	Property Damage
09/1960	Hurricane/Tropical Storm	43/0	\$0	\$0
10/1964	Hurricane/Tropical Storm	2/0	\$0	\$1,633,639
09/1965	Hurricane/Tropical Storm	0/0	\$0	\$10,875,677
06/1966	Hurricane/Tropical Storm	0/0	\$0	\$678,304
10/1966	Hurricane/Tropical Storm	0/0	\$513,573	\$513,573
06/1968	Hurricane/Tropical Storm	0/0	\$0	\$8,163,617
10/1968	Hurricane/Tropical Storm	0/0	\$0	\$643,669
06/1972	Hurricane/Tropical Storm	1/0	\$415	\$83,181
06/1974	Hurricane/Tropical Storm	0/0	\$1,968	\$0
09/1979	Hurricane/Tropical Storm	0/0	\$348,779	\$3,487,797
08/1981	Hurricane/Tropical Storm	0/0	\$985,685	\$98,568
08/1985	Hurricane/Tropical Storm	0/0	\$0	\$161,569
10/1987	Hurricane/Tropical Storm	0/0	\$0	\$14,647
08/1992	Hurricane/Tropical Storm	0/3	\$415,105,133	\$10,377,628,331
11/1994	Hurricane/Tropical Storm	0/0	\$3,274,806	\$3,274,806
08/1995	Hurricane/Tropical Storm	0/0	\$218,369	\$131,021
10/1995	Hurricane/Tropical Storm	0/0	\$0	\$3,057,178
11/1998	Hurricane/Tropical Storm	9/0	\$4,083,383	\$6,125,074
09/1999	Hurricane/Tropical Storm	0/0	\$0	\$113,611
09/2000	Hurricane/Tropical Storm	0/0	\$0	\$16,910
09/2001	Hurricane/Tropical Storm	0/0	\$0	\$21,923
08/2004	Hurricane/Tropical Storm	0/0	\$0	\$1,068,798
09/2004	Hurricane/Tropical Storm	0/0	\$18,498,438	\$127,639,224
10/2005	Hurricane/Tropical Storm	1/1	\$0	\$2,982,040,457
08/2008	Hurricane/Tropical Storm	0/0	\$0	\$3,606

Date	Hazard Type	Injuries/Fatalities	Crop Damage	Property Damage
<b>Total:</b>			<b>\$443,030,549</b>	<b>\$13,527,475,180</b>

Source: SHELDUS v13.1

### Storm Surge

According to the 2012 Collier County CEMP, it is estimated that only 3 storms caused significant storm surge flooding to the Greater Naples urban area. The urban area is defined as that area west of a line from one mile east of Collier Boulevard to the coast. The three storms that generated storm surge flooding were:

- October 7, 1873 - CAT 3 Surge est. 8 to 11 feet MSL
- September 25, 1894 - CAT 3 Surge est. 10 to 11 feet MSL
- September 10, 1960 - CAT 4 Max. Surge N Naples 11.86 feet MSL

Table 4-16 shows storm surge data reported by NCDC since 1950 for Collier County.

**Table 4-16 - NCDC Storm Surge Data for Collier County, 1950-2014**

Location	Date	Event Type	Deaths/ Injuries	Property Damage	Crop Damage
Coastal Collier	10/24/2005	Storm Surge	0	\$0	\$0
Coastal Collier	08/19/2008	Storm Surge	0	\$80,000	\$0
Coastal Collier	08/27/2012	Storm Surge	0	\$6,000,000	\$0
<b>Total:</b>				<b>\$6,080,000</b>	<b>\$0</b>

Source: NCDC

The following is a description of past storm surge events as provided by NCDC:

**Hurricane Wilma – October 24, 2005** - Hurricane Wilma produced a maximum measured storm tide of 8 feet at the USGS tide gauge at the Turner River near Chokoloskee in southern Collier County, with a storm surge of 7 feet after subtracting a 1 foot astronomical tide. Significant damage to structures close to the water was observed in Chokoloskee, along with some washing out of part of the road leading to the town. A storm tide of 7 feet was estimated in Marco Island by Collier County Emergency Management, along with significant beach erosion. An NWS survey team estimated a storm tide of 4 feet in Everglades City based on debris line heights, with little structural damage. The NOS tide gauge in Naples recorded a maximum storm tide of 4.8 feet, with a storm surge of 3.8 feet after considering astronomical tide levels.

**Tropical Storm Fay – August 19, 2008** - Tropical Storm Fay affected South Florida on the 18th and 19th of August. The storm made landfall early in the morning of the 19th near Cape Romano, and moved over inland sections of South Florida during the morning and afternoon hours of the 19th, exiting the area near Lake Okeechobee. Fay caused tropical storm force winds, significant rainfall flooding in some areas, as well as two confirmed tornadoes. Due to Fay remaining at tropical storm strength and the rather limited nature of its wind field, storm surge and coastal flooding impacts were rather minor. The highest storm tide was estimated to be in the Everglades City/Chokoloskee areas, where the maximum storm tide was in the 5 foot range according to tide gauge data and estimates from local officials. Water of 1-2 feet deep was observed in Everglades City, and the Chokoloskee Causeway was under water for a short time on the morning of the 19th. Minimal storm surge was noted elsewhere, although moderate to locally severe beach erosion occurred in Naples.

**Tropical Storm Isaac – August 27, 2012** - Tropical Storm Isaac moved west-northwest across the Florida Straits south of the Florida Keys on August 26. The northern edge of the wind and rain area associated with Isaac affected the South Florida peninsula throughout the day on the 26th. Isaac continued on a west-northwest track into the Gulf of Mexico on the 27th with winds, rain and flooding continuing over parts of South Florida. Severe beach erosion and coastal flooding occurred on Monday, August 27th as the center of Tropical Storm Isaac moved into the Gulf of Mexico. A storm surge of 2.05 feet was measured at the Naples pier. Farther east along the coast, inundation depths as high as 3 feet were reported in Goodland and Everglades City. Inundation in the Naples area was about 1 foot. Most damage from coastal flooding was to infrastructure in the Goodland and Everglades City areas and was estimated at \$400,000. Severe beach erosion in the Naples and Marco Island areas led to damage estimated at \$5.6 million.

### **Frequency/Likelihood of Future Occurrence**

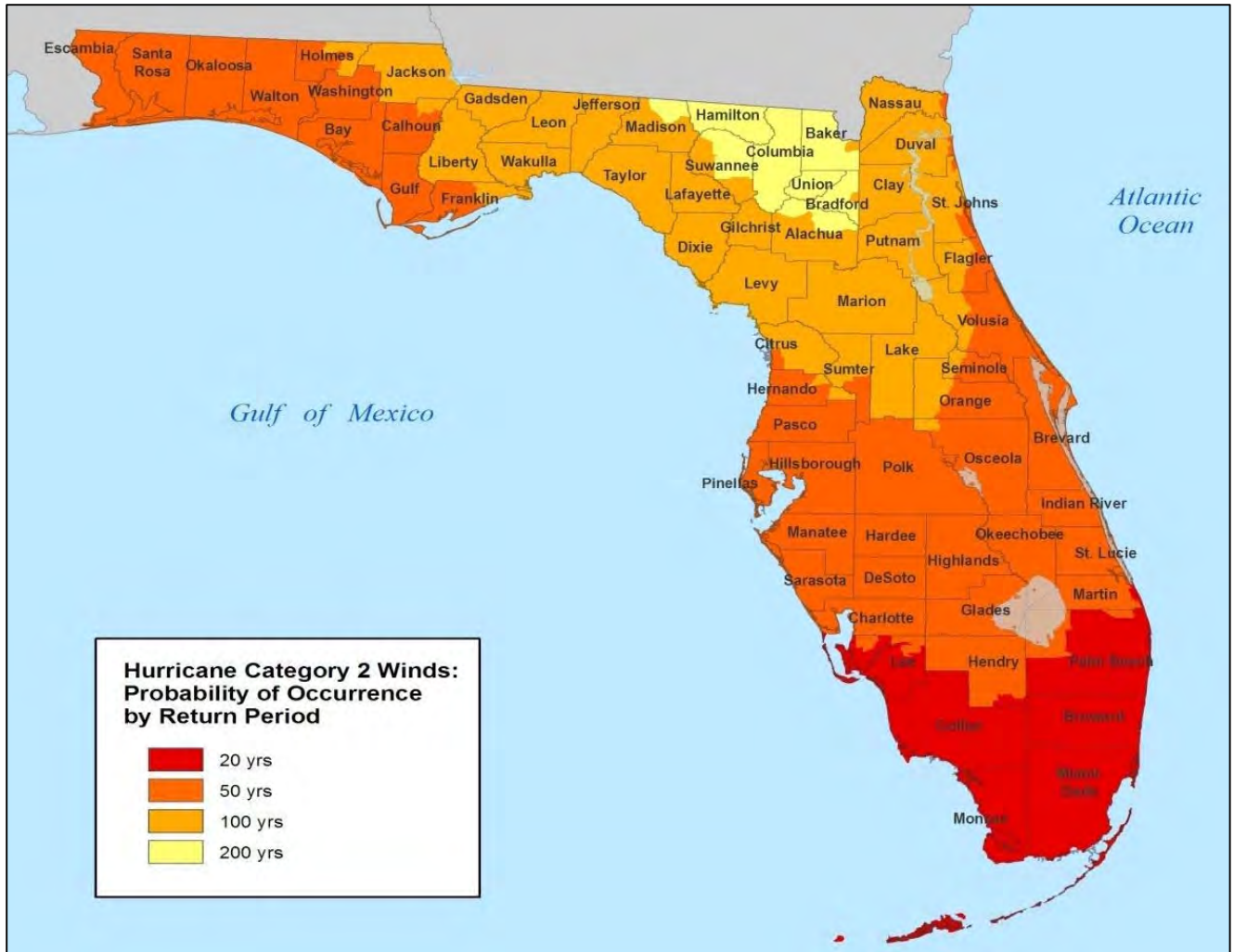
#### ***Hurricane and Tropical Storm***

**Likely** – Given the 81 hurricane and tropical storm occurrences recorded by NOAA over a period of 163 years (1851 - 2014), a hurricane or tropical storm affects Collier County on average once every two years.

The State of Florida Hazard Mitigation Plan produced a statewide vulnerability analysis based on information provided by county LMS plans. Based on the Collier County LMS plan, the County is categorized as a high-risk jurisdiction as shown in Figure 4-31.



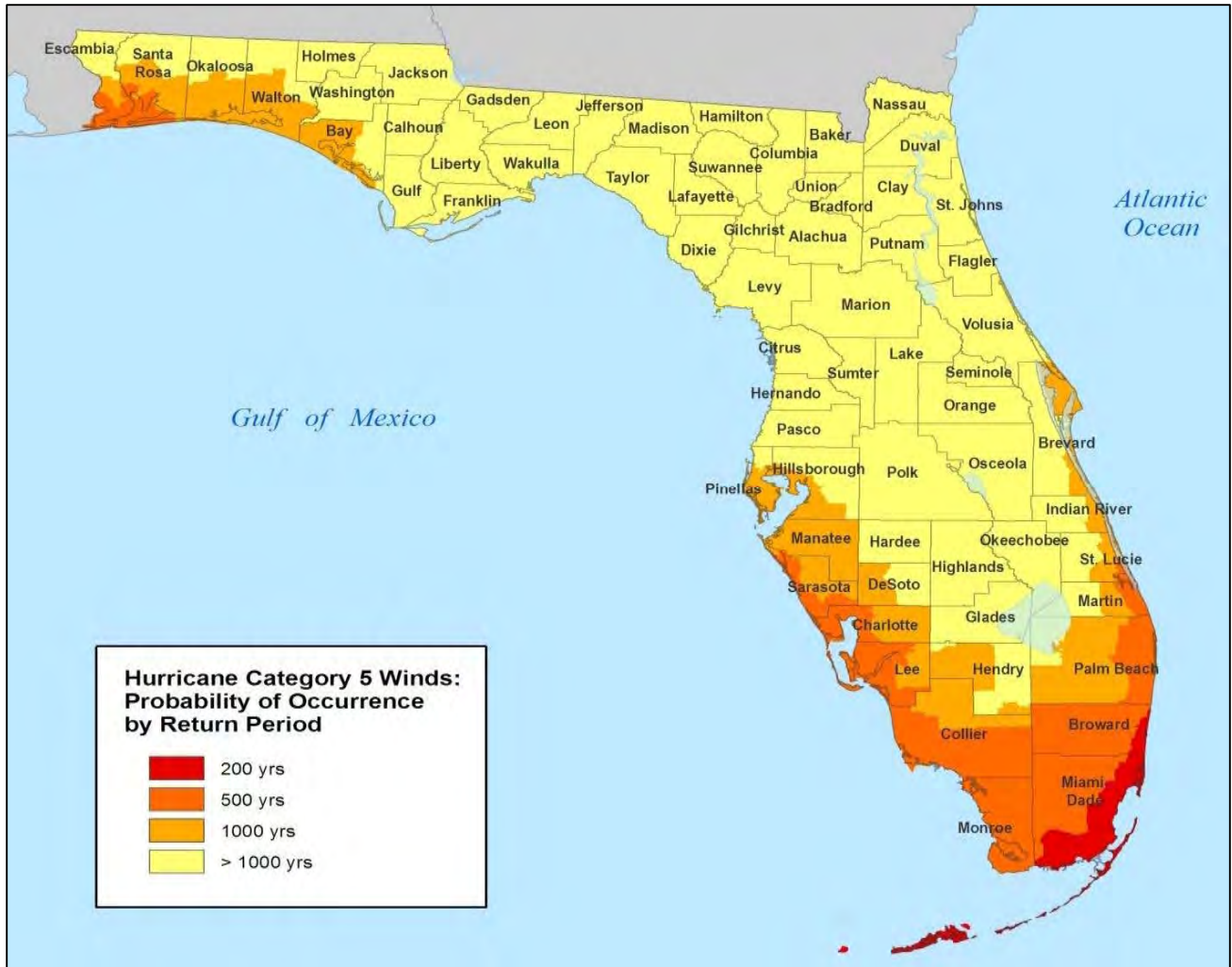




Source: State of Florida Enhanced Hazard Mitigation Plan

**Figure 4-32 - Hurricane Category 2 Probability of Occurrence**

Figure 4-33 contains a summary of the probability of occurrence that each county has based on geographic location for a return period of 200, 500, 1,000 or greater than 1,000 years for a Category 5 hurricane; Collier County has a probability of experiencing a Category 5 hurricane at least once every 500-1,000 years.



Source: State of Florida Enhanced Hazard Mitigation Plan

**Figure 4-33 - Hurricane Category 5 Probability of Occurrence**

### **Coastal Storm Surge**

**Likely** – Given the three storm surge occurrences recorded by the NCDC over a period of 64 years (1950-2014), a coastal storm surge event affects Collier County on average once every 21 years.

### **Climate Change and Hurricane and Tropical Storms**

One of the primary factors contributing to the origin and growth of tropical storm and hurricanes systems is water temperature. Sea surface temperature may increase significantly in the main hurricane development region of the North Atlantic during the next century as well as in the Gulf of Mexico.

Sea level change will be particularly important in influencing storm surge flooding in the Collier County area, since the area is already subject to flooding from above normal tides, surge and rainfall events from hurricanes and less powerful tropical storms. According to a 2014 report from the Union of Concerned Scientists, “tidal flooding, driven by sea level rise, will dramatically increase in U.S. East and Gulf Coast communities over the next 30 years.”

#### **4.2.7 Assessment of Areas Likely to Flood**

The following areas have been identified by the FMPC as areas likely to flood in the future. Some of these areas are already experiencing flooding but others are not. For example, changes in floodplain development, the watershed, population in combination with climate change and sea level rise will make these targeted areas more likely to flood in the future.

##### **Identified Area #1: 100yr SFHAs**

According to a May 16, 2012 Flood Insurance Study prepared by FEMA, almost the entire County is located within a Special Flood Hazard Area. Given that the population of Collier County is projected to increase by 32% between 2010 and 2040, changes in floodplain development and development within the watershed in general is likely to increase the size of the SFHAs due to an increase in impervious area. Furthermore, with its low topography, Collier County's infrastructure is vulnerable to the effects of climate change and sea level rise.

##### **Identified Area #2: Areas of Localized Stormwater Flooding**

Due to a flat terrain and a consistent level of annual precipitation, it is likely that unmitigated properties will continue to experience localized flooding. Future population increases will likely lead to new development. An increase in impervious area will exacerbate localizing flooding issues unless measures are taken to reduce the volume of runoff. Furthermore, the intensity of individual rainfall events is likely to increase in the future due to climate change which may further overwhelm stormwater drainage systems.

##### **Identified Area #3: Repetitive Loss Areas**

Properties categorized as repetitive loss properties have a greater need for flood protection. Repetitive loss can be attributed to development within the 100-yr floodplain as well as localized stormwater flooding. As mentioned above, both types of flooding are likely to increase in the future due to development in the floodplain/watershed as well as due to the effects of climate change and sea level rise. Therefore, it is very likely that unmitigated repetitive loss properties will continue to flood in the future.

##### **Identified Area #4: Zone X (Unshaded)**

Collectively, there are 37,448 buildings within Collier County, Marco Island and Naples that are located outside of the 100-year SFHA with a total value of \$13,388,426,118. Flooding is not limited to the 100-yr flood zones, and the Zone X unshaded designation may lead to a false sense of security. As mentioned above, changes in floodplain development and development within the watershed in general are likely to increase the size of the SFHAs due to an increase in impervious area. Therefore, the Zone X unshaded area is likely subject to future flood risk.

#### 4.2.8 Flood Hazards Profile Summary

Table 4-17 summarizes the results of the hazard profile for Collier County based on hazard identification data and input from the FMPC. For each hazard profiled within Section 4.2, this table includes the likelihood of future occurrence and whether or not the hazard is considered a priority for the County.

**Table 4-17 - Summary of Flood Hazard Profile Results**

<b>Hazard</b>	<b>Likelihood of Future Occurrence</b>	<b>Priority Hazard</b>
Climate Change and Sea Level Rise	Highly Likely	Y
Coastal/Canal Bank Erosion	Highly Likely	Y
Dam/Levee Failure	Unlikely	N
Flood: 100-/500-year	Occasional	Y
Flood: Stormwater/Localized Flooding	Highly Likely	Y
Hurricane and Tropical Storms (including Storm Surge)	Likely	Y

### 4.3 Vulnerability Assessment

**Requirement §201.6(c)(2)(ii): [The risk assessment shall include a] description of the jurisdiction’s vulnerability to the hazards described in paragraph (c)(2)(i) of this section. This description shall include an overall summary of each hazard and its impact on the community. Plans approved after October 1, 2008 must also address NFIP insured structures that have been repetitively damaged by floods. The plan should describe vulnerability in terms of:**

A) The types and numbers of existing and future buildings, infrastructure, and critical facilities located in the identified hazard areas;

(B): An estimate of the potential dollar losses to vulnerable structures identified in paragraph (c)(2)(ii)(A) of this section and a description of the methodology used to prepare the estimate; and

(C): Providing a general description of land uses and development trends within the community so that mitigation options can be considered in future land use decisions.

The FMPC conducted a vulnerability assessment of the hazards identified as a priority in order to assess the impact that each hazard would have on the County. The vulnerability assessment quantifies, to the extent feasible using best available data, assets at risk to natural hazards and estimates potential losses. Vulnerability assessments followed the methodology described in the FEMA publication *Understanding Your Risks—Identifying Hazards and Estimating Losses*. The vulnerability assessment first describes the total vulnerability and values at risk and then discusses vulnerability by hazard.

Data used to support this assessment included the following:

- County GIS data (hazards, base layers, and assessor’s data)
- Hazard layer GIS datasets from federal agencies
- Written descriptions of inventory and risks provided by the State Hazard Mitigation Plan
- Other Existing plans and studies provided by the County

#### Properties at Risk

Collier County’s 2014 parcel and building footprint layers were used as the basis for the inventory of properties at risk. Building exposure counts by FEMA flood zone were determined using a spatial intersection of the building footprints provided by Collier County and the effective FEMA flood zones provided in the Collier County DFIRM Database effective 5/16/2012. In order to determine the correct occupancy type for each parcel, the land use codes provided in the Collier County tax parcel data were translated into the following occupancy types which are specific to FEMA’s Hazus software: Agricultural, Commercial, Education, Government, Industrial, Religious and Residential.

The building values are based on 2014 Collier County tax assessor data. Content value estimations are based on the FEMA Hazus methodology of estimating value as a percent of improved structure value by occupancy type. Table 4-18 shows the breakdown of the different property types in Collier County and their estimated content replacement value percentages.

**Table 4-18 - Content Replacement Factors**

Occupancy Type	Content Replacement Values
Agricultural	0%
Residential	50%
Commercial	100%
Education	100%

Occupancy Type	Content Replacement Values
Government	100%
Religious	100%
Industrial	150%

Source: Hazus 2.1

Tables 4-19 through 4-22 show the total number of buildings, total building value, estimated content value and total value for all buildings located within a SFHA for Collier County Unincorporated Areas, City of Everglades City, City of Marco Island and City of Naples, respectively.

**Table 4-19 - Properties at Risk by Occupancy Type – Collier County Unincorporated Areas**

Occupancy Type	Total Number of Buildings in Floodplain	Total Building Value	Estimated Content Value	Total Value
<b>Zone VE</b>				
Agricultural	1	\$0	\$0	\$0
Commercial	15	\$2,078,539	\$2,078,539	\$4,157,078
Education	0	\$0	\$0	\$0
Government	20	\$311,178	\$311,178	\$622,355
Industrial	0	\$0	\$0	\$0
Religious	0	\$0	\$0	\$0
Residential	367	\$183,611,639	\$91,805,819	\$275,417,458
<b>Total</b>	<b>403</b>	<b>\$186,001,355</b>	<b>\$94,195,536</b>	<b>\$280,196,892</b>
<b>Zone AE</b>				
Agricultural	299	\$9,731,986	\$9,731,986	\$19,463,971
Commercial	785	\$246,352,548	\$241,979,528	\$488,332,076
Education	62	\$80,182,223	\$80,182,223	\$160,364,446
Government	187	\$170,432,941	\$170,432,941	\$340,865,882
Industrial	116	\$43,080,875	\$64,621,313	\$107,702,188
Religious	37	\$17,391,368	\$17,391,368	\$34,782,736
Residential	20,146	\$2,061,361,649	\$1,030,680,824	\$3,092,042,473
<b>Total</b>	<b>21,632</b>	<b>\$2,628,533,590</b>	<b>\$1,615,020,183</b>	<b>\$4,243,553,772</b>
<b>Zone AH</b>				
Agricultural	594	\$27,017,404	\$27,017,404	\$54,034,808
Commercial	525	\$206,282,854	\$206,282,854	\$412,565,708
Education	79	\$96,430,998	\$96,430,998	\$192,861,995
Government	352	\$83,495,333	\$83,495,333	\$166,990,665
Industrial	412	\$85,782,542	\$128,673,814	\$214,456,356
Religious	70	\$52,077,561	\$52,077,561	\$104,155,121
Residential	23,983	\$2,683,798,591	\$1,341,899,295	\$4,025,697,886
<b>Total</b>	<b>26,015</b>	<b>\$3,234,885,282</b>	<b>\$1,935,877,258</b>	<b>\$5,170,762,540</b>
<b>Zone A</b>				
Agricultural	6	\$237,256	\$237,256	\$474,512
Commercial	6	\$1,265,286	\$1,265,286	\$2,530,572
Education	0	\$0	\$0	\$0
Government	0	\$0	\$0	\$0
Industrial	0	\$0	\$0	\$0
Religious	0	\$0	\$0	\$0

Occupancy Type	Total Number of Buildings in Floodplain	Total Building Value	Estimated Content Value	Total Value
Residential	0	\$0	\$0	\$0
<b>Total</b>	<b>12</b>	<b>\$1,502,542</b>	<b>\$1,502,542</b>	<b>\$3,005,084</b>
<b>Zone X (500-yr)</b>				
Agricultural	102	\$8,391,494	\$8,391,494	\$16,782,988
Commercial	454	\$235,304,743	\$235,304,743	\$470,609,485
Education	79	\$105,795,721	\$105,795,721	\$211,591,442
Government	195	\$51,547,828	\$51,547,828	\$103,095,656
Industrial	177	\$56,642,885	\$84,964,328	\$141,607,214
Religious	48	\$28,661,569	\$28,661,569	\$57,323,138
Residential	22,513	\$4,161,476,716	\$2,080,738,358	\$6,242,215,073
<b>Total</b>	<b>23,568</b>	<b>\$4,647,820,956</b>	<b>\$2,595,404,041</b>	<b>\$7,243,224,997</b>
<b>Zone X (unshaded)</b>				
Agricultural	182	\$20,564,230	\$20,564,230	\$41,128,460
Commercial	1,156	\$653,795,358	\$653,795,358	\$1,307,590,717
Education	214	\$361,457,023	\$361,457,023	\$722,914,045
Government	353	\$73,755,541	\$73,755,541	\$147,511,082
Industrial	487	\$128,454,507	\$192,681,760	\$321,136,267
Religious	86	\$86,132,089	\$86,132,089	\$172,264,178
Residential	33,695	\$6,478,802,090	\$3,239,401,045	\$9,718,203,135
<b>Total</b>	<b>36,173</b>	<b>\$7,802,960,838</b>	<b>\$4,627,787,046</b>	<b>\$12,430,747,884</b>

Source: Collier County 2014 Tax Assessor's Data, FEMA 2012 DFIRM, Hazus v2.1

**Table 4-20 - Properties at Risk by Occupancy Type- City of Everglades City**

Occupancy Type	Total Number of Buildings in Floodplain	Total Building Value	Estimated Content Value	Total Value
<b>Zone VE</b>				
Agricultural	0	\$0	\$0	\$0
Commercial	3	\$385,226	\$344,140	\$729,366
Education	0	\$0	\$0	\$0
Government	2	\$606,285	\$606,285	\$1,212,570
Industrial	0	\$0	\$0	\$0
Religious	0	\$0	\$0	\$0
Residential	8	\$562,781	\$281,391	\$844,172
<b>Total</b>	<b>13</b>	<b>\$1,554,292</b>	<b>\$1,231,816</b>	<b>\$2,786,108</b>
<b>Zone AE</b>				
Agricultural	0	\$0	\$0	\$0
Commercial	34	\$3,729,582	\$3,591,982	\$7,321,564
Education	7	\$4,769,826	\$4,769,826	\$9,539,652
Government	15	\$2,603,863	\$2,603,863	\$5,207,726
Industrial	5	\$292,023	\$438,035	\$730,058
Religious	3	\$286,646	\$286,646	\$573,292
Residential	368	\$21,070,305	\$10,535,152	\$31,605,457
<b>Total</b>	<b>432</b>	<b>\$32,752,245</b>	<b>\$22,225,504</b>	<b>\$54,977,749</b>

Source: Collier County 2014 Tax Assessor's Data, FEMA 2012 DFIRM, Hazus v2.1



**Table 4-21 - Properties at Risk by Occupancy Type - City of Marco Island**

Occupancy Type	Total Number of Buildings in Floodplain	Total Building Value	Estimated Content Value	Total Value
<b>Zone VE</b>				
Agricultural	0	\$0	\$0	\$0
Commercial	3	\$531,915	\$531,915	\$1,063,833
Education	0	\$0	\$0	\$0
Government	3	\$193,407	\$193,407	\$386,818
Industrial	0	\$0	\$0	\$0
Religious	0	\$0	\$0	\$0
Residential	152	\$127,498,712	\$63,749,356	\$191,248,220
<b>Total</b>	<b>158</b>	<b>\$128,224,034</b>	<b>\$64,474,678</b>	<b>\$192,698,871</b>
<b>Zone AE</b>				
Agricultural	3	\$0	\$0	\$0
Commercial	190	\$61,405,658	\$58,595,449	\$120,001,107
Education	13	\$15,818,596	\$15,818,596	\$31,637,192
Government	72	\$11,833,209	\$11,833,209	\$23,666,418
Industrial	20	\$3,443,119	\$5,164,679	\$8,607,798
Religious	14	\$18,676,192	\$18,676,192	\$37,352,383
Residential	6,916	\$1,843,880,112	\$921,940,056	\$2,765,820,167
<b>Total</b>	<b>7,228</b>	<b>\$1,955,056,886</b>	<b>\$1,032,028,180</b>	<b>\$2,987,085,065</b>
<b>Zone X (500-yr)</b>				
Agricultural	0	\$0	\$0	\$0
Commercial	6	\$5,917,763	\$5,917,763	\$11,835,525
Education	0	\$0	\$0	\$0
Government	3	\$171,697	\$171,697	\$343,395
Industrial	0	\$0	\$0	\$0
Religious	3	\$3,332,973	\$3,332,973	\$6,665,947
Residential	71	\$5,926,073	\$2,963,037	\$8,889,110
<b>Total</b>	<b>83</b>	<b>\$15,348,506</b>	<b>\$12,385,470</b>	<b>\$27,733,976</b>
<b>Zone X (unshaded)</b>				
Agricultural	0	\$0	\$0	\$0
Commercial	3	\$5,370,059	\$5,370,059	\$10,740,118
Education	0	\$0	\$0	\$0
Government	0	\$0	\$0	\$0
Industrial	0	\$0	\$0	\$0
Religious	0	\$0	\$0	\$0
Residential	292	\$95,467,537	\$47,733,768	\$143,201,305
<b>Total</b>	<b>295</b>	<b>\$100,837,596</b>	<b>\$53,103,827</b>	<b>\$153,941,423</b>

Source: Collier County 2014 Tax Assessor's Data, FEMA 2012 DFIRM, Hazus v2.1

**Table 4-22 - Properties at Risk by Occupancy Type - City of Naples**

<b>Occupancy Type</b>	<b>Total Number of Buildings in Floodplain</b>	<b>Total Building Value</b>	<b>Estimated Content Value</b>	<b>Total Value</b>
<b>Zone VE</b>				
Agricultural	0	\$0	\$0	\$0
Commercial	4	\$5,241,072	\$5,241,072	\$10,482,144
Education	0	\$0	\$0	\$0
Government	7	\$239,845	\$239,845	\$479,690
Industrial	0	\$0	\$0	\$0
Religious	0	\$0	\$0	\$0
Residential	212	\$154,777,355	\$77,388,677	\$232,166,032
<b>Total</b>	<b>223</b>	<b>\$160,258,272</b>	<b>\$82,869,594</b>	<b>\$243,127,866</b>
<b>Zone AE</b>				
Agricultural	4	\$0	\$0	\$0
Commercial	326	\$279,572,431	\$276,696,900	\$556,269,331
Education	10	\$14,993,597	\$14,993,597	\$29,987,194
Government	177	\$75,531,238	\$75,531,238	\$151,062,475
Industrial	29	\$8,316,122	\$12,474,183	\$20,790,304
Religious	9	\$6,971,548	\$6,971,548	\$13,943,095
Residential	4,950	\$2,586,464,928	\$1,293,232,464	\$3,879,697,391
<b>Total</b>	<b>5,505</b>	<b>\$2,971,849,862</b>	<b>\$1,679,899,928</b>	<b>\$4,651,749,790</b>
<b>Zone AH</b>				
Agricultural	0	\$0	\$0	\$0
Commercial	26	\$9,077,300	\$9,077,300	\$18,154,600
Education	10	\$9,479,969	\$9,479,969	\$18,959,939
Government	3	\$9,392,469	\$9,392,469	\$18,784,938
Industrial	0	\$0	\$0	\$0
Religious	2	\$570,162	\$570,162	\$1,140,324
Residential	544	\$62,756,842	\$31,378,421	\$94,135,263
<b>Total</b>	<b>585</b>	<b>\$91,276,743</b>	<b>\$59,898,322</b>	<b>\$151,175,064</b>
<b>Zone X (500-yr)</b>				
Agricultural	0	\$0	\$0	\$0
Commercial	52	\$49,211,312	\$48,917,822	\$98,129,135
Education	2	\$1,089,948	\$1,089,948	\$2,179,897
Government	14	\$17,592,660	\$17,592,660	\$35,185,320
Industrial	4	\$3,055,041	\$4,582,562	\$7,637,603
Religious	3	\$8,321,274	\$8,321,274	\$16,642,547
Residential	736	\$176,396,702	\$88,198,351	\$264,595,054
<b>Total</b>	<b>811</b>	<b>\$255,666,938</b>	<b>\$168,702,617</b>	<b>\$424,369,555</b>
<b>Zone X (unshaded)</b>				
Agricultural	0	\$0	\$0	\$0
Commercial	121	\$148,429,147	\$148,429,147	\$296,858,294
Education	23	\$29,573,146	\$29,573,146	\$59,146,293
Government	17	\$6,876,207	\$6,876,207	\$13,752,415
Industrial	1	\$2,223,062	\$3,334,593	\$5,557,655
Religious	9	\$14,013,459	\$14,013,459	\$28,026,918

Occupancy Type	Total Number of Buildings in Floodplain	Total Building Value	Estimated Content Value	Total Value
Residential	809	\$266,930,158	\$133,465,079	\$400,395,237
<b>Total</b>	<b>980</b>	<b>\$468,045,179</b>	<b>\$335,691,631</b>	<b>\$803,736,811</b>

Source: Collier County 2014 Tax Assessor's Data, FEMA 2012 DFIRM, Hazus v2.1

### Critical Facility Inventory

Of significant concern with respect to any disaster event is the location of critical facilities in the planning area. Critical facilities are often defined as those essential services and facilities in a major emergency which, if damaged, would result in severe consequences to public health and safety or a facility which, if unusable or unreachable because of a major emergency, would seriously and adversely affect the health, safety, and welfare of the public. Critical facilities within Collier County, City of Everglades City, City of Marco Island and City of Naples are shown in Figures 4-34 through 4-37, respectively.

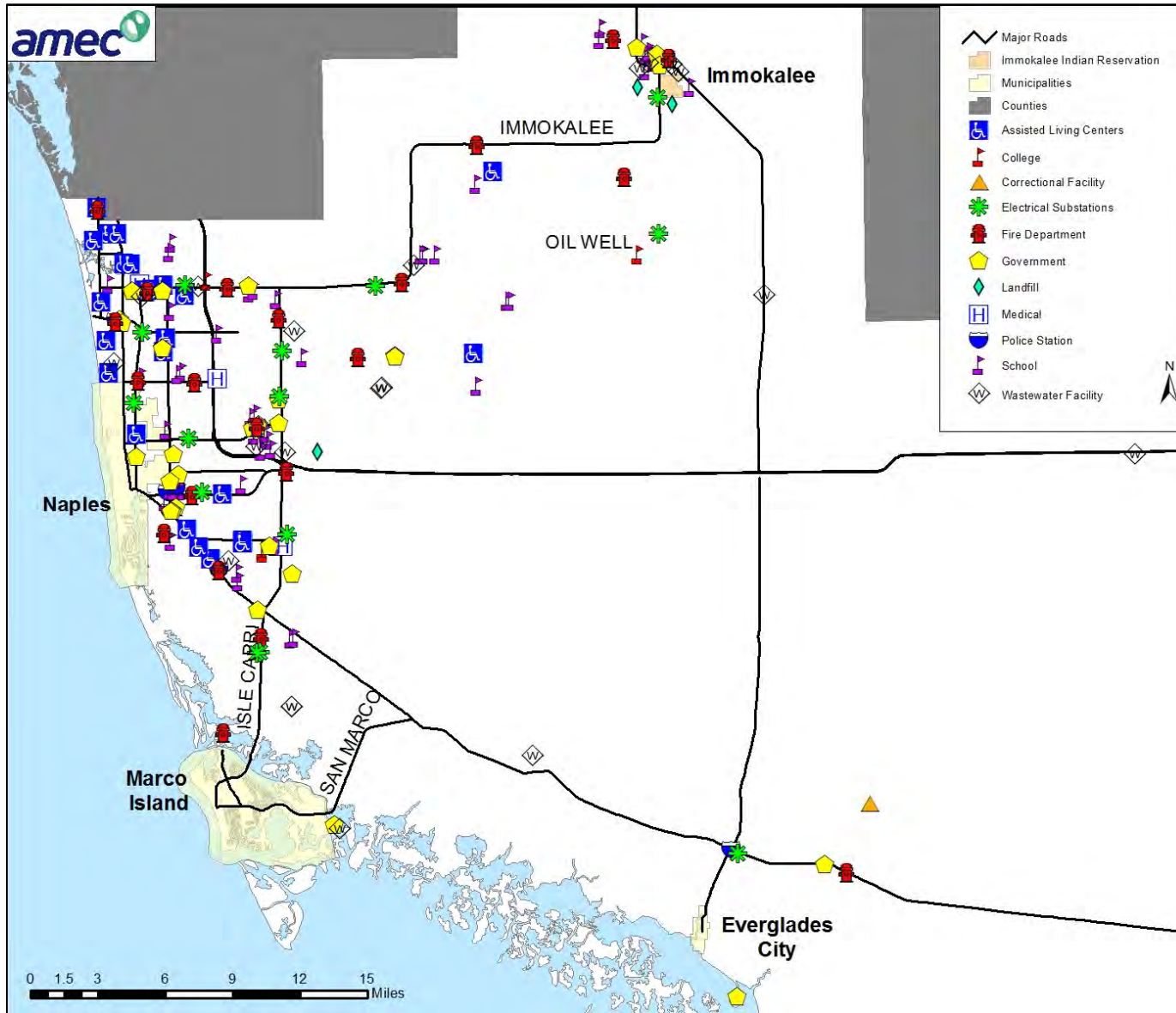


Figure 4-34 - Collier County Critical Facilities

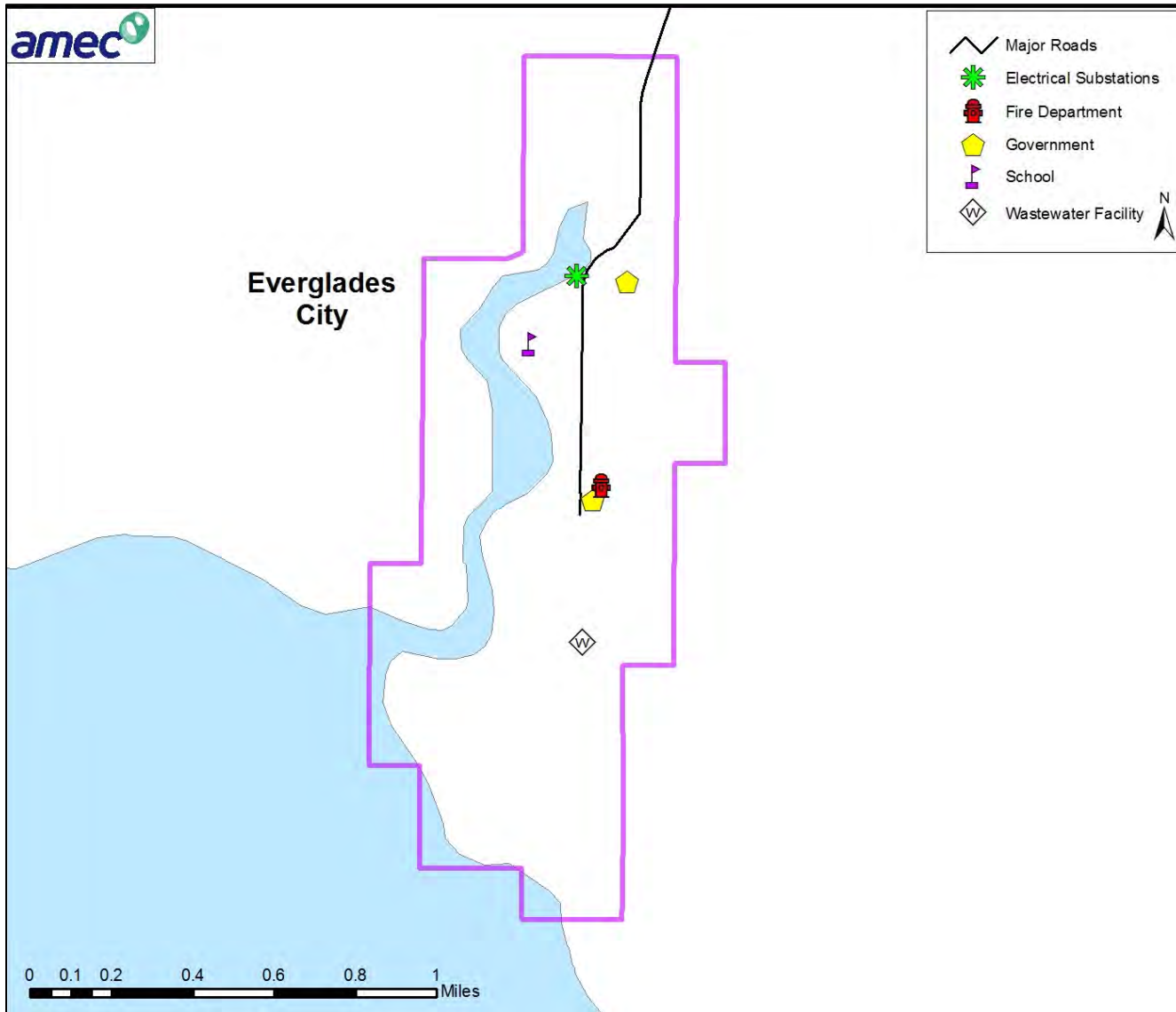


Figure 4-35 - City of Everglades City Critical Facilities

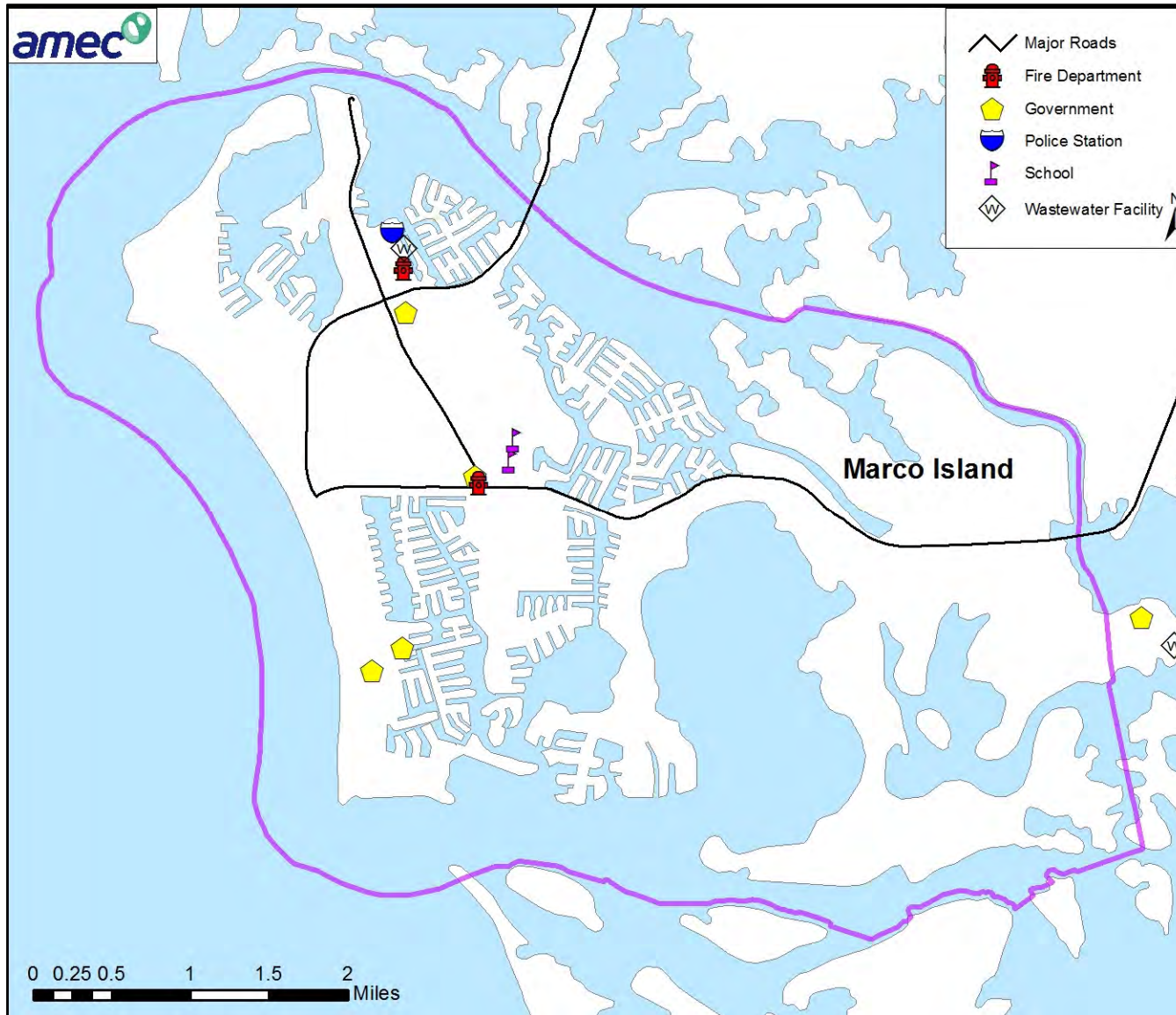


Figure 4-36 - City of Marco Island Critical Facilities

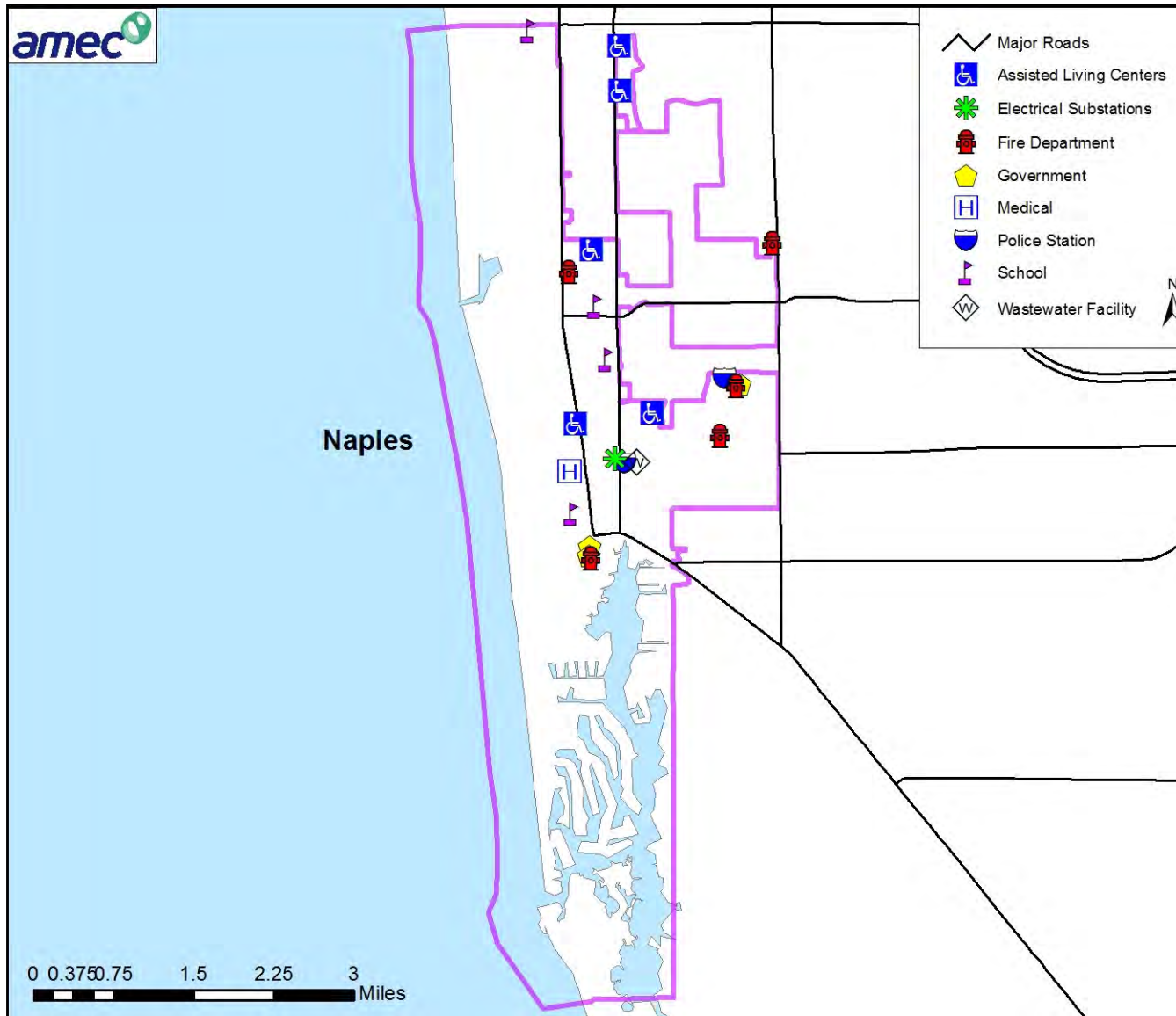


Figure 4-37 - City of Naples Critical Facilities

### Existing Land Use

As stated in Collier County’s Growth Management Plan Future Land Use Element, Collier County is situated in a unique, sensitive and intensely interactive physical environment. Natural resources are abundant: a subtropical climate with annual wet and dry seasons; enormous groundwater productivity; vast wetland areas; large ranges of habitat with diverse and unique flora and fauna, including many species that are federally and/or state listed, warranting special protection; extensive and highly productive estuarine systems; and, many miles of sandy beach. Protection and management of natural resources for long-term viability is essential to support the human population, ensure a high quality of life, and facilitate economic development within Collier County.

Figure 4-38 reflects existing land use within Collier County. Tables 4-23 through 4-26 detail existing land use by category and acreage for Collier County Unincorporated Areas, City of Everglades City, City of Marco Island and City of Naples, respectively.

**Table 4-23 - Existing Land Use - Collier County Unincorporated Areas**

Land Use	Acres
Bays and Estuaries	40,784
Commercial and Services	4,947
Communications	71
Cropland and Pastureland	73,120
Disturbed Land	2,288
Extractive	2,318
Feeding Operations	37
Herbaceous	7,887
Industrial	915
Institutional	3,113
Lakes	1,636
Major Bodies of Water	24,717
Mixed Rangeland	2,716
Non-Vegetated Wetlands	2,860
Nurseries and Vineyards	1,505
Open Land	2,407
Other Open Lands (Rural)	3,428
Recreational	11,756
Reservoirs	9,291
Residential, High Density	11,734
Residential, Medium Density	19,810
Residential, Low Density	42,123
Shrub and Brushland	23,266
Specialty Farms	345
Streams and Waterways	6,331
Transportation	5,560
Tree Crops	40,874
Upland Coniferous Forests	59,647
Upland Hardwood Forests	30,370
Utilities	725
Vegetated Non-Forested Wetlands	208,442
Wetland Coniferous Forests	376,075
Wetland Forested Mixed	15,327
Wetland Hardwood Forest	315,838
<b>Total</b>	<b>1,352,264</b>

Source: Collier County Planning and Zoning Department, 2014



**Table 4-24 - Existing Land Use - City of Everglades City**

<b>Land Use</b>	<b>Acres</b>
Bays and Estuaries	86
Commercial and Services	94
Communications	0
Cropland and Pastureland	0
Disturbed Land	0
Extractive	0
Feeding Operations	0
Herbaceous	10
Industrial	0
Institutional	29
Lakes	0
Major Bodies of Water	0
Mixed Rangeland	0
Non-Vegetated Wetlands	0
Nurseries and Vineyards	0
Open Land	21
Other Open Lands (Rural)	0
Recreational	0
Reservoirs	0
Residential, High Density	49
Residential, Medium Density	73
Residential, Low Density	21
Shrub and Brushland	0
Specialty Farms	0
Streams and Waterways	100
Transportation	25
Tree Crops	0
Upland Coniferous Forests	0
Upland Hardwood Forests	0
Utilities	3
Vegetated Non-Forested Wetlands	0
Wetland Coniferous Forests	0
Wetland Forested Mixed	0
Wetland Hardwood Forest	246
<b>Total</b>	<b>757</b>

**Table 4-25 - Existing Land Use - City of Marco Island**

<b>Land Use</b>	<b>Acres</b>
Bays and Estuaries	3,515
Commercial and Services	338
Communications	0
Cropland and Pastureland	0
Disturbed Land	0
Extractive	0
Feeding Operations	0
Herbaceous	0
Industrial	0
Institutional	76
Lakes	0

Land Use	Acres
Major Bodies of Water	1,678
Mixed Rangeland	0
Non-Vegetated Wetlands	977
Nurseries and Vineyards	0
Open Land	25
Other Open Lands (Rural)	0
Recreational	513
Reservoirs	42
Residential, High Density	610
Residential, Medium Density	3,188
Residential, Low Density	175
Shrub and Brushland	91
Specialty Farms	0
Streams and Waterways	1,311
Transportation	0
Tree Crops	0
Upland Coniferous Forests	0
Upland Hardwood Forests	72
Utilities	21
Vegetated Non-Forested Wetlands	62
Wetland Coniferous Forests	0
Wetland Forested Mixed	0
Wetland Hardwood Forest	3,074
<b>Total</b>	<b>15,768</b>

**Table 4-26 - Existing Land Use - City of Naples**

Land Use	Acres
Bays and Estuaries	10
Commercial and Services	809
Communications	0
Cropland and Pastureland	0
Disturbed Land	0
Extractive	0
Feeding Operations	0
Herbaceous	0
Industrial	0
Institutional	178
Lakes	0
Major Bodies of Water	2,396
Mixed Rangeland	0
Non-Vegetated Wetlands	0
Nurseries and Vineyards	0
Open Land	110
Other Open Lands (Rural)	0
Recreational	1,112
Reservoirs	214
Residential, High Density	1,020
Residential, Medium Density	2,754
Residential, Low Density	160
Shrub and Brushland	96

<b>Land Use</b>	<b>Acres</b>
Specialty Farms	0
Streams and Waterways	1,543
Transportation	690
Tree Crops	0
Upland Coniferous Forests	82
Upland Hardwood Forests	97
Utilities	30
Vegetated Non-Forested Wetlands	13
Wetland Coniferous Forests	8
Wetland Forested Mixed	18
Wetland Hardwood Forest	676
<b>Total</b>	<b>12,015</b>

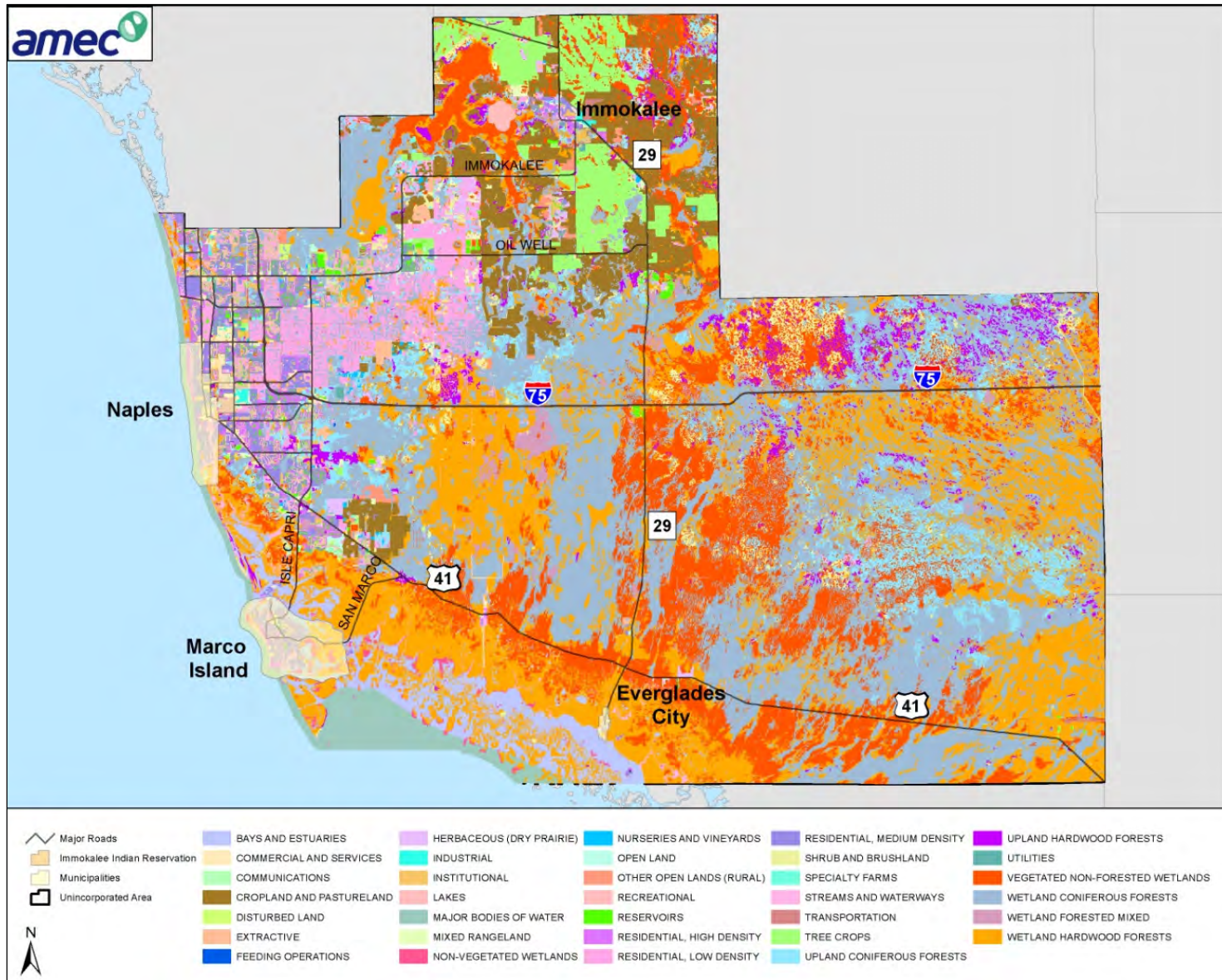


Figure 4-38 - Collier County Existing Land Use Map

#### 4.3.1 Vulnerability of Collier County to Specific Hazards

The Disaster Mitigation Act regulations require that the FMPC evaluate the risks associated with each of the hazards identified in the planning process. This section summarizes the possible impacts and quantifies the County's vulnerability to each of the hazards identified as a priority hazard in Table 4-17 in Section 4.2.8 Flood Hazards Profile Summary. The hazards evaluated as part of this vulnerability assessment include:

- Climate Change and Sea Level Rise
- Coastal/Canal Bank Erosion
- Flood: 100-/500-year
- Flood: Stormwater/Localized Flooding
- Hurricane and Tropical Storms (including storm surge)

Vulnerability is measured in general, quantitative terms and is a summary of the potential impact based on past occurrences, spatial extent, and damage and casualty potential. It is categorized into the following classifications:

- **Extremely Low** - The occurrence and potential cost of damage to life and property is very minimal to nonexistent.
- **Low** - Minimal potential impact. The occurrence and potential cost of damage to life and property is minimal.
- **Medium** - Moderate potential impact. This ranking carries a moderate threat level to the general population and/or built environment. Here the potential damage is more isolated and less costly than a more widespread disaster.
- **High** - Widespread potential impact. This ranking carries a high threat to the general population and/or built environment. The potential for damage is widespread. Hazards in this category may have occurred in the past.
- **Extremely High** - Very widespread with catastrophic impact.

Vulnerability can be quantified in those instances where there is a known, identified hazard area, such as a mapped floodplain. In these instances, the numbers and types of buildings subject to the identified hazard can be counted and their values tabulated. Other information can be collected in regard to the hazard area, such as the location of critical community facilities (e.g., a fire station), historic structures, and valued natural resources (e.g., an identified wetland or endangered species habitat). Together, this information conveys the impact, or vulnerability, of that area to that hazard.

#### 4.3.2 Climate Change and Sea Level Rise Vulnerability Assessment

**Likelihood of Future Occurrence**—Highly Likely  
**Vulnerability**—High

Collier County, due to its location on the Gulf Coast, is vulnerable to the potential impacts of climate change and sea level rise. The climate change hazard profile in Section 4.2.1 discusses how climate-driven hazards such as hurricanes and flooding are likely to increase in frequency, and possibly intensity, in the future. Thus the 25-year flood of today may become the 10 year event in the future. The reader should refer to the vulnerability assessment discussions on Flood (Section 4.3.4), Erosion (Section 4.3.3), and Hurricane (Section 4.3.6) for the current exposure and risk to these hazards with the perspective that climate change has the potential to exacerbate the existing risk and vulnerabilities. This section will focus on an assessment of direct impacts from sea level rise, using best available data. The potential impacts of climate change and

sea level rise include increased flooding frequency, potential damage to critical infrastructure, and increasing public costs associated with flood insurance claims, infrastructure repair and maintenance, environmental impacts and increased costs associated with emergency management efforts.

**Sea Level Rise**

Sea level rise can have the following impacts on property and infrastructure in Collier County:

- Coastal infrastructure: bridges, docks, piers
- Jettys/erosion control structures
- Roads and bridges
- Utility infrastructure
- Erosion hazard zones
- Built environment including residential development
- Natural resources
- Recreational facilities and amenities such as beaches, public access points, and parks
- Salt water intrusion into water supply
- Loss of property and property tax revenue due to inundation

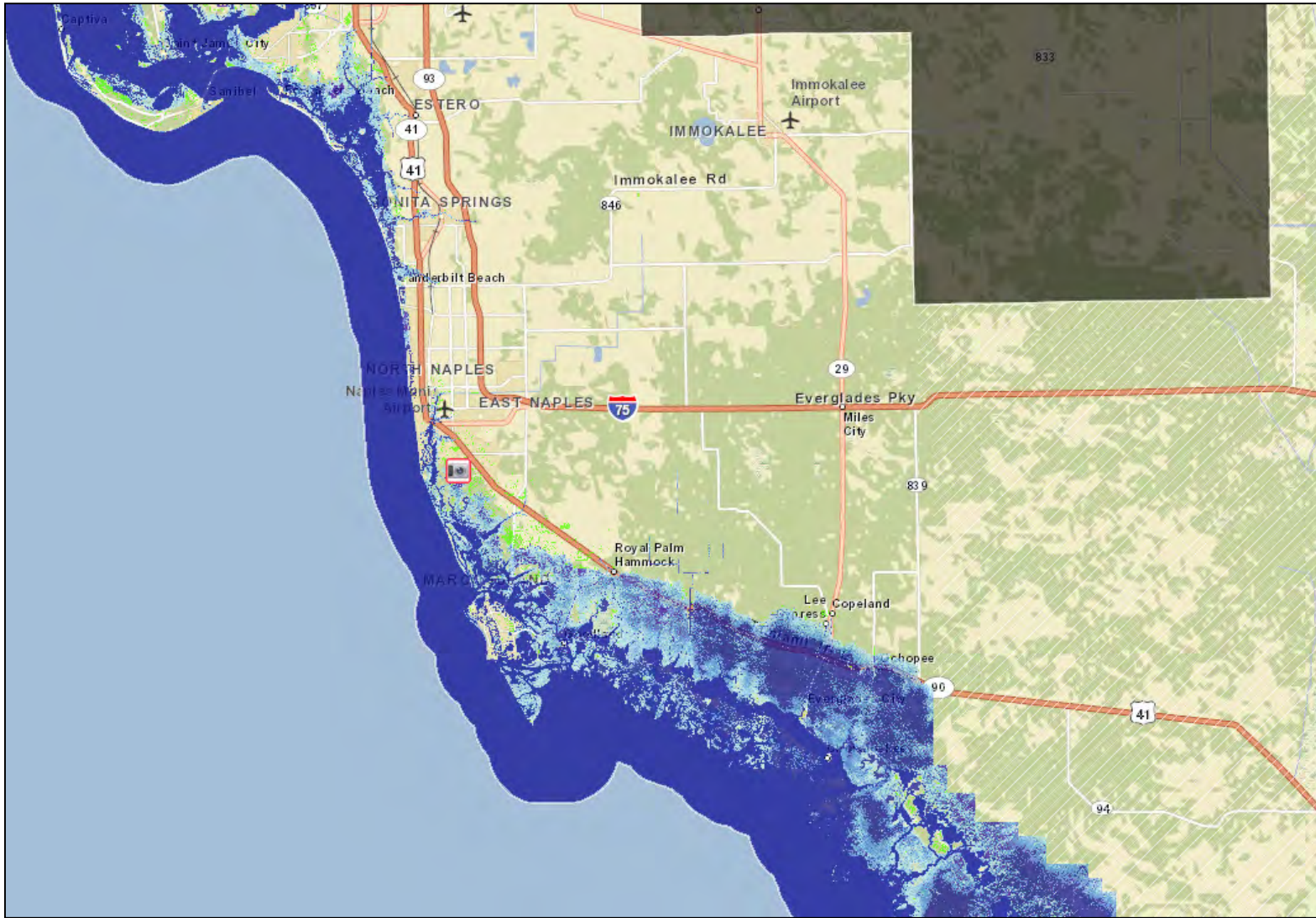
As discussed in Section 4.2.1, the USACE sea level rise projection for Collier County through 2060 ranges from 0.49 feet to 1.26 feet. Using the moderate acceleration scenario and the mean seal level trend for Naples, FL, Collier County should consider a projected 0.88 feet of seal level rise through 2060 for future planning purposes.

NOAA Coastal Services Center provides a sea level rise and coastal flooding impacts viewer in order to assess how sea level rise will impact coastal communities. Figure 4-39 reflects the impact of a one-foot sea level rise on Collier County using the coastal flooding impacts viewer provided by NOAA. The sea levels represent inundation at high tide, and areas that are hydrologically connected are shown in shades of blue (darker blue = greater depth). The low-lying areas, displayed in green, are hydrologically "unconnected" areas that may flood. The shaded area is unmapped. Table 4-27 provides an exposure analysis based on the elevation of land that structures are located on relative to local high tide. The results do not factor in structure elevation.



*Simulated 2ft SLR at Naples Botanical Garden*

Source: <http://www.csc.noaa.gov/digitalcoast/tools/slrviewer>



Source: <http://www.csc.noaa.gov/digitalcoast/tools/srviewer>

**Figure 4-39 - One-Foot Sea Level Rise Impact on Collier County**

**Table 4-27 - Sea Level Rise and Coastal Flood Exposure in Collier County**

		Elevation relative to local high tide line (Mean Higher High Water)									
Unit		< 1ft	< 2ft	< 3ft	< 4ft	< 5ft	< 6ft	< 7ft	< 8ft	< 9ft	< 10ft
<b>BY TOTALS</b>											
<b>High social vulnerability population</b>	Count	247	622	1770	5009	9219	15032	20636	25330	30540	38466
<b>Medium social vulnerability population</b>	Count	1575	3737	8149	17592	30883	44193	53916	62160	72019	86516
<b>Low social vulnerability population</b>	Count	184	424	1594	5043	9230	13051	15904	18501	21952	26707
<b>Property value</b>	\$Million	1030	2303	5865	14363	25388	35952	44743	51894	58738	66269
<b>Population</b>	Count	2007	4783	11513	27644	49332	72276	90455	105991	124511	151688
<b>Caucasian population</b>	Count	1779	4260	10296	24515	43401	63137	79445	93666	110406	134265
<b>Population of color</b>	Count	251	596	1390	3522	6583	10054	12125	13637	15674	19405
<b>African-American population</b>	Count	119	254	588	1579	3095	4990	6069	6730	7685	9547
<b>Asian population</b>	Count	21	53	131	318	574	834	1058	1256	1518	1946
<b>Hispanic population</b>	Count	345	859	2075	5112	9545	14071	16772	19223	22580	28773
<b>Native American population</b>	Count	20	55	108	246	404	563	679	782	910	1096
<b>Homes</b>	Count	1667	3886	9338	22398	39270	56690	71087	83085	95854	112273
<b>Hospitals</b>	Count	0	0	0	0	0	0	1	2	3	3
<b>Schools</b>	Count	0	0	0	1	4	10	18	22	26	29
<b>Colleges and Universities</b>	Count	0	0	0	1	1	1	2	4	5	5
<b>Libraries</b>	Count	0	1	1	1	1	2	3	5	6	8
<b>Theater, music &amp; arts buildings</b>	Buildings	0	0	0	0	1	2	2	3	3	3
<b>Houses of worship</b>	Count	2	5	8	19	28	34	42	47	56	62
<b>Government buildings</b>	Count	0	4	5	15	22	28	35	42	44	50
<b>Roads</b>	Miles	0	2	2	2	4	4	5	5	5	5
<b>County roads</b>	Miles	9	34	109	331	519	650	766	890	1052	1239
<b>Federal roads</b>	Miles	1	4	12	24	31	37	45	54	62	66
<b>Local roads</b>	Miles	0	1	7	19	23	28	32	36	38	41
<b>Primary roads</b>	Miles	7	28	89	284	454	570	674	783	933	1111
<b>Secondary roads</b>	Miles	0	0	0	0	0	0	0	0	0	2
<b>State roads</b>	Miles	0	1	8	23	34	42	47	53	57	60
<b>Passenger stations</b>	Count	0	0	1	4	11	14	15	17	19	20
<b>Intercity bus stations</b>	Count	0	0	0	0	1	1	1	1	1	1
<b>Ferry stations</b>		0	0	0	0	1	1	1	1	1	1
<b>Transit passenger stations</b>	Count	0	0	0	1	1	1	1	1	1	1



	Unit	Elevation relative to local high tide line (Mean Higher High Water)									
		< 1ft	< 2ft	< 3ft	< 4ft	< 5ft	< 6ft	< 7ft	< 8ft	< 9ft	< 10ft
<b>Airports</b>	COT	0	0	0	0	0	1	1	1	1	1
<b>Public airports</b>	COT	0	0	0	0	0	1	1	1	1	1
<b>Heliports</b>	Count	0	0	1	1	3	4	7	8	10	10
<b>FM radio transmitter sites</b>	Count	1	1	2	3	3	3	3	5	5	5
<b>EPA listed sites</b>	Count	14	27	50	106	165	202	256	329	371	424
<b>NPDES sites</b>	Count	8	14	23	39	66	87	108	137	154	170
<b>OIL sites</b>	Count	0	0	0	0	0	0	0	1	1	1
<b>RADINFO sites</b>	Count	6	13	27	64	94	110	139	178	202	234
<b>RMP Sites</b>	Count	0	0	0	0	0	0	1	1	1	2
<b>SSTS Sites</b>	Count	0	0	0	3	4	4	5	8	9	13
<b>TRI Sites</b>	Count	0	0	0	0	0	0	1	2	2	2
<b>Hazardous materials facilities</b>	Count	0	0	0	3	4	4	7	12	13	18
<b>Extreme hazmat facilities</b>	Count	0	0	0	0	0	0	1	1	1	2
<b>Oil facilities</b>	Count	0	0	0	0	0	0	0	1	1	1
<b>Pesticide facilities</b>	Count	0	0	0	3	4	4	5	8	9	13
<b>Hazardous waste sites</b>	Count	6	13	27	64	94	110	139	178	202	234
<b>Minor hazwaste source sites</b>	Count	5	10	17	45	62	73	91	124	137	155
<b>Unspecified hazardous waste sites</b>	Count	1	3	10	19	32	37	48	54	65	79
<b>Landfills</b>	Count	0	0	0	0	0	0	1	1	1	1
<b>Wastewater sites</b>	Count	8	14	23	39	66	87	108	137	154	170
<b>Non-major wastewater sites</b>	Count	8	14	23	39	66	87	108	137	154	170
<b>Sewage plants</b>	Count	0	0	0	0	1	2	2	2	3	3
<b>Land</b>	Acres	33801	58172	85489	121137	169680	238746	329109	405615	501351	586594
<b>Protected land</b>	Acres	27764	47724	69269	95221	130929	188638	269595	336838	420938	488697
<b>Federal protected land</b>	Acres	18923	30551	43481	58485	83436	128123	190794	239599	301719	353059
<b>Local protected land</b>	Acres	23	81	126	148	160	172	185	208	227	256
<b>State protected land</b>	Acres	8783	17011	25513	36400	47121	60122	78391	96803	118763	135153
<b>National Wildlife Refuges</b>	COT	0	1	2	2	2	2	2	2	2	2
<b>Local parks</b>	COT	3	8	9	10	11	12	12	13	13	15
<b>National parks</b>	COT	0	1	1	1	2	2	2	2	2	2
<b>State parks</b>	COT	0	1	2	3	3	3	3	3	3	3

Source: Climate Central 2014, Findings from Surging Seas (SurgingSeas.org)

### **4.3.3 Coastal/Canal Bank Erosion Vulnerability Assessment**

**Likelihood of Future Occurrence**—Highly Likely

**Vulnerability**—Medium

#### ***Coastal Erosion***

The severity of coastal erosion is typically measured through a quantitative assessment of annual shoreline change for a given beach cross-section profile (feet or meters per year) over a long period of time. Erosion rates vary as a function of shoreline type and are influenced primarily by episodic events, but can be used in land use and hazard management to define areas of critical concern. Unfortunately, there is no uniform erosion rate database or GIS data layer that defines erosion rates or such areas of critical concern for Collier County's shoreline. Coastal erosion is currently occurring as discussed in Section 4.2.2 and should be expected to continue to occur in the future.

#### ***Canal Bank Erosion***

Collier County has experienced canal bank erosion in the past. Canal bank erosion is a natural process, but acceleration of this natural process leads to a disproportionate sediment supply, stream channel instability, land loss, habitat loss and other adverse effects. Canal bank erosion can be expected to occur in the future as a matter of course in all canal bank areas.

### **4.3.4 Flood: 100-/500-year Vulnerability Assessment**

**Likelihood of Future Occurrence**—Occasional

**Vulnerability**—Extremely High

Flood damage is directly related to the depth of flooding by the application of a depth damage curve. In applying the curve, a specific depth of water translates to a specific percent damage to the structure which translates to the same percentage of the structure's replacement value. As previously shown in Figure 4.10, the majority of the County is located in areas vulnerable to the 100-year flood event under normal flood circumstances.

#### **Methodology**

Building counts by FEMA flood zone were determined using a spatial intersection of the building footprints provided by Collier County and the effective FEMA flood zones provided in the Collier County DFIRM Database effective 5/16/2012. In order to determine the correct occupancy class for each parcel, the land use codes provided in the Collier County tax parcel data were translated into the following occupancy types which are specific to FEMA's Hazus software: Agricultural, Commercial, Education, Government, Industrial, Religious and Residential. The occupancy types were translated to ensure the correct depth damage factor was applied to each building based on its occupancy class to ensure a more accurate damage assessment of the building.

Figure 4-40 depicts the depth of flooding that can be expected within the County during the 100-year flood event.

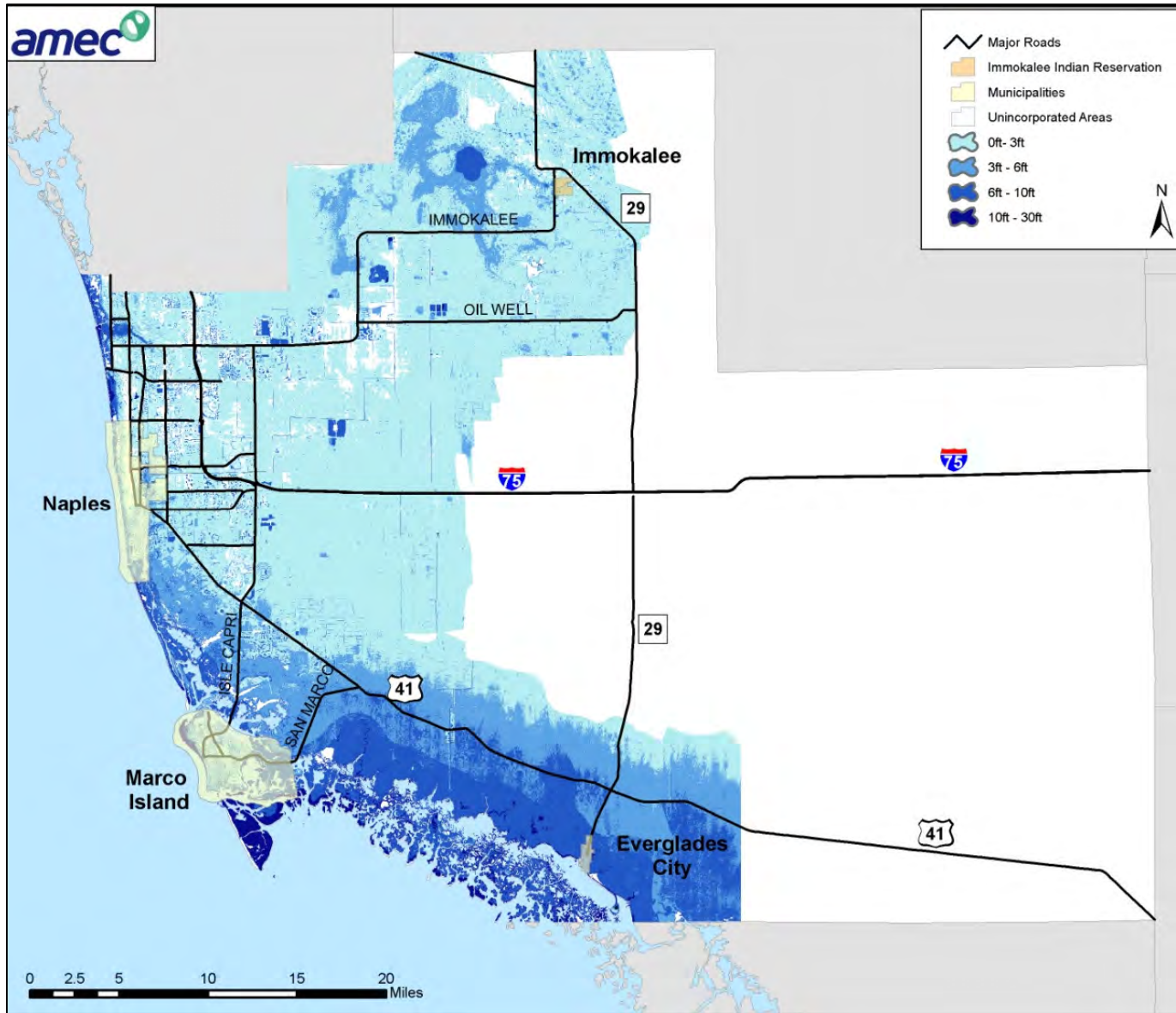


Figure 4-40 - 100-yr Flood Depths for Collier County

Table 4-28 provides the depth damage factors that were used in calculating flood losses for the County. These depth damage factors were developed based on the default depth damage curve used in Hazus. All depths assume the structure has no basement.

**Table 4-28 - Collier County Flood Loss Damage Factors**

Depth (ft)	Percent Damaged (%)						
	Agricultural	Commercial	Education	Government	Industrial	Religious	Residential
0	0	1	0	0	1	0	18
1	6	9	5	5	10	10	22
2	11	14	7	8	12	11	25
3	15	16	9	13	15	11	28
4	19	18	9	14	19	12	30
5	25	20	10	14	22	12	31
6	30	23	11	15	26	13	40
7	35	26	13	17	30	14	43
8	41	30	15	19	35	14	43
9	46	34	17	22	29	15	45
10	51	38	20	26	42	17	46
11	57	42	24	31	48	19	47
12	63	47	28	37	50	24	47
13	70	51	33	44	51	30	49
14	75	55	39	51	53	38	50
15	79	58	45	59	54	45	50
16	82	61	52	65	55	52	50
17	84	64	59	70	55	58	51
18	87	67	64	74	56	64	51
19	89	69	69	79	56	69	52
20	90	71	74	83	57	74	52
21	92	74	79	87	57	78	53
22	93	76	84	91	57	82	53
23	95	78	89	95	58	85	54
24	96	80	94	98	58	88	54

Source: Hazus 2.1

### Values at Risk

The loss estimate for flood is based on the total of improved building value and contents value. Land value is not included in any of the loss estimates as generally the land is not subject to loss from floods. It is important to note that information on those properties mitigated (e.g., floodproofed or elevated) in the SFHA was not available for analysis, thus the resulting flood damage loss estimates could be lower than actual figures. Once the total building and content value was calculated, the damage factor was applied to each building based on occupancy type. The loss estimates were then aggregated by flood zone.

Tables 4.29 through 4.32 show the building count, total value, estimated damages and loss ratio for buildings that fall within the 1% annual chance floodplain by flood zone and land use type. The loss ratio is the loss estimate divided by the total potential exposure (i.e., total of improved and contents value for all buildings located within the 1% annual chance flood zone) and displayed as a percentage of loss. FEMA considers loss ratios greater than 10% to be significant and an indicator a community may have more difficulties recovering from a flood.

**Table 4-29 – Estimated Building Damage and Content Loss – Collier County Unincorporated Areas**

Occupancy Type	Total Number of Buildings with Loss	Total Value (Building & Contents)	Estimated Building Damage	Estimated Content Loss	Estimated Total Damage	Loss Ratio
<b>Zone VE</b>						
Agricultural	1	\$0	\$0	\$0	\$0	0.0%
Commercial	15	\$4,157,078	\$393,671	\$1,661,702	\$2,055,373	49.4%
Education	0	\$0	\$0	\$0	\$0	0.0%
Government	20	\$622,355	\$51,728	\$299,211	\$350,939	56.4%
Industrial	0	\$0	\$0	\$0	\$0	0.0%
Religious	0	\$0	\$0	\$0	\$0	0.0%
Residential	366	\$275,417,458	\$69,320,492	\$43,246,783	\$112,567,275	40.9%
<b>Total</b>	<b>402</b>	<b>\$280,196,892</b>	<b>\$69,765,891</b>	<b>\$45,207,696</b>	<b>\$114,973,587</b>	<b>41.0%</b>
<b>Zone AE</b>						
Agricultural	299	\$19,463,971	\$125,950	\$632,459	\$758,409	3.9%
Commercial	782	\$488,332,076	\$7,713,193	\$18,892,030	\$26,605,223	5.4%
Education	62	\$160,364,446	\$736,797	\$4,086,032	\$4,822,830	3.0%
Government	233	\$340,865,882	\$4,041,341	\$25,358,228	\$29,399,569	8.6%
Industrial	116	\$107,702,188	\$1,902,674	\$4,865,097	\$6,767,771	6.3%
Religious	37	\$34,782,736	\$338,534	\$2,584,330	\$2,922,864	8.4%
Residential	20,086	\$3,092,042,473	\$234,125,287	\$131,322,082	\$365,447,368	11.8%
<b>Total</b>	<b>21,615</b>	<b>\$4,243,553,772</b>	<b>\$248,983,776</b>	<b>\$187,740,258</b>	<b>\$436,724,034</b>	<b>10.3%</b>
<b>Zone AH</b>						
Agricultural	591	\$54,034,808	\$74,529	\$649,882	\$724,412	1.3%
Commercial	523	\$412,565,708	\$670,732	\$2,454,467	\$3,125,199	0.8%
Education	78	\$192,861,995	\$206,567	\$1,115,879	\$1,322,445	0.7%
Government	352	\$166,990,665	\$28,150	\$173,117	\$201,267	0.1%
Industrial	410	\$214,456,356	\$626,990	\$4,214,175	\$4,841,165	2.3%
Religious	69	\$104,155,121	\$544,608	\$5,068,761	\$5,613,369	5.4%
Residential	23,852	\$4,025,697,886	\$81,636,805	\$29,503,415	\$111,140,220	2.8%
<b>Total</b>	<b>25,875</b>	<b>\$5,170,762,540</b>	<b>\$83,788,380</b>	<b>\$43,179,697</b>	<b>\$126,968,077</b>	<b>2.5%</b>
<b>Zone X (500-yr)</b>						
Agricultural	22	\$16,782,988	\$0	\$14,991	\$14,991	0.1%
Commercial	53	\$470,609,485	\$77,799	\$176,564	\$254,363	0.1%
Education	5	\$211,591,442	\$1,361	\$7,349	\$8,710	0.0%
Government	6	\$103,095,656	\$0	\$0	\$0	0.0%
Industrial	12	\$141,607,214	\$3,378	\$61,337	\$64,715	0.0%
Religious	1	\$57,323,138	\$0	\$2,076	\$2,076	0.0%
Residential	6,090	\$6,242,215,073	\$40,069,959	\$16,270,923	\$56,340,882	0.9%
<b>Total</b>	<b>6,189</b>	<b>\$7,243,224,997</b>	<b>\$40,152,497</b>	<b>\$16,533,240</b>	<b>\$56,685,737</b>	<b>0.8%</b>
<b>Total</b>	<b>54,081</b>	<b>\$16,937,738,201</b>	<b>\$442,690,544</b>	<b>\$292,660,891</b>	<b>\$735,351,435</b>	<b>4.3%</b>

Source: Collier County 2014 Tax Assessor's Data, FEMA 2012 DFIRM

**Table 4-30 - Estimated Building Damage and Content Loss – City of Everglades City**

Occupancy Type	Total Number of Buildings with Loss	Total Value (Building & Contents)	Estimated Building Damage	Estimated Content Loss	Estimated Total Damage	Loss Ratio
<b>Zone VE</b>						
Agricultural	0	\$0	\$0	\$0	\$0	0.0%
Commercial	3	\$729,366	\$80,505	\$266,141	\$346,646	47.5%
Education	0	\$0	\$0	\$0	\$0	0.0%
Government	2	\$1,212,570	\$93,726	\$594,818	\$688,544	56.8%
Industrial	0	\$0	\$0	\$0	\$0	0.0%
Religious	0	\$0	\$0	\$0	\$0	0.0%
Residential	6	\$844,172	\$223,328	\$134,380	\$357,708	42.4%
Total	11	\$2,786,108	\$397,559	\$995,339	\$1,392,898	50.0%
<b>Zone AE</b>						
Agricultural	0	\$0	\$0	\$0	\$0	0.0%
Commercial	34	\$7,321,564	\$735,862	\$2,757,699	\$3,493,561	47.7%
Education	6	\$9,539,652	\$361,089	\$2,412,743	\$2,773,832	29.1%
Government	10	\$5,207,726	\$383,856	\$2,502,331	\$2,886,187	55.4%
Industrial	5	\$730,058	\$79,269	\$242,592	\$321,861	44.1%
Religious	2	\$573,292	\$36,060	\$277,300	\$313,360	54.7%
Residential	208	\$31,605,457	\$6,925,037	\$4,480,901	\$11,405,937	36.1%
Total	265	\$54,977,749	\$8,521,173	\$12,673,566	\$21,194,738	38.6%
<b>Total</b>	<b>276</b>	<b>\$57,763,857</b>	<b>\$8,918,732</b>	<b>\$13,668,905</b>	<b>\$22,587,636</b>	<b>39.1%</b>

Source: Collier County 2014 Tax Assessor's Data, FEMA 2012 DFIRM

**Table 4-31 - Estimated Building Damage and Content Loss - City of Marco Island**

Occupancy Type	Total Number of Buildings with Loss	Total Value (Building & Contents)	Estimated Building Damage	Estimated Content Loss	Estimated Total Damage	Loss Ratio
<b>Zone VE</b>						
Agricultural	0	\$0	\$0	\$0	\$0	0.0%
Commercial	3	\$1,063,833	\$55,368	\$276,818	\$332,186	31.2%
Education	0	\$0	\$0	\$0	\$0	0.0%
Government	3	\$386,818	\$30,568	\$184,637	\$215,205	55.6%
Industrial	0	\$0	\$0	\$0	\$0	0.0%
Religious	0	\$0	\$0	\$0	\$0	0.0%
Residential	136	\$191,248,220	\$30,695,697	\$20,265,484	\$50,961,180	26.6%
Total	142	\$192,698,871	\$30,781,632	\$20,726,939	\$51,508,571	26.7%
<b>Zone AE</b>						
Agricultural	3	\$0	\$0	\$0	\$0	0.0%
Commercial	189	\$120,001,107	\$2,596,961	\$7,898,076	\$10,495,037	8.7%
Education	13	\$31,637,192	\$374,036	\$2,020,566	\$2,394,602	7.6%
Government	72	\$23,666,418	\$252,247	\$1,559,503	\$1,811,750	7.7%
Industrial	20	\$8,607,798	\$221,175	\$729,922	\$951,097	11.0%
Religious	13	\$37,352,383	\$131,894	\$1,342,014	\$1,473,907	3.9%
Residential	6,706	\$2,765,820,167	\$271,346,420	\$138,951,297	\$410,297,717	14.8%
Total	7,016	\$2,987,085,065	\$274,922,734	\$152,501,377	\$427,424,111	14.3%
<b>Zone X (500-yr)</b>						
Agricultural	0	\$0	\$0	\$0	\$0	0.0%
Commercial	1	\$11,835,525	\$5,457	\$10,914	\$16,371	0.1%
Education	0	\$0	\$0	\$0	\$0	0.0%
Government	0	\$343,395	\$0	\$0	\$0	0.0%
Industrial	0	\$0	\$0	\$0	\$0	0.0%
Religious	0	\$6,665,947	\$0	\$0	\$0	0.0%
Residential	1	\$8,889,110	\$0	\$0	\$0	0.0%
Total	2	\$27,733,976	\$0	\$0	\$0	0.0%
<b>Total</b>	<b>7,160</b>	<b>\$3,207,517,913</b>	<b>\$305,704,366</b>	<b>\$173,228,316</b>	<b>\$478,932,682</b>	<b>14.9%</b>

Source: Collier County 2014 Tax Assessor's Data, FEMA 2012 DFIRM

**Table 4-32 - Estimated Building Damage and Content Loss – City of Naples**

Occupancy Type	Total Number of Buildings with Loss	Total Value (Building & Contents)	Estimated Building Damage	Estimated Content Loss	Estimated Total Damage	Loss Ratio
<b>Zone VE</b>						
Agricultural	0	\$0	\$0	\$0	\$0	0.0%
Commercial	4	\$10,482,144	\$977,303	\$4,156,859	\$5,134,162	49.0%
Education	0	\$0	\$0	\$0	\$0	0.0%
Government	7	\$479,690	\$40,152	\$239,776	\$279,928	58.4%
Industrial	0	\$0	\$0	\$0	\$0	0.0%
Religious	0	\$0	\$0	\$0	\$0	0.0%
Residential	212	\$232,166,032	\$45,164,011	\$29,012,751	\$74,176,761	31.9%
<b>Total</b>	<b>223</b>	<b>\$243,127,866</b>	<b>\$46,181,465</b>	<b>\$33,409,386</b>	<b>\$79,590,851</b>	<b>32.7%</b>
<b>Zone AE</b>						
Agricultural	4	\$0	\$0	\$0	\$0	0.0%
Commercial	326	\$556,269,331	\$9,388,816	\$26,585,701	\$35,974,518	6.5%
Education	10	\$29,987,194	\$50,663	\$277,931	\$328,594	1.1%
Government	176	\$151,062,475	\$2,008,726	\$12,965,559	\$14,974,285	9.9%
Industrial	29	\$20,790,304	\$56,866	\$517,166	\$574,032	2.8%
Religious	9	\$13,943,095	\$320,958	\$2,032,480	\$2,353,438	16.9%
Residential	4,948	\$3,879,697,391	\$352,885,961	\$195,566,069	\$548,452,030	14.1%
<b>Total</b>	<b>5,502</b>	<b>\$4,651,749,790</b>	<b>\$364,711,992</b>	<b>\$237,944,906</b>	<b>\$602,656,898</b>	<b>13.0%</b>
<b>Zone AH</b>						
Agricultural	0	\$0	\$0	\$0	\$0	0.0%
Commercial	25	\$18,154,600	\$104,013	\$525,871	\$629,884	3.5%
Education	10	\$18,959,939	\$43,498	\$234,890	\$278,388	1.5%
Government	3	\$18,784,938	\$0	\$0	\$0	0.0%
Industrial	0	\$0	\$0	\$0	\$0	0.0%
Religious	2	\$1,140,324	\$0	\$7,159	\$7,159	0.6%
Residential	539	\$94,135,263	\$3,332,591	\$1,718,236	\$5,050,827	5.4%
<b>Total</b>	<b>579</b>	<b>\$151,175,064</b>	<b>\$3,480,102</b>	<b>\$2,486,157</b>	<b>\$5,966,258</b>	<b>3.9%</b>
<b>Zone X (500-yr)</b>						
Agricultural	0	\$0	\$0	\$0	\$0	0.0%
Commercial	6	\$98,129,135	\$14,405	\$14,405	\$28,809	0.0%
Education	1	\$2,179,897	\$0	\$0	\$0	0.0%
Government	1	\$35,185,320	\$0	\$0	\$0	0.0%
Industrial	1	\$7,637,603	\$0	\$27,542	\$27,542	0.4%
Religious	1	\$16,642,547	\$0	\$18,078	\$18,078	0.1%
Residential	8	\$264,595,054	\$8,632	\$2,877	\$11,510	0.0%
<b>Total</b>	<b>18</b>	<b>\$424,369,555</b>	<b>\$23,037</b>	<b>\$62,902</b>	<b>\$85,939</b>	<b>0.0%</b>
<b>Total</b>	<b>6,322</b>	<b>\$5,470,422,276</b>	<b>\$414,396,596</b>	<b>\$273,903,351</b>	<b>\$688,299,946</b>	<b>12.6%</b>

Source: Collier County 2014 Tax Assessor's Data, FEMA 2012 DFIRM



### Flooded acres

Also of interest is the land area affected by the various flood zones. The following is an analysis of flooded acres in the County in comparison to total area within the County limits.

### Methodology

GIS was used to calculate acres flooded by FEMA flood zones. The Collier County parcel layer and effective DFIRM were intersected and the flooded parcel area was calculated in acres. The flood zone was assigned to any given parcel based on the intersection of the parcel with a flood zone. Parcels can be located in multiple flood zones, and only the flooded acreage within the parcel was counted for each flood zone.

### Limitations

One limitation to be made from this analysis is that the parcel layer does not include right-of-way areas. Due to this, there are voids of land that are not accounted for; therefore, this analysis only represents total parcel acres. Table 4-33 represents a detailed and summary analysis of total improved flooded acres by FEMA DFIRM flood zone for Collier County Unincorporated Areas, City of Everglades City, City of Marco Island and City of Naples.

**Table 4-33 - Total Parcel Acres to Improved Flooded Acres by Flood Zone**

Flood Zone	Total Parcel Acres	Improved Flooded Acres
<b>Collier County Unincorporated Areas</b>		
Zone AE	290,516	27,790
Zone VE	33,062	367
Zone AH	280,139	65,532
Zone A	659,591	47,792
Zone X (500-yr)	19,819	9,054
Zone X (unshaded)	36,877	18,081
<b>Total</b>	<b>1,320,002</b>	<b>168,616</b>
<b>City of Everglades City</b>		
Zone AE	1,559	145
Zone VE	861	49
Zone AH	0	0
Zone A	0	0
Zone X (500-yr)	1	1
Zone X (unshaded)	0	0
<b>Total</b>	<b>2,422</b>	<b>195</b>
<b>City of Marco Island</b>		
Zone AE	10,162	2,783
Zone VE	5,103	253
Zone AH	0	0
Zone A	0	0
Zone X (500-yr)	52	34
Zone X (unshaded)	236	127
<b>Total</b>	<b>15,553</b>	<b>3,196</b>
<b>City of Naples</b>		
Zone AE	9,347	4,194

Flood Zone	Total Parcel Acres	Improved Flooded Acres
Zone VE	2,382	280
Zone AH	851	434
Zone A	0	0
Zone X (500-yr)	753	515
Zone X (unshaded)	1,120	685
<b>Total</b>	<b>14,453</b>	<b>6,110</b>

Source: Collier County 2014 Tax Assessor's Data, FEMA 2012 DFIRM

### Population at Risk

A separate analysis was performed to determine the population at risk to the individual FEMA flood zones. Using GIS, the DFIRM flood zones were intersected with the building footprint layer. Those residential buildings that intersected the flood zones were counted and multiplied by the Census Bureau household factor for each community as shown in Table 4-34.

**Table 4-34 - Collier County Population at Risk to Flood**

Occupancy Type	Residential Property Count	Census Bureau Household Factor	Population at Risk
<b>Zone VE</b>			
Collier County Unincorporated Areas	367	2.64	969
City of Everglades City	8	2.64*	21
City of Marco Island	152	2.14	325
City of Naples	212	1.99	422
<b>Zone AE</b>			
Collier County Unincorporated Areas	20,146	2.64	53,185
City of Everglades City	368	2.64*	972
City of Marco Island	6,916	2.14	14,800
City of Naples	4,950	1.99	9,851
<b>Zone AH</b>			
Collier County Unincorporated Areas	23,983	2.64	63,315
City of Everglades City	0	2.64*	0
City of Marco Island	0	2.14	0
City of Naples	544	1.99	1,083
<b>Zone A</b>			
Collier County Unincorporated Areas	0	2.64	0
City of Everglades City	0	2.64*	0
City of Marco Island	0	2.14	0
City of Naples	0	1.99	0
<b>Zone X (500-yr)</b>			
Collier County Unincorporated Areas	22,513	2.64	59,434
City of Everglades City	0	2.64*	0
City of Marco Island	71	2.14	152
City of Naples	736	1.99	1,465
<b>Zone X (unshaded)</b>			
Collier County Unincorporated Areas	33,695	2.64	88,955
City of Everglades City	0	2.64*	0
City of Marco Island	292	2.14	625
City of Naples	809	1.99	1,610
<b>Total</b>			<b>297,183</b>

Source: Collier County 2014 Tax Assessor's Data, FEMA 2012 DFIRM, U.S. Census Bureau (2008-2012)

\*A separate household factor was not available for Everglades City. The Collier County household factor was used instead.

### **Critical Facilities at Risk**

A separate analysis was performed to determine critical facilities in the 1% and 0.2% annual chance floodplains. Using GIS, the DFIRM flood zones were overlaid on the critical facility location data. Figure 4-41 shows critical facilities and DFIRM flood zones. Figure 4-42 shows critical facilities and 100-yr flood depth. Table 4-35 details critical facilities by facility type, flood zone, replacement value, and base flood elevation Collier County Unincorporated Areas, City of Everglades City, City of Marco Island and City of Naples.

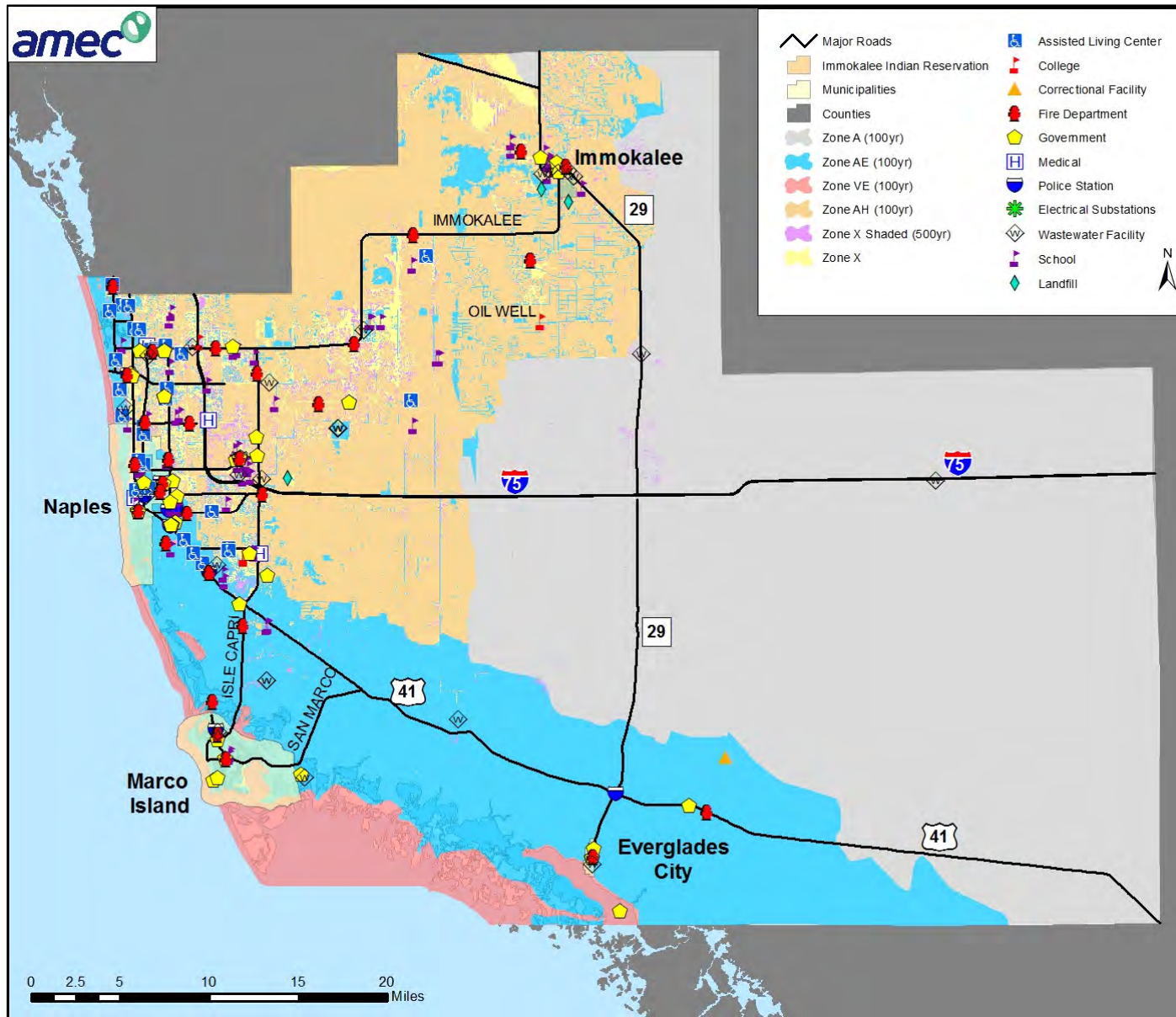


Figure 4-41 - Critical Facilities and FEMA Flood Zones

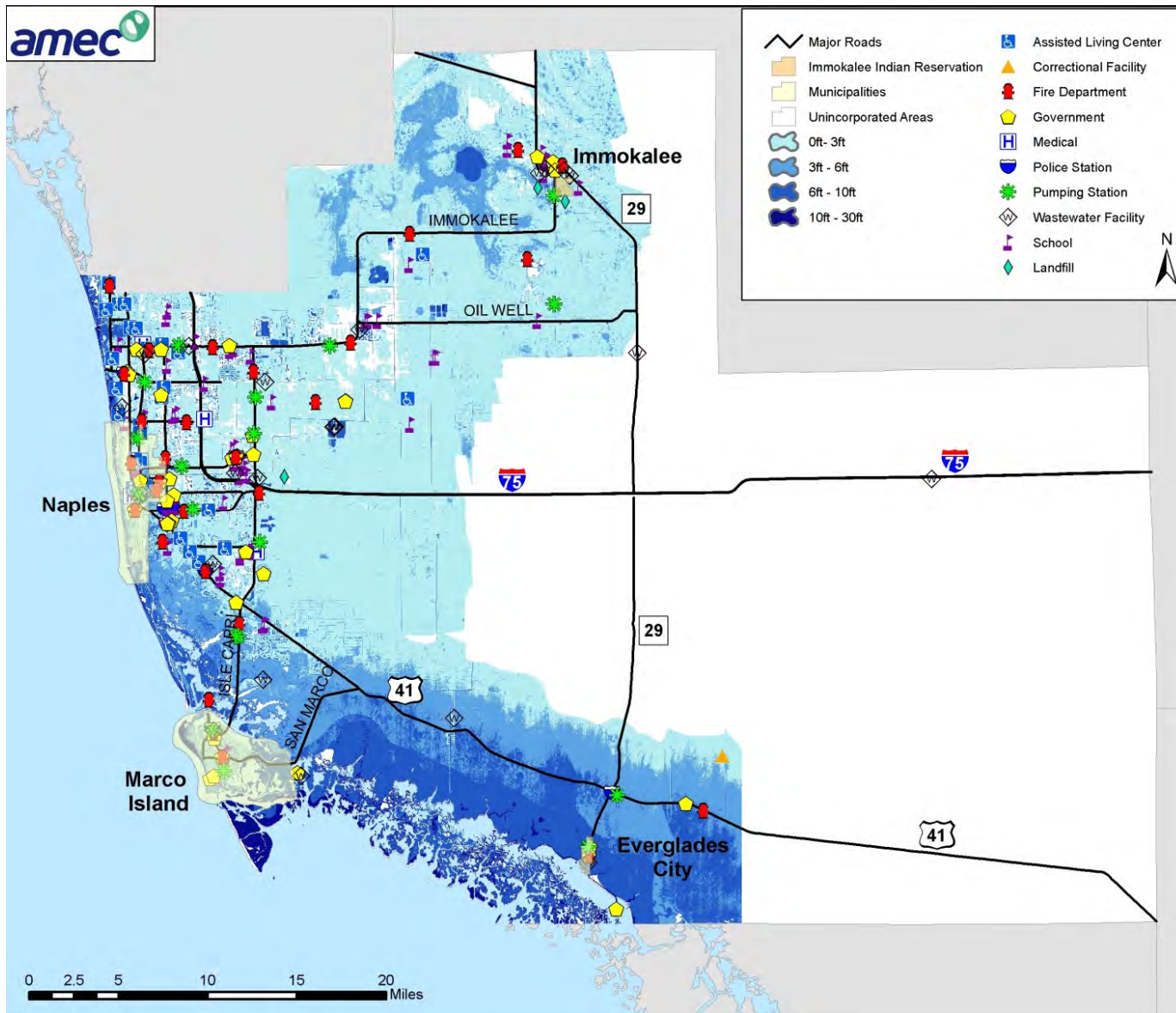


Figure 4-42 - Critical Facilities and 100-yr Flood Depths

**Table 4-35 - Critical Facilities by Flood Zone**

Facility Name	Facility Type	Address	Estimated 100yr Flood Depth (Ft)
<b>Collier County Unincorporated Areas</b>			
<b>Zone X (500-yr)</b>			
Merrill Gardens At Naples	Assisted Living Centers	1710 Southwest Health Parkway	0.0
Manorcare At Lely Palms	Assisted Living Centers	6135 Rattlesnake Hammock Road	0.0
The Aristocrat	Assisted Living Centers	10949 Parnu Street	0.0
Imperial Health Care Center	Assisted Living Centers	900 Imperial Golf Course Boulevard	0.0
Aston Gardens At Pelican Marsh LLC	Assisted Living Centers	4750 Aston Gardens Way	0.0
Fpl-Golden Gate	Electrical Transfer Sta	4105 15th Ave SW	0.0
Golden Gate Fire Control And Rescue District Station 70	Fire	4741 Golden Gate Parkway	0.0
Calusa Park	School	4600 Santa Barbara Boulevard	0.0
Immokalee Community	School	123 N 4th Street	0.0
Lely	School	1 Lely High School Boulevard	0.0
<b>Zone A</b>			
I-75 Big Cypress Rest Stop	Wastewater Facility		0.0
Sunniland Mine - Florida Rock	Wastewater Facility		0.0
<b>Zone AE</b>			
Tuscany Villa Of Naples	Assisted Living Centers	8901 Tamiami Trail East	0.0
Manorcare Nursing And Rehabilitation Center	Assisted Living Centers	3601 Lakewood Boulevard	0.0
The Glenview At Pelican Bay	Assisted Living Centers	100 Glenview Place	0.0
Arbor Glen At Arbor Trace	Assisted Living Centers	1000 Arbor Lake Drive	0.0
Barrington Terrace Of Naples	Assisted Living Centers	5175 Tamiami Trail East	0.0
Cove At The Marbella The	Assisted Living Centers	7425 Pelican Bay Blvd.	0.5
Aristocrat The	Assisted Living Centers	10949 Parnu Street	0.4
Juniper Village At Naples	Assisted Living Centers	1155 Encore Way	0.0
Terracina Grand	Assisted Living Centers	6825 Davis Blvd	5.3
Vanderbilt Beach Assisted Living Home	Assisted Living Centers	517 100th Avenue N.	0.6
Collier County Sheriff	Correctional Facility	3319 Tamiami Trl E	0.0
Big Cypress Wilderness	Correctional Facility	25959 Turner River Rd	1.4
Collier Juvenile Detention Center	Correctional Facility	3351 E Tamiami Trl	0.0
Fpl-Capri	Electrical Transfer Sta	5785 Collier Blvd	2.8
Lcec-Belle Meade	Electrical Transfer Sta	5735 Collier Blvd	1.8

Facility Name	Facility Type	Address	Estimated 100yr Flood Depth (Ft)
Lcec-Carnestown	Electrical Transfer Stations	32096 Tamiami Trl E	3.1
East Naples Fire Control And Rescue District Station 23	Fire	6055 Collier Boulevard	2.4
Ochopee Fire Rescue Station 66	Fire	40808 East Tamiami Trail	3.5
Isles Of Capri Fire And Rescue Station 50	Fire	175 Capri Boulevard	3.1
East Naples Fire Control And Rescue District Station 22	Fire	4375 Bayshore Drive	0.0
East Naples Fire Control And Rescue District Station 21	Fire	11121 East Tamiami Trail	2.0
U S Post Office - Naples	Government	1200 Goodlette Rd N	0.0
Collier County Property Appraiser	Government	3950 Radio Rd	0.0
Collier County Health Department	Government	3339 Tamiami Trl E	0.0
Collier County - County Court	Government	3315 Tamiami Trl E	0.0
Collier County Tax Collector	Government	3291 E Tamiami Trl	0.0
Collier County Supervisor Of Elections	Government	3295 E Tamiami Trl	0.0
U S Post Office - Chokoloskee	Government	195 Smallwood Dr	3.9
U S Post Office - Ochopee	Government	38000 Tamiami Trl E	3.8
U S Post Office - Goodland	Government	427 Papaya St	0.6
Collier County Tax Collector	Government	12668 E Tamiami Trl	0.9
Collier County Tax Collector	Government	725 Airport Rd S	1.0
North Collier Hospital	Medical Center	11190 Health Park Boulevard	0.0
Everglades Police Sub Station	Police	32020 East Tamiami Trail	2.2
Collier County Sheriff Office	Police	11121 Tamiami Trl E	2.0
Collier County Sheriff Office	Police	3305 Tamiami Trail East	1.7
Sheriff Office-Special Oper	Police	3123 Terrace Ave	0.5
Manatee	School	1880 Manatee Road	0.0
Poinciana	School	2825 Airport Pulling Road S	0.0
Manatee	School	1920 Manatee Road	0.0
Avalon	School	3300 Thomasson Drive	0.2
Naples Park	School	685 111th Avenue N	0.0
Shadowlawn	School	2161 Shadowlawn Drive	1.2
East Naples	School	4100 Estey Avenue	0.1
Alternative Schools	School	3710 Estey Avenue	0.4
Pelican Bay Sewage Treat Plant	Wastewater Facility	6652 Watergate Way	0.3
Marco Island, City of - RO Plant	Wastewater Facility		0.0

Facility Name	Facility Type	Address	Estimated 100yr Flood Depth (Ft)
Marco Shores Utilities	Wastewater Facility		0.0
Goodland Isles Estates	Wastewater Facility		6.3
Port Of The Islands WWTP	Wastewater Facility	12600 Union Rd	1.0
<b>Zone AH</b>			
Hazels Mansion Incorporated	Assisted Living Centers	2861 Golden Gate Boulevard East	0.0
Arden Courts Of Lely Palms	Assisted Living Centers	6125 Rattlesnake Hammock Road	0.0
Lely Palms Retirement Community	Assisted Living Centers	1000 Lely Palms Drive	0.0
Coke Alvan St Aubyn	Assisted Living Centers	3620 64th Avenue Ne	1.8
Fpl-Weber	Electrical Transfer Sta	191 Weber Blvd N	0.0
Fpl-Alligator	Electrical Transfer Sta	4995 Davis Blvd	0.0
Lcec-Ave Maria South	Electrical Transfer Sta	6095 Camp Keais Rd	0.0
Lcec-Immokalee	Electrical Transfer Sta	1299 S 1st Street	0.0
Fpl-Pine Ridge	Electrical Transfer Sta	7990 Goodlette-Frank Rd N	0.8
Fpl-Collier B1	Electrical Transfer Sta	8500 Collier Blvd	0.0
Immokalee Fire Control District Station 30	Fire	502 New Market Road East	0.0
East Naples Fire Control And Rescue District Station 20 - Headquarters	Fire	4798 Davis Boulevard	0.0
North Naples Fire Control And Rescue District Station 45	Fire	1885 Veterans Park Drive	0.0
Golden Gate Fire Control And Rescue District Station 72	Fire	3820 Beck Boulevard	0.0
Immokalee Fire Control District Station 31	Fire	1107 Carson Road	0.0
Collier County Health Department - Immokalee Office	Government	419 N First St	0.0
Collier County Emergency Management	Government	8075 Lely Cultural Pkwy	0.0
Physicians Regional Medical Center - Collier Boulevard	Medical Center	8300 Collier Boulevard	0.0
Collier County Sheriff Office	Police	4741 Golden Gate Pkwy	0.0
Pine Ridge	School	1515 Pine Ridge Road	0.2
Palmetto	School	3000 10th Avenue Se	0.7
Florida Southwestern State College	University/College	7007 Lely Cultural Parkway	0.0
Immokalee WWTF	Wastewater Facility		0.0
Handy Food Store #91	Wastewater Facility		0.0
Davis Oil Company - Davis Service Center	Wastewater Facility	726 E Main St	0.6



Facility Name	Facility Type	Address	Estimated 100yr Flood Depth (Ft)
Collier County North Regional WRF	Wastewater Facility		1.3
Orange Tree WWTP	Wastewater Facility		0.0
<b>Zone X (Unshaded)</b>			
Harbor Memory Care Of North Collier	Assisted Living Centers	101 Cypress Way East	1.8
Windsor Place	Assisted Living Centers	2626 Goodlette Road North	0.0
The Carlisle Naples	Assisted Living Centers	6945 Carlisle Court	0.0
Harborage Of Naples	Assisted Living Centers	7801 Airport Pulling Road North	0.0
Bentley Village	Assisted Living Centers	704 Village Circle	0.0
Harborage Of Naples	Assisted Living Centers	7801 Airport Pulling Road North	0.0
Bentley Care Center	Assisted Living Centers	875 Retreat Drive	0.0
Kiva At Canterbury Limited Liability Company	Assisted Living Centers	10 7th Street	0.0
Fpl-Collier	Electrical Transfer Sta	7221 Golden Gate Pkwy	0.0
Fpl-Solana	Electrical Transfer Sta	1405 Solana Rd	0.0
Fpl-Vanderbilt	Electrical Transfer Sta	2355 Piper Blvd	0.0
Fpl-Orangetree	Electrical Transfer Sta	625 24th Ave NW	0.0
Immokalee Fire Control District Station 32	Fire	4817 Ave Maria Boulevard	0.4
North Naples Fire Control And Rescue District Station 40	Fire	1441 Pine Ridge Road	0.0
North Naples Fire Control And Rescue District Station 46	Fire	3410 Pine Ridge Road	0.0
North Naples Fire Control And Rescue District Station 43	Fire	16325 Vanderbilt Drive	0.0
Golden Gate Fire Control And Rescue District Station 71	Fire	100 13th Street Southwest	0.0
Big Corkscrew Island Fire Control And Rescue District Station 10	Fire	13240 Immokalee Road	0.0
Big Corkscrew Island Fire Control And Rescue District Station 12	Fire	21520 Immokalee Road	0.0
North Naples Fire Control District Station 44	Fire	8970 Hammock Oak Drive	0.0
Golden Gate Fire Control And Rescue District Station 73	Fire	14575 Collier Boulevard	0.0
North Naples Fire Control And Rescue District Station 42	Fire	7010 Immokalee Road	0.0
U S Post Office - Cpu Veronawalk	Government	8090 Sorrento Ln	0.0

Facility Name	Facility Type	Address	Estimated 100yr Flood Depth (Ft)
U S Post Office - East Naples Carrier Annex	Government	3573 Progress Ave	0.0
U S Post Office - Coco River	Government	1130 Creekside Way	0.0
U S Post Office - Immokalee	Government	810 N 15th St	0.0
Collier County - Wilson Blvd	Government	50 Wilson Blvd S	0.0
Collier County Health Department - Golden Gate Parkway	Government	4945 Golden Gate Pkwy	0.0
Collier County - County Court - Golden Gate	Government	4715 Golden Gate Pkwy	0.0
Collier County - County Court - North Collier Government Service Center	Government	2335 Orange Blossom Dr	0.0
Collier County - County Court - Greentree - Greentree Shopping Center	Government	2348 Immokalee Rd	0.0
Collier County - County Court - Immokalee Courthouse	Government	106 S First St	0.0
Collier County Property Appraiser	Government	4715 Golden Gate Pkwy	0.0
Collier County Property Appraiser	Government	2335 Orange Blossom Dr	0.0
U S Post Office - Golden Gate	Government	11665 Collier Blvd	0.0
U S Post Office - Golden Gate Carrier Annex	Government	4080 15th Ave SW	0.0
U S Post Office - Vanderbilt Beach	Government	851 Vanderbilt Beach Rd	0.0
U S Post Office - Cpu Amoco Town Market	Government	7770 Preserve Ln	0.0
Collier County Tax Collector	Government	2348 Immokalee Rd	0.0
Collier County Tax Collector	Government	4715 Golden Gate Pkwy	0.0
Collier County Tax Collector	Government	106 1st St S	0.0
Collier County Tax Collector	Government	2335 Orange Blossom Dr	0.0
Collier County Tax Collector	Government	50 Wilson Blvd S	0.0
Collier County Tax Collector	Government	8771 Tamiami Trl N	0.0
Physicians Regional Medical Center - Pine Ridge	Medical Center	6101 Pine Ridge Road	0.0
Sheriff Office-Training	Police	3702 Estey Ave	3.5
Collier County Sheriff Office	Police	776 Vanderbilt Beach Rd	0.0
Collier County Sheriff Office	Police	112 S 1st St	0.0
Highlands	School	1101 Lake Trafford Road	0.0
Mike Davis	School	3215 Magnolia Pond Drive	0.1
Lorenzo Walker Institute	School	3702 Estey Avenue	0.2
Immokalee	School	401 9th Street N	0.0
North Naples	School	16165 Learning Lane	0.0

Facility Name	Facility Type	Address	Estimated 100yr Flood Depth (Ft)
Walker Institute Of Technology	School	3702 Estey Avenue	0.2
Parkside	School	5322 Texas Avenue	0.0
Big Cypress	School	3250 Golden Gate Boulevard W	0.0
Eden Park	School	3650 Westclox Street	0.0
Estates	School	5945 Everglades Blvd N	0.0
Golden Gate	School	4911 20th Place SW	0.0
Golden Gate	School	5055 20th Place SW	0.0
Golden Terrace North	School	2711 44th Terrace SW	0.0
Golden Terrace South	School	2965 44th Terrace SW	0.0
Lake Trafford	School	3500 Lake Trafford Road	0.0
Laurel Oak	School	7800 Immokalee Road	0.0
Lely	School	8125 Lely Cultural Parkway	0.0
Osceola	School	5770 Osceola Trail	0.0
Pelican Marsh	School	9480 Airport Pulling Road N	0.0
Sabal Palm	School	4095 18th Avenue Ne	0.0
Veterans Memorial	School	15960 Veterans Memorial Blvd	0.0
Village Oaks	School	1601 State Road 29	0.0
Vineyards	School	6225 Arbor Boulevard W	0.0
Barron Collier	School	5600 Cougar Drive	0.0
Golden Gate	School	2925 Titan Way	0.0
Gulf Coast	School	7878 Shark Way	0.0
Immokalee	School	701 Immokalee Drive	0.0
Cypress Palm	School	4255 18th Avenue Ne	0.0
Golden Gate	School	2701 48th Terrace SW	0.0
Oakridge	School	14975 Collier Boulevard	0.0
Immokalee Technical Center	School	508 N 9th Street	0.0
Corkscrew	School	1165 County Road 858	0.0
Palmetto Ridge	School	1655 County Road 858	0.0
Corkscrew	School	1065 County Road 858	0.0
Pinecrest	School	313 S Ninth Street	0.0
Immokalee Lf (Eustis Ave.)	Solid Waste	Eustis Ave Extension	0.0
Naples Sanitary Landfill	Solid Waste	3750 White Lake Blvd.	0.0
Immokalee Slf And Transfer Station (Stockade)	Solid Waste	700 Stockade Rd @ Cr846	0.0
Ave Maria University	University/College	5050 Ave Maria Boulevard	0.0

Facility Name	Facility Type	Address	Estimated 100yr Flood Depth (Ft)
Barry University - Naples Campus	University/College	7007 Lely Cultural Parkway	0.0
Hodges University - Naples Campus	University/College	2655 Northbrooke Drive	0.0
Krehling Industries - Plant 10	Wastewater Facility		0.0
Shell Oil Company	Wastewater Facility		0.0
Collier County South Regional WRF	Wastewater Facility	5600 Warren St	0.0
Golden Gate WWTP	Wastewater Facility		0.0
Collier South Regional WTP	Wastewater Facility	3851 City Gate Dr	0.0
Collier North Regional WTP	Wastewater Facility		0.0
Apac - Florida Inc. Golden Gate	Wastewater Facility		0.0
Krehling Industries - Plant 6	Wastewater Facility		0.0
<b>City of Everglades City</b>			
<b>Zone AE</b>			
LCEC-EGC	Electrical Transfer Sta	603 Begonia St	0.8
Ochopee Fire Rescue Station 60	Fire	201 Buckner Avenue North	6.8
Collier County - County Court - Everglades - Everglades City Hall	Government	102 Copeland Ave N	6.8
City Of Everglades City Hall	Government	102 SW Copeland St	6.7
U S Post Office - Everglades City	Government	601 Collier Ave	6.8
Collier County Tax Collector	Government	102 Broadway Ave E	5.3
Everglades City	School	415 School Drive	6.3
Everglades City, City of - WWTF	Wastewater Facility	401 Copeland Ave S	7.2
<b>City of Marco Island</b>			
<b>Zone X (500-yr)</b>			
Collier County Sheriff Dept	Police	990 N Barfield Dr	0.4
<b>Zone AE</b>			
Lcec-Fred H. Smith	Electrical Transfer Sta	1340 Lily Ct	0.9
Lcec-Marco	Electrical Transfer Sta	965 N Barfield Dr	2.6
City Of Marco Island Fire Rescue Department Station 50	Fire	1280 San Marco Road	1.2
City Of Marco Island Fire Rescue Department Station 51	Fire	751 East Elkcam Circle	1.5
U S Post Office - Cpu Sunshine Booksellers	Government	677 S Collier Blvd	2.8
U S Post Office - Marco Island	Government	600 E Elkcam Circle	1.4
City Of Marco Island City Hall	Government	50 Bald Eagle Dr	0.8
Collier County Tax Collector	Government	1040 Winterberry Dr	1.6
Tommie Barfield	School	101 Kirkwood Street	0.4
Marco Island Charter	School	1401 Trinidad Street	0.8

Facility Name	Facility Type	Address	Estimated 100yr Flood Depth (Ft)
Marco Island WWTF & Reclaimed Water Service Area	Wastewater Facility		3.1
<b>City of Naples</b>			
<b>Zone X (500-yr)</b>			
Sheriff Office-Crime Prevention	Police	2373 North Horseshoe Dr	0.0
<b>Zone AE</b>			
Homewood Residence at Naples	Assisted Living Centers	770 Goodlette Road, N	6.5
Fpl-Naples	Electrical Transfer Sta	1220 5th Ave N	2.5
Collier County Emergency Medical Services And Fire	Fire	2705 South Horseshoe Drive	0.0
East Naples Fire Control And Rescue District Station 24	Fire	2795 North Airport Road	0.0
North Naples Fire Control And Rescue District Station 47	Fire	2795 North Airport Road	0.0
City Of Naples Fire Department Sta 1	Fire	835 8th Avenue South	1.7
City Of Naples Fire Department Sta 3	Fire	300 Citation Point	0.0
City Of Naples City Hall	Government	735 8th St S	3.3
U S Post Office - Downtown Naples	Government	860 6th Ave S	2.1
Collier County Tax Collector	Government	2800 Horseshoe Dr N	0.0
Collier County Tax Collector	Government	735 8th St S	3.3
Naples Community Hospital	Medical Center	350 7th Street North	0.1
Naples Police Department	Police	355 Riverside Circle	0.4
Naples, City Of - WWTP I	Wastewater Facility		0.9
<b>Zone AH</b>			
Orchid Terrace	Assisted Living Centers	111 Moorings Park Dr	0.0
Lakeside Pavilion Care and Rehabilitation Center	Assisted Living Centers	2900 12th Street North	0.0
<b>Zone X (Unshaded)</b>			
Heritage Healthcare And Rehabilitation Center	Assisted Living Centers	777 9th Street North	0.0
The Chateau at Moorings Park	Assisted Living Centers	130 Moorings Park Drive	0.0
City of Naples Fire Department Sta 2	Fire	977 26th Avenue North	0.0
Lake Park	School	1295 14th Avenue N	0.0
Sea Gate	School	650 Seagate Drive	0.0
Gulfview	School	255 6th Street S	0.0
Naples	School	1100 Golden Eagle Circle	0.0

Source: Collier County 2014 Tax Assessor's Data, FEMA 2012 DFIRM

## Future Development

A GIS analysis was performed for Collier County unincorporated areas to quantify parcels within future development areas that are also located within a special flood hazard area.

## Methodology

The 2014 Collier County parcel layer was used to identify potential areas of future development located within FEMA flood zones. Parcel counts by FEMA flood zone were determined using a spatial intersection of the tax parcels and the effective flood hazard area provided in the Collier County FEMA DFIRM Database, effective 5/16/2012. In the event that a parcel was affected by multiple zones, the flood zone covering the majority of the parcel was assigned to the parcel. Table 4-36 delineates the future development areas by flood zone and land use. Figure 4-43 reflects Collier County future land use designations.

**Table 4-36 - Future Land Use and FEMA Flood Zones – Collier County Unincorporated Areas**

Future Land Use	Unimproved Parcel Count	Unimproved Acreage
<b>Zone AE</b>		
Agricultural / Rural Designation	73	8,404.3
Agricultural / Rural Mixed Use District	203	22,035.4
Bayshore/Gateway Triangle Redevelopment	529	2,278.8
Buckley Mixed Use Subdistrict	14	2.2
Conservation Designation	6,016	198,078.9
Estates Designation	5,093	11,997.5
Henderson Creek Mixed Use Subdistrict	18	34.8
Incorporated Area	3,849	12,320.0
Industrial District	50	137.7
Interchange Activity Center Subdistrict	2	2.1
Mixed Use Activity Center Subdistrict	87	182.5
Residential Density Bands	633	816.1
RF-Neutral	293	1,302.6
RF-Receiving	28	3,706.0
RF-Sending	128	4,261.2
Rural Industrial District	3	13.2
Rural Settlement Area District	297	276.1
Urban Coastal Fringe Subdistrict	3,138	7,898.2
Urban Residential Fringe Subdistrict	261	1,884.1
Urban Residential Subdistrict	4,560	11,057.5
<b>Total</b>	<b>25,275</b>	<b>286,689.1</b>
<b>Zone A</b>		
Agricultural / Rural Designation	28	1,374.3
Agricultural / Rural Mixed Use District	349	65,825.3
Conservation Designation	12,459	535,656.1
Estates Designation	4,777	10,308.0
Rural Industrial District	1	411.0
Urban Residential Subdistrict	2	416.5
<b>Total</b>	<b>17,616</b>	<b>613,991.2</b>
<b>Zone AH</b>		
Agricultural / Rural Designation	599	12,117.6
Agricultural / Rural Mixed Use District	757	54,936.9
Buckley Mixed Use Subdistrict	7	13.4
Collier Blvd Community Facility Subdistrict	1	0.0
Conservation Designation	52	19,613.4

Future Land Use	Unimproved Parcel Count	Unimproved Acreage
Corkscrew Island Neighborhood Commercial Subdistrict	19	87.9
Estates Designation	23,117	51,309.5
Goodlette/Pine Ridge Commercial Infill Subdistrict	4	13.9
Incorporated Area	175	99.2
Industrial District	526	827.3
Interchange Activity Center Subdistrict	22	66.9
Livingston/Radio Rd Commercial Infill Subdistrict	3	22.2
Livingston/Veterans Mem Commercial Infill Subdistrict	3	7.1
Mixed Use Activity Center Subdistrict	243	349.3
Orange Blossom Mixed Use District	16	17.2
Residential Density Bands	4,023	3,723.3
RF-Neutral	632	4,906.8
RF-Receiving	630	6,541.5
RF-Sending	1,874	31,392.7
Rural Settlement Area District	388	578.2
Urban Coastal Fringe Subdistrict	33	87.3
Urban Residential Fringe Subdistrict	487	1,880.5
Urban Residential Subdistrict	11,348	20,754.2
Vanderbilt Beach Rd Neighborhood Commercial Subdistrict	1	9.1
Vanderbilt Beach/Collier Blvd Commercial Subdistrict	2	1.7
<b>Total</b>	<b>44,962</b>	<b>209,356.9</b>
<b>Zone VE</b>		
Agricultural / Rural Designation	13	1,332.3
Conservation Designation	1,024	36,141.5
Incorporated Area	231	7,164.1
Urban Coastal Fringe Subdistrict	35	35.6
Urban Residential Subdistrict	100	125.0
<b>Total</b>	<b>1,403</b>	<b>44,798.7</b>
<b>Zone X (500-yr)</b>		
Agricultural / Rural Designation	4	373.1
Agricultural / Rural Mixed Use District	47	12,872.6
Buckley Mixed Use Subdistrict	9	4.2
Conservation Designation	77	2,470.4
Estates Designation	2,357	5,548.5
Incorporated Area	640	349.1
Industrial District	58	85.2
Interchange Activity Center Subdistrict	23	157.1
Livingston/Radio Rd Commercial Infill Subdistrict	3	15.5
Livingston/Veterans Mem Commercial Infill Subdistrict	1	0.2
Mixed Use Activity Center Subdistrict	109	197.4
Orange Blossom Mixed Use District	14	7.6
Residential Density Bands	1,849	1,717.9
RF-Neutral	43	87.5
RF-Receiving	57	2,030.3
RF-Sending	17	143.9
Rural Industrial District	4	5.1
Rural Settlement Area District	153	97.3
Urban Coastal Fringe Subdistrict	86	96.2

<b>Future Land Use</b>	<b>Unimproved Parcel Count</b>	<b>Unimproved Acreage</b>
Urban Residential Fringe Subdistrict	38	19.5
Urban Residential Subdistrict	5,862	6,460.6
Vanderbilt Beach Rd Neighborhood Commercial Subdistrict	1	7.8
Vanderbilt Beach/Collier Blvd Commercial Subdistrict	7	25.6
<b>Total</b>	<b>11,459</b>	<b>32,772.6</b>
<b>Zone X (unshaded)</b>		
Agricultural / Rural Designation	6	884.6
Agricultural / Rural Mixed Use District	1,274	5,636.7
Buckley Mixed Use Subdistrict	38	24.1
Conservation Designation	4	684.4
Corkscrew Island Neighborhood Commercial Subdistrict	1	12.5
Estates Designation	3,172	7,749.9
Goodlette/Pine Ridge Commercial Infill Subdistrict	13	45.4
Incorporated Area	805	455.5
Industrial District	169	277.0
Interchange Activity Center Subdistrict	17	19.0
Livingston Road Commercial Infill Subdistrict	1	11.2
Livingston/ Eatonwood Ln Commercial Infill Subdistrict	4	29.3
Livingston/Pine Ridge Commercial Infill Subdistrict	2	13.7
Livingston/Veterans Mem Commercial Infill Subdistrict	1	2.4
Mixed Use Activity Center Subdistrict	337	508.8
Orange Blossom Mixed Use District	24	19.1
Residential Density Bands	4,035	2,276.5
RF-Neutral	46	462.5
RF-Receiving	475	745.1
RF-Sending	14	275.5
Rural Settlement Area District	1,225	1,831.1
Urban Coastal Fringe Subdistrict	76	80.4
Urban Residential Fringe Subdistrict	96	139.2
Urban Residential Subdistrict	12,651	8,742.4
Vanderbilt Beach/Collier Blvd Commercial Subdistrict	10	39.7
<b>Total</b>	<b>24,496</b>	<b>30,966.0</b>

Source: Collier County 2014 Tax Assessor's Data, FEMA 2012 DFIRM



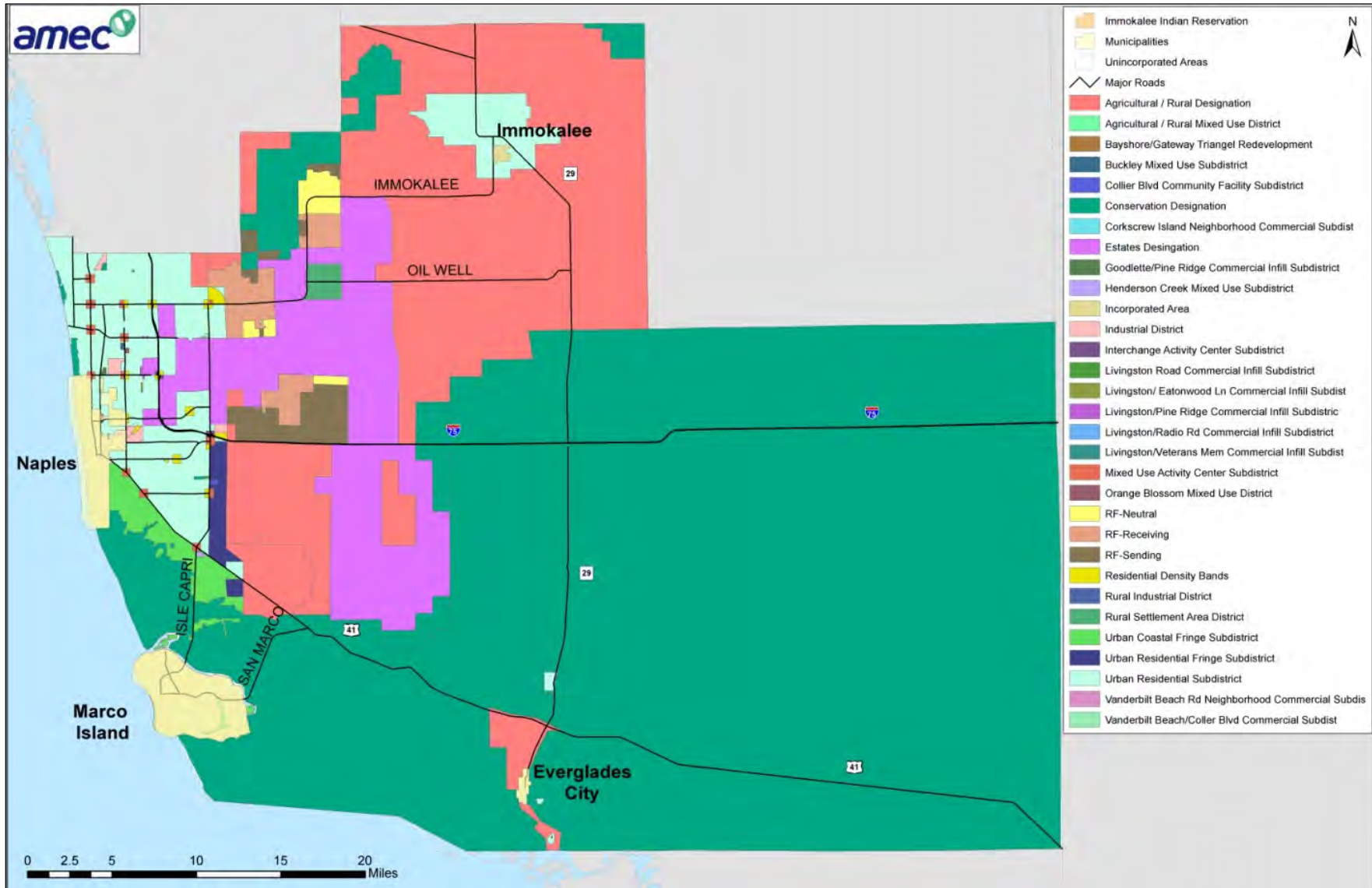


Figure 4-43 - Collier County Future Land Use

### Flood Insurance Analysis

One valuable source of information on flood hazards is current flood insurance data for active policies and past claims. Flood insurance is required as a condition of federal aid or a mortgage or loan that is federally insured for a building located in a FEMA flood zone.

Collier County has been a participant in the NFIP since September 1979. Collier County has achieved a Class 6 flood insurance rating through participation in the NFIP's Community Rating System which rewards all policyholders in the SFHA with a 20 percent reduction in their flood insurance premiums. Non-SFHA policies receive a 10% discount, and preferred risk policies receive no discount. Tables 4-37 through 4-40 reflect NFIP policy and claims data for the County categorized by occupancy type, flood zone, Pre-FIRM and Post-FIRM.

**Table 4-37 - NFIP Policy and Claims Data by Occupancy Type – Collier County**

Structure Type	Number of Policies in Force	Total Premium	Total Coverage	Number of Closed Paid Losses	Total of Closed Paid Losses
Single Family	33,821	19,588,410	9,573,754,000	536	\$6,035,088
2-4 Family	6,238	2,562,955	1,270,703,400	36	\$446,754
All Other Residential	28,008	8,544,275	5,347,704,300	23	\$191,264
Non-Residential	2,037	3,486,197	838,674,900	79	\$2,103,511
<b>Total</b>	<b>70,104</b>	<b>34,181,837</b>	<b>17,030,836,600</b>	<b>674</b>	<b>\$8,776,613</b>

Source: FEMA Community Information System, September 2014

**Table 4-38 - NFIP Policy and Claims Data by Flood Zone – Collier County**

Flood Zone <sup>1</sup>	Number of Policies in Force	Total Premium	Total Coverage	Number of Closed Paid Losses	Total of Closed Paid Losses
A01-30 & AE Zones	39,273	19,707,539	8,696,121,500	536	\$6,542,311
A Zones	14	13,868	2,511,800	0	\$0
AO Zones	0	0	0	0	\$0
AH Zones	9,565	2,634,326	2,009,316,700	5	\$111,286
AR Zones	0	0	0	0	\$0
A99 Zones	0	0	0	0	\$0
V01-30 & VE Zones	990	2,335,192	252,952,700	30	\$1,144,570
V Zones	0	0	0	0	\$0
D Zones	34	53,236	8,126,600	0	\$0
B, C & X Zone					
Standard	902	836,346	202,687,800	36	\$229,611
Preferred	19,326	8,601,330	5,859,119,500	59	\$559,785
<b>Total</b>	<b>70,104</b>	<b>34,181,837</b>	<b>17,030,836,600</b>	<b>666</b>	<b>\$8,587,558</b>

Source: FEMA Community Information System, September 2014

<sup>1</sup>Flood zone is indicative of historic policy zone.

**Table 4-39 - NFIP Policy and Claims Data Pre-FIRM – Collier County**

Flood Zone <sup>1</sup>	Number of Policies in Force	Total Premium	Total Coverage	Number of Closed Paid Losses	Total of Closed Paid Losses
A01-30 & AE Zones	7,298	6,888,718	1,384,630,100	462	\$5,952,336
A Zones	6	5,642	987,700	0	\$0
AO Zones	0	0	0	0	\$0
AH Zones	1,113	350,777	191,778,300	1	\$29,246
AR Zones	0	0	0	0	\$0
A99 Zones	0	0	0	0	\$0
V01-30 & VE Zones	342	561,717	91,200,900	14	\$516,815
V Zones	0	0	0	0	\$0
D Zones	1	1,930	151,100	0	\$0
B, C & X Zone	2,400	1,179,457	679,729,100	60	\$624,845
Standard	164	139,453	33,519,100	23	\$134,444
Preferred	2,236	1,040,004	646,210,000	37	\$490,401
<b>Total</b>	<b>11,160</b>	<b>8,988,241</b>	<b>2,348,477,200</b>	<b>537</b>	<b>\$7,123,239</b>

Source: FEMA Community Information System, September 2014

<sup>1</sup>Flood zone is indicative of historic policy zone.

**Table 4-40 - NFIP Policy and Claims Data Post-FIRM – Collier County**

Flood Zone <sup>1</sup>	Number of Policies in Force	Total Premium	Total Coverage	Number of Closed Paid Losses	Total of Closed Paid Losses
A01-30 & AE Zones	31,975	12,818,821	7,311,491,400	74	\$589,975
A Zones	8	8,226	1,524,100	0	\$0
AO Zones	0	0	0	0	\$0
AH Zones	8,452	2,283,549	1,817,538,400	4	\$82,040
AR Zones	0	0	0	0	\$0
A99 Zones	0	0	0	0	\$0
V01-30 & VE Zones	648	1,773,475	161,751,800	16	\$627,755
V Zones	0	0	0	0	\$0
D Zones	33	51,306	7,975,500	0	\$0
B, C & X Zone	17,828	8,258,219	5,382,078,200	43	\$353,605
Standard	738	696,893	169,168,700	13	\$95,167
Preferred	17,090	7,561,326	5,212,909,500	30	\$258,438
<b>Total</b>	<b>58,944</b>	<b>25,193,596</b>	<b>14,682,359,400</b>	<b>137</b>	<b>\$1,653,372</b>

Source: FEMA Community Information System, September 2014

<sup>1</sup>Flood zone is indicative of historic policy zone.

The City of Everglades City has been a participant in the NFIP since October 1972. Everglades City is not currently participating in the CRS Program. Tables 4-41 and 4-42 reflect NFIP policy and claims data for Everglades City categorized by occupancy type and flood zone, respectively.

**Table 4-41 - NFIP Policy and Claims Data by Occupancy Type - City of Everglades City**

Structure Type	Number of Policies in Force	Total Premium	Total Coverage	Number of Closed Paid Losses	Total of Closed Paid Losses
Single Family	92	\$104,840	\$20,616,500	48	\$559,695
2-4 Family	15	\$6,423	\$1,305,200	0	\$0
All Other Residential	93	\$21,546	\$15,438,800	0	\$0
Non-Residential	22	\$116,201	\$10,752,600	5	\$260,836
<b>Total</b>	<b>222</b>	<b>\$249,010</b>	<b>\$48,113,100</b>	<b>53</b>	<b>\$820,529</b>

Source: FEMA Community Information System, September 2014

**Table 4-42 - NFIP Policy and Claims Data by Flood Zone – City of Everglades City**

Flood Zone <sup>1</sup>	Number of Policies in Force	Total Premium	Total Coverage	Number of Closed Paid Losses	Total of Closed Paid Losses
A01-30 & AE Zones	215	\$227,730	\$46,929,200	45	\$795,259
A Zones	0	\$0	\$0	0	\$0
AO Zones	0	\$0	\$0	0	\$0
AH Zones	0	\$0	\$0	0	\$0
AR Zones	0	\$0	\$0	0	\$0
A99 Zones	0	\$0	\$0	0	\$0
V01-30 & VE Zones	7	\$21,280	\$1,183,900	8	\$25,272
V Zones	0	\$0	\$0	0	\$0
D Zones	0	\$0	\$0	0	\$0
B, C & X Zone					
Standard	0	\$0	\$0	0	\$0
Preferred	0	\$0	\$0	0	\$0
<b>Total</b>	<b>222</b>	<b>\$249,010</b>	<b>\$48,113,100</b>	<b>53</b>	<b>\$820,530</b>

Source: FEMA Community Information System, September 2014

<sup>1</sup>Flood zone is indicative of historic policy zone.

The City of Marco Island has been a participant in the NFIP since October 1998. Marco Island has achieved a Class 6 flood insurance rating through participation in the NFIP’s Community Rating System which rewards all policyholders in the SFHA with a 20 percent reduction in their flood insurance premiums. Non-SFHA policies receive a 10% discount, and preferred risk policies receive no discount. Tables 4-43 and 4-44 reflect NFIP policy and claims data for Marco Island categorized by occupancy type and flood zone, respectively.

**Table 4-43 - NFIP Policy and Claims Data by Occupancy Type - City of Marco Island**

Structure Type	Number of Policies in Force	Total Premium	Total Coverage	Number of Closed Paid Losses	Total of Closed Paid Losses
Single Family	4,164	\$3,930,892	\$1,286,844,500	3	\$35,812
2-4 Family	428	\$270,802	\$79,899,600	0	\$0
All Other Residential	8,442	\$3,000,784	\$1,702,098,200	13	\$57,153
Non-Residential	248	\$472,804	\$88,206,400	0	\$0
<b>Total</b>	<b>13,282</b>	<b>\$7,675,282</b>	<b>\$3,157,048,700</b>	<b>16</b>	<b>\$92,964</b>

Source: FEMA Community Information System, September 2014

**Table 4-44 - NFIP Policy and Claims Data by Flood Zone – City of Marco Island**

Flood Zone <sup>1</sup>	Number of Policies in Force	Total Premium	Total Coverage	Number of Closed Paid Losses	Total of Closed Paid Losses
A01-30 & AE Zones	12,914	\$7,152,315	\$3,080,342,800	16	\$92,965
A Zones	0	\$0	\$0	0	\$0
AO Zones	0	\$0	\$0	0	\$0
AH Zones	0	\$0	\$0	0	\$0
AR Zones	0	\$0	\$0	0	\$0
A99 Zones	0	\$0	\$0	0	\$0
V01-30 & VE Zones	266	\$486,918	\$54,746,200	0	\$0
V Zones	0	\$0	\$0	0	\$0
D Zones	1	\$1,969	\$350,000	0	\$0
B, C & X Zone					\$0
Standard	68	\$20,700	\$11,334,700	0	\$0
Preferred	33	\$13,380	\$10,275,000	0	\$0
<b>Total</b>	<b>13,282</b>	<b>\$7,675,282</b>	<b>\$3,157,048,700</b>	<b>16</b>	<b>\$92,965</b>

Source: FEMA Community Information System, September 2014

<sup>1</sup>Flood zone is indicative of historic policy zone.

The City of Naples has been a participant in the NFIP since July 1971. Naples has achieved a Class 6 flood insurance rating through participation in the NFIP’s Community Rating System which rewards all policyholders in the SFHA with a 20 percent reduction in their flood insurance premiums. Non-SFHA policies receive a 10% discount, and preferred risk policies receive no discount. Tables 4-45 and 4-46 reflect NFIP policy and claims data for Naples categorized by occupancy type and flood zone, respectively.

**Table 4-45 - NFIP Policy and Claims Data by Occupancy Type - City of Naples**

Structure Type	Number of Policies in Force	Total Premium	Total Coverage	Number of Closed Paid Losses	Total of Closed Paid Losses
Single Family	3,851	\$4,861,094	\$1,168,707,900	112	\$1,427,383
2-4 Family	1,080	\$788,284	\$224,227,700	5	\$43,512
All Other Residential	7,831	\$3,603,164	\$1,636,996,600	13	\$1,012,638
Non-Residential	679	\$1,758,483	\$283,764,700	35	\$828,209
<b>Total</b>	<b>13,441</b>	<b>\$11,011,025</b>	<b>\$3,313,696,900</b>	<b>165</b>	<b>\$3,311,740</b>

Source: FEMA Community Information System, September 2014

**Table 4-46 - NFIP Policy and Claims Data by Flood Zone – City of Naples**

Flood Zone <sup>1</sup>	Number of Policies in Force	Total Premium	Total Coverage	Number of Closed Paid Losses	Total of Closed Paid Losses
A01-30 & AE Zones	11,973	\$9,318,868	\$2,943,938,400	141	\$1,764,175
A Zones	0	\$0	\$0	1	\$10,532
AO Zones	0	\$0	\$0	0	\$0
AH Zones	71	\$39,065	\$16,397,800	0	\$0
AR Zones	0	\$0	\$0	0	\$0

Flood Zone <sup>1</sup>	Number of Policies in Force	Total Premium	Total Coverage	Number of Closed Paid Losses	Total of Closed Paid Losses
A99 Zones	0	\$0	\$0	0	\$0
V01-30 & VE Zones	502	\$1,125,131	\$94,666,900	11	\$1,474,040
V Zones	0	\$0	\$0	0	\$0
D Zones	3	\$4,582	\$828,600	0	\$0
B, C & X Zone					
Standard	272	\$221,636	\$57,620,200	10	\$51,043
Preferred	620	\$301,743	\$200,245,000	2	\$11,951
<b>Total</b>	<b>13,441</b>	<b>\$11,011,025</b>	<b>\$3,313,696,900</b>	<b>165</b>	<b>\$3,311,739</b>

Source: FEMA Community Information System, September 2014

<sup>1</sup>Flood zone is indicative of historic policy zone.

### Repetitive Loss Analysis

A repetitive loss property is a property for which two or more flood insurance claims of more than \$1,000 have been paid by the NFIP within any 10-year period since 1978. An analysis of repetitive loss was completed for Collier County Unincorporated Areas, City of Everglades City, City of Marco Island and City of Naples to examine repetitive loss properties against FEMA flood zones.

### Methodology

According to 2014 NFIP records, there are a total of 32 unmitigated and nine mitigated repetitive loss properties within Collier County Unincorporated Areas. One unmitigated property is classified as severe repetitive loss. Table 4-47 details repetitive loss building counts, FEMA flood zones and total payment for the unmitigated properties.

**Table 4-47 – Unmitigated Repetitive Loss Summary – Collier County Unincorporated Areas**

Flood Zone <sup>1</sup>	Building Count		Total Building Payment	Total Content Payment	Total Paid
	Insured	Uninsured			
AE	9	12	\$417,458	\$87,556	\$505,014
AH	5	3	\$644,006	\$29,775	\$673,782
500-yr	0	2	\$64,686	\$10,674	\$75,359
X	0	1	\$21,844	\$0	\$21,844
<b>Total</b>	<b>14</b>	<b>18</b>	<b>\$1,147,994</b>	<b>\$128,005</b>	<b>\$1,275,999</b>

Source: NFIP Repetitive Loss Data 2014

<sup>1</sup>Flood Zone is based on current 2012 DFIRM.

Figure 4-44 illustrates the location of the repetitive loss properties separated out by the classification of mitigated or unmitigated in relation to the known flood hazard areas within Collier County.

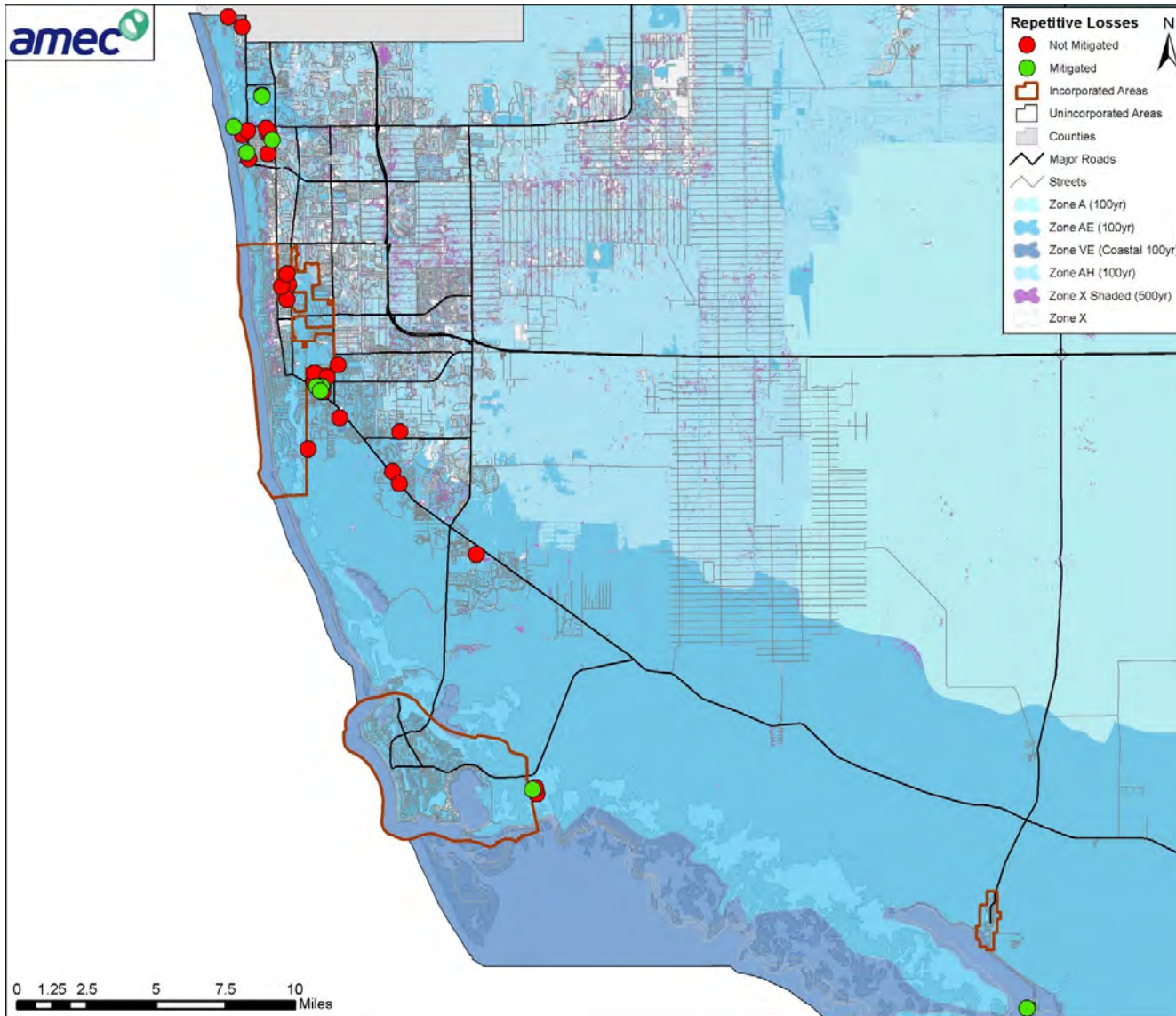


Figure 4-44 - Collier County Repetitive Loss Properties and FEMA Flood Zones

According to 2014 NFIP records, there are a total of five unmitigated repetitive loss properties within the City of Everglades City. Table 4-48 details repetitive loss building counts, FEMA flood zones and total payment for the unmitigated properties.

**Table 4-48 – Unmitigated Repetitive Loss Summary – City of Everglades City**

Flood Zone <sup>1</sup>	Building Count		Total Building Payment	Total Content Payment	Total Paid
	Insured	Uninsured			
AE	3	2	\$317,139	\$63,595	\$380,734
<b>Total</b>	<b>3</b>	<b>2</b>	<b>\$317,139</b>	<b>\$63,595</b>	<b>\$380,734</b>

Source: NFIP Repetitive Loss Data 2014

<sup>1</sup>Flood Zone is based on current 2012 DFIRM.

Figure 4-45 illustrates the location of the repetitive loss properties separated out by the classification of mitigated or unmitigated in relation to the known flood hazard areas within the City of Everglades City.



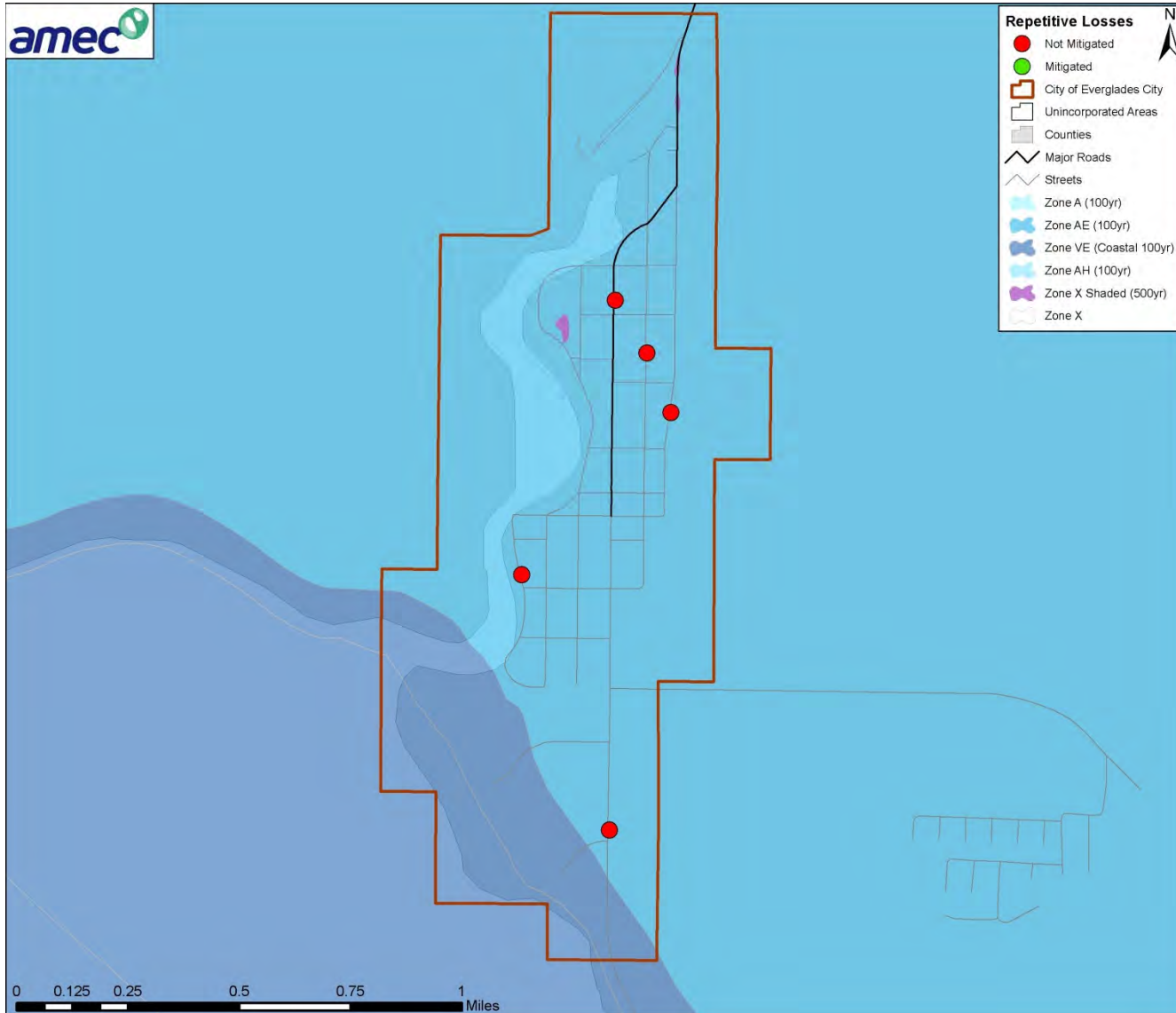


Figure 4-45 - Everglades City Repetitive Loss Properties and FEMA Flood Zones

According to 2014 NFIP records, there is one mitigated repetitive loss property within the City of Marco Island. There are zero unmitigated repetitive loss properties. Figure 4-46 illustrates the location of the repetitive loss properties separated out by the classification of mitigated or unmitigated in relation to the known flood hazard areas within the City of Marco Island.

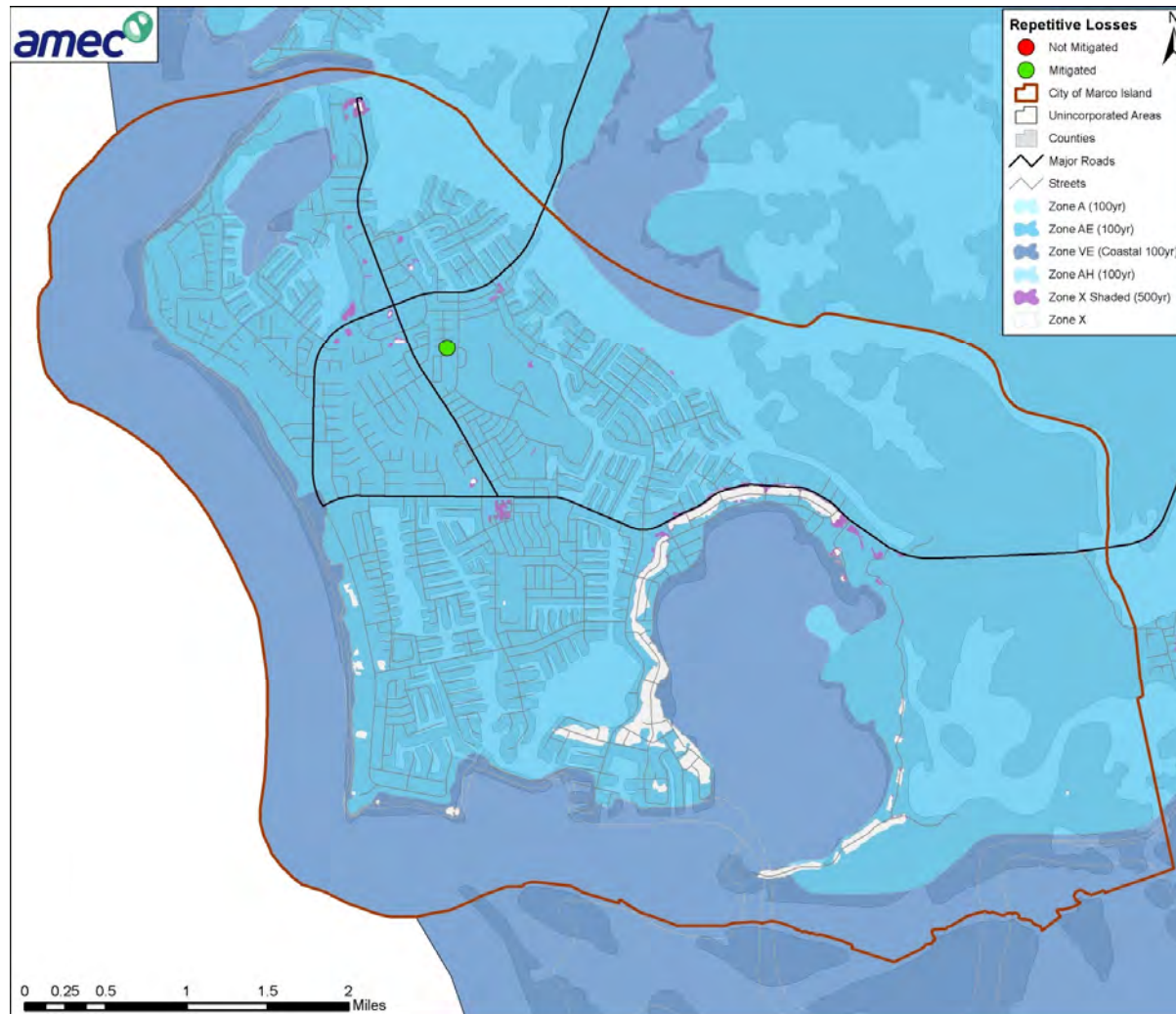


Figure 4-46 - Marco Island Repetitive Loss Properties and FEMA Flood Zones

According to 2014 NFIP records, there are a total of five mitigated and 10 unmitigated repetitive loss properties within the City of Naples. Table 4-49 details repetitive loss building counts, FEMA flood zones and total payment for the unmitigated properties.

**Table 4-49 – Unmitigated Repetitive Loss Summary – City of Naples**

Flood Zone <sup>1</sup>	Building Count		Total Building Payment	Total Content Payment	Total Paid
	Insured	Uninsured			
AE	5	4	\$476,099	\$106,485	\$582,584
AH	1	0	\$3,856	\$3,049	\$6,904
<b>Total</b>	<b>6</b>	<b>4</b>	<b>\$479,955</b>	<b>\$109,532</b>	<b>\$589,488</b>

Source: NFIP Repetitive Loss Data 2014

<sup>1</sup>Flood Zone is based on current 2012 DFIRM.

Figure 4-47 illustrates the location of the repetitive loss properties separated out by the classification of mitigated or unmitigated in relation to the known flood hazard areas within the City of Naples.

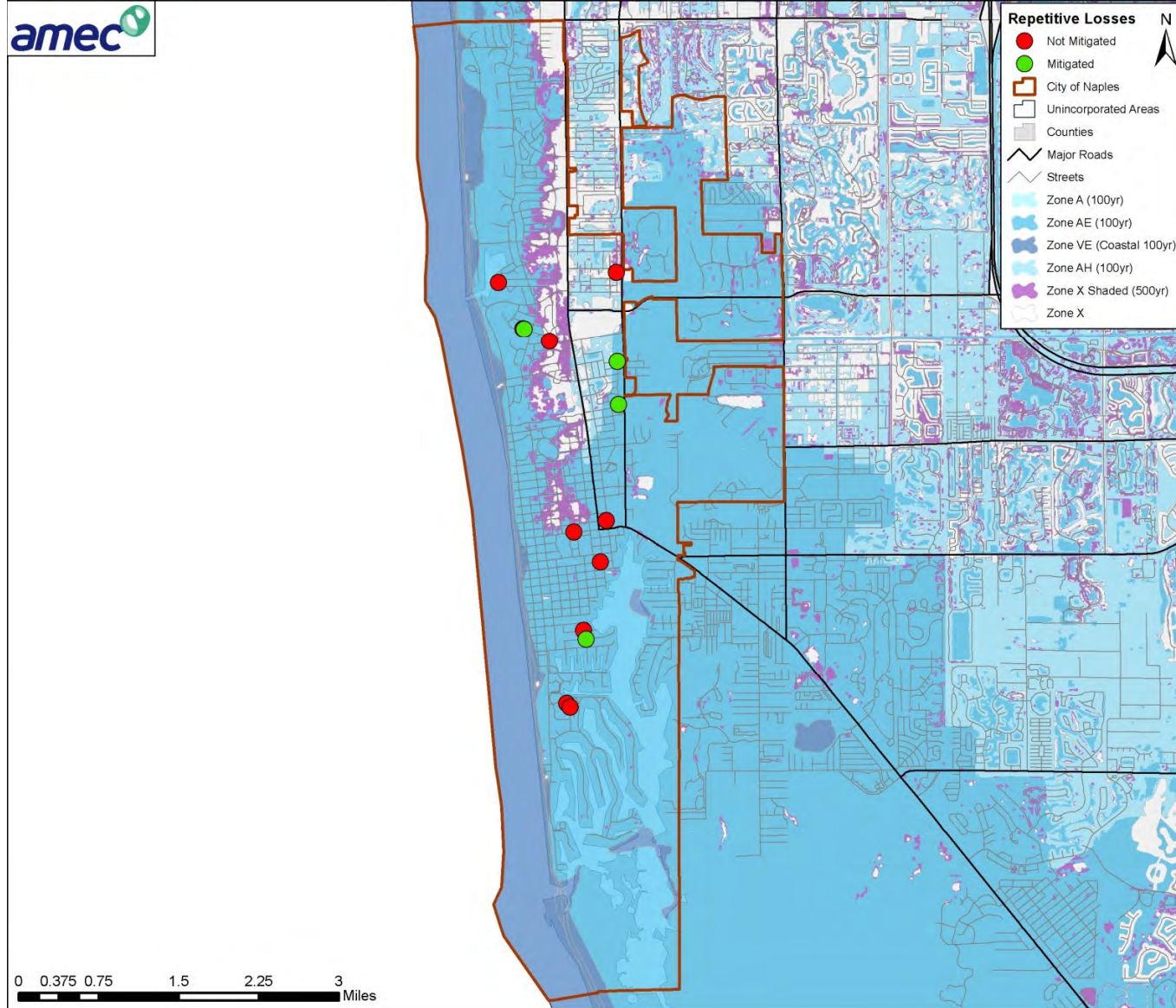


Figure 4-47 - Naples Repetitive Loss Properties and FEMA Flood Zones

### 4.3.5 Flood: Stormwater/Localized Flooding Vulnerability Assessment

Likelihood of Future Occurrence—Highly Likely  
 Vulnerability—High

Localized flooding occurs at various times throughout the year with several areas of primary concern to the County. Localized flooding and ponding affect streets and property. Figure 4.48 shows the possible correlation between localized flooding and repetitive loss areas.

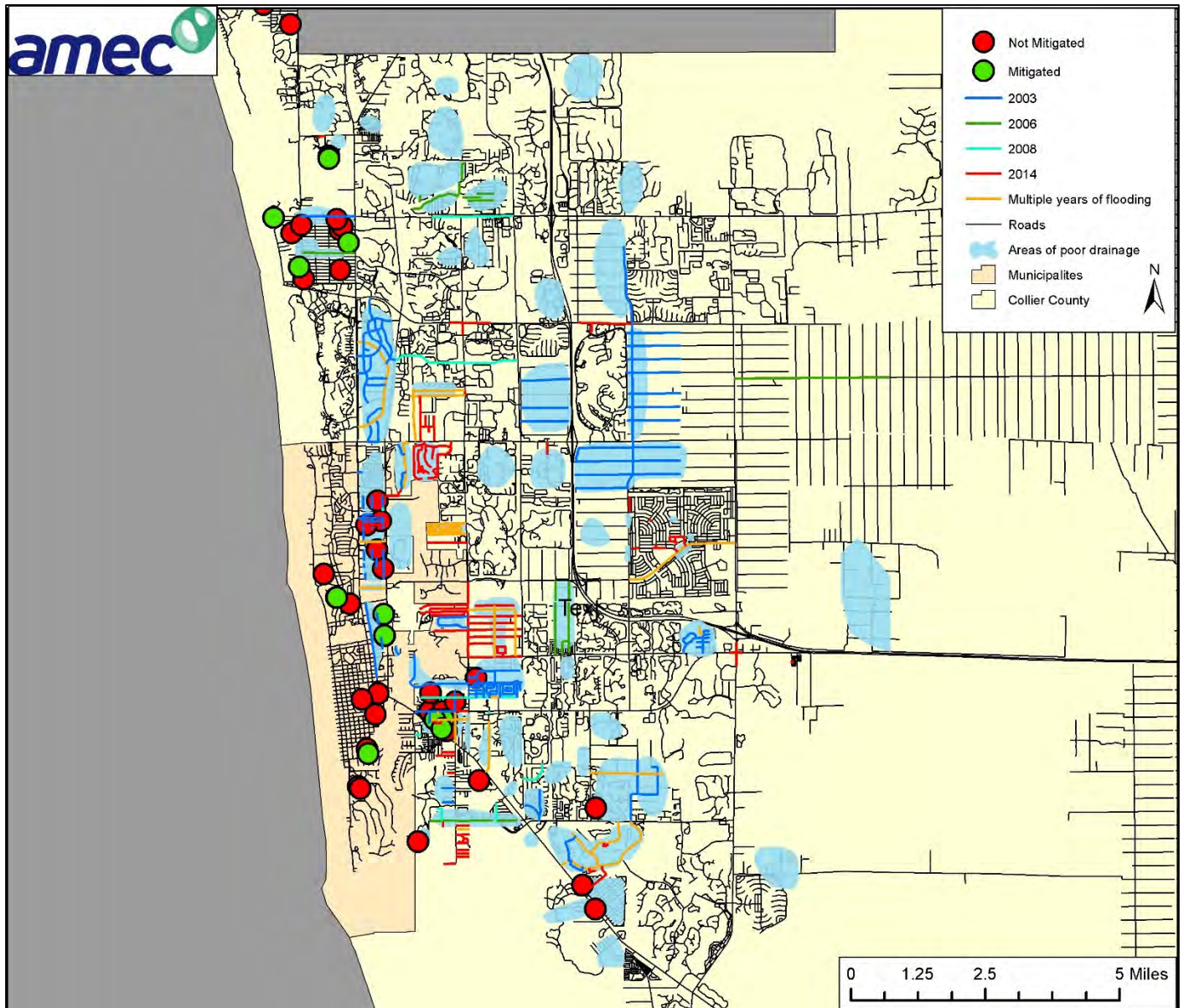


Figure 4-48 - Collier County Localized Flooding and Repetitive Loss Areas

### 4.3.6 Hurricane and Tropical Storm Vulnerability Assessment

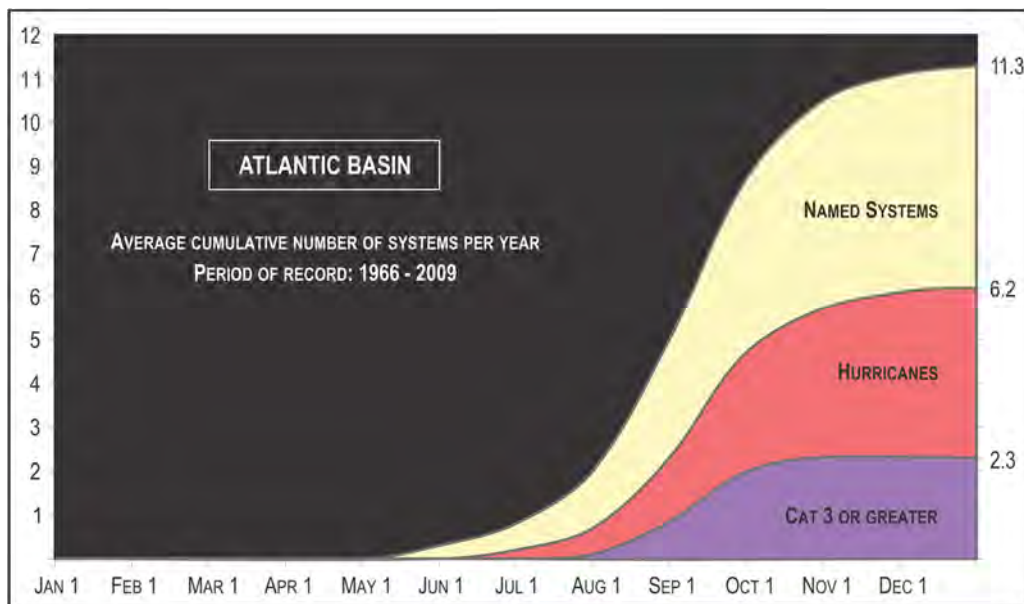
**Likelihood of Future Occurrence—Likely**  
**Vulnerability—Extremely High**

The heavy rains associated with tropical weather systems are not only responsible for major flooding in areas where the storm initially strikes, but can also affect areas hundreds of miles inland. Torrential rains from hurricanes and tropical storms can produce extensive urban and riverine flooding, especially if the storm systems are large and slow moving. Winds from these storms located offshore can drive ocean water up the mouth of a river or canal, compounding the severity of inland overbank flooding.

In addition to the combined destructive forces of wind, rain, and lightning, hurricanes can cause a surge in the ocean, which can raise the sea level as high as 25 feet or more in the strongest hurricanes. As a hurricane approaches the coast, its winds drive water toward the shore. Once the edge of the storm reaches the shallow waters of the continental shelf, the water begins to pile up. Winds of hurricane strength eventually force the water onto the shore. At first, the water level climbs slowly, but as the eye of the storm approaches, water rises rapidly. Furthermore, storm surge can also cause extensive damage on the backside of a hurricane as storm surge waters are sucked back out to sea.

Natural resources, particularly beaches, are devastated by hurricanes. The erosion of the coastline is considerable due to the impact of wind, waves, and debris in a hurricane event. Beaches need to be replenished with appropriate materials to reduce erosion. Storm surge and subsequent erosion of the shoreline often leads to the loss of property. Vulnerability of the County to coastal erosion is discussed in Section 4.3.3.

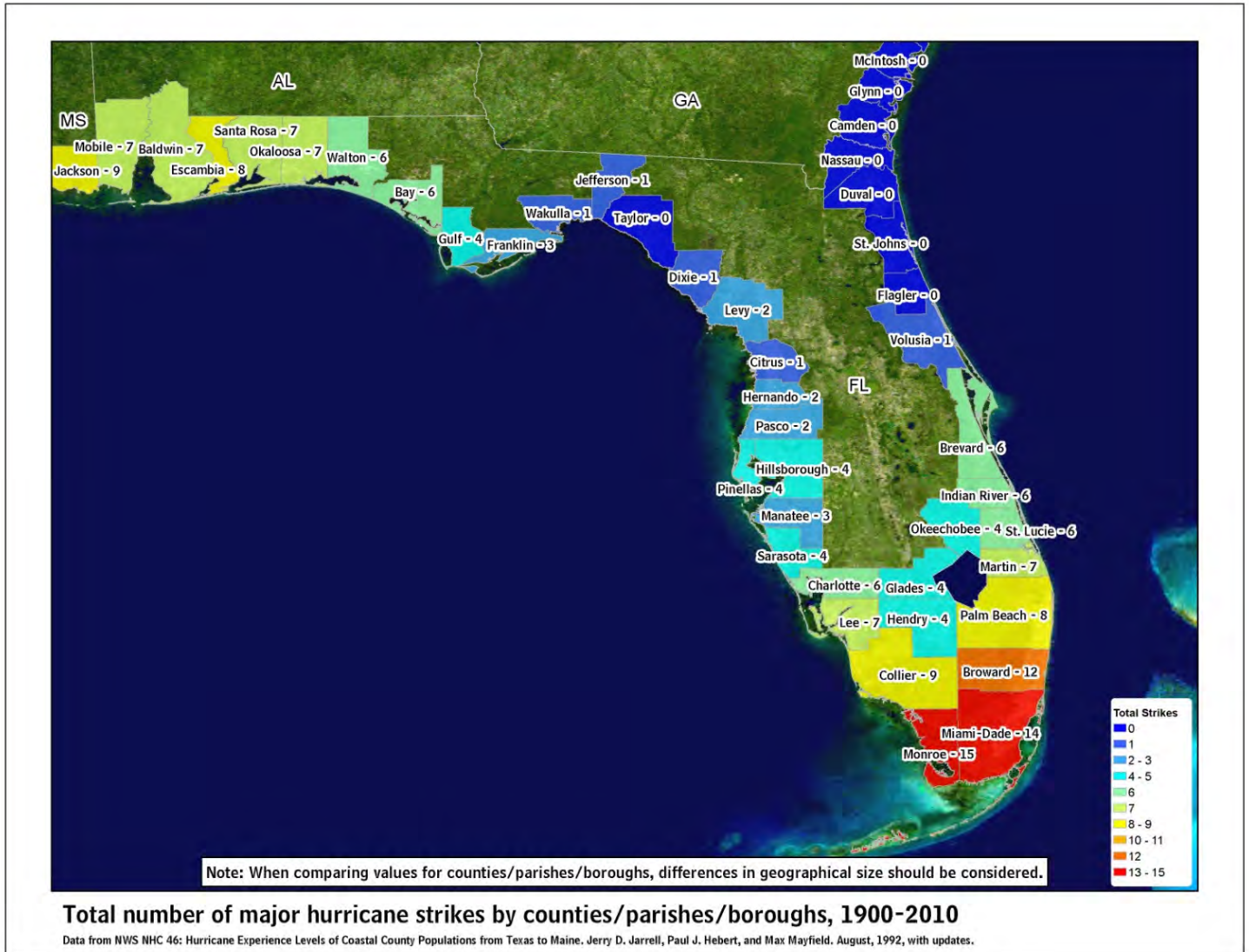
The Atlantic basin hurricane season runs from June 1st to November 30<sup>th</sup>. The Atlantic basin includes the Atlantic Ocean, Caribbean Sea, and Gulf of Mexico. Figure 4-49 shows the progress of a typical hurricane season in terms of the total number of tropical systems and hurricanes produced throughout the year in the Atlantic basin. The curves represent the average cumulative production of all named tropical systems, all hurricanes, and those hurricanes which were Category 3 or stronger in those basins.



Source: NOAA/National Hurricane Center

**Figure 4-49 – Average Number of Tropical Storms per Year (Atlantic Basin)**

Figure 4.50 represents the total number of major hurricane strikes for Collier County from 1900-2010.



Source: NOAA/National Hurricane Center  
**Figure 4-50 – Major Hurricane Strikes – Collier County**

**Methodology**

A hurricane surge analysis was conducted by intersecting the building footprint layer provided by Collier County with the polygon shapefile for each hurricane surge layer. The polygon shapefiles depicting each hurricane surge zone were created using a Surge Modeling application created for the Florida Statewide Regional Evacuation Update Study. The data was derived from National Hurricane Center SLOSH model runs on all the NOAA SLOSH basins throughout Florida. The runs create outputs for all different storm simulations from all points of the compass. Each direction has a MEOW (maximum envelope of water) for each category of storm (1-5), and all directions combined result in a MOMs (maximum of maximums) set of data. The MOMs are used in this surge model. The application uses three input parameters or data: elevation (from LIDAR), SLOSH basin results, and contiguous shoreline or sea polygons.

## Properties at Risk

Tables 4-50 through 4-55 and Figures 4-51 through 4-56 provide a summary of assets at risk to hurricane surge based on each hurricane category. The assets at risk estimate for each hurricane category is based on the total of improved and contents value. The building values are based on 2014 Collier County tax assessor data. Content value estimations are based on the FEMA Hazus methodology of estimating value as a percent of improved structure value by occupancy type as previously shown in Table 4-18. The value of land is not included in the loss estimates as generally the land is not subject to loss from hurricane and tropical storm damage.

**Table 4-50 – Assets at Risk to a Tropical Storm**

Land Use	Total Building Count	Total Building Value	Estimated Content Value	Total Value <sup>1</sup>
<b>Collier County Unincorporated Areas</b>				
Agricultural	50	\$1,333,478	\$1,333,478	\$2,666,956
Commercial	155	\$21,465,279	\$17,683,265	\$39,148,544
Education	2	\$446,032	\$446,032	\$892,063
Government	56	\$2,882,478	\$2,882,478	\$5,764,955
Industrial	23	\$1,559,513	\$2,339,270	\$3,898,783
Religious	6	\$1,870,610	\$1,870,610	\$3,741,220
Residential	5,328	\$319,181,422	\$159,590,711	\$478,772,133
<b>Total</b>	<b>5,620</b>	<b>\$348,738,811</b>	<b>\$186,145,843</b>	<b>\$534,884,654</b>
<b>City of Everglades City</b>				
Agricultural	0	\$0	\$0	\$0
Commercial	35	\$4,052,305	\$3,904,870	\$7,957,175
Education	6	\$3,857,436	\$3,857,436	\$7,714,872
Government	15	\$3,210,148	\$3,210,148	\$6,420,296
Industrial	5	\$292,023	\$438,035	\$730,058
Religious	3	\$286,646	\$286,646	\$573,292
Residential	373	\$21,529,886	\$10,764,943	\$32,294,829
<b>Total</b>	<b>437</b>	<b>\$33,228,444</b>	<b>\$22,462,078</b>	<b>\$55,690,521</b>
<b>City of Marco Island</b>				
Agricultural	0	\$0	\$0	\$0
Commercial	34	\$4,508,448	\$3,721,752	\$8,230,200
Education	0	\$0	\$0	\$0
Government	4	\$223,335	\$223,335	\$446,671
Industrial	0	\$0	\$0	\$0
Religious	0	\$0	\$0	\$0
Residential	271	\$116,209,508	\$58,104,754	\$174,314,262
<b>Total</b>	<b>309</b>	<b>\$120,941,291</b>	<b>\$62,049,841</b>	<b>\$182,991,132</b>
<b>City of Naples</b>				
Agricultural	3	\$0	\$0	\$0
Commercial	57	\$23,479,074	\$20,883,709	\$44,362,783
Education	1	\$703,759	\$703,759	\$1,407,518
Government	12	\$5,332,553	\$5,332,553	\$10,665,107
Industrial	5	\$138,869	\$208,304	\$347,173
Religious	1	\$164,457	\$164,457	\$328,914
Residential	759	\$221,401,187	\$110,700,593	\$332,101,780
<b>Total</b>	<b>838</b>	<b>\$251,219,900</b>	<b>\$137,993,375</b>	<b>\$389,213,275</b>

Source: Collier County 2014 Tax Assessor's Data, NOAA, FDEM

<sup>1</sup>Total value does not include land value.



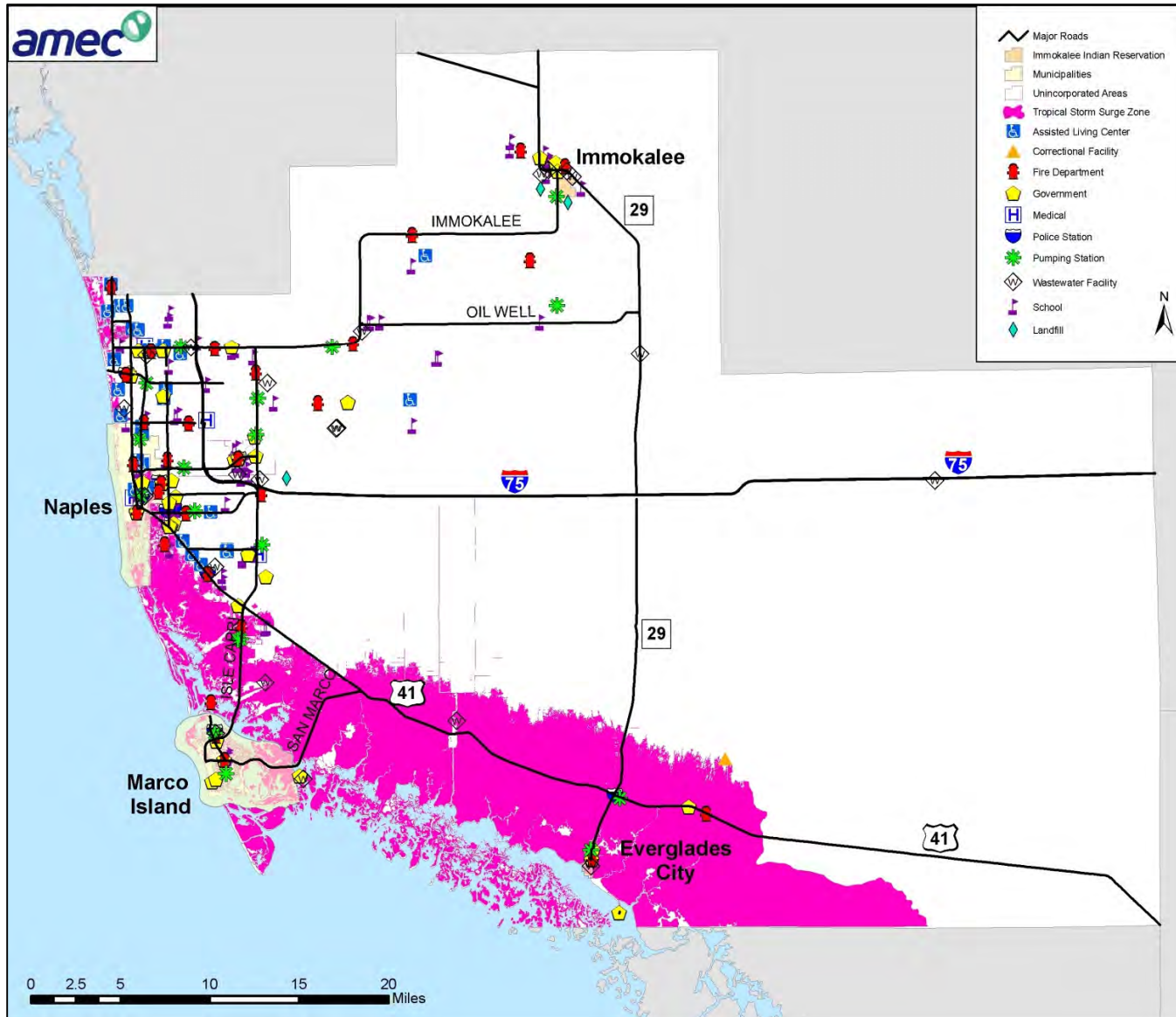


Figure 4-51 - Tropical Storm Impact in Collier County

**Table 4-51 - Assets at Risk to Category 1 Storm Surge**

Land Use	Total Building Count	Total Building Value	Estimated Content Value	Total Value <sup>1</sup>
<b>Collier County Unincorporated Areas</b>				
Agricultural	166	\$5,869,582	\$5,869,582	\$11,739,165
Commercial	531	\$137,493,809	\$133,377,277	\$270,871,086
Education	41	\$43,839,372	\$43,839,372	\$87,678,744
Government	146	\$102,096,677	\$102,096,677	\$204,193,353
Industrial	81	\$13,213,808	\$19,820,712	\$33,034,520
Religious	24	\$6,929,756	\$6,929,756	\$13,859,512
Residential	15,100	\$1,291,345,889	\$645,672,944	\$1,937,018,833
<b>Total</b>	<b>16,089</b>	<b>\$1,600,788,892</b>	<b>\$957,606,321</b>	<b>\$2,558,395,213</b>
<b>City of Everglades City</b>				
Agricultural	0	\$0	\$0	\$0
Commercial	35	\$4,052,305	\$3,904,870	\$7,957,175
Education	6	\$3,857,436	\$3,857,436	\$7,714,872
Government	17	\$3,210,148	\$3,210,148	\$6,420,296
Industrial	5	\$292,023	\$438,035	\$730,058
Religious	3	\$286,646	\$286,646	\$573,292
Residential	374	\$21,612,906	\$10,806,453	\$32,419,359
<b>Total</b>	<b>440</b>	<b>\$33,311,464</b>	<b>\$22,503,588</b>	<b>\$55,815,052</b>
<b>City of Marco Island</b>				
Agricultural	0	\$0	\$0	\$0
Commercial	106	\$22,976,552	\$20,793,780	\$43,770,332
Education	4	\$4,867,260	\$4,867,260	\$9,734,521
Government	39	\$5,530,305	\$5,530,305	\$11,060,609
Industrial	15	\$2,082,833	\$3,124,249	\$5,207,082
Religious	4	\$3,035,435	\$3,035,435	\$6,070,870
Residential	4,195	\$1,033,881,736	\$516,940,868	\$1,550,822,605
<b>Total</b>	<b>4,363</b>	<b>\$1,072,374,121</b>	<b>\$554,291,897</b>	<b>\$1,626,666,018</b>
<b>City of Naples</b>				
Agricultural	4	\$0	\$0	\$0
Commercial	154	\$120,949,903	\$118,354,538	\$239,304,441
Education	1	\$703,759	\$703,759	\$1,407,518
Government	124	\$40,473,903	\$40,473,903	\$80,947,805
Industrial	11	\$3,088,145	\$4,632,218	\$7,720,363
Religious	5	\$1,943,580	\$1,943,580	\$3,887,160
Residential	2,181	\$820,130,922	\$410,065,461	\$1,230,196,383
<b>Total</b>	<b>2,480</b>	<b>\$987,290,212</b>	<b>\$576,173,459</b>	<b>\$1,563,463,671</b>

Source: Collier County 2014 Tax Assessor's Data, NOAA, FDEM

<sup>1</sup>Total value does not include land value.

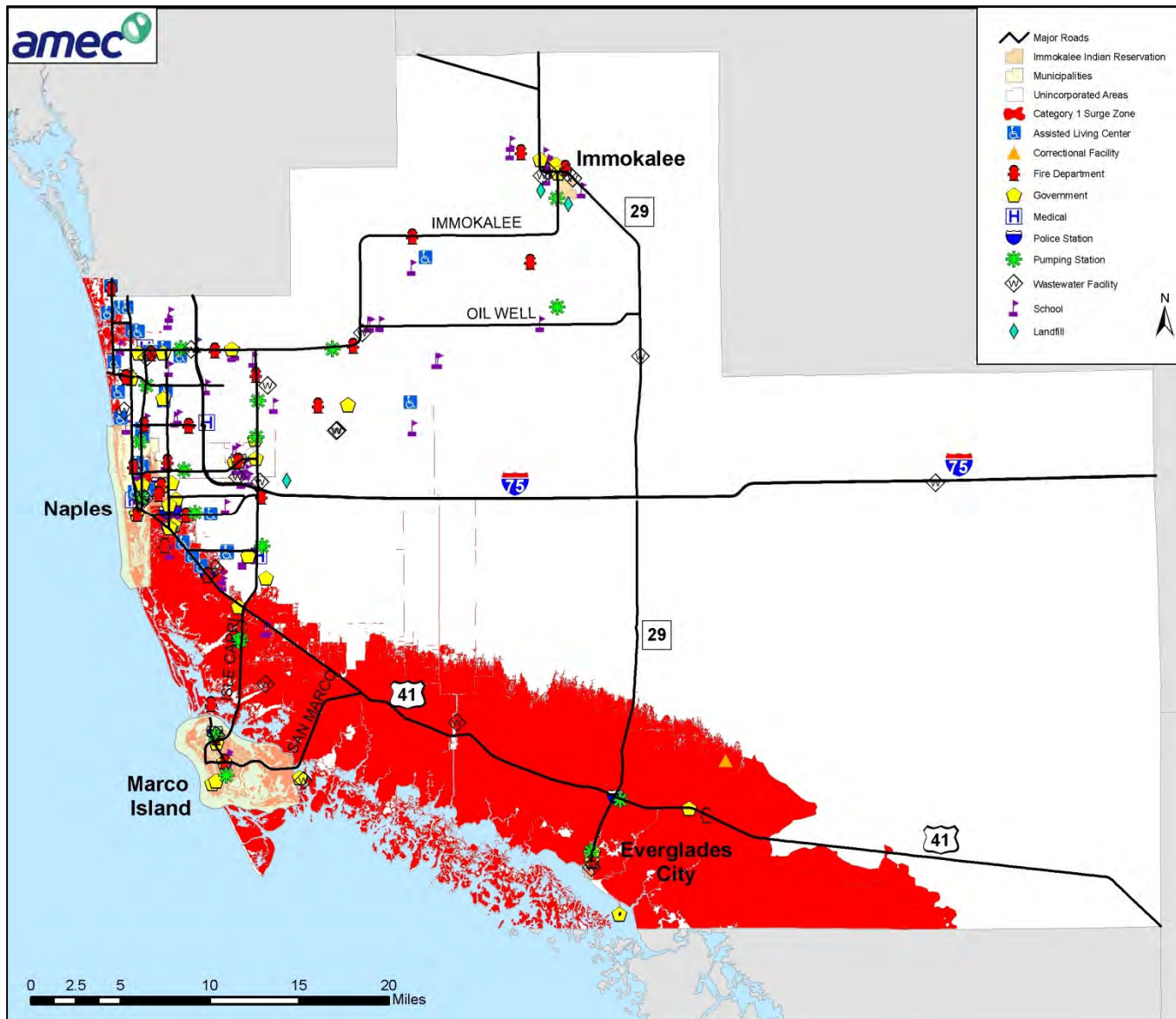


Figure 4-52 - Category 1 Storm Surge Impact in Collier County

**Table 4-52 - Assets at Risk to Category 2 Storm Surge**

Land Use	Total Building Count	Total Building Value	Estimated Content Value	Total Value <sup>1</sup>
<b>Collier County Unincorporated Areas</b>				
Agricultural	505	\$18,649,754	\$18,649,754	\$37,299,508
Commercial	1,079	\$359,384,338	\$355,267,807	\$714,652,145
Education	110	\$138,108,952	\$138,108,952	\$276,217,905
Government	252	\$195,256,285	\$195,256,285	\$390,512,570
Industrial	431	\$107,445,731	\$161,168,596	\$268,614,327
Religious	68	\$50,449,104	\$50,449,104	\$100,898,209
Residential	37,037	\$4,226,857,087	\$2,113,428,544	\$6,340,285,631
<b>Total</b>	<b>39,482</b>	<b>\$5,096,151,252</b>	<b>\$3,032,329,042</b>	<b>\$8,128,480,294</b>
<b>City of Everglades City</b>				
Agricultural	0	\$0	\$0	\$0
Commercial	35	\$4,052,305	\$3,904,870	\$7,957,175
Education	7	\$4,769,826	\$4,769,826	\$9,539,652
Government	17	\$3,210,148	\$3,210,148	\$6,420,296
Industrial	5	\$292,023	\$438,035	\$730,058
Religious	3	\$286,646	\$286,646	\$573,292
Residential	374	\$21,612,906	\$10,806,453	\$32,419,359
<b>Total</b>	<b>441</b>	<b>\$34,223,854</b>	<b>\$23,415,977</b>	<b>\$57,639,831</b>
<b>City of Marco Island</b>				
Agricultural	3	\$0	\$0	\$0
Commercial	188	\$60,308,987	\$58,126,216	\$118,435,203
Education	13	\$15,818,596	\$15,818,596	\$31,637,192
Government	74	\$11,969,384	\$11,969,384	\$23,938,768
Industrial	20	\$3,443,119	\$5,164,679	\$8,607,798
Religious	13	\$17,479,439	\$17,479,439	\$34,958,877
Residential	6,547	\$1,758,827,971	\$879,413,985	\$2,638,241,956
<b>Total</b>	<b>6,858</b>	<b>\$1,867,847,496</b>	<b>\$987,972,298</b>	<b>\$2,855,819,794</b>
<b>City of Naples</b>				
Agricultural	4	\$0	\$0	\$0
Commercial	353	\$291,923,092	\$289,313,975	\$581,237,066
Education	21	\$24,832,433	\$24,832,433	\$49,664,865
Government	186	\$85,445,714	\$85,445,714	\$170,891,427
Industrial	30	\$9,540,210	\$14,310,316	\$23,850,526
Religious	12	\$9,349,505	\$9,349,505	\$18,699,010
Residential	5,547	\$2,758,145,904	\$1,379,072,952	\$4,137,218,856
<b>Total</b>	<b>6,153</b>	<b>\$3,179,236,858</b>	<b>\$1,802,324,894</b>	<b>\$4,981,561,751</b>

Source: Collier County 2014 Tax Assessor's Data, NOAA, FDEM

<sup>1</sup>Total value does not include land value.

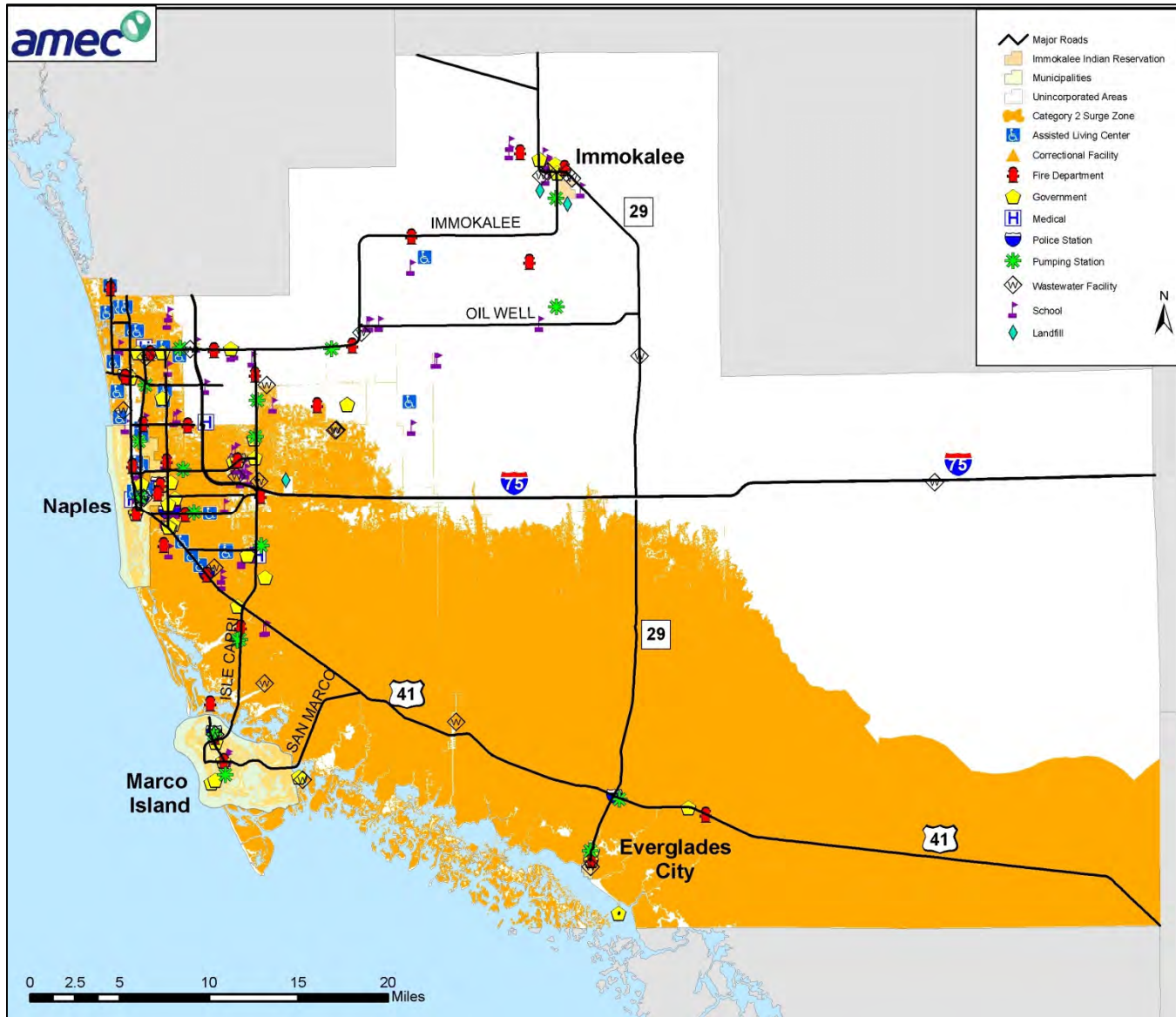


Figure 4-53 - Category 2 Storm Surge Impact in Collier County

**Table 4-53 - Assets at Risk to Category 3 Storm Surge**

Land Use	Total Building Count	Total Building Value	Estimated Content Value	Total Value <sup>1</sup>
<b>Collier County Unincorporated Areas</b>				
Agricultural	723	\$31,070,578	\$31,070,578	\$62,141,156
Commercial	1,203	\$487,301,364	\$483,184,833	\$970,486,197
Education	133	\$179,128,275	\$179,128,275	\$358,256,549
Government	309	\$227,290,964	\$227,290,964	\$454,581,927
Industrial	489	\$127,240,243	\$190,860,364	\$318,100,607
Religious	78	\$67,779,850	\$67,779,850	\$135,559,701
Residential	46,624	\$6,047,584,093	\$3,023,792,046	\$9,071,376,139
<b>Total</b>	<b>49,559</b>	<b>\$7,167,395,366</b>	<b>\$4,203,106,910</b>	<b>\$11,370,502,276</b>
<b>City of Everglades City</b>				
Agricultural	0	\$0	\$0	\$0
Commercial	35	\$4,052,305	\$3,904,870	\$7,957,175
Education	7	\$4,769,826	\$4,769,826	\$9,539,652
Government	17	\$3,210,148	\$3,210,148	\$6,420,296
Industrial	5	\$292,023	\$438,035	\$730,058
Religious	3	\$286,646	\$286,646	\$573,292
Residential	374	\$21,612,906	\$10,806,453	\$32,419,359
<b>Total</b>	<b>441</b>	<b>\$34,223,854</b>	<b>\$23,415,977</b>	<b>\$57,639,831</b>
<b>City of Marco Island</b>				
Agricultural	3	\$0	\$0	\$0
Commercial	188	\$60,308,987	\$58,126,216	\$118,435,203
Education	13	\$15,818,596	\$15,818,596	\$31,637,192
Government	74	\$11,969,384	\$11,969,384	\$23,938,768
Industrial	20	\$3,443,119	\$5,164,679	\$8,607,798
Religious	13	\$17,479,439	\$17,479,439	\$34,958,877
Residential	6,559	\$1,763,899,745	\$881,949,872	\$2,645,849,617
<b>Total</b>	<b>6,870</b>	<b>\$1,872,919,270</b>	<b>\$990,508,185</b>	<b>\$2,863,427,455</b>
<b>City of Naples</b>				
Agricultural	4	\$0	\$0	\$0
Commercial	355	\$292,084,062	\$289,474,945	\$581,559,006
Education	21	\$24,832,433	\$24,832,433	\$49,664,865
Government	187	\$85,680,979	\$85,680,979	\$171,361,957
Industrial	30	\$9,540,210	\$14,310,316	\$23,850,526
Religious	12	\$9,349,505	\$9,349,505	\$18,699,010
Residential	5,603	\$2,762,841,042	\$1,381,420,521	\$4,144,261,562
<b>Total</b>	<b>6,212</b>	<b>\$3,184,328,230</b>	<b>\$1,805,068,697</b>	<b>\$4,989,396,927</b>

Source: Collier County 2014 Tax Assessor's Data, NOAA, FDEM

<sup>1</sup>Total value does not include land value.

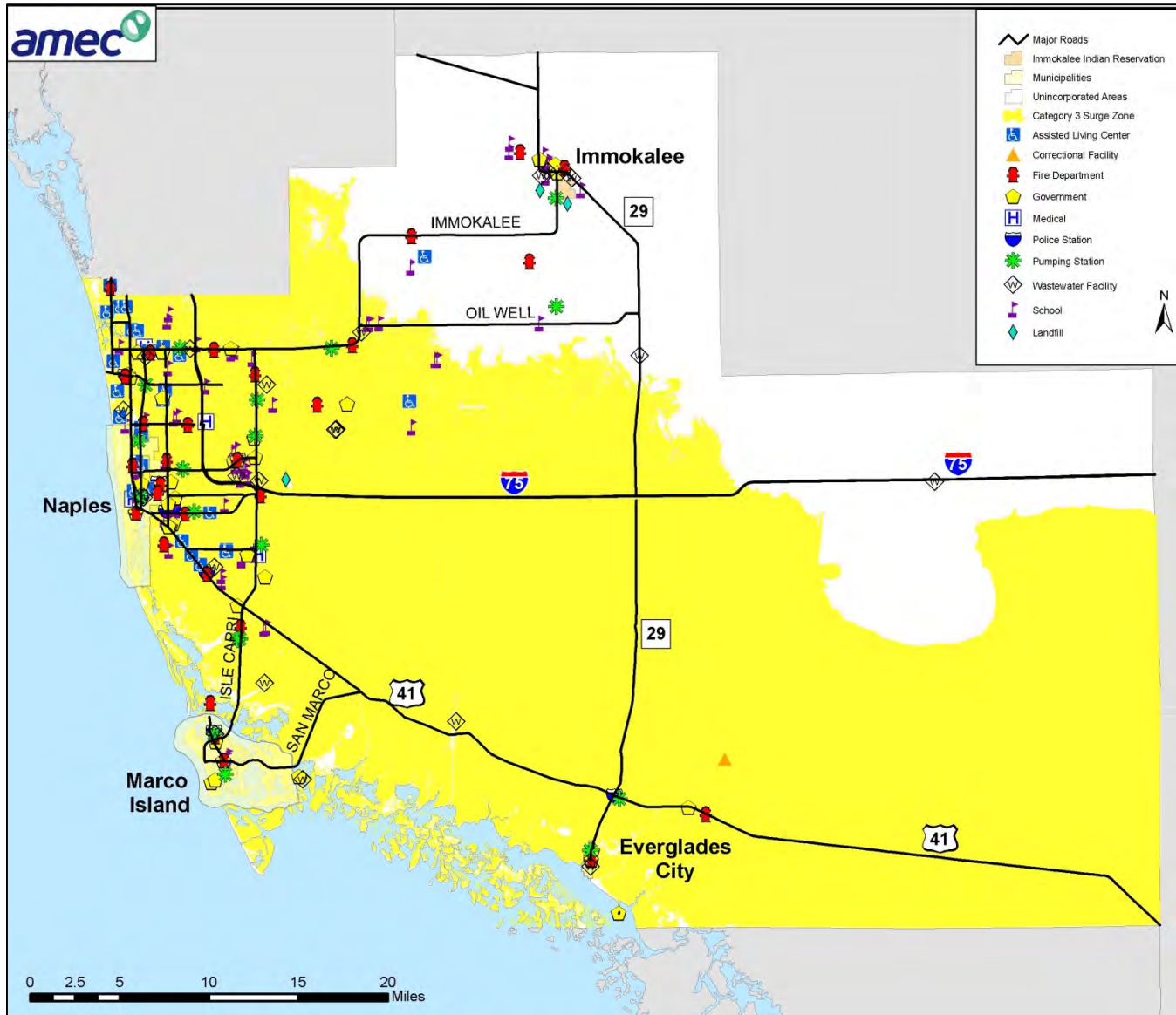


Figure 4-54 - Category 3 Storm Surge Impact in Collier County

**Table 4-54 - Assets at Risk to Category 4 Storm Surge**

Land Use	Total Building Count	Total Building Value	Estimated Content Value	Total Value <sup>1</sup>
<b>Collier County Unincorporated Areas</b>				
Agricultural	851	\$35,656,325	\$35,656,325	\$71,312,649
Commercial	1,233	\$489,787,488	\$485,670,956	\$975,458,444
Education	133	\$179,128,275	\$179,128,275	\$358,256,549
Government	324	\$229,272,496	\$229,272,496	\$458,544,992
Industrial	491	\$127,290,800	\$190,936,200	\$318,227,001
Religious	78	\$67,779,850	\$67,779,850	\$135,559,701
Residential	47,896	\$6,198,207,552	\$3,099,103,776	\$9,297,311,327
<b>Total</b>	<b>51,006</b>	<b>\$7,327,122,785</b>	<b>\$4,287,547,878</b>	<b>\$11,614,670,663</b>
<b>City of Everglades City</b>				
Agricultural	0	\$0	\$0	\$0
Commercial	35	\$4,052,305	\$3,904,870	\$7,957,175
Education	7	\$4,769,826	\$4,769,826	\$9,539,652
Government	17	\$3,210,148	\$3,210,148	\$6,420,296
Industrial	5	\$292,023	\$438,035	\$730,058
Religious	3	\$286,646	\$286,646	\$573,292
Residential	374	\$21,612,906	\$10,806,453	\$32,419,359
<b>Total</b>	<b>441</b>	<b>\$34,223,854</b>	<b>\$23,415,977</b>	<b>\$57,639,831</b>
<b>City of Marco Island</b>				
Agricultural	3	\$0	\$0	\$0
Commercial	188	\$60,308,987	\$58,126,216	\$118,435,203
Education	13	\$15,818,596	\$15,818,596	\$31,637,192
Government	74	\$11,969,384	\$11,969,384	\$23,938,768
Industrial	20	\$3,443,119	\$5,164,679	\$8,607,798
Religious	13	\$17,479,439	\$17,479,439	\$34,958,877
Residential	6,559	\$1,763,899,745	\$881,949,872	\$2,645,849,617
<b>Total</b>	<b>6,870</b>	<b>\$1,872,919,270</b>	<b>\$990,508,185</b>	<b>\$2,863,427,455</b>
<b>City of Naples</b>				
Agricultural	4	\$0	\$0	\$0
Commercial	355	\$292,084,062	\$289,474,945	\$581,559,006
Education	21	\$24,832,433	\$24,832,433	\$49,664,865
Government	187	\$85,680,979	\$85,680,979	\$171,361,957
Industrial	30	\$9,540,210	\$14,310,316	\$23,850,526
Religious	12	\$9,349,505	\$9,349,505	\$18,699,010
Residential	5,603	\$2,762,841,042	\$1,381,420,521	\$4,144,261,562
<b>Total</b>	<b>6,212</b>	<b>\$3,184,328,230</b>	<b>\$1,805,068,697</b>	<b>\$4,989,396,927</b>

Source: Collier County 2014 Tax Assessor's Data, NOAA, FDEM

<sup>1</sup>Total value does not include land value.



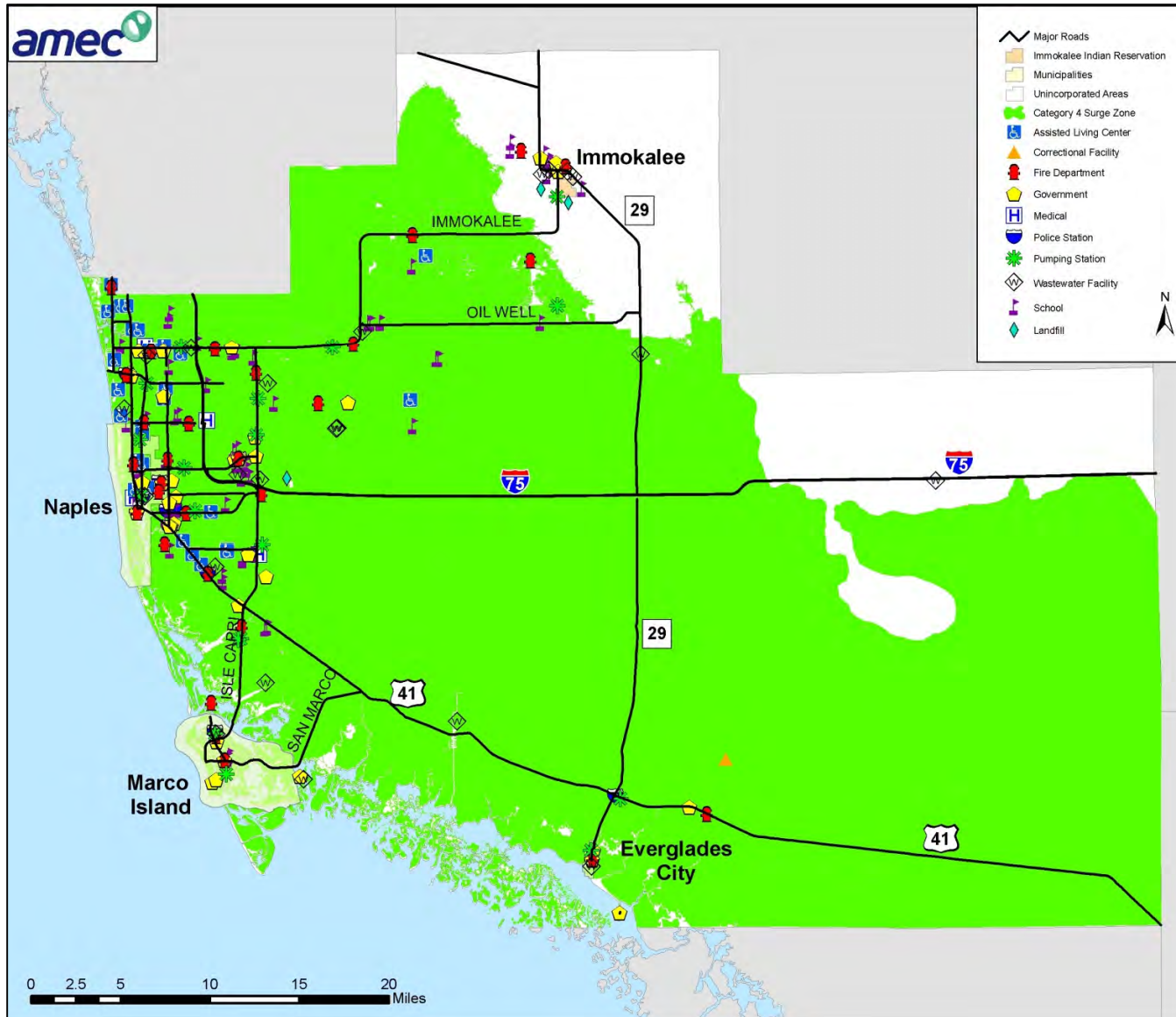


Figure 4-55 - Category 4 Storm Surge Impact in Collier County

**Table 4-55 - Assets at Risk to Category 5 Storm Surge**

Land Use	Total Building Count	Total Building Value	Estimated Content Value	Total Value <sup>1</sup>
<b>Collier County Unincorporated Areas</b>				
Agricultural	866	\$36,678,393	\$36,678,393	\$73,356,785
Commercial	1,236	\$491,266,251	\$487,076,243	\$978,342,494
Education	133	\$179,128,275	\$179,128,275	\$358,256,549
Government	329	\$229,450,409	\$229,450,409	\$458,900,818
Industrial	494	\$127,445,105	\$191,167,658	\$318,612,763
Religious	85	\$68,041,032	\$68,041,032	\$136,082,064
Residential	48,183	\$6,221,569,879	\$3,110,784,939	\$9,332,354,818
<b>Total</b>	<b>51,326</b>	<b>\$7,353,579,343</b>	<b>\$4,302,326,948</b>	<b>\$11,655,906,291</b>
<b>City of Everglades City</b>				
Agricultural	0	\$0	\$0	\$0
Commercial	35	\$4,052,305	\$3,904,870	\$7,957,175
Education	7	\$4,769,826	\$4,769,826	\$9,539,652
Government	17	\$3,210,148	\$3,210,148	\$6,420,296
Industrial	5	\$292,023	\$438,035	\$730,058
Religious	3	\$286,646	\$286,646	\$573,292
Residential	374	\$21,612,906	\$10,806,453	\$32,419,359
<b>Total</b>	<b>441</b>	<b>\$34,223,854</b>	<b>\$23,415,977</b>	<b>\$57,639,831</b>
<b>City of Marco Island</b>				
Agricultural	3	\$0	\$0	\$0
Commercial	188	\$60,308,987	\$58,126,216	\$118,435,203
Education	13	\$15,818,596	\$15,818,596	\$31,637,192
Government	74	\$11,969,384	\$11,969,384	\$23,938,768
Industrial	20	\$3,443,119	\$5,164,679	\$8,607,798
Religious	13	\$17,479,439	\$17,479,439	\$34,958,877
Residential	6,559	\$1,763,899,745	\$881,949,872	\$2,645,849,617
<b>Total</b>	<b>6,870</b>	<b>\$1,872,919,270</b>	<b>\$990,508,185</b>	<b>\$2,863,427,455</b>
<b>City of Naples</b>				
Agricultural	4	\$0	\$0	\$0
Commercial	355	\$292,084,062	\$289,474,945	\$581,559,006
Education	21	\$24,832,433	\$24,832,433	\$49,664,865
Government	187	\$85,680,979	\$85,680,979	\$171,361,957
Industrial	30	\$9,540,210	\$14,310,316	\$23,850,526
Religious	12	\$9,349,505	\$9,349,505	\$18,699,010
Residential	5,603	\$2,762,841,042	\$1,381,420,521	\$4,144,261,562
<b>Total</b>	<b>6,212</b>	<b>\$3,184,328,230</b>	<b>\$1,805,068,697</b>	<b>\$4,989,396,927</b>

Source: Collier County 2014 Tax Assessor's Data, NOAA, FDEM

<sup>1</sup>Total value does not include land value

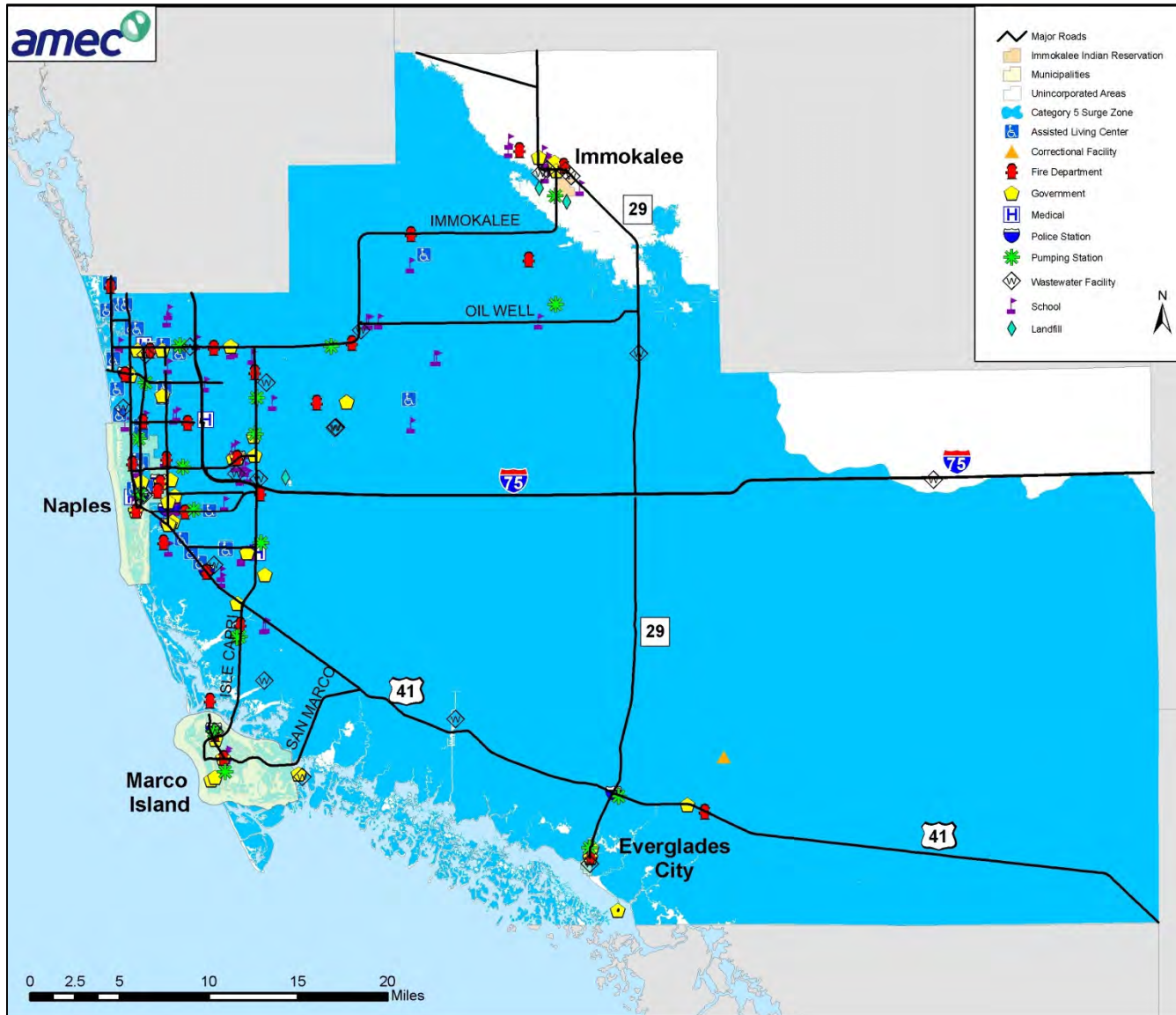


Figure 4-56 - Category 5 Storm Surge Impact in Collier County

### Critical Facilities at Risk

Figure 4-57 and Tables 4-56 through 4-59 provide an overall summary of when a critical facility becomes at risk due to storm surge from a Category 1 through a Category 5 hurricane for Collier County Unincorporated Areas, City of Everglades City, City of Marco Island and City of Naples, respectively.

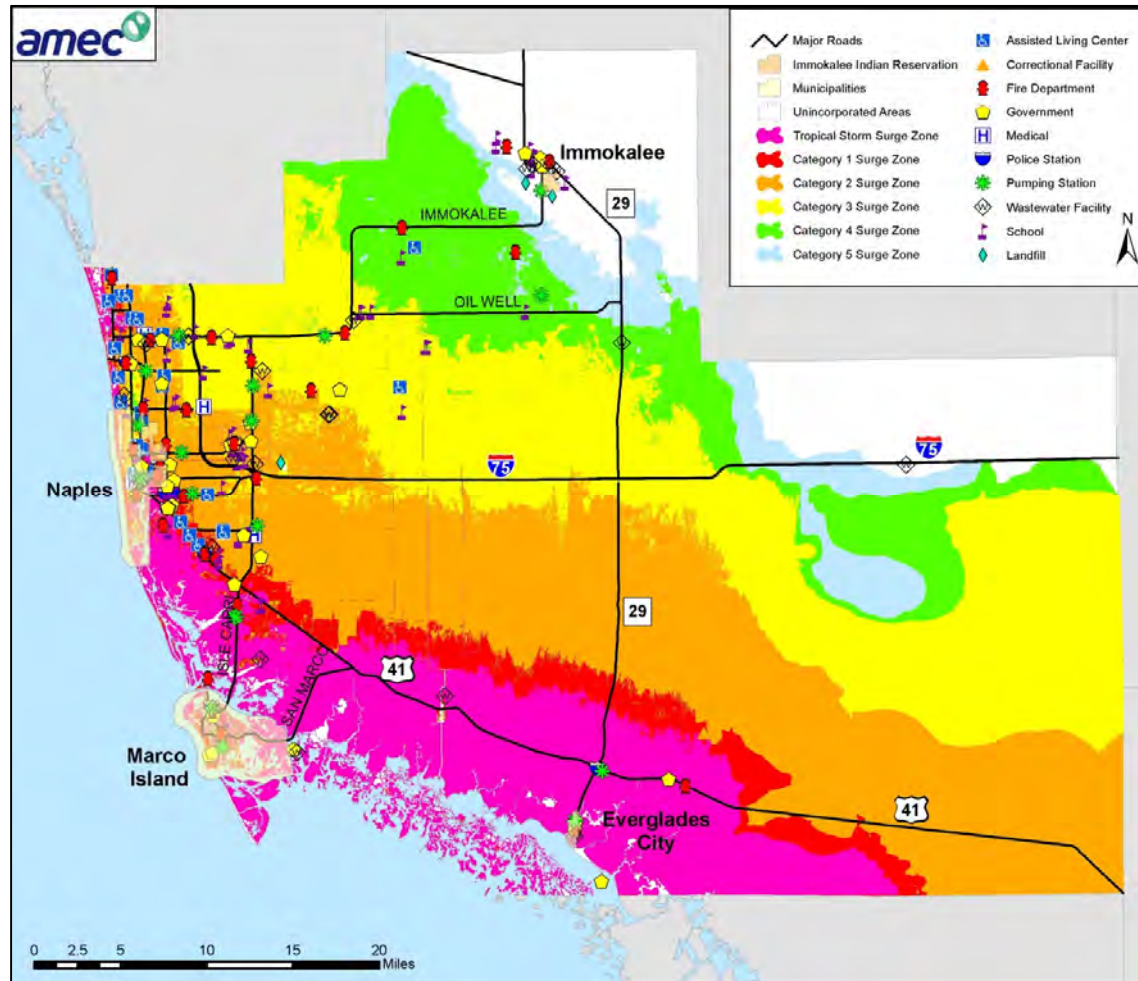


Figure 4-57 – Collier County Storm Surge Impact (Category 1-5)

**Table 4-56 - Critical Facilities at Risk by Storm Surge Category - Collier County Unincorporated Areas**

Facility	Address	CAT T	CAT 1	CAT 2	CAT 3	CAT 4	CAT 5
Alternative Schools	3710 Estey Avenue	No	No	Yes	Yes	Yes	Yes
APAC - Florida Inc. Golden Gate		No	No	Yes	Yes	Yes	Yes
Arbor Glen at Arbor Trace	1000 Arbor Lake Drive	No	No	No	Yes	Yes	Yes
Arden Courts of Lely Palms	6125 Rattlesnake Hammock Rd	No	No	No	No	No	Yes
Avalon	3300 Thomasson Drive	No	No	Yes	Yes	Yes	Yes
Ave Maria University	5050 Ave Maria Boulevard	No	Yes	Yes	Yes	Yes	Yes
Barrington Terrace of Naples	5175 Tamiami Trail East	No	No	Yes	Yes	Yes	Yes
Barron Collier	5600 Cougar Drive	No	No	No	Yes	Yes	Yes
Barry University	7007 Lely Cultural Parkway	No	No	No	Yes	Yes	Yes
Bentley Care Center	875 Retreat Drive	No	No	Yes	Yes	Yes	Yes
Bentley Village	704 Village Circle	No	Yes	Yes	Yes	Yes	Yes
Big Corkscrew Island fire control and rescue district station 10	13240 Immokalee Road	No	Yes	Yes	Yes	Yes	Yes
Big Corkscrew Island fire control and rescue district station 112	21520 Immokalee Road	No	Yes	Yes	Yes	Yes	Yes
Big Cypress	3250 Golden Gate Blvd W	No	Yes	Yes	Yes	Yes	Yes
Big Cypress Wilderness	25959 Turner River Rd	No	Yes	Yes	Yes	Yes	Yes
Calusa Park	4600 Santa Barbara Boulevard	No	No	Yes	Yes	Yes	Yes
Coke Alvan St Aubyn	3620 64Th Avenue Ne	No	No	Yes	Yes	Yes	Yes
Collier County - Health Department - Immokalee Office	419 N First St	No	No	Yes	Yes	Yes	Yes
Collier County - Health Department Golden Gate Parkway	4945 Golden Gate Pkwy	No	No	No	Yes	Yes	Yes
Collier County Court- Greentree Shopping Center	2348 Immokalee Rd	No	No	Yes	Yes	Yes	Yes
Collier County Court-North Collier Government Service Center	2335 Orange Blossom Dr	No	No	No	No	Yes	Yes
Collier County - Emergency Mgmt	8075 Lely Cultural Pkwy	No	No	Yes	Yes	Yes	Yes
Collier County - Wilson Blvd	50 Wilson Blvd S	No	No	No	Yes	Yes	Yes
Collier County- County Court	3315 Tamiami Trl E	No	No	No	Yes	Yes	Yes
Collier County Court- Golden Gate	4715 Golden Gate Pkwy	No	No	No	Yes	Yes	Yes
Collier County Property Appraiser	2335 Orange Blossom Dr	No	No	No	Yes	Yes	Yes
Collier County Sheriff	3301 Tamiami Trl E	No	No	Yes	Yes	Yes	Yes
Collier County Sheriff's Office	3301 Tamiami Trail East	No	No	Yes	Yes	Yes	Yes
Collier County Sheriff's Office	112 S 1St St	No	No	Yes	Yes	Yes	Yes
Collier County Sheriff's Office	11121 Tamiami Trl E	No	No	Yes	Yes	Yes	Yes
Collier County Sheriff's Office	4741 Golden Gate Pkwy	No	No	Yes	Yes	Yes	Yes
Collier County Sheriff's Office	776 Vanderbilt Beach Rd	No	No	Yes	Yes	Yes	Yes
Collier County South Regional WRF	5600 Warren St	No	No	Yes	Yes	Yes	Yes
Collier Co Supervisor of Elections	3301 E Tamiami Trl	No	No	No	No	Yes	Yes
Collier County Tax Collector	3291 E Tamiami Trl	No	No	Yes	Yes	Yes	Yes
Collier County Tax Collector	2348 Immokalee Rd	No	No	No	Yes	Yes	Yes
Collier County Tax Collector	12668 E Tamiami Trl	No	No	No	Yes	Yes	Yes
Collier County Tax Collector	106 1St St S	No	No	Yes	Yes	Yes	Yes
Collier County Tax Collector	2335 Orange Blossom Dr	No	No	No	Yes	Yes	Yes
Collier County Tax Collector	50 Wilson Blvd S	No	No	No	Yes	Yes	Yes

Facility	Address	CAT T	CAT 1	CAT 2	CAT 3	CAT 4	CAT 5
Collier County Tax Collector	8771 Tamiami Trl N	No	No	Yes	Yes	Yes	Yes
Collier Juvenile Detention Center	3315 E Tamiami Trl	No	No	Yes	Yes	Yes	Yes
Collier North Regional WTP		No	No	No	No	Yes	Yes
Collier South Regional WTP	3851 City Gate Dr	No	No	Yes	Yes	Yes	Yes
Corkscrew	1165 County Road 858	No	No	Yes	Yes	Yes	Yes
Cypress Palm	4255 18Th Avenue Ne	No	No	Yes	Yes	Yes	Yes
Davis Oil Company - Davis Service Center	726 E Main St	No	No	No	Yes	Yes	Yes
East Naples	4100 Estey Avenue	No	No	No	Yes	Yes	Yes
East Naples Fire Control and Rescue District Station 20 - Headquarters	4798 Davis Boulevard	No	No	Yes	Yes	Yes	Yes
East Naples Fire Control and Rescue District Station 21	11121 East Tamiami Trail	No	No	Yes	Yes	Yes	Yes
East Naples Fire Control and Rescue District Station 23	6055 Collier Boulevard	No	No	Yes	Yes	Yes	Yes
Eden Park	3650 Westclox Street	No	No	No	No	Yes	Yes
Edison College - Collier Campus	7007 Lely Cultural Parkway	No	No	No	Yes	Yes	Yes
Estates	5945 Everglades Boulevard N	No	No	No	No	Yes	Yes
FPL-Alligator	4995 Davis Blvd	No	No	No	Yes	Yes	Yes
FPL-Capri	5785 Collier Blvd	No	No	Yes	Yes	Yes	Yes
FPL-Collier	7221 Golden Gate Pkwy	No	No	Yes	Yes	Yes	Yes
FPL-Collier B1	8500 Collier Blvd	No	No	Yes	Yes	Yes	Yes
FPL-Golden Gate	4105 15Th Ave SW	No	No	No	Yes	Yes	Yes
FPL-Orangetree	625 24Th Ave NW	No	No	No	Yes	Yes	Yes
FPL-Pine Ridge	7990 Goodlette-Frank Rd N	No	No	Yes	Yes	Yes	Yes
FPL-Solana	1405 Solana Rd	No	No	Yes	Yes	Yes	Yes
FPL-Vanderbilt	2355 Piper Blvd	No	No	Yes	Yes	Yes	Yes
FPL-Weber	191 Weber Blvd N	No	No	Yes	Yes	Yes	Yes
Golden Gate	4911 20Th Place SW	No	No	No	Yes	Yes	Yes
Golden Gate	5055 20Th Place SW	No	No	No	Yes	Yes	Yes
Golden Gate	2925 Titan Way	No	No	No	Yes	Yes	Yes
Golden Gate	2701 48Th Terrace SW	No	No	Yes	Yes	Yes	Yes
Golden Gate Fire Control and Rescue District Station 70	4741 Golden Gate Parkway	No	No	Yes	Yes	Yes	Yes
Golden Gate Fire Control and Rescue District Station 71	100 13Th Street Southwest	No	No	Yes	Yes	Yes	Yes
Golden Gate Fire Control and Rescue District Station 72	3820 Beck Boulevard	No	No	Yes	Yes	Yes	Yes
Golden Gate Fire Control and Rescue District Station 73	14575 Collier Boulevard	No	No	Yes	Yes	Yes	Yes
Golden Gate WWTP		No	No	Yes	Yes	Yes	Yes
Golden Terrace North	2711 44Th Terrace SW	No	No	Yes	Yes	Yes	Yes
Golden Terrace South	2965 44Th Terrace SW	No	No	Yes	Yes	Yes	Yes
Goodland Isles Estates		No	No	Yes	Yes	Yes	Yes
Gulf Coast	7878 Shark Way	No	No	Yes	Yes	Yes	Yes
Handy Food Store #91		No	No	No	Yes	Yes	Yes
Harbor Memory Care of North Collier	101 Cypress Way East	No	No	Yes	Yes	Yes	Yes

Facility	Address	CAT T	CAT 1	CAT 2	CAT 3	CAT 4	CAT 5
Harborchase of Naples	7801 Airport Pulling Road N	No	No	Yes	Yes	Yes	Yes
Harborchase of Naples	7801 Airport Pulling Road N	No	No	No	No	Yes	Yes
Hazels Mansion Incorporated	2861 Golden Gate Boulevard E	No	No	Yes	Yes	Yes	Yes
Highlands	1101 Lake Trafford Road	No	No	Yes	Yes	Yes	Yes
Hodges University - Naples Campus	2655 Northbrooke Drive	No	No	Yes	Yes	Yes	Yes
I-75 Big Cypress Rest Stop		No	No	Yes	Yes	Yes	Yes
Immokalee	701 Immokalee Drive	No	No	Yes	Yes	Yes	Yes
Immokalee Community	123 N 4Th Street	No	No	No	Yes	Yes	Yes
Immokalee Fire Control District Sta 30	502 New Market Road East	No	No	Yes	Yes	Yes	Yes
Immokalee Fire Control District Sta 31	1107 Carson Road	No	No	Yes	Yes	Yes	Yes
Immokalee Fire Control District Sta 32	4817 Ave Maria Boulevard	No	No	Yes	Yes	Yes	Yes
Immokalee SLF	Eustis Ave Extension	No	No	Yes	Yes	Yes	Yes
Immokalee SLF and Transfer Station	700 Stockade Rd @ Cr846	No	No	Yes	Yes	Yes	Yes
Immokalee Technical Center	508 N 9Th Street	No	No	No	Yes	Yes	Yes
Immokalee WWTF		No	No	No	Yes	Yes	Yes
Isle of Capri Fire and Rescue Sta50	175 Capri Boulevard	No	No	No	Yes	Yes	Yes
Juniper Village at Naples	1155 Encore Way	No	No	No	Yes	Yes	Yes
Kiva at Canterbury Limited Liability Company	10 7Th Street	No	No	Yes	Yes	Yes	Yes
Krehling Industries - Plant 6		No	No	No	Yes	Yes	Yes
Lake Trafford	3500 Lake Trafford Road	No	No	No	Yes	Yes	Yes
Laurel Oak	7800 Immokalee Road	Yes	Yes	Yes	Yes	Yes	Yes
LCEC-Ave Maria South	6095 Camp Keais Rd	Yes	Yes	Yes	Yes	Yes	Yes
LCEC-Belle Meade	5735 Collier Blvd	No	No	Yes	Yes	Yes	Yes
LCEC-Carnestown	32096 Tamiami Trl E	No	No	Yes	Yes	Yes	Yes
LCEC-Immokalee	1299 S 1St St	No	No	No	Yes	Yes	Yes
Lely	8125 Lely Cultural Parkway	No	No	No	Yes	Yes	Yes
Lely	1 Lely High School Boulevard	No	No	No	Yes	Yes	Yes
Lely Palms Retirement Community	1000 Lely Palms Drive	No	No	No	No	Yes	Yes
Lorenzo Walker Institute	3702 Estey Avenue	No	No	Yes	Yes	Yes	Yes
Manatee	1880 Manatee Road	No	No	No	Yes	Yes	Yes
Manatee	1920 Manatee Road	No	Yes	Yes	Yes	Yes	Yes
Manorcare Nursing and Rehabilitation Center	3601 Lakewood Boulevard	No	No	No	Yes	Yes	Yes
Marco Island, City of - RO Plant		No	No	No	Yes	Yes	Yes
Marco Shores Utilities		No	No	Yes	Yes	Yes	Yes
Merrill Gardens at Naples	1710 Southwest Health Pkwy	No	No	No	Yes	Yes	Yes
Mike Davis	3215 Magnolia Pond Drive	No	No	Yes	Yes	Yes	Yes
Naples Park	685 111Th Avenue N	Yes	Yes	Yes	Yes	Yes	Yes
Naples Sanitary Landfill	3750 White Lake Blvd.	No	No	Yes	Yes	Yes	Yes
North Collier Hospital	11190 Health Park Boulevard	No	No	No	Yes	Yes	Yes
North Naples	16165 Learning Lane	No	No	No	Yes	Yes	Yes
North Naples Fire Control and Rescue District Station 40	1441 Pine Ridge Road	No	No	Yes	Yes	Yes	Yes
North Naples Fire Control and Recue District Station 42	7010 Immokalee Road	No	No	Yes	Yes	Yes	Yes

Facility	Address	CAT T	CAT 1	CAT 2	CAT 3	CAT 4	CAT 5
North Naples Fire Control and Rescue District Station 43	16325 Vanderbilt Drive	Yes	Yes	Yes	Yes	Yes	Yes
North Naples Fire Control and Rescue District Station 45	1885 Veterans Park Drive	No	Yes	Yes	Yes	Yes	Yes
North Naples Fire Control and Rescue District Station 46	3410 Pine Ridge Road	No	No	Yes	Yes	Yes	Yes
North Naples Fire Control District Station 44	8970 Hammock Oak Drive	No	No	No	Yes	Yes	Yes
Oakridge	14975 Collier Boulevard	No	No	No	Yes	Yes	Yes
Ochopee Fire Rescue Station 66	40808 East Tamiami Trail	No	No	No	Yes	Yes	Yes
Orange Tree WWTP		No	No	No	No	Yes	Yes
Osceola	5770 Osceola Trail	No	No	No	No	No	Yes
Palmetto Ridge	1655 County Road 858	No	No	No	Yes	Yes	Yes
Pelican Bay Sewage Treat Plant	6652 Watergate Way	No	Yes	Yes	Yes	Yes	Yes
Pelican Marsh	9480 Airport Pulling Road N	No	No	No	Yes	Yes	Yes
Physicians Regional Medical Center	8300 Collier Boulevard	No	No	No	Yes	Yes	Yes
Poinciana	2825 Airport Pulling Road S	Yes	Yes	Yes	Yes	Yes	Yes
Port Of The Islands WWTP	12600 Union Rd	No	No	Yes	Yes	Yes	Yes
Sabal Palm	4095 18Th Avenue Ne	No	No	Yes	Yes	Yes	Yes
Shadowlawn	2161 Shadowlawn Drive	No	No	No	Yes	Yes	Yes
Shell Oil Company		No	No	Yes	Yes	Yes	Yes
Sheriff's Office - Training	3702 Estey Ave	No	No	No	No	Yes	Yes
Sheriff's Office- Special Operations	3123 Terrace Ave	Yes	Yes	Yes	Yes	Yes	Yes
Sunniland Mine - Florida Rock		Yes	Yes	Yes	Yes	Yes	Yes
The Aristocrat	10949 Parnu Street	No	No	Yes	Yes	Yes	Yes
The Aristocrat	10949 Parnu Street	No	No	Yes	Yes	Yes	Yes
Aston Gardens at Pelican Marsh LLC	4750 Aston Gardens Way	No	No	Yes	Yes	Yes	Yes
The Carlisle Naples	6945 Carlisle Court	No	No	No	Yes	Yes	Yes
The Cove at the Marbella	7425 Pelican Bay Blvd.	No	No	No	Yes	Yes	Yes
US Post Office - CPU Veronawalk	8090 Sorrento Ln	No	No	No	No	No	Yes
US Post Office - East Naples Carrier Annex	3573 Progress Ave	No	No	Yes	Yes	Yes	Yes
US Post Office - Golden Gate	11665 Collier Blvd	No	No	Yes	Yes	Yes	Yes
US Post Office - Golden Gate Carrier Annex	4080 15Th Ave SW	No	No	No	Yes	Yes	Yes
US Post Office - Goodland	427 Papaya St	No	No	Yes	Yes	Yes	Yes
US Post Office - Naples	1200 Goodlette Rd N	No	No	No	Yes	Yes	Yes
US Post Office - Ochopee	38000 Tamiami Trl E	No	No	Yes	Yes	Yes	Yes
US Post Office - Vanderbilt Beach	851 Vanderbilt Beach Rd	No	No	No	Yes	Yes	Yes
US Post Office -Immokalee	810 N 15Th St	No	No	Yes	Yes	Yes	Yes
Vanderbilt Beach Assisted Living Home	517 100Th Avenue N.	No	No	Yes	Yes	Yes	Yes
Veterans Memorial	15960 Veterans Memorial Boulevard	Yes	Yes	Yes	Yes	Yes	Yes
Village Oaks	1601 State Road 29	No	No	No	Yes	Yes	Yes
Vineyards	6225 Arbor Boulevard W	No	No	No	Yes	Yes	Yes
Walker Institute of Technology	3702 Estey Avenue	No	No	No	Yes	Yes	Yes



Facility	Address	CAT T	CAT 1	CAT 2	CAT 3	CAT 4	CAT 5
Windsor Place	2626 Goodlette Road North	Yes	Yes	Yes	Yes	Yes	Yes

Source: Collier County 2014 Tax Assessor's Data, NOAA, FDEM

**Table 4-57 - Critical Facilities at Risk by Storm Surge Category - City of Everglades City**

Facility	Address	CAT T	CAT 1	CAT 2	CAT 3	CAT 4	CAT 5
City of Everglades City hall	102 SW Copeland St	No	No	Yes	Yes	Yes	Yes
Collier County Court - Everglades City Hall	102 Copeland Ave N	Yes	Yes	Yes	Yes	Yes	Yes
Collier County Tax Collector	102 Broadway Ave E	Yes	Yes	Yes	Yes	Yes	Yes
Everglades City	415 School Drive	Yes	Yes	Yes	Yes	Yes	Yes
Everglades City, City of - WWTF	401 Copeland Ave S	Yes	Yes	Yes	Yes	Yes	Yes
LCEC-EGC	603 Begonia St	Yes	Yes	Yes	Yes	Yes	Yes
Ochopee Fire Rescue Station 60	201 Buckner Avenue North	Yes	Yes	Yes	Yes	Yes	Yes
US Post Office - Everglades City	601 Collier Ave	Yes	Yes	Yes	Yes	Yes	Yes

Source: Collier County 2014 Tax Assessor's Data, NOAA, FDEM

**Table 4-58 - Critical Facilities at Risk by Storm Surge Category - City of Marco Island**

Facility	Address	CAT T	CAT 1	CAT 2	CAT 3	CAT 4	CAT 5
City of Marco Island City Hall	50 Bald Eagle Dr	No	No	Yes	Yes	Yes	Yes
City of Marco Island Fire Rescue Department Station 50	1280 San Marco Road	No	No	Yes	Yes	Yes	Yes
City of Marco Island Fire Rescue Department Station 51	751 East Elkcarn Circle	No	Yes	Yes	Yes	Yes	Yes
Collier County Sheriff's Department	990 N Barfield Dr	No	Yes	Yes	Yes	Yes	Yes
Collier County Tax Collector	1040 Winterberry Dr	No	No	Yes	Yes	Yes	Yes
LCEC-Fred H. Smith	1340 Lily Ct	No	No	Yes	Yes	Yes	Yes
LCEC-Marco	965 N Barfield Dr	No	Yes	Yes	Yes	Yes	Yes
Marco Island Charter	1401 Trinidad Street	No	No	Yes	Yes	Yes	Yes
Marco Island WWTF & Reclaimed Water Service Area		No	Yes	Yes	Yes	Yes	Yes
Tommie Barfield	101 Kirkwood Street	No	No	Yes	Yes	Yes	Yes
US Post Office - CPU Sunshine Booksellers	677 S Collier Blvd	No	Yes	Yes	Yes	Yes	Yes
US Post Office - Marco Island	600 E Elkcarn Circle	No	Yes	Yes	Yes	Yes	Yes

Source: Collier County 2014 Tax Assessor's Data, NOAA, FDEM

**Table 4-59 - Critical Facilities at Risk by Storm Surge Category - City of Naples**

Facility	Address	CAT T	CAT 1	CAT 2	CAT 3	CAT 4	CAT 5
North Naples Fire Control and Rescue District Station 47	2795 North Airport Road	No	No	Yes	Yes	Yes	Yes
East Naples Fire Control and Rescue District Station 24	2795 North Airport Road	No	No	Yes	Yes	Yes	Yes
Collier County Emergency Medical Services and Fire	2705 South Horseshoe Drive	No	No	Yes	Yes	Yes	Yes
City of Naples Fire Department Sta 3	300 Citation Point	No	No	Yes	Yes	Yes	Yes
Collier County Tax Collector	2800 Horseshoe Dr N	No	No	No	Yes	Yes	Yes
Orchid Terrace	111 Moorings Park Drive	No	No	Yes	Yes	Yes	Yes
Lakeside Pavilion Care and Rehabilitation Center	2900 12Th Street North	No	No	Yes	Yes	Yes	Yes
City of Naples Fire Department Sta 2	977 26Th Avenue North	No	No	Yes	Yes	Yes	Yes
Gulfview	255 6Th Street S	No	No	Yes	Yes	Yes	Yes
Heritage Healthcare and Rehabilitation Center	777 9Th Street North	No	No	Yes	Yes	Yes	Yes
Lake Park	1295 14Th Avenue N	No	No	Yes	Yes	Yes	Yes
Naples	1100 Golden Eagle Circle	Yes	Yes	Yes	Yes	Yes	Yes
Sea Gate	650 Seagate Drive	Yes	Yes	Yes	Yes	Yes	Yes
Sheriff's Office - Crime Prevention	2373 North Horseshoe Drive	No	Yes	Yes	Yes	Yes	Yes
The Chateau at Moorings Park	130 Moorings Park Drive	No	No	Yes	Yes	Yes	Yes
Naples Community Hospital	350 7Th Street North	Yes	Yes	Yes	Yes	Yes	Yes
Naples Police Department	355 Riverside Circle	No	No	Yes	Yes	Yes	Yes
Naples, City of - WWTP I		No	No	Yes	Yes	Yes	Yes
City of Naples Fire Department Sta1	835 8Th Avenue South	No	No	Yes	Yes	Yes	Yes
US Post Office - Downtown Naples	860 6Th Ave S	Yes	Yes	Yes	Yes	Yes	Yes
FPL-Naples	1220 5Th Ave N	No	No	Yes	Yes	Yes	Yes
City of Naples City Hall	735 8Th St S	No	No	No	Yes	Yes	Yes
Collier County Tax Collector	735 8Th St S	No	Yes	Yes	Yes	Yes	Yes
Homewood Residence at Naples	770 Goodlette Road, North	No	Yes	Yes	Yes	Yes	Yes

Source: Collier County 2014 Tax Assessor's Data, NOAA, FDEM

### Population at Risk

A hurricane surge analysis was conducted by intersecting the improved parcel layer provided by Collier County with the polygon shapefile for each hurricane surge layer. In evaluating populations at risk, only those people residing in the hurricane storm surge zones are included. Thus, those improved residential parcels intersecting the hurricane surge zones were counted and multiplied by the Census Bureau household factor for each community as shown in Table 4-60.

**Table 4-60 - Population at Risk to Storm Surge**

Surge Category	Residential Property Count	Census Bureau Household Factor	Population at Risk
<b>Tropical Storm</b>			
Collier County Unincorporated Areas	5,328	2.64	14,066
City of Everglades City	373	2.64*	985
City of Marco Island	271	2.14	580
City of Naples	759	1.99	1,510
<b>Category 1</b>			
Collier County Unincorporated Areas	15,100	2.64	39,864
City of Everglades City	374	2.64*	987
City of Marco Island	4,195	2.14	8,977
City of Naples	2,181	1.99	4,340
<b>Category 2</b>			
Collier County Unincorporated Areas	37,037	2.64	97,778
City of Everglades City	374	2.64*	987
City of Marco Island	6,547	2.14	14,011
City of Naples	5,547	1.99	11,039
<b>Category 3</b>			
Collier County Unincorporated Areas	46,624	2.64	123,087
City of Everglades City	374	2.64*	987
City of Marco Island	6,559	2.14	14,036
City of Naples	5,603	1.99	11,150
<b>Category 4</b>			
Collier County Unincorporated Areas	47,896	2.64	126,445
City of Everglades City	374	2.64*	987
City of Marco Island	6,559	2.14	14,036
City of Naples	5,603	1.99	11,150
<b>Category 5</b>			
Collier County Unincorporated Areas	48,183	2.64	127,203
City of Everglades City	374	2.64*	987
City of Marco Island	6,559	2.14	14,036
City of Naples	5,603	1.99	11,150
<b>Total</b>			<b>650,381</b>

Source: Collier County 2014 Tax Assessor's Data, FEMA 2012 DFIRM, U.S. Census Bureau (2008-2012)

\*A separate household factor was not available for Everglades City. The Collier County household factor was used instead.

### Evacuation Zones

Figure 4-58 depicts hurricane evacuation zones for Collier County. This figure utilizes a polygon set based on regional surge zones from a 2007-2010 statewide evacuation study initiated by FDEM.

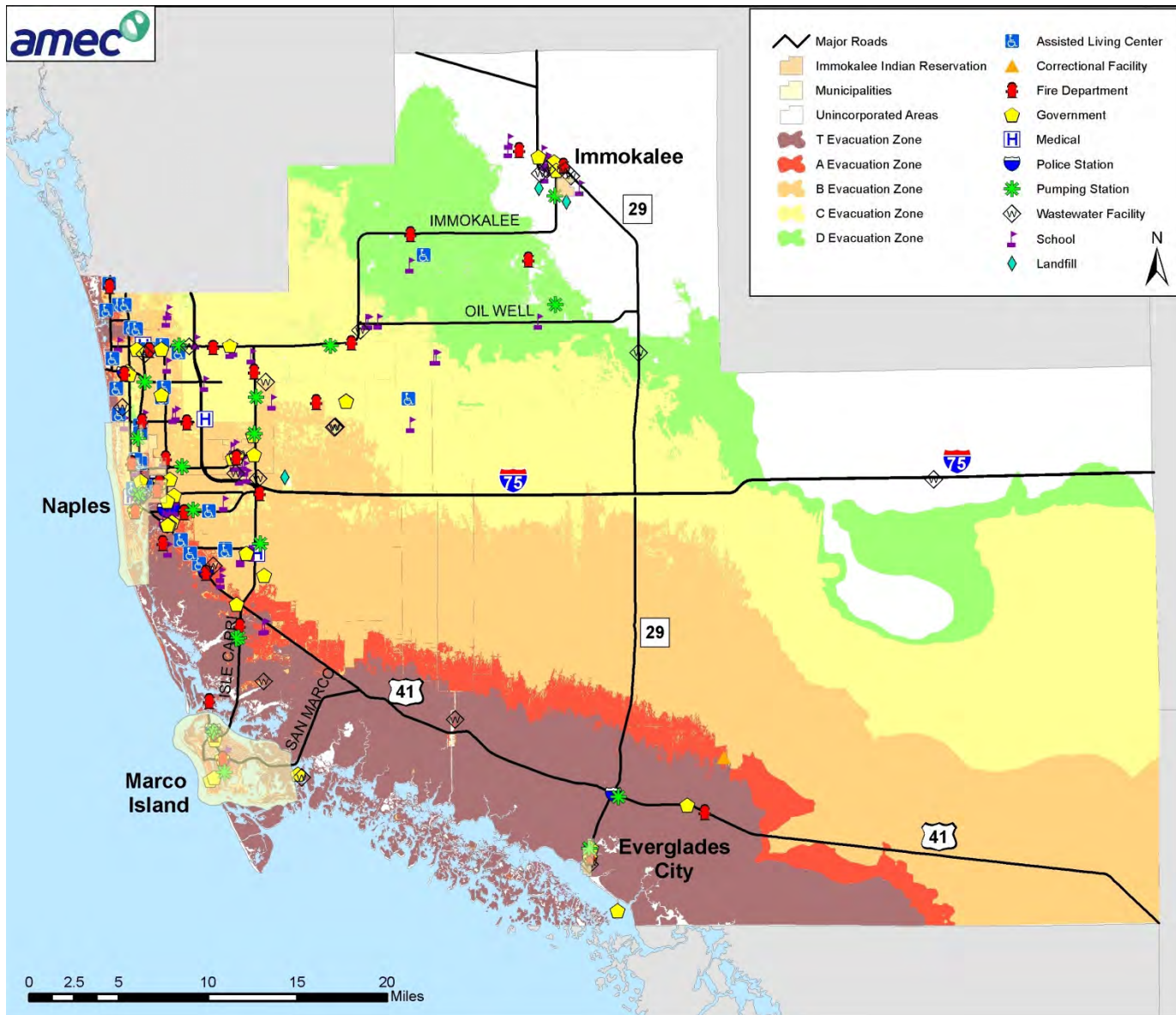


Figure 4-58 - Collier County Evacuation Zones

#### 4.4 Capability Assessment

Table 4-61 lists regulatory mitigation capabilities, including planning and land management tools, typically used by local jurisdictions to implement hazard mitigation activities and indicates those that are in place in Collier County, the City of Marco Island and the City of Naples. Excerpts from applicable policies, regulations, and plans and program descriptions follow to provide more detail on existing mitigation capabilities.

**Table 4-61 - Regulatory Mitigation Capabilities**

Regulatory Tool (ordinances, codes, plans)	Y/N	Date*			Comments
		C	N	M	
Comprehensive Plan	Y	2014	2013	2009	
Zoning Ordinance	Y	2014	2014	2013	
Subdivision Ordinance	Y	2014	2014	2014	
Floodplain Ordinance	Y	2013	2012	2012	
Stormwater Ordinance		2013	2007	n/a	
Building Code	Y	2010			2010 FBC effective on 3/15/12
BCEGS Rating	Y	2013		2013	Co. & Marco Island: 4/4 Naples: 3/3
Erosion or Sediment Control Program	Y	2009	2014	n/a	Addressed in the Co. with the NPDES Construction General Permit (CGP) requirements; Naples requires a Construction Site Management Plan
Stormwater Management Program	Y	2013	2007	n/a	NPDES Permit #FLR04E037 (Co.) NPDES Permit #FLR04E080 (Naples)
Site Plan Review Requirements	Y				
Capital Improvements Plan	Y	2013	2013	2011	
Economic Development Plan		2013	n/a	n/a	Economic Element of Comprehensive Plan
Local Emergency Operations Plan	Y	2012	2012	2013	
Flood Insurance Study or Other Engineering Study for Streams	Y	2012			
Repetitive Loss Plan	N				
Elevation Certificates	Y				

Key: C – Collier County; N – Naples; M – Marco Island

\* Most recent version (includes latest amendments)

#### Comprehensive Plans

Florida's Growth Management Act requires the state's counties and municipalities to adopt Comprehensive Plans that guide future growth and development. A Comprehensive Plan establishes goals, policies and objectives for the implementation of the plan.

#### *Collier County Growth Management Plan (1997, most recently amended in 2014)*

Goals, objectives and/or policies in the Plan include:

- Provide stormwater management facilities and services for drainage and flood protection for existing and future development, minimize the degradation of quality of receiving waters and surrounding natural areas, and protect the functions of natural groundwater aquifer recharge areas.

- Verify the design storm capacity of the drainage facilities within each basin, and determine the costs necessary to maintain the facility capacities to selected design storm standards. This information shall be used to program operational funds in the Annual County Budget and to identify necessary capital projects and basin studies in the Annual Capital Improvement Element Update and Amendment.
- Maintain adopted drainage level of service standards for basins and sub-basins.
- Regulate land use and development in a manner that protects the functions of natural drainage features, the stormwater management network and natural groundwater aquifer recharge areas.
- Floodplain storage compensation shall be evaluated for developments within the designated Flood Hazard Area (flood zones starting with the letter “V” or “A”) as depicted on the Flood Insurance Rate Maps published by the Federal Emergency Management Agency with an effective date of May 16, 2012. Floodplain storage compensation shall also be evaluated for areas known to be periodically inundated by intense rainfall or sheet flow conditions.
- All new development and re-development projects shall ensure surrounding properties will not be adversely impacted from the project’s influence on stormwater sheet flow.
- Within the *Urban Designation* and the *Rural Fringe Mixed Use District*, required wetland preservation areas, buffer areas, and mitigation areas shall be dedicated as conservation and common areas in the form of conservation easements and shall be identified or platted as separate tracts; land uses shall not include any activities that are detrimental to drainage, flood control, water conservation, erosion control or fish and wildlife habitat conservation and preservation.
- On-site shelters within mobile home parks or mobile home subdivisions shall be elevated to a minimum height equal to or above the worst case Category 3 hurricane flooding level, based upon the current National Oceanic and Atmospheric Administration’s storm surge model, known as Sea, Lake, and Overland Surges from Hurricanes (SLOSH).
- All new Public Safety facilities in Collier County will be flood-resistant and designed to meet 155 mph wind load requirements and shall have provisions for back-up generator power.
- Ensure that publicly funded buildings and publicly funded development activities are carried out in a manner that demonstrates best practice to minimize the loss of life, property, and re-building cost from the effects from hurricanes, flooding, natural and technological disaster events. Best practice efforts may include, but are not limited to construction above the flood plain.
- The County shall participate in the National Flood Insurance Program (NFIP).
- The County shall consider the Coastal High Hazard Area as a geographical area lying below the elevation of the Category 1 storm surge line as presently defined in the 2011 Southwest Florida Regional Planning Council’s Hurricane Evacuation Study, or subsequently authorized storm surge or evacuation planning studies coordinated by the Collier County Emergency Management Department and approved by the Board of County Commissioners.
- The County shall require that all new sanitary sewer facilities in the coastal high hazard area be flood proofed, be designed to reduce leakage of raw sewage during flood events to the maximum extent practicable and, new septic tanks shall be fitted with back-flow preventers.
- The County shall continue to assess all undeveloped property within the coastal high hazard area and make recommendations on appropriate land use.
- Within the Coastal High Hazard Area maximum permissible residential density is limited in recognition of the level of risk, the existing deficiency of evacuation shelter space and existing patterns of density.
- To encourage residential in-fill in urban areas of existing development outside of the Coastal High Hazard Area, a maximum of 3 residential dwelling units per gross acre may be added if (certain) criteria are met.

- Drainage and stormwater management practices shall be governed by the South Florida Water Management District Surface Water Management regulations.
- Prepare Watershed Management Plans, which contain appropriate mechanisms to protect the County's estuarine and wetland systems.

*City of Naples Comprehensive Plan (amended in 2013)*

Goals, objectives and/or policies in the Plan include:

- Conservation Areas: The areas designated as environmentally sensitive lands are delineated on the Future Land Use Map (including tidal swamp and marsh areas, which slow the surge of flood waters and reduce inland flooding). Before development can be approved, an environmental assessment must be prepared which details the specific habitats and communities present on the property and takes into account site topography and hydrology.
- Coordinate the Conservation and Coastal Management Element with the Future Land Use Element.
- Limit public expenditure that encourages or subsidizes private development in the coastal high hazard area to the provision of services per density levels as determined by the Future Land Use Map, Policy 1-1 and as further limited by the Code of Ordinances.
- Direct new population growth away from known or predicted coastal high hazard areas except for residential development in compliance with the Future Land Use Map and as may be further limited by the Code of Ordinances.
- The Coastal High Hazard Area is the area below the elevation of the Category 1 Storm Surge line as established by a Sea, Lake and Overland Surges from Hurricanes (SLOSH) computerized storm surge model. This area includes much of the City of Naples, including most of its public infrastructure.
- Enforce existing development standards for stormwater management.
- Utilize a combination of existing wetlands, created wetlands, and other stormwater management technology, as appropriate, to manage stormwater runoff consistent with South Florida Water Management District regulations.
- Enforce development regulations found in the Code of Ordinances pertaining to the coastal building zone, the Coastal Construction Setback Line, and the flood insurance program.
- Continue to participate in the National Flood Insurance Program (NFIP).
- The level of service standard for surface water management for all development, redevelopment and the primary drainage system requires no flooding during a 5 year, one hour storm event for roads, yard drainage, pump stations and trunk lines and requires no flooding during a 100 year storm event for building finished floors elevations.
- Pursue intergovernmental cooperation with Collier County, the South Florida Water Management District, and the Big Cypress Basin to implement projects and programs that mitigate flooding and improve water quality.
- Develop and maintain public information program to inform the citizens of, and encourage support for, a stormwater quality program with emphasis on stormwater retention in swales and lakes.
- Continue to implement a City-wide swale restoration program, including inspection and maintenance of the design capacity within the right-of-way and landscaped easements.
- Include in individual land development plans stormwater runoff systems that are compatible with basin wide master drainage plans.

### *City of Marco Island Comprehensive Plan (2009)*

Goals, objectives and/or policies in the Plan include:

- The City of Marco Island will operate and maintain a stormwater management system that will meet or exceed adopted Levels of Service (LOS) design standards over the next five years.
- The LOS design standard for new stormwater management facilities will be the 10 year, one hour storm event, with a 3.3 inches/hour intensity duration.
- With respect to proposed developments, post-development stormwater runoff shall, at a minimum, not exceed pre-development conditions.
- Existing stormwater management systems, public or private, that are proposed for expansion and/or reconstruction shall, to the greatest degree practical, meet current stormwater management regulations for quantity discharges.
- The City will implement a proactive maintenance program to ensure that all current and future stormwater management facilities operate at designed capacity.
- The City will conduct annual inspections of stormwater facilities consistent with requirements and obligations in the City's Community Rating System (CRS) Plan.
- The City shall maintain and enforce building codes at least as stringent as required by Florida law to limit the potential damage of structures from hurricanes and tropical storms. These codes shall include building elevation requirements that conform to federal laws and Flood Insurance Rate Maps.
- Proposed changes to the Future land Use Map will be thoroughly reviewed for compatibility and coordination with underlying topographic, soil, flooding probability, and existing infrastructure services to ensure the development envisioned in the proposed change can be accommodated without adverse impacts or severe limitations due to topographic, soil, or infrastructure services.
- All new development shall be required to comply with minimum base flood elevations as established on the applicable FEMA Flood Insurance Rate Map (FIRM) or not less than 10.0 NGVD as mandated by the City of Marco Island to ensure projects approved and permitted will not be adversely impacted by flooding. Remodeling of existing structures may occur at existing structure elevations in which case minimum FEMA elevations shall apply.
- Any future subdivision of land which results in a net increase of lots shall be reviewed to ensure that the desired density conforms to prescribed limitations contained on the Future Land Use Map. Further, any proposed subdivision not currently abutting a public street shall be evaluated to prevent periodic and seasonal flooding.
- The maximum density of future residential development is limited to a maximum density of four units per acre in recognition of natural hazards and existing population concentrations.
- The City will utilize a post-disaster redevelopment plan and associated build-back policies to reduce or eliminate the exposure of human life, and public and private property to catastrophic.

### **Stormwater Management Plans**

#### *Collier County Stormwater Master Plan (1988)*

A County-wide Stormwater Master Plan reflected a broad watershed planning philosophy, as well as a scope of service for detailed individual basin studies with a multi-disciplinary objective of appropriate land use and natural resource management as well as traditional flood protection. The Master Plan study was used to develop the Drainage Sub-Element of the County's Growth Management Plan, which was updated



in 2013. Marco Island also addresses stormwater management in its comprehensive plan (the Stormwater Management Sub-Element). Recommended goals, objectives and policies are included in the listings under the Comprehensive Plans section of this Capability Assessment.

#### *City of Naples Stormwater Master Plan (2007)*

Naples has a stand-alone Stormwater Master Plan that was updated in 2007. The purpose of the plan is to compile existing stormwater data, alternative analyses, cost, and recommendations into a master plan with focus on improving flood control, improving pollution control, and improving Naples Bay on a regional level. The plan's recommendations include several actions intended to address both water quality and quantity, including the following:

- Create a stormwater management definition section in the City's Code.
- Create specific Stormwater Management Codes and thresholds to address to the City of Naples specific concerns and needs.
- Establish a maximum impervious area by percentage for each residential land use to guarantee that some reasonable area will be set aside for trees, grasses and landscaping to filter and percolate stormwater runoff prior to discharge to receiving waters.

#### **Emergency Management Plans**

The Collier County Comprehensive Emergency Management Plan (CEMP) was prepared in 2012 and also adopted by the Cities of Marco Island and Naples. The plan is designed to provide a framework through which the County may prevent or mitigate the impacts of, prepare for, respond to, and recover from natural, manmade, and technological hazards. The plan includes flood/surge impact scenarios and establishes a Flood Warning Program, which:

- Describes the various types of flooding that could occur and provides procedures for disseminating warning information and for determining, assessing and reporting the severity and magnitude of flooded areas,
- Establishes the concepts under which the county government will maintain a 24/7 flood warning program, and
- Creates a framework for expeditious, effective and coordinated employment of local resources.

Marco Island also prepared a complementary CEMP in 2013. The plan includes a Flood Recovery Standard Operating Procedure (SOP). The purpose of the SOP is to ensure that timely and pertinent flood preparedness, recovery and mitigation information is available to the public before, during and after a flooding event in support of the National Flood Insurance Program (NFIP) and the requirements of the community.

#### **Collier County Local Mitigation Strategy (2010; 2015 update underway)**

The purpose of the Collier County Local Mitigation Strategy is to develop a unified approach among county and municipal governments, with input from the private sector, for dealing with identified hazard and hazard management problems in the Collier County area. The document addresses following hazards: tropical cyclones and coastal storms, severe storms and tornados, flooding and wildfires. All jurisdictions in the County adopted the 2010, which is currently being updated.

### **City of Marco Post-Disaster Recovery Plan (2001)**

In accordance with the City of Marco Island Comprehensive Plan recommendations, the City adopted a Post-Disaster Recovery Plan with associated build-back requirements. Structures damaged by disaster by more than 50 percent of the replacement value at the time of disaster can be rebuilt to their original square footage and density, provided they comply with several requirements, including federal requirements for elevation above the 100-year flood level and the City's building Code requirements for flood-proofing.

### **Collier County Watershed Management Plan (2011)**

The development of Watershed Management Plans (WMPs) is specifically recommended in the County's Growth Management Plan. WMP goals include addressing the effects on natural floodplains, stream channels, native vegetative communities and natural protective barriers which are involved in the accommodation of flood waters and identifying non-structural methods of surface water management, such as the following specific initiatives that are included in the WMP that has been completed to date:

- Low Impact Development (LID) Program
- Stormwater Retrofit Program
- Fee-Based Stormwater Utility Incentive Program
- Allowable Maximum Site Discharges
- Stormwater Runoff Volume Control
- Verification of No Floodplain Impact
- Flood Protection Levels of Service (FPLOS) Criteria
- Golden Gate Estates Transfer of Development
- Rights Program
- Golden Gate Estates Watershed Mitigation Program
- Modified Operations of Water Control Structures
- Stormwater System Maintenance and Certification

### **Repetitive Loss Data to Support Sections 501-503 in the CRS (2013)**

Collier County is classified as a Repetitive Loss Category "C" community. To comply with the requirements in Sections 501 through 503 of the CRS Program, the county provided a detailed analysis of the causes of repetitive flooding including background data on flood insurance and historical flood issues in the general area. All of this information is contained in a comprehensive repetitive loss report. The repetitive loss data contained within this report was used in the development of this FMP and is also required as an annual reporting tool for the CRS Recertification.

### **Flood Damage Prevention Ordinance**

A floodplain ordinance is perhaps a community's most important flood mitigation tool. Collier County and the Cities of Marco Island and Naples updated their ordinances after a new Digital Flood Insurance Rate Map (DFIRM) became effective in 2012. The new map is based on updated topographical and hydrological data and now identifies the risk from coastal storm surge flooding as well as rainfall from the coastline to roughly State Route 29. Many areas of the county that had been exempt under previous flood zone mapping (D-Zones) are now included, such as the Golden Gate Estates area up to Immokalee in the northern portion of the County; this area is now largely shown as the AH-Zone. There were also changes in X-Zones, which

cover much of the urban area of the County. Base Flood Elevations (BFEs) range from 8.5 feet along the coast to 37.5 feet further inland.

Collier County's current Flood Damage Prevention Ordinance was adopted in 2011 and amended in 2013. The objectives of the ordinance are to:

- Protect human life, health and to eliminate or minimize property damage;
- Minimize expenditure of public money for costly flood control projects;
- Minimize the need for rescue and relief efforts associated with flooding and generally undertaken at the expense of the general public;
- Minimize prolonged business interruptions;
- Minimize damage to public facilities and public utilities such as water and gas mains, electric, telephone and sewer lines, roadways, and bridges and culverts located in floodplains;
- Maintain a stable tax base by providing for the sound use and development of flood-prone areas in such a manner as to minimize flood blight areas; and
- Ensure that potential homebuyers are notified that property is in a special flood hazard area.

## **Zoning and Subdivision Regulations**

### ***Collier County Land Development Code***

In addition to the Flood Damage Prevention Ordinance, the Collier County Code of Ordinances includes a Land Development Code, which contains land use and development standards. Some of these standards address flooding and are summarized below in the following representative examples.

- Coastal Zone Management Regulations – Intended to manage and conserve the habitats, species, natural shoreline, and dune systems in the County's coastal zone through the identification, protection, conservation, and appropriate use of native vegetative communities and wildlife habitats.
- Interim Watershed Management Regulations – New development and redevelopment are required to meet specific water quality volumetric requirements and limiting offsite discharge rates. Includes floodplain storage compensation requirements. (Updated requirements are recommended in the 2012 Watershed Management Plan.)
- Site Design Requirements that address environmental protection and flood protection / control for:
  - Waterfront lots
  - Shorelines
  - Hurricane shelters in mobile home lots
  - Big Cypress Area of Critical State Concern Special Treatment Overlay (ACSC-ST) District

### ***Naples Land Development Code***

- C Conservation and TC Transitional Conservation Zoning Districts – The principal consideration concerning uses within the conservation zoning district is the preservation of the natural functions and benefits of these areas while allowing natural uses and low intensity development which follows the guidelines outlined for each subcategory in this division. The categories are as follows:

<b>Future Land Use Classification:</b>	Vital	Limited Development
<b>Zoning:</b>	Conservation	Transitional Conservation
<b>Includes:</b>	Marine grass beds Tidal swamp/marsh areas Freshwater swamp/marsh areas Class II waters Gulf beaches/dunes High-hazard areas*	Marginal land High-hazard areas* Passive recreation/open space areas Class III waters

\*Defined as "Areas seaward of the most restrictive of the following: State of Florida Coastal Construction Control Line or Federal Emergency Management Agency designated Velocity zones (FEMA V zones), and erosion-prone bay frontage."

- Coastal Construction Code – Addresses design and construction of buildings and structures within the coastal building zone (land area from the seasonal high-water line to a line 1,500 feet landward from the state-established coastal construction control line) and coastal barrier islands.
- Flood Damage Prevention Standards for Subdivision Proposals – Requires all subdivision proposals and other proposed development (including manufactured homes) to meet the following standards:
  - All subdivision proposals shall be consistent with the need to minimize flood damage;
  - All subdivision proposals shall locate and construct public utilities and facilities such as sewer, gas, electrical, and water systems to minimize or eliminate flood damage;
  - All subdivision proposals shall provide adequate drainage to reduce exposure to flood hazards;
  - The special flood hazard area shall be delineated and the base flood elevations shown on tentative and final subdivision plats.

**Marco Island Land Development Code**

- Vegetation Removal and Protection – Standards to protect existing vegetation within the city by regulating its removal; to assist in the control of flooding, soil erosion, dust, heat, air pollution and noise.
- Transfer of Development Rights – To protect lands of environmental sensitivity, such as wetlands, an owner of land located within areas designated with the Special Treatment (ST) overlay, may transfer some or all of the residential development rights from one parcel of land (“sending lands”) to another parcel located in the urban designated area of unincorporated Collier County (“receiving lands”). Owners of eligible sending land seeking to transfer development rights shall adhere to Transfer of Development Rights (TDR) provisions contained in the **Collier County Land Development Code**.

**Flood Insurance Study (2012)**

A Flood Insurance Study (FIS) dated May 16, 2012 was prepared by FEMA for Collier County, Florida and Incorporated Areas which includes the City of Marco Island and the City of Naples. The FIS identifies areas within Collier County that are subject to flooding from the 100-year storm event. This information is used by Collier County and Incorporated Areas to implement floodplain regulations as part of participation in the NFIP and to promote sound land use and floodplain development within the community.

The FIS was used in the development of this FMP to identify FEMA flood hazard areas and to calculate the associated flood depths for the 100-year storm event. The flood depths were then used to prepare the risk assessment for Collier County. Based on the flood depth, a depth damage factor was applied to each building based on its occupancy class in order to calculate an accurate damage assessment for each building located within the 100-year flood hazard area.

#### 4.4.1 Administrative/Technical Mitigation Capabilities

Table 4-62 identifies personnel responsible for activities related to mitigation and loss prevention in Collier County, the City of Marco Island and the City of Naples.

**Table 4-62 - Administrative/Technical Capabilities**

Resource	Y/ N	Responsible Department		
		C	N	M
Planner/Engineer with knowledge of land development/land management practices	Y	Growth Management Division - Planning and Zoning Dept. Staff	Planning Dept. (Director & staff)	Growth Management Dept. (Director & staff)
Engineer/Professional trained in construction practices related to buildings and/or infrastructure	Y	Growth Management Division - Operations & Regulatory Management Staff	Building Dept.	Building Services
Planner/Engineer/Scientist with an understanding of natural hazards	Y	Growth Management Division -Department of Natural Resources Staff	Natural Resources Dept. (Natural Resources Manager & staff)	Environmental Services (Environmental Specialist)
Personnel skilled in GIS	Y	Information Technology - GIS Services; Planning and Zoning Dept.	Planning Dept.	Growth Management Dept. (IT/GIS Manager)
Full time building official	Y	Growth Management Division - Operations & Regulatory Management (Building Official)	Building Dept. (Building Official)	Building Services (Chief Building Official)
Floodplain Manager	Y	Growth Management Division - Department of Natural Resources (Floodplain Coordinator)	Building Dept. (Floodplain Coordinator)	Growth Management Dept. (Planner/Floodplain Coordinator)
Emergency Manager	Y	Bureau of Emergency Services - Emergency Management Dept.	Fire Rescue Dept.	Fire Rescue Dept. (Emergency Management Coordinator)
Grant writer	Y	Grants Coordinator	Grants Coordinator	Grants Coordinator
GIS data – Hazard areas	Y	Growth Management Division - Planning and Zoning Dept.	Planning Dept.	Growth Management Dept.- GIS Services
GIS data – Critical facilities	Y	Growth Management Division - Planning and Zoning Dept.	Planning Dept.	Growth Management Dept.- GIS Services
GIS data – Land use	Y	Growth Management Division - Planning and Zoning Dept.	Planning Dept.	Growth Management Dept.- GIS Services
GIS data – Building footprints	Y	Growth Management Division - Planning and Zoning Dept.	Planning Dept.	Growth Management Dept.- GIS Services

Resource	Y/ N	Responsible Department		
		C	N	M
GIS data – Links to Assessor’s data	Y	Growth Management Division - Planning and Zoning Dept.	Planning Dept.	Growth Management Dept.- GIS Services
Warning Systems/Services	Y	CodeRed Telephone Notification System, Radio & TV PSAs, Electronic Message Service, Lightning Detection System (Marco Island)		

Key: C – Collier County; N – Naples; M – Marco Island

#### 4.4.2 Fiscal Mitigation Capabilities

Table 4-63 identifies financial tools or resources that the County could potentially use to help fund mitigation activities.

**Table 4-63 - Fiscal Mitigation Capabilities**

Resource	Accessible/Eligible to Use (Y/N)		
	C	N	M
Community Development Block Grants	Y	Y	Y
Capital improvements project funding	Y	Y	Y
Authority to levy taxes for specific purposes	Y	Y	Y
Fees for water, sewer, gas or electric services	Y	Y	Y
Impact fees for new development	Y	Y	Y
Incur debt through general obligation bonds	Y	Y	Y
Incur debt through special tax bonds	Y	Y	
Incur debt through private activity bonds	Y		
Withhold spending in hazard prone areas	N*	N*	N
South Florida Water Management District Cooperative Funding Program	Y	Y	Y
Other			

Key: C = Collier County; N = Naples; M = Marco Island

\* Policy statements in local comprehensive plans including limiting public expenditures in coastal high hazard areas to those that support development that is consistent with the Future Land Use element

#### 4.4.3 Mitigation Partnerships and Outreach

##### Partnerships

###### *Local*

Collier County and the Cities of Naples and Marco Island have developed their own emergency management programs but work closely together. The Collier County Emergency Management Department works with the City of Marco Island, City of Naples, Everglades City, Collier County Sheriff’s Office, Collier County Public Schools District, and the Collier County Mosquito Control District and the Independent Fire Districts in coordinating resources and personnel.

To prepare for natural disasters such as flooding, the County and its municipalities participate in the Collier County Local Mitigation Strategy Working Group. The group is composed of members drawn from county and municipal governments as well as from interested citizens from around Collier County and formed under the Collier County Citizen Corps. The purpose of the Working Group is to identify new mitigation opportunities, techniques and, if necessary, reprioritize existing mitigation projects. This group meets at least annually and after every disaster event that causes significant damages to infrastructure.

The following is a list of partners identified in the 2012 Collier County Comprehensive Emergency Management Plan (EMP) to help mitigate natural hazards through mutual aid agreements, memoranda of understanding, and other agreements:

American Red Cross of Collier County	Immokalee Technical School (ITECH)
Career and Service Center of Immokalee	Isles of Capri Fire District
Catholic Charities of Collier County	Living Word Family Church
Collier County Private Schools	Marco Island YMCA
Collier County School Board	Marco Presbyterian Church
David Lawrence Center & EMS	Mayflower Congregational Church
Collier County Health Department	Moorings Presbyterian Church
East Naples Fire District	Naples Civil Air Patrol Squadron FL023
Emmanuel Lutheran Church	Naples United Church of Christ
Farm Workers Village	Ochopee Fire District
FDEM Support Trailer	Shepherd of the Glades Lutheran Church
First Baptist Church of Naples	The Salvation Army
First Church of Christ Scientist	United Way of Collier County
Florida Alert Response Team	Veterans of Foreign Wars Post 7721
Goodwill Industries of SW Florida	
Golden Gate Fire District	
Guadalupe Center	
Guadalupe Social Services	
Habitat for Humanity of Collier County	
Harry Chapin Food Bank	
Hodges University	
Immokalee Friendship House	
Immokalee Helping Our People in Emergencies (I HOPE)	

The EMP's Flood Warning Program section further describes the roles and responsibilities of County departments and partners, including the American Red Cross, the Salvation Army, the School Board, and the South Florida Water Management District's (SFWMD) Big Cypress Basin office. The Flood Warning Program requires the Big Cypress Basin to monitor and/or run the real-time hydrologic monitoring and modeling system and to report flooding threats and trends as they occur.

The Big Cypress Basin includes all of Collier County and a portion of mainland Monroe County. It is responsible for operating and maintaining 162 miles of canals and 46 water control structures and providing capital improvements to enhance water supply and environmental and flood control capabilities. The basin

is one of two taxing basins that forms the SFWMD, a regional governmental agency that oversees water resources in the southern half of the state and offers technical assistance and expertise to local, regional and state agencies on water resource issues and policies.

The Basin's priorities for maximizing flood protection include:

- Maintaining preparedness for emergency storm operations
- Efficiently operating and maintaining the Basin's primary canal and water control structure network
- Improving canal conveyance capacities while emphasizing water resource protection and beneficial alternative uses
- Protecting existing canal right of way from encroachments and unauthorized uses
- Retrofitting old inefficient water control structures; building new structures to meet current or future design conditions
- Inventorying, prioritizing, and retrofitting coastal and other water control structures, while considering the potential effects of sea level rise
- Cooperating with local governments to improve and maintain secondary and tertiary stormwater management systems

### ***State***

The County is a partner with the State of Florida Department of Emergency Management. The County utilizes the State's hurricane surge maps and hurricane evacuation zones to perform local risk assessments and to develop mitigation strategies. The County also partners with the State on grant funding opportunities.

### ***Federal***

The County is a partner with FEMA. The County utilizes FEMA's flood insurance study to perform local risk assessments and to enforce local floodplain management ordinances. The County also utilizes FEMA literature and brochures to promote flood risk awareness. Collier County is also a partner with the U.S. Army Corps of Engineers in developing and implementing flood mitigation projects in the County.

### **Outreach**

The SFWMD provides several informational materials on preparing for emergencies, including flooding. These materials are provided on their website and can be utilized by any local government as well as the public. The City of Marco Island provides a link to SFWMD materials with a "Rainy Season Readiness" link on its FEMA Information webpage. Marco Island also provides a Hurricane Readiness webpage and provides storm related information to residents through the CODERed Alert system and email news alerts.



The City of Naples also promotes the use of CODERed on its website and provides flood-related information under the following topics:

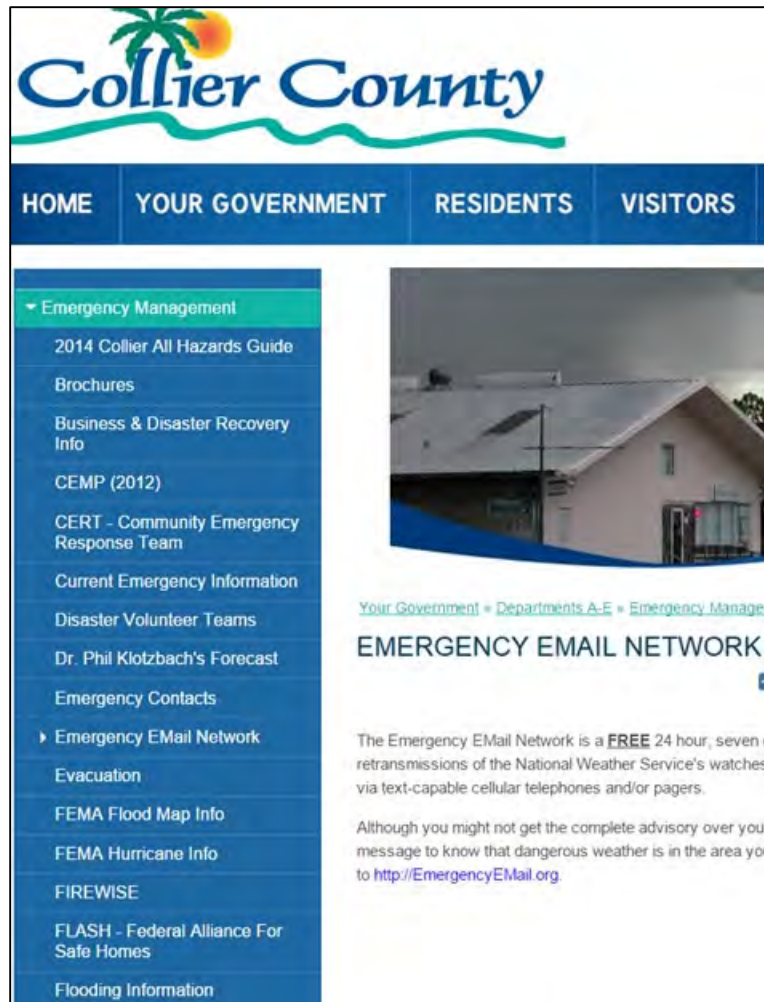
- Current Water & Weather Conditions
- Flood Zone Maps
- Flood Rules



- Flood Insurance
- Flood Programs
- Flood Facts
- Flood Safety
- Flood Protection
- Elevation Certificates
- Drainage System Maintenance

Collier County provides information on a variety of emergency management educational and awareness topics and training opportunities. In addition to the topics shown in the image below, information is provided on the following:

- Gas Stations with Generators
- Hazards Lookup
- Hazard Viewer
- Hurricane Seminar Schedule
- In the News
- Kids-Disaster Prep
- LIBRARY (Reference)
- Local Media
- National Hurricane Center
- Personal Disaster Plan, etc.
- Pet Information
- Private Nonprofits (PNPs)
- Rainy Season Readiness
- Re-Entry After a Disaster
- Response Information
- Shelter Information
- SKYWARN
- Special Needs & Sheltering Info
- Surge (SLOSH)
- The Weather Channel
- Training & Events
- Tropics Information
- Weather Alerts - Email & SMS
- Weather Videos & Games
- Why Evacuate?



## 5 MITIGATION STRATEGY

**Requirement §201.6(c)(3): [The plan shall include] a mitigation strategy that provides the jurisdiction’s blueprint for reducing the potential losses identified in the risk assessment, based on existing authorities, policies, programs and resources, and its ability to expand on and improve these existing tools.**

This section describes the mitigation strategy process and mitigation action plan for the Collier County Floodplain Management Plan. It describes how the County met the following requirements from the 10-step planning process:

- Planning Step 6: Set Goals
- Planning Step 7: Review Possible Activities
- Planning Step 8: Draft an Action Plan

### 5.1 Mitigation Strategy: Overview

The results of the planning process, the risk assessment, the goal setting, and the identification of mitigation actions led to the mitigation strategy and mitigation action plan for this FMP. Section 5.2 below identifies the goals and objectives of this plan and Section 5.4 details the new mitigation action plan. The following umbrella mitigation strategy was developed for this FMP:

**Communicate** the hazard information collected and analyzed through this planning process as well as FMPC success stories so that the community better understands what can happen where and what they themselves can do to be better prepared.

**Implement** the action plan recommendations of this plan.

**Use** existing rules, regulations, policies, and procedures already in existence.

**Monitor** multi-objective management opportunities so that funding opportunities may be shared and packaged and broader constituent support may be garnered.

#### 5.1.1 Continued Compliance with the NFIP

Given the flood hazards in the planning area, an emphasis will be placed on continued compliance with the NFIP and participation in the CRS. The CRS was created in 1990. It is designed to recognize floodplain management activities that are above and beyond the NFIP’s minimum requirements. Collier County, the City of Marco Island, and the City of Naples are currently classified as Class 6 communities, which gives a 20% premium discount to individuals in the Special Flood Hazard Area, and a 10% discount to policyholders outside the Special Flood Hazard Area. All three communities meet or exceed the following minimum requirements as set by the NFIP:

- Issuing or denying floodplain development/building permits
- Inspecting all development to assure compliance with the local ordinance
- Maintaining records of floodplain development
- Assisting in the preparation and revision of floodplain maps

- Helping residents obtain information on flood hazards, floodplain map data, flood insurance and proper construction measures

The County's Growth Management Division is responsible for the review and approval of all development applications to the County. The application review process includes an analysis for compliance with the County's Land Development Code, the County's Code of Laws and Ordinances (which includes the Flood Damage Prevention Ordinance), the Florida Building Code, the South Florida Water Management District permitting rules (when applicable), the County's Growth Management Plan, and other related regulations for development approval compliance. Both the development permit and building permit approval processes consist of extensive reviews of the submitted applications to determine compliance before a recommendation for approval is given. Once a development begins actual construction, there are a number of periodic on-site inspections performed by trained inspection staff to ensure compliance before the construction can proceed toward completion. The Growth Management Division also maintains the record of all map revisions and changes received from FEMA. As a part of the services offered to the public, the Growth Management Division provides FEMA floodplain mapping information, flood insurance program information, flooding hazards, and proper construction methods within the special flood hazard area.

The City of Naples Building Department is responsible for performing the above stated duties for the City of Naples. The City of Marco Island Growth Management Department is responsible for performing these duties for the City of Marco Island.

The following is a summary of the CRS Activities for which Collier County currently receives credit:

**Activity 310 – Elevation Certificates:** The Building Department maintains elevation certificates for new and substantially improved buildings. Copies of elevation certificates are made available upon request. Elevation Certificates are also kept for post-FIRM structures and are listed on the community's website.

**Activity 320 – Map Information Service:** Credit is provided for furnishing inquirers with flood zone information from the community's latest FIRM, publicizing the service annually and maintaining records.

**Activity 330 – Outreach Projects:** A community brochure is included in the local telephone book and is delivered to all properties in the community on an annual basis. An outreach brochure is mailed annually to all properties in the community's Special Flood Hazard Area (SFHA). The community also provides flood information through displays at public buildings.

**Activity 350 – Flood Protection Information:** Documents relating to floodplain management are available in the reference section of the Collier County Public Library. Credit is also provided for floodplain information displayed on the community's website.

**Activity 360 – Flood Protection Assistance:** The community provides site specific flood and flood related data to interested property owners and annually publicizes the service.

**Activity 410 – Additional Flood Data:** Credit is provided for a cooperating technical partnership agreement with FEMA.

**Activity 420 – Open Space Preservation:** Credit is provided for preserving approximately 152,270 acres in the SFHA as open space. Credit is also provided for open space land that is deed restricted and preserved in a natural state.

**Activity 430 – Higher Regulatory Standards:** Credit is provided for enforcing state mandated regulatory standards. Credit is also provided for a BCEGS Classification of 4/4.

**Activity 440 – Flood Data Maintenance:** Credit is provided for maintaining and using digitized maps in the day to day management of the floodplain. Credit is also provided for establishing and maintaining a system of benchmarks and maintaining copies of all previous FIRMs.

**Activity 450 – Stormwater Management:** The community enforces regulations for stormwater management, freeboard in non-SFHA zones, soil and erosion control, and water quality.

**Activity 510 – Floodplain Management Planning:** Credit is provided for the adoption and implementation of the Floodplain Management Plan. A progress report must be submitted on an annual basis.

**Activity 540 – Drainage System Maintenance:** A portion of the community's drainage system is inspected regularly throughout the year and maintenance is performed as needed by the Collier County Road Maintenance/Stormwater Management Department. Records are being maintained for both inspections and required maintenance. Credit is also provided for an ongoing Capital Improvements Program. The community also enforces a regulation prohibiting dumping in the drainage system.

**Activity 610 – Flood Warning Program:** Credit is provided for a program that provides timely identification of impending flood threats, disseminates warnings to appropriate floodplain residents, and coordinates flood response activities. Credit is also provided for the designation as a StormReady Community by the National Weather Service.

**Activity 630 – Dam Safety:** All Florida communities currently receive CRS credit for the state's dam safety program.

## 5.2 Goals and Objectives

**Requirement §201.6(c)(3)(i): [The mitigation strategy section shall include a] description of mitigation goals to reduce or avoid long-term vulnerabilities to the identified hazards.**

Section 4.0 documents the flood hazards and associated risks that threaten Collier County including the vulnerability to structures, infrastructure, and critical facilities. Section 4.0 also evaluates the capacity of the County to reduce the impact of those hazards. The intent of Goal Setting is to identify areas where improvements to existing capabilities (policies and programs) can be made so that community vulnerability is reduced. Goals are also necessary to guide the review of possible mitigation measures. This Plan needs to make sure that recommended actions are consistent with what is appropriate for the County. Mitigation goals need to reflect community priorities and should be consistent with other plans in the County.

**Goals:** are general guidelines that explain what is to be achieved. They are usually broad-based policy type statements, long term and represent Global visions. Goals help define the benefits that the plan is trying to achieve.

**Objectives:** are short term aims, when combined, form a strategy or course of action to meet a goal. Unlike goals, objectives are specific and measurable.

### 5.2.1 Coordination with Other Planning Efforts

The goals of this plan need to be consistent with and complement the goals of other planning efforts. The primary planning document where the goals of this Plan must complement and be consistent with is the Collier Local Mitigation Strategy and to a lesser degree the participating communities' comprehensive plans. The comprehensive plan is important as it is developed and designed to guide future growth within the community. Therefore, there should be some consistency in the overall goals and how they relate to each other. Likewise, the goals of the county's LMS play an important role as it also focuses on flood hazards and projects must be prioritized in the LMS in order to receive funding.

### 5.2.2 Goal Setting Exercise

On November 19th, 2014, the Collier County FMPC conducted an exercise to outline its goals for this floodplain management plan. The first part of the exercise including asking each committee member: "What would you most like to see in Collier County's future?" Each member was given a handout which appears in Figure 5-1.

Committee members wrote down their choices on post-it-notes. Each member then explained their choices to the larger committee membership. The notes were posted on the wall and then organized by similar topics. There was some consistency in the members' topics. The handout has 22 possible statements, but the members' nominations included fewer than half of them. The resulting similar topics are listed below:

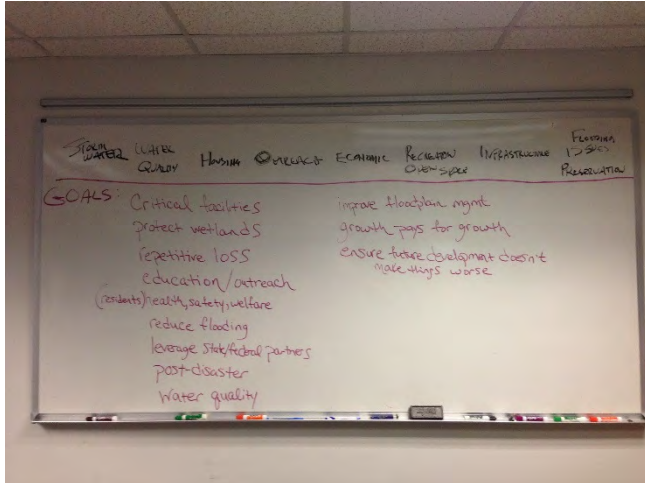
- Improved stormwater management
- Improved water quality
- Improved/more housing
- Enhanced outreach efforts to residents and local businesses
- Economic (job opportunities, younger people staying/moving into the area)
- Improved recreation/open space
- Improved infrastructure

- Preserved historical/cultural sites
- Reduced flooding issues



A second exercise was then conducted to recommend mitigation goals. Each member was given the hand out that appears in Figure 5-2 which asks “What should be the goals of the mitigation program?” Committee members wrote down their top three choices on post-it-notes. Each member explained their choices to the larger membership. After the notes were placed on the wall, they were then organized by similar topics. The resulting goals are listed below:

- Protect critical facilities
- Protect wetlands/environmentally sensitive areas
- Protect repetitively flooded areas
- Enhanced education/outreach
- Protect people’s lives and public health
- Reduce flooding
- Leverage state/federal partnerships
- Improve post-disaster recovery
- Improve water quality
- Improve floodplain management
- Growth pays for growth
- Ensure future development doesn’t make things worse



The goal statements selected by committee members were in line with what they wanted to see in Collier County’s future. The exercise revealed important information to guide the planning effort. For example, members stressed the importance of protecting lives and property, even though improving the economy and increasing the number of jobs was an important part of their vision for the future.

### 5.2.3 Resulting Goals and Objectives

At the end of the exercises, the FMPC agreed upon five general goals for this planning effort. The FMPC also included objectives in support of the goals. The refined goals and objectives include:

**Goal 1 - Reduce vulnerability and exposure to flood hazards in order to protect the health, safety and welfare of residents and guests.**

- Objective 1.1:** Maintain a database of flood problems and hazards.
- Objective 1.2:** Maintain a database of repetitive loss claim history and mitigation activities.
- Objective 1.3:** Review the Growth Management Plan, Land Development Code, and Ordinances for compatibility with these goals and objectives, and revise where appropriate and financially feasible.
- Objective 1.4:** Develop more comprehensive evacuation plans.
- Objective 1.5:** Review the adequacy of emergency procedures for flood events and coastal storm surge through training and exercises.
- Objective 1.6:** Update FEMA designated flood zones based on the best available technical data and analysis.
- Objective 1.7:** Enforce code requirements of the National Flood Insurance Program.
- Objective 1.8:** Conduct site investigations, research exposure and hazard data, and evaluate proposed modifications to repair and mitigate stormwater management problems.
- Objective 1.9:** Develop projects to reduce deficiencies within the stormwater management system as art of the Annual Update and Inventory Report (AUIR) and budget development process.

**Goal 2 – Encourage property owners, through education and outreach measures, to protect their homes and businesses from flood damage.**

**Objective 2.1:** Educate property owners, including repetitive loss properties, on FEMA grant programs and other methods in order to mitigate possible flood damage.

**Objective 2.2:** Provide the current floodproofing and retrofitting information to property owners.

**Objective 2.3:** Effectively communicate flood risk to residents, businesses, contractors, realtors and prospective buyers.

**Objective 2.4:** Enhance community websites to provide comprehensive flood protection and flood preparedness information.

**Goal 3 – Reduce the vulnerability of critical facilities and infrastructure from the effects of flood hazards.**

**Objective 3.1:** Ensure protection standards for critical facilities meet Florida Building Code standards.

**Objective 3.2:** Work with appropriate personnel to prioritize critical and essential facilities in need of protection from potential flood damage.

**Objective 3.3:** Implement flood mitigation measures or strategies, as necessary, to protect critical facilities.

**Goal 4 – Protect natural resources by employing watershed-based approaches that balance environmental, economic and engineering considerations.**

**Objective 4.1:** Maintain and enforce regulations to protect and restore wetlands and ecological functions for long-term environmental, economic and recreational values.

**Objective 4.2:** Continue beach re-nourishment and dune construction programs for the protection of marine habitat, environmentally sensitive lands and other coastal resources.

**Objective 4.3:** Pursue water management approaches and techniques that improve water quality and protect public health.

**Objective 4.4:** Preserve and maintain open space in flood prone areas to reduce flood damage to buildings and to provide recreational benefits.

**Objective 4.5:** Continue to protect aquifers and environmentally sensitive lands from encroachment of development by requiring buffers and other setbacks mechanisms.



**Goal 5 – Minimize the adverse impacts to surrounding areas and watershed functions.**

**Objective 5.1:** Reduce stormwater runoff through adequate stormwater management, flood control, on-site retention and best management practices to mitigate impacts associated with incremental construction and redevelopment projects.

**Objective 5.2:** Evaluate funding mechanisms to increase stormwater capital improvement programs.

**Objective 5.3:** Ensure floodplain compensation is provided as established in the Growth Management Plan and Land Development Code.

## Goals Exercise – Part 1

### What would you most like to see in Collier County’s future?

Here are possible answers to this question, listed in alphabetical order. Pick three that you think are most important. You may reword them or add new ones if you want.

You have three cards. Use one card for each of your top three answers.

- Educated children
- Improved air quality
- Improved water quality
- Less new development
- Less traffic congestion
- Improved/more businesses
- Improved/more cultural facilities
- Improved/more housing
- Improved/more public transportation
- Improved/more job opportunities
- Improved/more knowledgeable residents
- Improved/more open space
- Improved/more shopping
- New development confined to areas already developed
- Preserved historical/cultural sites
- Special attention given to elderly/disabled
- Special attention given to lower income areas
- Special attention given to newer shopping areas
- Special attention given to older business areas
- Younger people staying/moving into the area
- Other \_\_\_\_\_

Figure 5-1 - Handout for Goals Exercise – Part 1

## Goals Exercise – Part 2

### What should be the goals of our mitigation program?

Here are possible answers to this question, listed in alphabetical order. Pick three that you think are most important. You may reword them or add new ones if you want.

You have three cards. Use one card for each of your top three answers.

- Help people protect themselves
- Make sure future development doesn't make things worse
- Maximize the share paid by benefiting property owners
- Maximize use of state and federal funds
- Minimize property owner's expenditures
- Minimize public expenditures
- New developments should pay the full cost of protection measures
- Protect businesses from damage
- Protect cars and other vehicles
- Protect centers of employment
- Protect critical facilities
- Protect forests
- Protect homes
- Protect new/future buildings
- Protect people's lives
- Protect power stations and power lines
- Protect public health
- Protect public services (fire, police, etc.)
- Protect repetitively flooded areas
- Protect scenic areas, greenways, etc.
- Protect schools
- Protect shopping areas
- Protect streets
- Protect utilities (power, phone, water, sewer, etc.)
- Protect wetlands/environmentally sensitive areas
- Protect a particular area \_\_\_\_\_
- Protect a particular property \_\_\_\_\_
- Restrict development in hazardous areas
- Use public/private partnerships
- Other \_\_\_\_\_

Figure 5-2 - Handout for Goals Exercise - Part 2

### 5.3 Identification and Analysis of Mitigation Activities

**Requirement §201.6(c)(3)(ii): [The mitigation strategy section shall include a] section that identifies and analyzes a comprehensive range of specific mitigation actions and projects being considered to reduce the effects of each hazard, with particular emphasis on new and existing buildings and infrastructure. All plans approved by FEMA after October 1, 2008, must also address the jurisdiction's participation in the NFIP, and continued compliance with NFIP requirements, as appropriate.**

In order to identify and select mitigation projects to support the mitigation goals, each hazard identified in Section 4.1 Hazard Identification was evaluated. The following were determined to be priority flood-related hazards:

- Climate Change and Sea Level Rise
- Coastal/Canal Bank Erosion
- Flood: 100/500 year
- Flood: Stormwater/ Localized Flooding
- Hurricane and Tropical Storms (including Storm Surge)

Once it was determined which flood hazards warranted the development of specific mitigation actions, the FMPC analyzed viable mitigation options that supported the identified goals and objectives. The FMPC was provided with the following list of mitigation categories which are utilized as part of the CRS planning process.

- Prevention (Required to be evaluated)
- Property Protection
- Natural Resource Protection
- Emergency Services
- Structural Projects
- Public Information and Outreach

The FMPC was also provided with examples of potential mitigation actions for each of the above categories. The FMPC was instructed to consider both future and existing buildings in evaluating possible mitigation actions. A facilitated discussion then took place to examine and analyze the options. Appendix B, Mitigation Strategy, provides a detailed discussion organized by CRS mitigation category of possible mitigation alternatives to assist the County in the review and identification of possible mitigation activities. This comprehensive review of possible mitigation activities details why some were appropriate for implementation and why others were not. As promoted by CRS, Prevention type mitigation alternatives were discussed for the flood hazards. This discussion was followed by a brainstorming session that generated a list of preferred mitigation actions by hazard.

#### 5.3.1 Prioritization Process

Once the mitigation actions were identified, the FMPC was provided with several decision-making tools, including FEMA's recommended prioritization criteria, STAPLEE sustainable disaster recovery criteria; Smart Growth principles; and others, to assist in deciding why one recommended action might be more important, more effective, or more likely to be implemented than another. STAPLEE stands for the following:

- Social: Does the measure treat people fairly? (e.g. different groups, different generations)
- Technical: Is the action technically feasible? Does it solve the problem?
- Administrative: Are there adequate staffing, funding and other capabilities to implement the project?
- Political: Who are the stakeholders? Will there be adequate political and public support for the project?
- Legal: Does the jurisdiction have the legal authority to implement the action? Is it legal?
- Economic: Is the action cost-beneficial? Is there funding available? Will the action contribute to the local economy?
- Environmental: Does the action comply with environmental regulations? Will there be negative environmental consequences from the action?

In accordance with the DMA requirements, an emphasis was placed on the importance of a benefit-cost analysis in determining action priority. It was agreed that the following four criteria would be used to determine the priority of the action items:

- Contribution of the action to save life or property
- Availability of funding and perceived cost-effectiveness
- Available resources for implementation
- Ability of the action to address the problem

A comprehensive review of mitigation measures was performed using the criteria (alternatives and selection criteria) in Appendix B.

With these criteria in mind, FMPC members were asked to prioritize each mitigation project based on whether the project should be considered a short term, medium range or long range priority. The priority time frames for project implementation were determined to be as follows:

- Short Range** = Project should be completed in less than one year
- Medium Range** = Project should be completed in two to three years
- Long Range** = Project should be completed in more than four years

The process of identification and analysis of mitigation alternatives allowed the FMPC to come to consensus and to prioritize recommended mitigation actions. The FMPC discussed the contribution of the action to saving lives or property as first and foremost, with additional consideration given to the benefit-cost aspect of a project; however, this was not a quantitative analysis. The team agreed that prioritizing the actions collectively enabled the actions to be ranked in order of relative importance and helped steer the development of additional actions that meet the more important objectives while eliminating some of the actions which did not garner much support. Benefit-cost was also considered in greater detail in the development of the Mitigation Action Plan detailed below in Section 5.4. The cost-effectiveness of any mitigation alternative will be considered in greater detail through performing benefit-cost project analyses when seeking FEMA mitigation grant funding for eligible actions associated with this plan.

## 5.4 Mitigation Action Plan

**Requirement §201.6(c)(3)(iii): [The mitigation strategy section shall include an] action plan describing how the actions identified in section (c)(3)(ii) will be prioritized, implemented, and administered by the local jurisdiction. Prioritization shall include a special emphasis on the extent to which benefits are maximized according to a cost benefit review of the proposed projects and their associated costs.**

This action plan was developed to present the recommendations developed by the FMPC for how Collier County can reduce the risk and vulnerability of people, property, infrastructure, and natural and cultural resources to future disaster losses. Emphasis was placed on both future and existing development. The action plan summarizes who is responsible for implementing each of the prioritized actions as well as when and how the actions will be implemented. Each action summary also includes a discussion of the benefit-cost review conducted to meet the regulatory requirements of the Disaster Mitigation Act. Table 5-1 identifies the mitigation actions.

It is important to note that Collier County has many existing, detailed action descriptions, which include benefit-cost estimates, in other planning documents, such as, stormwater plans, and capital improvement budgets and reports. These actions are considered to be part of this plan, and the details, to avoid duplication, should be referenced in their original source document. The FMPC also realizes that new needs and priorities may arise as a result of a disaster or other circumstances and reserves the right to support new actions, as necessary, as long as they conform to the overall goals of this plan.

Further, it should be clarified that the actions included in this mitigation strategy are subject to further review and refinement; alternatives analyses; and reprioritization due to funding availability and/or other criteria. The County is not obligated by this document to implement any or all of these projects. Rather this mitigation strategy represents the desires of the community to mitigate the risks and vulnerabilities from identified hazards. The actual selection, prioritization, and implementation of these actions will also be further evaluated in accordance with the CRS mitigation categories and criteria contained in Appendix B.

**Table 5-1 - Summary of Collier County Mitigation Actions**

Action	Related to Goal	Address Current Development	Address Future Development	Continued Compliance with NFIP	Mitigation Category	Prioritized in Collier County LMS?
<b>Existing Mitigation Actions Carried Forward from 2008 Plan</b>						
Review amendments to the Growth Management Plan and the Land Development Code (LDC) to incorporate smart growth criteria.	1, 4, 5	N	Y	Y	Prevention, Property Protection, Natural Resource Protection	
Prepare an amendment to the Code of Laws and Ordinances to establish a maximum allowable discharge rate in accordance with the Belle Meade Stormwater Master Plan.	1, 5	N	Y	Y	Prevention	
Annually prepare and schedule FMP progress report by April of each year and recommended FMPC activity to the BCC each year.	1	N	N	Y	Prevention	
The Flood Damage Prevention Ordinance will be evaluated for amending as needed, but no less than biennially.	1, 3	Y	Y	Y	Prevention, Property Protection	
Coordinate roadway stormwater maintenance programs to address stormwater flooding problems.	1, 3, 5	Y	Y	Y	Prevention, Property Protection, Structural Projects	
Continue support of the Coastal Zone Management program.	4	Y	Y	N	Natural Resource Protection	
Annually recommended Conservation Collier land acquisition areas, and recommend land use amendment petitions to the BCC throughout the year. Prepare an acquisition report in July of each year.	4	N	Y	Y	Natural Resource Protection	
Continue to implement policies requiring BMPs for erosion and sediment controls to comply with NPDES permit requirements.	4, 5	Y	Y	N	Prevention, Natural Resource Protection	
Create a grant program for enhancing the efficiencies of existing stormwater management systems and seek alternative funding sources to bring existing systems to higher standards.	5	Y	Y	Y	Prevention, Structural Projects	
Continue to annually fulfill all training and reporting requirements to be certified as a “Storm Ready” community.	1, 2	N	N	N	Emergency Services, Public Information and Outreach	

Action	Related to Goal	Address Current Development	Address Future Development	Continued Compliance with NFIP	Mitigation Category	Prioritized in Collier County LMS?
Continue stormwater management and water quality programs to address BMP opportunities throughout the County. Annually complete outreach schedule and provide status report in January of each year.	4, 5	Y	Y	N	Prevention, Natural Resource Protection	
Continue development of an Interlocal Agreement between the County and BCB/SFWMD to fund the preliminary engineering and design study to divert water from the Main Golden Gate Canal.	1, 5	Y	Y	Y	Prevention, Structural Projects	
Prepare a grant application to enhance the efficiencies of existing stormwater management systems by seeking alternative funding sources to bring existing channels to higher functional standards.	1, 5	Y	Y	Y	Prevention, Structural Projects	
Annually prepare a budget to fully implement the Stormwater Capital Improvement Plan.	1, 5	Y	Y	Y	Prevention, Structural Projects	
Prepare a map showing the location of existing mobile homes within the SFHA. The map will be updated annually by January of each year.	1, 2	Y	N	Y	Property Protection, Public Information and Outreach	
Prepare a public information meeting schedule annually and coordinate public information meetings for the FMPC.	1, 2	Y	N	Y	Public Information and Outreach	
Enhance the County floodplain management website and hold meetings with federal/state/local organizations and agencies to identify flood hazard information and enhance flood hazard awareness.	1, 2	Y	N	Y	Public Information and Outreach	
Coordinate with the local real estate boards to hold all hazards educational meetings and will prepare a grant application to coordinate the preparation of "All Hazard" educational brochures for distribution to prospective clients.	1, 2	Y	N	Y	Public Information and Outreach	
Annually visit each library branch containing the floodplain and flood insurance information by December of each year and update/replace materials as needed by the following February and report in April of the following year.	1, 2	Y	N	Y	Public Information and Outreach	



Action	Related to Goal	Address Current Development	Address Future Development	Continued Compliance with NFIP	Mitigation Category	Prioritized in Collier County LMS?
Coordinate with other County departments to develop a program for addressing all technical assistance questions from the general public.	1, 2	Y	N	Y	Public Information and Outreach	
<b>New 2015 Flood Hazard Mitigation Actions</b>						
Develop a Program for Public Information (PPI) involving Collier County, Marco Island, Naples and Everglades City	2	Y	N	Y	Public Information and Outreach	
Provide flood insurance information to residents and local business owners	2	Y	N	Y	Public Information and Outreach	
Construction of the Belle Meade Diversion project (reduction of flow from the Golden Gate Canal)	1, 5	Y	Y	Y	Prevention, Structural Projects	
Develop a professional landscaper certification program	2, 4	Y	Y	Y	Public Information and Outreach	
Utilize pollutant screening baskets in catch basins	4	Y	Y	N	Prevention, Natural Resource Protection	
Develop a Low Impact Development (LID) Manual	1, 4, 5	N	Y	Y	Prevention, Natural Resource Protection	
Construction of the Southwestern Protection Levee as part of the Picayune Strand Restoration Project	4	Y	Y	Y	Prevention, Natural Resource Protection	
Identify and prioritize critical facilities at risk to flooding	3	Y	Y	Y	Property Protection, Emergency Services	
Provide education/outreach for the Flood Watch Program (BCB Tool)	2	Y	N	Y	Public Information and Outreach	
Maintain the localized flooding "bubble map"	1	Y	Y	Y	Property Protection	
Review the LDC and investigate impacts to the floodplain/recommend improvements to the LDC manual as appropriate	1, 4	Y	Y	Y	Prevention, Property Protection	
Collect LiDAR data	1, 3	Y	Y	Y	Prevention, Property Protection	
Provide education/outreach for non-point source pollution prevention	2, 4	Y	N	Y	Public Information and Outreach	

## 5.5 New 2015 Flood Hazard Mitigation Actions

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### 1. Develop a Program for Public Information (PPI) involving Collier County, Marco Island, Naples and Everglades City

**Project Description:**

**Hazards Addressed:**

**Issue/Background:**

**Other Alternatives:**

**Existing Planning Mechanism(s) through which Action Will Be Implemented:**

**Responsible Office:**

**Priority (H, M, L):**

**Cost Estimate:**

**Benefits (Losses Avoided):**

**Potential Funding:**

**Timeframe:**

### 2. Provide flood insurance information to residents and local business owners

**Project Description:**

**Hazards Addressed:**

**Issue/Background:**

**Other Alternatives:**

**Existing Planning Mechanism(s) through which Action Will Be Implemented:**

**Responsible Office:**

**Priority (H, M, L):**

**Cost Estimate:**

**Benefits (Losses Avoided):**

**Potential Funding:**

**Timeframe:**

**3. Construction of the Belle Meade Diversion project (reduction of flow from the Golden Gate Canal)**

**Project Description:**

**Hazards Addressed:**

**Issue/Background:**

**Other Alternatives:**

**Existing Planning Mechanism(s) through which Action Will Be Implemented:**

**Responsible Office:**

**Priority (H, M, L):**

**Cost Estimate:**

**Benefits (Losses Avoided):**

**Potential Funding:**

**Timeframe:**

**4. Develop a professional landscaper certification program**

**Project Description:**

**Hazards Addressed:**

**Issue/Background:**

**Other Alternatives:**

**Existing Planning Mechanism(s) through which Action Will Be Implemented:**

**Responsible Office:**

**Priority (H, M, L):**

**Cost Estimate:**

**Benefits (Losses Avoided):**

**Potential Funding:**

**Timeframe:**

**5. Utilize pollutant screening baskets in catch basins**

**Project Description:**

**Hazards Addressed:**

**Issue/Background:**

**Other Alternatives:**

**Existing Planning Mechanism(s) through which Action Will Be Implemented:**

**Responsible Office:**

**Priority (H, M, L):**

**Cost Estimate:**

**Benefits (Losses Avoided):**

**Potential Funding:**

**Timeframe:**

**6. Develop a Low Impact Development (LID) Manual**

**Project Description:**

**Hazards Addressed:**

**Issue/Background:**

**Other Alternatives:**

**Existing Planning Mechanism(s) through which Action Will Be Implemented:**

**Responsible Office:**

**Priority (H, M, L):**

**Cost Estimate:**

**Benefits (Losses Avoided):**

**Potential Funding:**

**Timeframe:**

**7. Construction of the Southwestern Protection Levee as part of the Picayune Strand Restoration Project**

**Project Description:**

**Hazards Addressed:**

**Issue/Background:**

**Other Alternatives:**

**Existing Planning Mechanism(s) through which Action Will Be Implemented:**

**Responsible Office:**

**Priority (H, M, L):**

**Cost Estimate:**

**Benefits (Losses Avoided):**

**Potential Funding:**

**Timeframe:**

**8. Identify and prioritize critical facilities at risk to flooding**

**Project Description:**

**Hazards Addressed:**

**Issue/Background:**

**Other Alternatives:**

**Existing Planning Mechanism(s) through which Action Will Be Implemented:**

**Responsible Office:**

**Priority (H, M, L):**

**Cost Estimate:**

**Benefits (Losses Avoided):**

**Potential Funding:**

**Timeframe:**

**9. Provide education/outreach for the Flood Watch Program (BCB Tool)**

**Project Description:**

**Hazards Addressed:**

**Issue/Background:**

**Other Alternatives:**

**Existing Planning Mechanism(s) through which Action Will Be Implemented:**

**Responsible Office:**

**Priority (H, M, L):**

**Cost Estimate:**

**Benefits (Losses Avoided):**

**Potential Funding:**

**Timeframe:**

**10. Maintain the localized flooding “bubble map”**

**Project Description:**

**Hazards Addressed:**

**Issue/Background:**

**Other Alternatives:**

**Existing Planning Mechanism(s) through which Action Will Be Implemented:**

**Responsible Office:**

**Priority (H, M, L):**

**Cost Estimate:**

**Benefits (Losses Avoided):**

**Potential Funding:**

**Timeframe:**

**11. Review the LDC and investigate impacts to the floodplain/recommend improvements to the LDC manual as appropriate**

**Project Description:**

**Hazards Addressed:**

**Issue/Background:**

**Other Alternatives:**

**Existing Planning Mechanism(s) through which Action Will Be Implemented:**

**Responsible Office:**

**Priority (H, M, L):**

**Cost Estimate:**

**Benefits (Losses Avoided):**

**Potential Funding:**

**Timeframe:**

**12. Collect LiDAR data**

**Project Description:**

**Hazards Addressed:**

**Issue/Background:**

**Other Alternatives:**

**Existing Planning Mechanism(s) through which Action Will Be Implemented:**

**Responsible Office:**

**Priority (H, M, L):**

**Cost Estimate:**

**Benefits (Losses Avoided):**

**Potential Funding:**

**Timeframe:**

**13. Provide education/outreach for non-point source pollution prevention**

**Project Description:**

**Hazards Addressed:**

**Issue/Background:**

**Other Alternatives:**

**Existing Planning Mechanism(s) through which Action Will Be Implemented:**

**Responsible Office:**

**Priority (H, M, L):**

**Cost Estimate:**

**Benefits (Losses Avoided):**

**Potential Funding:**

**Timeframe:**



## 6 PLAN ADOPTION

**Requirement §201.6(c)(5): [The plan shall include] documentation that the plan has been formally approved by the governing body of the jurisdiction requesting approval of the plan (e.g., City Council, County Commissioner, Tribal Council).**

The purpose of formally adopting this plan is to secure buy-in from Collier County, the City of Marco Island and the City of Naples, raise awareness of the plan, and formalize the plan's implementation. The adoption of this plan completes Planning Step 9 of the 10-step planning process: Adopt the Plan, in accordance with the requirements of DMA 2000. The Collier County Commission and City of Marco Island and City of Naples City Councils have adopted the Floodplain Management Plan by passing a resolution. Copies of the executed resolutions are shown below.

**Note to Reviewers:** When this plan has been reviewed and approved pending adoption by FEMA Region IV, the adoption resolutions will be signed and added here.

## 7 PLAN IMPLEMENTATION AND MAINTENANCE

**Requirement §201.6(c)(4): [The plan maintenance process shall include a] section describing the method and schedule of monitoring, evaluating, and updating the mitigation plan within a five-year cycle.**

Implementation and maintenance of the plan is critical to the overall success of hazard mitigation planning. This is Planning Step 10 of the 10-step planning process. This section provides an overview of the overall strategy for plan implementation and maintenance and outlines the method and schedule for monitoring, updating, and evaluating the plan. The section also discusses incorporating the plan into existing planning mechanisms and how to address continued public involvement.

### 7.1 Implementation

Once adopted, the plan must be implemented in order to be effective. While this plan contains many worthwhile actions, Collier County will need to decide which action(s) to undertake first. The priority assigned the actions in the planning process and funding availability will affect that decision. Low or no-cost actions most easily demonstrate progress toward successful plan implementation.

An important implementation mechanism that is highly effective and low-cost is incorporation of the floodplain management plan recommendations and their underlying principles into other plans and mechanisms, such as the County's Comprehensive Growth Management Plan and Stormwater Management Plan. Collier County already implements policies and programs to reduce losses to life and property from hazards. This plan builds upon the momentum developed through previous and related planning efforts and mitigation programs and recommends implementing actions, where possible, through these other program mechanisms.

Mitigation is most successful when it is incorporated into the day-to-day functions and priorities of government. Implementation will be accomplished by adhering to the schedules identified for each action and through constant, pervasive, and energetic efforts to network and highlight the multi-objective, win-win benefits to each program and the community. This effort is achieved through the routine actions of monitoring agendas, attending meetings, and promoting a safe, sustainable community. Additional mitigation strategies could include consistent and ongoing enforcement of existing policies and vigilant review of programs for coordination and multi-objective opportunities.

Simultaneous to these efforts, it is important to maintain a constant monitoring of funding opportunities that can be leveraged to implement some of the more costly recommended actions. This will include creating and maintaining a bank of ideas on how to meet local match or participation requirements. When funding does become available, the County will be in a position to capitalize on the opportunity. Funding opportunities to be monitored include special pre- and post-disaster funds, state and federal earmarked funds, benefit assessments, and other grant programs, including those that can serve or support multi-objective applications.

#### **Responsibility for Implementation of Goals and Activities**

Elected officials, officials appointed to head community departments and community staff are charged with implementation of various activities in the plan. During the quarterly reviews as described later in this section, an assessment of progress on each of the goals and activities in the plan will be determined and noted. At that time, recommendations will be made to modify timeframes for completion of activities,

funding resources, and responsible entities. On a quarterly basis, the priority standing of various activities may also be changed. Some activities that are found not to be doable may be deleted from the plan entirely and activities addressing problems unforeseen during plan development may be added.

### **7.1.1 Role of Floodplain Management Planning Committee in Implementation, Monitoring and Maintenance**

With adoption of this plan, Collier County will be responsible for the plan implementation and maintenance. The FMPC identified in Section 3 will reconvene **quarterly** each year to ensure mitigation strategies are being implemented and the County continues to maintain compliance with the NFIP. As such, Collier County agrees to continue its relationship with the FMPC and:

- Act as a forum for flood mitigation issues;
- Disseminate flood mitigation ideas and activities to all participants;
- Pursue the implementation of high-priority, low/no-cost recommended actions;
- Ensure flood mitigation remains a consideration for community decision makers;
- Maintain a vigilant monitoring of multi-objective cost-share opportunities to help the community implement the plan's recommended actions for which no current funding exists;
- Monitor and assist in implementation and update of this plan;
- Report on plan progress and recommended revisions to the County Commission; and
- Inform and solicit input from the public.

The primary duty is to see the plan successfully carried out and report to the County Commission, FDEM, FEMA, and the public on the status of plan implementation and mitigation opportunities. Other duties include reviewing and promoting mitigation proposals, considering stakeholder concerns about flood mitigation, passing concerns on to appropriate entities, and posting relevant information on the County's website (and others as appropriate).

## **7.2 Maintenance**

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Plan maintenance implies an ongoing effort to monitor and evaluate plan implementation and to update the plan as progress, roadblocks, or changing circumstances are recognized.

### **7.2.1 Maintenance Schedule**

Collier County's Growth Management Division is responsible for initiating plan reviews. In order to monitor progress and update the mitigation strategies identified in the action plan, Collier County will revisit this plan quarterly and following a hazard event. The County will submit a five-year written update to FDEM and FEMA Region IV, unless disaster or other circumstances (e.g., changing regulations) require a change to this schedule. With this plan update anticipated to be fully approved and adopted in 2015, the next plan update for the County will occur in 2020.

### **7.2.2 Maintenance Evaluation Process**

Evaluation of progress can be achieved by monitoring changes in vulnerabilities identified in the plan. Changes in vulnerability can be identified by noting:

- Decreased vulnerability as a result of implementing recommended actions;
- Increased vulnerability as a result of failed or ineffective mitigation actions; and/or
- Increased vulnerability as a result of new development (and/or further annexation).

Updates to this plan will:

- Consider changes in vulnerability due to action implementation;
- Document success stories where mitigation efforts have proven effective;
- Document areas where mitigation actions were not effective;
- Document any new hazards that may arise or were previously overlooked;
- Incorporate new data or studies on hazards and risks;
- Incorporate new capabilities or changes in capabilities;
- Incorporate growth and development-related changes to infrastructure inventories; and
- Incorporate new action recommendations or changes in action prioritization.

Changes will be made to the plan during the update process to accommodate for actions that have failed or are not considered feasible after a review of their consistency with established criteria, time frame, community priorities, and/or funding resources. Actions that were not ranked high but were identified as potential mitigation activities will be reviewed as well during the monitoring and update of this plan to determine feasibility of future implementation. Updating of the plan will be by written changes and submissions, as is appropriate and necessary, and as approved by the County Commission. In keeping with the five-year update process, the FMPC will convene public meetings to solicit public input on the plan and its routine maintenance and the final product will be adopted by the County Commission

Specifically, the County will adhere to the following process for the next update of this FMP:

#### **Quarterly Plan Review Process**

For the 2015 floodplain management plan update review process, Collier County's Growth Management Division will be responsible for facilitating, coordinating, and scheduling reviews and maintenance of the plan. The review of the Floodplain Management Plan will normally occur on a quarterly basis each year and will be conducted as follows:

- The County's Growth Management Division will place an advertisement in the local newspaper advising the public of the date, time, and place for each quarterly review of the plan and will be responsible for leading the meeting to review the plan.
- Notices will be mailed to the members of the FMPC, federal, state, and local agencies, non-profit groups, local planning agencies, representatives of business interests, neighboring communities, and others advising them of the date, time, and place for the review.
- County and local City officials will be noticed by email and telephone or personal visit and urged to participate.
- Members of the County's Planning Commission and other appointed commissions and groups will also be noticed by email and either by telephone or personal visit.
- Prior to the review, department heads and others tasked with implementation of the various activities will be queried concerning progress on each activity in their area of responsibility and asked to present a report at the review meeting.
- The local news media will be contacted and a copy of the current plan will be available for public comment.
- After the review meeting, minutes of the meeting and a quarterly report will be prepared by the FMPC and forwarded to the news media (public) and the ISO/CRS specialist for the CRS program. The report will also be presented to the County Commission for review, and a request will be made that the Commission take action to recognize and adopt any changes resulting from the review.

#### **Criteria for Quarterly Reviews**

The criteria recommended in 44 CFR 201 and 206 will be utilized in reviewing and updating the plan. More specifically, the quarterly reviews will include the following information:

- Community growth or change in the past quarter.
- The number of substantially damaged or substantially improved structures by flood zone
- The renovations to public infrastructure including water, sewer, drainage, roads, bridges, gas lines, and buildings.
- Natural hazard occurrences that required activation of the Emergency Operations Center (EOC) and whether or not the event resulted in a presidential disaster declaration.
- Natural hazard occurrences that were not of a magnitude to warrant activation of the EOC or a federal disaster declaration but were severe enough to cause damage in the community or closure of businesses, schools, or public services.
- The dates of hazard events descriptions.
- Documented damages due to the event.
- Closures of places of employment or schools and the number of days closed.
- Road or bridge closures due to the hazard and the length of time closed.
- Assessment of the number of private and public buildings damaged and whether the damage was minor, substantial, major, or if buildings were destroyed. The assessment will include residences, mobile homes, commercial structures, industrial structures, and public buildings, such as schools and public safety buildings.
- Review of any changes in federal, state, and local policies to determine the impact of these policies on the community and how and if the policy changes can or should be incorporated into the Floodplain Management Plan. Review of the status of implementation of projects (mitigation strategies) including projects completed will be noted. Projects behind schedule will include a reason for delay of implementation.

### **7.2.3 Incorporation into Existing Planning Mechanisms**

Another important implementation mechanism that is highly effective and low-cost is incorporation of the Floodplain Management Plan recommendations and their underlying principles into other plans and mechanisms. Where possible, plan participants will use existing plans and/or programs to implement hazard mitigation actions. As previously stated, mitigation is most successful when it is incorporated into the day-to-day functions and priorities of government and development. As described in this plan's capability assessment, Collier County, the City of Marco Island and the City of Naples already implement policies and programs to reduce losses to life and property from hazards. This plan builds upon the momentum developed through previous and related planning efforts and mitigation programs and recommends implementing actions, where possible, through these other program mechanisms. These existing mechanisms include:

- Collier County Local Mitigation Strategy
- Comprehensive Growth Management Plans
- Emergency Management Plans
- Ordinances
- Flood/stormwater management/master plans
- Other plans, regulations, and practices with a mitigation focus

Those involved in these other planning mechanisms will be responsible for integrating the findings and recommendations of this plan with these other plans, programs, etc., as appropriate. As described in Section

7.1 Implementation, incorporation into existing planning mechanisms will be done through the routine actions of:

- Monitoring other planning/program agendas;
- Attending other planning/program meetings;
- Participating in other planning processes; and
- Monitoring community budget meetings for other community program opportunities.

The successful implementation of this mitigation strategy will require constant and vigilant review of existing plans and programs for coordination and multi-objective opportunities that promote a safe, sustainable community.

Efforts should continuously be made to monitor the progress of mitigation actions implemented through other planning mechanisms and, where appropriate, their priority actions should be incorporated into updates of this floodplain management plan.

#### **7.2.4 Continued Public Involvement**

Continued public involvement is imperative to the overall success of the plan's implementation. The update process provides an opportunity to solicit participation from new and existing stakeholders and to publicize success stories from the plan implementation and seek additional public comment. The plan maintenance and update process will include continued public and stakeholder involvement and input through attendance at designated committee meetings, web postings, press releases to local media, and through public hearings.

##### **Public Involvement Process for Quarterly Reviews**

The public will be noticed by placing an advertisement in the newspaper specifying the date and time for the review and inviting public participation. The FMPC, local, state, and regional agencies will be notified and invited to attend and participate.

##### **Public Involvement for Five-year Update**

When the FMPC reconvenes for the update, they will coordinate with all stakeholders participating in the planning process—including those that joined the committee since the planning process began—to update and revise the plan. In reconvening, the FMPC plans to identify a public outreach subcommittee, which will be responsible for coordinating the activities necessary to involve the greater public. The subcommittee will develop a plan for public involvement and will be responsible for disseminating information through a variety of media channels detailing the plan update process. As part of this effort, public meetings will be held and public comments will be solicited on the plan update draft. The subcommittee will also coordinate this public outreach process with the public information program established pursuant to the 2013 guidelines from the CRS.

# Appendix A

# APPENDIX A

## Appendix A: Planning Process

### Planning Step 1: Organize to Prepare the Plan

**Table A-1: FMPC Meeting Dates**

Note: All FMPC Meetings were open to the public.

Meeting Type	Meeting Topic	Meeting Date	Meeting Location
FMPC #1 (Kick-off)	4) Introduction to DMA, CRS and the planning process	July 16, 2014	Collier County Growth Management Division Office
	5) Organize resources: the role of the FMPC, planning for public involvement, and coordinating with other agencies and stakeholders		
	6) Introduction to hazard identification		
FMPC #2	3) Review/discussion of Flood Risk Assessment (Assess the Hazard)	September 30, 2014	Collier County Growth Management Division Office
	4) Review/discussion of Vulnerability Assessment (Assess the Problem)		
FMPC #3	3) Review of existing Goals from 2008 FMP	November 19, 2014	Collier County Government Center Risk Management Training Room
	4) Development of new Goals for 2014 FMP		
FMPC #4	3) Review/status of existing Mitigation Strategies from 2008 FMP	November 20, 2014	Collier County Government Center Risk Management Training Room
	4) Development of new/updated Mitigation Strategies for 2014 FMP		
FMPC #5	3) Review "Draft" Floodplain Management Plan	December 16, 2014	Collier County Government Center Risk Management Training Room
	4) Solicit comments and feedback from the FMPC		



**Table A-2: FMPC Invitation List**

No.	Name	Title/Organization	Address	City	State	Zip
1.	Joy Duperault, CFM	NFIP Program Manager Florida Division of Emergency Management	2555 Shumard Oak Boulevard	Tallahassee	FL	32399
2.	Miles Anderson	State Hazard Mitigation Officer & NFIP Coordinator	2555 Shumard Oak Boulevard	Tallahassee	FL	32399
3.	Danny Hinson, CFM, FPPEM, CHS-III	Florida Community Rating System Coordinator	2555 Shumard Oak Boulevard	Tallahassee	FL	32399
4.	Sherry Harper, AICP, CFM	Planning Technical Coordinator ISO Community Hazard Mitigation	2382 Susan Drive	Crestview	FL	32536
5.	Lori Lehr, CFM	ISO/CRS Specialist	3441 Pittman Road	Dover	FL	3527
6.	Susan Wilson, CFM	Floodplain Management and Insurance Branch Chief FEMA Region IV	3303 Chamblee Tucker Road	Atlanta	GA	30341
7.	Janice Mitchell	CRS Coordinator - FEMA Region IV	3303 Chamblee Tucker Road	Atlanta	GA	30341
8.	Jason Hunter	NFIP - FEMA Region IV	3303 Chamblee Tucker Road	Atlanta	GA	30341
9.	Collen Thayer	Bureau Chief of Public Affairs Southwest Florida Water Management District	2379 Broad Street	Brooksville	FL	34604
10.	Mark Hammond	Resource Management Director Southwest Florida Water Management District	2379 Broad Street	Brooksville	FL	34604
11.	To Whom It May Concern	United States Army Corp of Engineers - Fort Myers Permit Section	1520 Royal Palm Square Boulevard, Suite 310	Fort Myers	FL	33176
12.	Kenny Howell	Florida's Southern Gulf Region of the American Red Cross	2610 Northbrooke Plaza Drive	Naples	FL	34119
13.	Deanna Cleary	Florida's Southern Gulf Region of the American Red Cross	2610 Northbrooke Plaza Drive	Naples	FL	34119
14.	Rusty Pfof	Meteorologist in Charge Miami Field Office National Weather Service	11691 SW 17th Street	Miami	FL	33165

No.	Name	Title/Organization	Address	City	State	Zip
15.	Dr. Kamella Patton	Superintendent Collier County Public Schools	5775 Ocoola Trail	Naples	FL	34109
16.	To Whom It May Concern	Florida Panther National Wildlife Refuge	3860 Tollgate Boulevard, Suite 300	Naples	FL	34114
17.	Mr. William P. Mitchell	City Manager, City of Fort Myers	2200 Second Street	Fort Myers	FL	33901
18.	The Honorable Larry Kiker	Chairman of the Lee County Commissioners	2115 Second Street	Fort Myers	FL	33901
19.	The Honorable Karson Turner	Chairman of the Hendry County Commissioners	P.O. Box 1769	La Belle	FL	33975
20.	Dr. Jeffery S. Allbritten	President - Florida SouthWestern State College	7505 Grand Lely Drive	Naples	FL	34113
21.	Ms. Jeanette Brock	President - Hodges University	2655 Northbrooke Drive	Naples	FL	34119
22.	H. James Towney	President - Ave Maria University	5050 Ave Maria Boulevard	Ave Maria	FL	34142
23.	John Inglehart	FL Department of Environmental Protection - South District Director	2295 Victoria Avenue, Suite 364	Fort Myers	FL	33902
24.	Thomas Edison, PH.D.	Director of Habitat and Species Conservation - Florida Fish and Wildlife Conservation Commission	620 S. Meridian Street	Tallahassee	FL	32399
25.	To Whom It May Concern	Rookery Bay National Estuarine Research Reserve	300 Tower Road	Naples	FL	34113
26.	Margaret Wuerstle, Executive Director	Southwest Florida Regional Planning Council	1926 Victoria Avenue	Fort Myers	FL	33901
27.	To Whom It May Concern	FL Department of Environmental Protection - Coastal Zone Management Program	3900 Commonwealth Boulevard, M.S. 49	Tallahassee	FL	32399
28.	James E. Billie	Chairman - Seminole Tribe of Florida (Immokalee Reservation)	6300 Sterling Road	Hollywood	FL	33024
29.	Greg Ulrich	President - Collier County Building Industry Association	3200 Bailey Lane, Suite 110	Naples	FL	34105
30.	To Whom It May Concern	Collier County Extension	14700 Immokalee Road	Naples	FL	34120



**FMPC Meeting Minutes and Sign-in Sheets**

**MINUTES OF THE MEETING OF THE COLLIER COUNTY  
FLOODPLAIN MANAGEMENT PLANNING COMMITTEE**

Naples, Florida, July 16, 2014

LET IT BE REMEMBERED, the Collier County Floodplain Management Planning Committee in and for the County of Collier, having conducted business herein, met on this date at 10:00 A.M. in REGULAR SESSION at the Collier County Growth Management Division Building, Conference Room #609/610, 2800 N. Horseshoe Drive, Naples, Florida, with the following members present:

Chairman: Jerry Kurtz, CC Staff  
Vice Chairman: Craig Pajer, CC Staff  
Kenneth Bills  
Rick Zyvolosk (Alt.), CC Staff  
John Walsh, CC Staff  
Christa Carrera, City of Naples  
Phillip Brougham  
Clarence Tears (Excused)  
Chris Sparacino, City of Marco Island  
Joseph Gagnier  
Duke Vasey (Excused)  
Mike Sheffield, CC Staff  
Lisa Koehler (Excused)  
Terry Smallwood, Everglade City (Absent)  
(Vacancy)

ALSO PRESENT: Caroline Cilek, M.S., Senior Planner, LDC Coordinator  
Robert Wiley, Floodplain Management Planning  
Gary McAlpin, Director, Coastal Zone Management

*Any persons in need of the verbatim record of the meeting may request a copy of the audio recording from the Collier County Growth Management Division – Planning and Regulation building –Contact Mr. Evy Ybaceta at 239-252-2400.*

**1. Call to Order**

**Chairman Kurtz** called the meeting to order at 10:00am and a quorum was established.

*Mr. Brougham requested Staff provide the Members attendance records and any related policies to the Committee for information purposes.*

**2. Old Business**

**a. Approval of Minutes for the 6-2-14 Meeting (Jerry Kurtz)**

*Mr. Brougham moved to approve the minutes of June 2, 2014 meeting as presented. Second by Mr. Gagnier. Carried unanimously 10 - 0.*

**3. Kick Off” meeting for Floodplain Management Plan. (David Stroud, AMEC and Gary McAlpin)**

**Gary McAlpin and David Stroud** presented the Slideshow “*Collier County Fl Floodplain Management Plan Kickoff Meeting, July 16, 2014*” highlighting the following:

- The Objectives of the Plan are to:
  - Identify and Address Trends in Disasters (reduces costs for disaster recovery and probability for property losses).
  - Meet the requirements of the Disaster Mitigation Act (DMA) making the County eligible for disaster planning, disaster relief funds and ensures the community is less prone to disaster.
  - Improve standing in the voluntary Community Rating System (CRS) program.
- The goals of the 2013 CRS Program are to reduce flood damage to insurable property, strengthen and support the insurance aspects of the National Flood Insurance Program and encourage a comprehensive approach to floodplain management.
- The CRS program is a point based program with 10 classification levels which allow for increasing standards being met resulting in reduction of insurance premiums to citizens in the jurisdiction participating in the Program.
- The benefits for participating in the CRS Program are a 5 % premium discount for every 500 points achieved, improved flood protection, provision of technical assistance to communities participating, economic benefits to the local economy from an individuals insurance premium savings, etc.
- The DMA Planning process is comprised of 4 Phases - Phase 1: Organizing Resources; Phase 2: Risk Assessment; Phase 3: Developing a Mitigation Plan; Phase 4: Adoption and Implementation of the Floodplain Management Plan.
- Staff and consultants will be developing a draft of the Plan and present it to the Floodplain Management Committee for review and comment.

The Committee requested clarification on how County Staff and consultants intend to develop the Plan.

**Mr. McAlpin** reported:

- All information is intended to be accessible on the internet in one location.

- A meeting will be held with the Committee on September 30, 2014 to review and comment on the updated hazard identifications and vulnerability assessment. The goal of the meeting will be to agree on the hazard identifications and vulnerability assessment.
- On November 12 – 13 meetings will be held to review the Mitigation Goals and Strategies.
- A final Draft Plan will be made available for Committee review on January 8, 2015.
- The Plan will be reviewed by the Collier County Planning Commission in February 2015 and forwarded to the Board of County Commissioners for consideration.
- Additional Committee meetings will be held as necessary.
- Development of the Plan will include input from citizens via public meetings.
- A major goal of the Plan will be to improve the County's CRS rating from level 6 to level 5.

**Mr. Stroud** noted

- They will be reviewing the draft plan previously prepared and identify any of its shortfalls that need to be addressed.
- The Committee will be reviewing the proposed Plan in Sections as the information becomes available.
- They will attempt to provide a majority of the information to be reviewed at a meeting 1 week in advance of the meeting.
- During the September 30, 2014 meeting (and other leading up to the January meeting), Committee members should focus on reviewing the concepts of the Section(s) or information presented as opposed to “wordsmith” editing.
- The goal is to have the Committee review the final plan in its entirety at the January 2015 meeting.
- Staff and Consultants intend to reach out to the City of Marco Island and Naples for input.

**4. Public Comments**

It was reported the City of Marco Island will hold an ICC Flood Venting Seminar on August 5, 2014, 10 – 12 am. It is open to the public

**5. Schedule Next Meeting**

*Next Regular Meeting – Monday September 8, 2014 - GMD Conference Room 610 – 9:00am*

**There being no further business for the good of the County, the meeting was adjourned by the order of the Chair at 11:30AM.**

**COLLIER COUNTY FLOODPLAIN MANAGEMENT  
COMMITTEE**

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**Chairman, Jerry Kurtz**

July 16, 2014

These Minutes were approved by the Board/Chairman on \_\_\_\_\_, as presented \_\_\_\_\_, or as amended \_\_\_\_\_.

**MINUTES OF THE MEETING OF THE COLLIER COUNTY  
FLOODPLAIN MANAGEMENT PLANNING COMMITTEE**

Naples, Florida, September 30, 2014

LET IT BE REMEMBERED, the Collier County Floodplain Management Planning Committee in and for the County of Collier, having conducted business herein, met on this date at 9:00 A.M. in REGULAR SESSION at the Collier County Growth Management Division Building, Conference Room #609/610, 2800 N. Horseshoe Drive, Naples, Florida, with the following members present:

Chairman: Jerry Kurtz, CC Staff  
Vice Chairman: Craig Pajer, CC Staff  
Kenneth Bills  
Rick Zyvoloski (Alt.), CC Staff  
Christa Carrera, City of Naples  
Phillip Brougham  
Clarence Tears  
Chris Sparacino, City of Marco Island  
Joseph Gagnier  
Duke Vasey  
Mike Sheffield, CC Staff (Excused)  
Lisa Koehler  
Terry Smallwood, Everglade City (Excused)  
Jon Walsh, CC Staff  
James Hale

ALSO PRESENT: Caroline Cilek, M.S., Senior Planner, FPMC Staff  
Gary McAlpin, Director, Coastal Zone Management  
William Lang, Operations Coordinator, Floodplain Management



*Any persons in need of the verbatim record of the meeting may request a copy of the audio recording from the Collier County Growth Management Division – Planning and Regulation building –Contact Mr. Evy Ybaceta at 239-252-2400.*

**Chairman Kurtz** called the meeting to order at 10:02am.

### **Old Business**

#### **1. Approval of Minutes for the 6-2-14 Regular Meeting and Floodplain Management Plan Public Meeting Minutes 7 -16-14 (Jerry Kurtz)**

*Mr. Vasey moved to approve the minutes of June 2, 2014 meeting subject to the following change:*

- Page 3, line 7 – from “...ensure Emergency Management Services fully...” to “...ensure *Bureau of Emergency Services* fully...”

*Second by Mr. Brougham. Carried unanimously 10 - 0.*

**Mr. Vasey:**

- Requested an update on the Big Cypress Basin’s responsibility for conducting flood plain reviews for the County.
- Recommended the term “Stakeholders,” in its relation to any aspects of the Floodplain Management Plan be defined as “taxpayers.”

**Ms. Cilek** reported the flood plain review requirements are being addressed at the Administrative level of the GMD and will provide an update in the next monthly report.

*Staff reported a Regular Committee meeting and Public Information Meeting was held on July 16, 2014. The public meeting minutes have been included for information purposes. The Regular Committee meeting minutes will be approved at the next meeting.*

*Mr. Walsh arrived at 10:10am*

### **New Business**

#### **1. Updates from Floodplain Management Section: staffing, CRS 5 yr. cycle visit/White Paper and August Monthly Report (Caroline Cilek)**

**Ms. Cilek** presented the “*Floodplain Management Section August 2014*” report for information purposes.

*Mr. Tears arrived at 10:20am*

#### **2. Discussion of the Flood Risk Assessment and Hazard Vulnerability sections for the Floodplain Management Plan (David Stroud, Paige Hatley - AMEC and Gary McAlpin)**

**David Stroud**, AMEC provided copies of Section 4 – Flood Risk Assessment of the Floodplain Management Plan for review. He noted:

- The main purpose of the item is for the Committee to provide a recommendation on the ranking of the County’s flood hazards as identified on Page 130, Table 4.1 “*Flood Hazard Summary*” of the report.

- The hazards identified are Climate Change and Sea Level Rise, Coastal/Canal Erosion, Dam/Levee Failure, Flood: 100/500 year, Flood: Stormwater/Localized Flooding and Hurricane and Tropical Storms (including Storm Surge).
- The table also rates the Frequency of Occurrence, Spatial Extent, Potential Magnitude and Significance of the events.

Power Point presentations were provided by Mr. Stroud and Ms. Hatley “(Review of the Hazard Identification and Hazard Vulnerability, Collier County Florida, September 30, 2014)”, Mr. Kurtz (“Overview of Collier County Planned Stormwater projects – Presentation to the Floodplain Management Committee September 30, 2014”).

During the presentations the following was highlighted by Staff/Consultants and Committee members:

- Although the Plan is a “5 year Plan,” Table 4.1 identifies the hazards based on probabilities and impacts of the hazard over a 1 year period.
- Sea level rise should be identified as a hazard, however the affects are cumulative over time with minimal chance it will have a major impact over a 1 year period.
- Localized flooding is a major issue and continued mapping of “hot spots” will be an essential.
  - *Staff noted the County tracks the information on a GIS mapping system and the City of Marco Island has similar data.*
- Many of the projects identified in Mr. Kurtz’s presentation could be considered “transportation projects” which may be beneficial given the limited funding for stormwater projects.
  - *Staff noted currently the County considers these neighborhood drainage projects with the purpose at this point being to identify the hazards to be addressed, not determining the funding mechanism for improvements.*
- Some areas currently experience sheet flow flooding at given times, (i.e. bike paths).
  - *Staff reported this could be addressed, however these areas were designed with this condition in mind and they would be considered a low priority hazard.*
- Table 4.34 identifying Critical Facilities by Flood Zone should be reviewed as some facilities are not listed such as sewage transfer stations, etc.

*Mr. Brougham left at 11:07am*

- Protection of the floodplains ecological and environmental characteristics will be addressed in the Plan.
- Septic systems and well fields could be considered a hazard given their potential failure during flooding events.

The Committee reviewed the Table 4.1 – Flood Hazard Summary with the following comments noted:

- The definition of “flooding” should be amended to clarify it is events that impede the ingress and egress to critical facilities/neighborhood areas/homes, damage to structures and infrastructure, etc. as opposed to those times standing water is present in non essential areas (i.e. ponding of water in yards, etc.).

- It would be advantageous to separate the table by jurisdictions within the County.
- Although negatives impacts from sea level rise may not occur unless long term conditions persist, it could have a major impact on those facilities upstream that drain towards the Gulf.

The Committee recommended the following rankings for those hazards identified in Table 4.1

<b>Hazard</b>	<b>Frequency of Occurrence</b>	<b>Spatial Extent</b>	<b>Potential Magnitude</b>	<b>Significance</b>
Climate Change and Sea Level Rise	Highly Likely	Limited	Negligible	Low
Coastal/Canal Bank Erosion	Highly Likely	Limited	Negligible	Medium
Dam/Levee Failure	Unlikely	Limited	Negligible	Low
Flood: 100-/500-year	Occasional	Extensive	Catastrophic	High
Flood: Stormwater/Localized Flooding	Highly Likely	Limited	Negligible	Medium
Hurricane and Tropical Storms (including Storm Surge)	Likely	Extensive	Catastrophic	High

*The Committee recommended the Table be reorganized to provide rankings from a high priority to a low priority.*

*Staff requested the Committee to review the Sections of the Plan provided today and submit comments back to Gail Hambright at the Coastal Zone Management Office within 2 weeks. The review by members should be prioritized as “data driven” followed by “wordsmithing.”*

**3. Public Comments**

None

**4. Committee Correspondence**

*Mr. Sparacino requested Staff email a copy of the PowerPoint presentation reviewed in item 2 to the Committee.*

*Mr. Zivoloski reported the County needs to update the record of disaster events (if any) for years 2013 – 2014.*

**5. Scheduling of next meeting – will be focused on the Floodplain Management Plan (Gary McAlpin and Caroline Cilek**

*The next meeting will be held on October 23, 2014 at 10:00am*

**There being no further business for the good of the County, the meeting was adjourned by the order of the Chair at 12:03PM.**

**COLLIER COUNTY FLOODPLAIN MANAGEMENT  
COMMITTEE**

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**Chairman, Jerry Kurtz**

These Minutes were approved by the Board/Chairman on \_\_\_\_\_, as presented \_\_\_\_\_, or as amended \_\_\_\_\_.

**Planning Step 2: Involve the Public**

**Table A-3: Public Meeting Dates**

<b>Meeting Type</b>	<b>Meeting Topic</b>	<b>Meeting Date</b>	<b>Meeting Locations</b>
Public Meeting #1	3) Introduction to DMA, CRS and the planning process	July 16, 2014	Collier County Growth Management Division Office
	4) Introduction to hazard identification		
Public Meeting #2	3) Review complete "Draft" Floodplain Management Plan	December 16, 2014	Collier County Government Center Risk Management Training Room
	4) Solicit comments and feedback from the public		



## Public Meeting Advertisements in Local Newspaper

<b>PUBLIC NOTICE    PUBLIC NOTICE    PUBLIC NOTICE</b>
<b>Floodplain Management Plan Development Public Information Meeting</b>
<b>Wednesday, July 16, 2014 • 5:15 p.m. to 7 p.m.</b> <b>Growth Management Division - Planning and Regulation, Rooms 609/610, 2800 North Horseshoe Drive, Naples, FL 34104</b>
Collier County is in the process of updating its Floodplain Management Plan as a requirement to maintain eligibility for Federal Emergency Management Agency (FEMA) federal disaster funding and to increase credit in the Community Rating System (CRS) Program. The county would like public participation, knowledge and feedback throughout the planning process. Individuals and organizations with data relating to the flooding hazards affecting Collier County including stormwater flooding, coastal flooding, severe storms, repetitive flooding, etc., are asked to provide input into the planning process and the updating of the hazard identification and risk assessment portion of the plan.
<ul style="list-style-type: none"><li>• There will be a formal presentation followed by an opportunity for attendees to ask questions.</li><li>• All members of the public wanting to learn more about the Floodplain Management process are welcome to attend.</li><li>• Additional meetings planned by the Floodplain Management Committee will be posted on the Collier County web calendar at <a href="http://www.colliergov.net/GMDcalendar">www.colliergov.net/GMDcalendar</a></li></ul>
Two or more members of the Board of County Commissioners (BCC) may be present and may participate at this public information meeting. The subject matter of this meeting may be an item for discussion and action at a future BCC meeting.
For more information call 239-252-8192.
Anyone who requires an auxiliary aid or service for effective communication, or other reasonable accommodations in order to participate in this proceeding, should contact the Collier County Facilities Management Department located at 3335 Tamiami Trail East, Naples, Florida 34112, or 239-252-8380 as soon as possible, but no later than 48 hours before the scheduled event. Such reasonable accommodations will be provided at no cost to the individual.
<small>No. 231130859</small> <span style="float: right;"><small>July 6, 13, 2014</small></span>

*Naples Daily News – July 6 and July 13, 2014*

<b>PUBLIC NOTICE    PUBLIC NOTICE    PUBLIC NOTICE</b>
<b>Floodplain Management “DRAFT” Plan Review Public Information Meeting</b>
<b>Tuesday, Dec. 16, 2014 • 5:15 p.m.</b> <b>Collier County Risk Management Training Room, Collier County Government Center, 3311 Tamiami Trail E., Naples, FL 34112</b>
Collier County is in the process of updating its Floodplain Management Plan as a requirement to maintain eligibility for Federal Emergency Management Agency (FEMA) federal disaster funding and to increase credit in the Community Rating System (CRS) Program. The county, working with the public and local stakeholders over the past five months, has developed a “DRAFT” Floodplain Management Plan. The county is soliciting public participation, knowledge and feedback in the review of this plan. Individuals and organizations with data relating to the flooding hazards, stormwater flooding, coastal flooding, severe storms, repetitive flooding, and loss prevention are asked to provide input into the DRAFT Floodplain Management Plan.
<ul style="list-style-type: none"><li>• There will be a formal presentation followed by an opportunity for attendees to ask questions and discuss topics.</li><li>• All members of the public wanting to learn more about the Floodplain Management plan and process are welcome to attend.</li><li>• Additional meetings planned by the Floodplain Management Committee will be posted on the Collier County web calendar at <a href="http://www.colliergov.net/GMDcalendar">www.colliergov.net/GMDcalendar</a></li></ul>
Two or more members of the Board of County Commissioners (BCC) may be present and may participate at this public information meeting. The subject matter of this meeting may be an item for discussion and action at a future BCC meeting.
For more information call 239-252-8192.
Anyone who requires an auxiliary aid or service for effective communication, or other reasonable accommodations in order to participate in this proceeding, should contact the Collier County Facilities Management Department located at 3335 Tamiami Trail E., Naples, Florida 34112 or 239-252-8380 as soon as possible, but no later than 48 hours before the scheduled event. Such reasonable accommodations will be provided at no cost to the individual.
<small>No. 231123902</small> <span style="float: right;"><small>December 7, 14, 2014</small></span>

*Naples Daily News – December 7 and December 14, 2014*

MINUTES FOR THE COLLIER COUNTY  
FLOODPLAIN MANAGEMENT PLAN PUBLIC MEETING

Naples, Florida, July 16, 2014

LET IT BE REMEMBERED Collier County Held a Public Meeting for the Floodplain Management Plan in and for the County of Collier on this date at 5:15 P.M. at the Collier County Growth Management Division Building, Conference Room #609/610, 2800 N. Horseshoe Drive, Naples, Florida, with the following Staff Members present:

STAFF PRESENT: Gary McAlpin, Director, Coastal Zone Management  
Caroline Cilek, M.S., Senior Planner, LDC Coordinator  
Robert Wiley, Floodplain Management Planning  
Jerry Kurtz, Stormwater and Environmental Planning

*Any persons in need of the verbatim record of the meeting may request a copy of the audio recording from the Collier County Growth Management Division – Planning and Regulation building –Contact Mr. Evy Ybaceta at 239-252-2400.*

**1. Call to Order**

**Mr. McAlpin** called the meeting to order at 5:20pm. He reported the purpose of the meeting was to provide information to, and garner information from the public on preparation of the Floodplain Management Plan.

**2. “Kick Off” meeting for Floodplain Management Plan (David Stroud, AMEC and Gary McAlpin)**

**Gary McAlpin and David Stroud** presented the Slideshow “*Collier County Fl Floodplain Management Plan Kickoff Meeting, July 16, 2014*” highlighting the following:

- The Objectives of the Plan are to:
  - Identify and Address Trends in Disasters (reduces costs for disaster recovery and probability for property losses).
  - Meet the requirements of the Disaster Mitigation Act (DMA) making the County eligible for disaster planning, disaster relief funds and ensures the community is less prone to disaster.
  - Improve standing in the voluntary Community Rating System (CRS) program.
- The goals of the 2013 CRS Program are to reduce flood damage to insurable property, strengthen and support the insurance aspects of the National Flood Insurance Program and encourage a comprehensive approach to floodplain management.
- The CRS program is a point based program with 10 classification levels which allow for increasing standards being met resulting in reduction of insurance premiums to citizens in the jurisdiction participating in the Program.
- The benefits for participating in the CRS Program are a 5 % premium discount for every 500 points achieved, improved flood protection, provision of technical assistance to communities participating, economic benefits to the local economy from an individuals insurance premium savings, etc.
- The DMA Planning process is comprised of 4 Phases - Phase 1: Organizing Resources; Phase 2: Risk Assessment; Phase 3: Developing a Mitigation Plan; Phase 4: Adoption and Implementation of the Floodplain Management Plan.

**Mr. McAlpin** reported:

- Development of the Plan will include input from the Floodplain Management Committee.
- A meeting will be held with the Committee on September 30, 2014 to review and comment on the updated hazard identifications and vulnerability assessment. The goal of the meeting will be to agree on the hazard identifications and vulnerability assessment.
- On November 12 -13, 2014 meetings will be held to review the Mitigation Goals and Strategies.
- A final Draft Plan will be made available for review on January 8, 2015.
- The Plan will be reviewed by the Collier County Planning Commission in February 2015 and forwarded to the Board of County Commissioners for consideration.



**3. Public Comments**

**Brad Estes** queried if the process will address the failure and/or maintenance of the existing neighborhood stormwater systems and areas where there are no systems.

**Mr. Stroud** reported existing “hot spots” of continual flooding conditions will be identified and a determination will need to be made for any connection between these conditions and property damage.

**There being no further business for the good of the County, the meeting was adjourned at 6:20PM.**

**News Releases, Public Notices, Meeting Minutes, Up-coming Meeting Dates/Agendas and Meeting Presentations posted on Collier County's website**

• **News Releases**

[7/16/2004 Committee Meeting](#)  
[7/16/2004 Public Information Meeting \(Released on 6/25/2014\)](#)  
[7/16/2004 Public Information Meeting \(Released on 7/2/2014\)](#)  
[11/6/2014 Floodplain Management Plan Survey](#)

• **Public Notices**

[Wednesday, July 16, 2014 at 10 a.m. \(Committee Meeting\)](#)  
[Wednesday, July 16, 2014 at 5:15 p.m. \(Public Information Meeting\)](#)  
[Tuesday, September 30, 2014 at 10:00 a.m. \(Committee Meeting\)](#)  
[Wednesday, November 19 and Thursday, November 20, 2014 at 1:00 p.m. \(Committee Meeting\)](#)  
[Tuesday, December 16, 2014 at 10:00 a.m. \(Committee Meeting\)](#)  
[Tuesday, December 16, 2014 at 5:00 p.m. \(Public Information Meeting\)](#)  
[Thursday, January 8, 2015, at 10:00 a.m. \(Committee Meeting\)](#)  
[Thursday, January 8, 2015 at 5:15 p.m. \(Public Information Meeting\)](#)

• **Meeting Minutes**

[Monday, June 2, 2014 at 9:00 a.m. \(Committee Meeting\)](#)  
[Wednesday, July 16, 2014 at 10:00 a.m. \(Committee Meeting\)](#)  
[Wednesday, July 16, 2014 at 5:15 p.m. \(Public Information Meeting\)](#)  
[Tuesday, September 30, 2014 at 10:00 a.m. \(Committee Meeting\)](#)  
[Wednesday, November 19, 2014 at 1:00 p.m. \(Committee Meeting\)](#)  
[Thursday, November 20, 2014 at 1:00 p.m. \(Committee Meeting\)](#)  
[Thursday, November 13, 2014 at 10:00 a.m. \(Committee Meeting\)](#)  
[Thursday, January 8, 2015, at 10:00 a.m. \(Committee Meeting\)](#)  
[Thursday, January 8, 2015 at 5:15 p.m. \(Public Information Meeting\)](#)

• **Up-coming Meeting Dates and Agendas**

[Wednesday, July 15, 2014 at 10:00 a.m. \(Committee Meeting\)](#)  
[Wednesday, July 16, 2014 at 5:15 p.m. \(Public Information Meeting\)](#)  
[Tuesday, September 30, 2014 at 10:00 a.m. \(Committee Meeting\)](#)  
[Wednesday, November 19 and Thursday, November 20, 2014 at 1:00 p.m. \(Committee Meeting\)](#)  
[Thursday, January 8, 2015, at 10:00 a.m. \(Committee Meeting\)](#)  
[Thursday, January 8, 2015 at 5:15 p.m. \(Public Information Meeting\)](#)

• **Meeting Presentations**

[7/16/2014 Committee Meeting AMEC Presentation](#)  
[9/30/2014 Committee Meeting Floodplain Management Section - August 2014](#)  
[9/30/2014 Committee Meeting Flood Risk Assessment](#)  
[9/30/2014 Committee Meeting Vulnerability Assessment](#)  
[9/30/2014 Review of the Hazard Identification & Hazard Vulnerability](#)  
[11/19&20/2014 Floodplain Meeting E-mail](#)  
[11/19/2014 Collier County Existing Goals](#)  
[11/20/2014 Collier County Mitigation Strategy Development Guide](#)

**Newspaper Article in Naples Daily News**

## Collier County looking to help residents lower flood insurance rates

BY: John Osborne

POSTED: 8:21 PM, Jul 16, 2014

UPDATED: 8:45 PM, Jul 16, 2014

TAG: local news | local government



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Naples, Fla. - Collier County wants to be ready if disaster strikes and help residents in the unincorporated areas reduce their flood insurance rates at the same time.

About a dozen people turned out for a presentation Wednesday night of the floodplain management plan that will likely go before commissioners for final approval at the end of February.

David Stroud, a county consultant experienced in Federal Emergency Management Agency (FEMA) planning requirements, said a program connected to the plan could help some Collier residents obtain lower flood insurance in return for improved flood protection measures throughout the county.

Stroud said participating in the Community Rating System (CRS) — a voluntary, FEMA incentive program that discounts flood insurance premiums as a result of community actions that meet CRS goals, including reducing flood damage to insurable property — would be a boon to the local economy.

“There are 52,000 flood insurance policies in unincorporated Collier County, and this program reduces the price people would pay for flood insurance, which offsets the cost of improving flood protection,” he said. “If you’re not spending that money on flood insurance, you’re buying dinner, you’re putting tires on your car and you’re improving your house, so that money stays in the community.”

Stroud said some of the more vulnerable areas of unincorporated Collier could see an average savings of \$121 on flood insurance premiums, while those in less-vulnerable areas could keep an extra \$96 in their pockets.

“As the population grows, more people want to live next to the water for recreation and other purposes,” he said. “Since there’s more people living in hazardous areas these days than ever before, there’s a great exposure to risk of lives, property and infrastructure.”

Stroud said improvements could include drainage improvement projects, flooding studies and the elevation of certain at-risk structures.

“We haven’t gotten to the point where we’ve identified the projects, but we do know federal grant programs typically feature a 75 percent, 25 percent split of costs, with the federal government paying 75 percent,” he said.

County Coastal Zone Manager Gary McAlpin said it would be premature to discuss numbers at this point.

East Naples resident Jack Cole, who works as a property manager for a “small homeowners association,” said the allure of lower premiums drew him to Wednesday’s meeting.

“We’re always looking for ways to improve our flood insurance and to help with the costs,” he said. “The program sounds like it could help, but I don’t want to say, ‘Yeah, great, let’s do it,’ if it’s not going to help. What I heard tonight sounds pretty good.”

Wednesday’s meeting will be followed by similar information meetings over the next four or five months, McAlpin said.

“The goal is to update the public on the process and to solicit public input, knowledge and response to the floodplain management process,” he said. “We’d definitely like the public’s input into this.”

McAlpin said the next two meetings would be scheduled for Sept. 30 and Nov. 11, with the emphasis on updating hazard identification, vulnerability assessment and mitigation goals and strategies.


“As we move forward with this plan development, we will put updated information on the website,” he said.

For more information, visit [www.colliergov.net](http://www.colliergov.net).

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## Collier County CCTV Schedule

	Monday July 14 2014	Tuesday July 15 2014	Wednesday July 16 2014	Thursday July 17 2014	Friday July 18 2014	Saturday July 19 2014	Sunday July 20 2014
Midnight to 6:00am	Bulletin Board						
6:00am	Bulletin Board	Bulletin Board	Bulletin Board	Bulletin Board	Bulletin Board	Bulletin Board	Bulletin Board
7:00am	Bulletin Board	Bulletin Board	Bulletin Board	Bulletin Board	Bulletin Board	Bulletin Board	Bulletin Board
8:00am	Happy Tails						
8:30am	Collier Recap						
9:00am	Board of County Commissioners	Board of County Commissioners	Contractors Licensing Board	Planning Commission	Code Enforcement	Planning Commission	Contractors Licensing Board
9:30am							
10:00am	Regular Meeting 7-8-14	Budget Hearing	Live	Regular Meeting	Special Magistrate	Regular Meeting	Replay
10:30am							
11:00am	Replay	Replay		Live	Live	Replay 7-17-14	7-16-14
11:30am							
12 noon							
12:30pm	Happy Tails						
1:00pm	Storm Ready						
1:30pm	Waterways						
2:00pm	Untold Stories						
2:30pm	Happy Tails					Happy Tails	
3:00pm	Recap					Recap	
3:30pm	On Scene	LWV School Board Forum	On Scene	LWV School Board Forum	On Scene		
4:00pm	Storm Ready		Storm Ready		Storm Ready		
4:30pm	LWV BCC Forum		Floodplain Management Plan		Happy Tails		
5:00pm			5:15		Recap		
5:30pm	Bulletin Board			Bulletin Board			
6:00pm	Bulletin Board			Bulletin Board			
6:30pm	Happy Tails						
7:00pm	Collier Recap						
7:30pm	Waterways						
8:00pm	Untold Stories						
8:30pm	Storm Ready						
9:00pm	On Scene						
9:30pm	Happy Tails						
10:00pm	Recap						
10:30pm	Storm Ready						
11:00pm	Untold Stories						
11:30pm							


1<sup>st</sup> Public Meeting Aired Live on July 16, 2014

	Monday July 21 2014	Tuesday July 22 2014	Wednesday July 23 2014	Thursday July 24 2014	Friday July 25 2014	Saturday July 26 2014	Sunday July 27 2014
Midnight to 6:00am	<b>Bulletin Board</b>						
6:00am	Bulletin Board	Bulletin Board	Bulletin Board	Bulletin Board	Bulletin Board	Bulletin Board	Bulletin Board
7:00am	Bulletin Board	Bulletin Board	Bulletin Board	Bulletin Board	Bulletin Board	Bulletin Board	Bulletin Board
8:00am	Happy Tails						
8:30am	Collier Recap						
9:00am	Conservation Collier  Live	Floodplain Management Information 7-16-14	Planning Commission  Replay 7-17-14	Code Enforcement Board  "Live"	Code Enforcement Board  Replay 7-24-14	Planning Commission  Replay 7-17-14	Code Enforcement Board  Replay 7-24-14
9:30am							
10:00am		Storm ready					
10:30am							
11:00am	On Scene						
11:30am	Happy Tails						
12 noon	Recap			Recap			Recap
12:30pm	Storm Ready						
1:00pm	Waterways						
1:30pm	Untold Stories						
2:00pm	Happy Tails						
2:30pm	Recap						
3:00pm	On Scene						
3:30pm	Storm Ready						
4:00pm	Happy Tails						
4:30pm	Recap						
5:00pm	<b>Bulletin Board</b>					On Scene	
5:30pm	<b>Bulletin Board</b>					Storm ready	
6:00pm	Happy Tails						
6:30pm	Collier Recap						
7:00pm	Waterways						
7:30pm	Untold Stories						
8:00pm	Storm Ready						
8:30pm	On Scene						
9:00pm	Happy Tails						
9:30pm	Recap						
10:00pm	Storm Ready						
10:30pm	Untold Stories						
11:00pm							
11:30pm							

1<sup>st</sup> Public Meeting Re-aired on July 22, 2014

## Public Survey

Collier County distributed a public survey that requested public input into the floodplain management plan planning process and the identification of mitigation activities that could lessen the risk and impact of future flood hazard events. Public information regarding the survey was provided in a News Release, and the survey itself was provided on Collier County's website as well as distributed to attendees at the second public meeting.

The official seal of Collier County, Florida, featuring a central figure surrounded by the words "COLLIER COUNTY" and "1919".

## **Collier County Government**

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<p><b>Growth Management Division</b> 2800 N. Horseshoe Drive Naples, Florida 34104</p>	<p><b>Contact: Connie Deane</b> Community Liaison 239-252-8192 or 8365 <a href="http://colliergov.net">colliergov.net</a> <a href="https://twitter.com/CollierPIO">twitter.com/CollierPIO</a> <a href="https://facebook.com/CollierGov">facebook.com/CollierGov</a> <a href="https://youtube.com/CollierGov">youtube.com/CollierGov</a></p>
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Nov. 6, 2014

**FOR IMMEDIATE RELEASE**

**Floodplain Management Plan Survey**

Collier County is in the process of updating its Floodplain Management Plan as a requirement to maintain eligibility for Federal Emergency Management Agency (FEMA) federal disaster funding and to increase credit in the Community Rating System (CRS) Program. The county is working to better develop hazard mitigation to reduce or eliminate long-term risk to human life and property from hazards.

Public participation is needed to assist with identifying and assessing our community's flood hazard risks and determine how to best minimize or manage those risks. The information provided will help the county to better understand hazard concerns in the community and can lead to mitigation activities that would help reduce the impacts of future hazard events. Additionally, public input will assist in determining what outreach materials would be better in communicating flood hazard risks.

A survey has been created for members of the public to share opinions and participate in the mitigation planning process. The survey is on the Collier County website at [www.Colliergov.net/floodplainmgmtplan](http://www.Colliergov.net/floodplainmgmtplan). All members of the public are welcome to provide their input whether full-time or part-time residents as well as seasonal visitors. We look forward to hearing from you.

**To have your input included in the Floodplain Management Plan, please submit surveys by Jan. 15, 2015.**

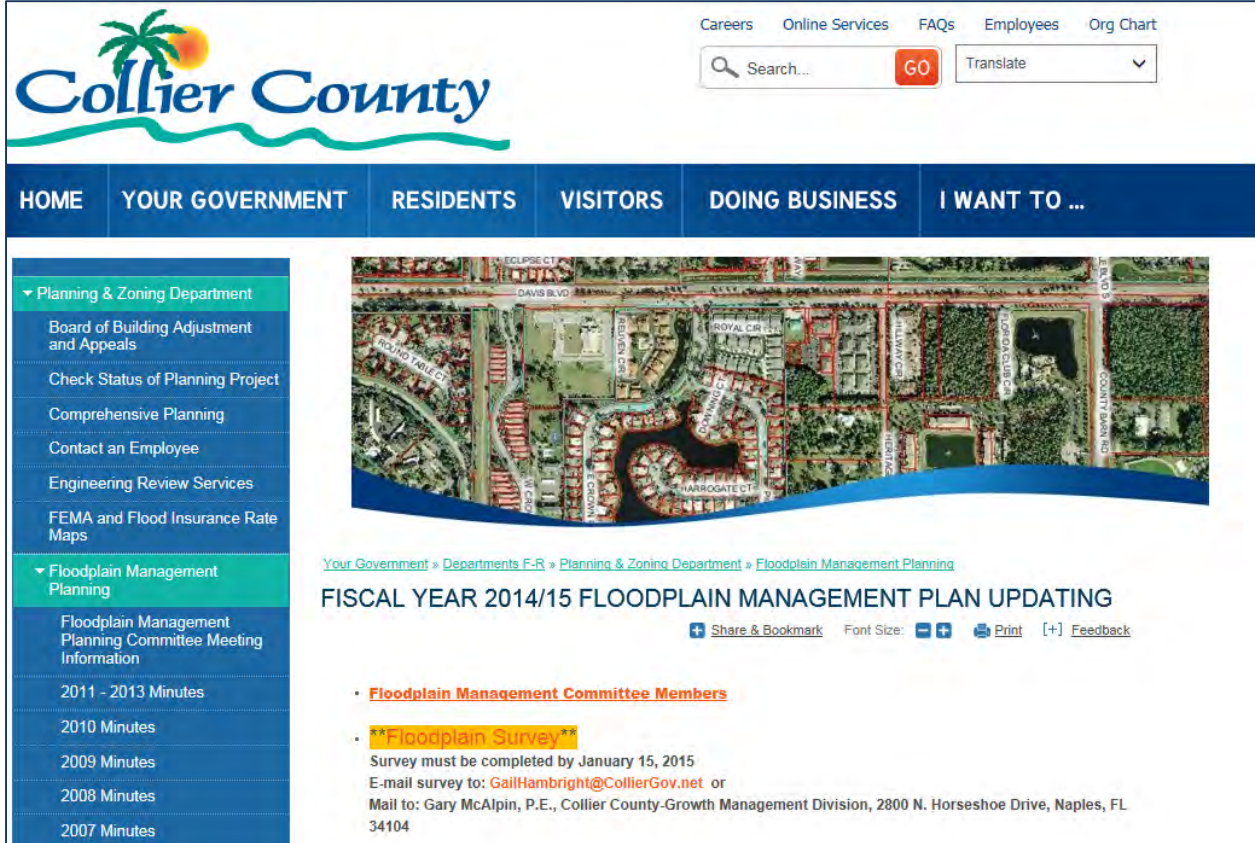
Surveys can be faxed to 239-252-2950 or emailed to [GailHambright@colliergov.net](mailto:GailHambright@colliergov.net).

Surveys can also be mailed to:  
Gary McAlpin, P.E.  
Collier County - Growth Management Division  
2800 N. Horseshoe Drive  
Naples, FL 34104

For more information call Gail Hambright at 239-252-2966.

*November 6, 2014 News Release for Public Survey*





The screenshot shows the Collier County website with a navigation menu and a sidebar. The main content area features a map of a residential area and a heading for the 'FISCAL YEAR 2014/15 FLOODPLAIN MANAGEMENT PLAN UPDATING'. Below the heading, there are links for 'Share & Bookmark', 'Font Size', 'Print', and 'Feedback'. A list of items includes 'Floodplain Management Committee Members' and '\*\*Floodplain Survey\*\*'. The survey details state it must be completed by January 15, 2015, and provide contact information for GailHambright@CollierGov.net and Gary McAlpin, P.E.

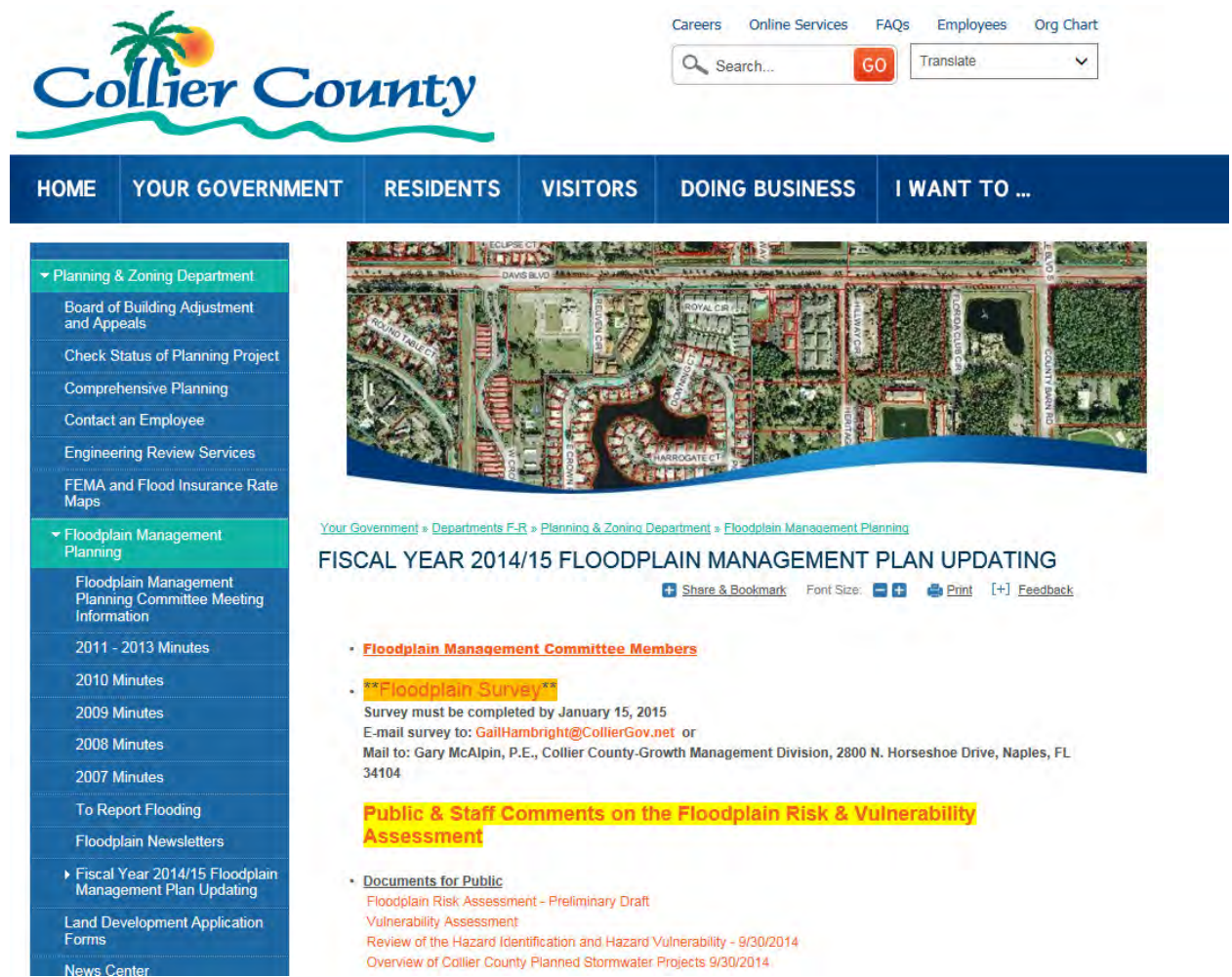
*Website Posting of Public Survey*

Collier County received      completed surveys. The following is a summary of survey responses.

**Note to Reviewers:** A summary of survey results will be inserted here once all surveys have been received.

Collier County posted the Draft Risk and Vulnerability Assessment for public review and comment on its website.

**September 30, 2014 Posting of Draft Risk and Vulnerability Assessment**



The screenshot shows the Collier County website interface. At the top left is the Collier County logo. To the right are navigation links: Careers, Online Services, FAQs, Employees, and Org Chart. Below these is a search bar with a 'GO' button and a 'Translate' dropdown menu. A dark blue navigation bar contains the following menu items: HOME, YOUR GOVERNMENT, RESIDENTS, VISITORS, DOING BUSINESS, and I WANT TO ...

The main content area features a left-hand sidebar with a 'Floodplain Management Planning' section. The main content area displays an aerial map of a residential area with street names like ROYAL CROWN CT, HARROGATE CT, and ROYAL CROWN CT. Below the map is the breadcrumb trail: [Your Government](#) » [Departments F-R](#) » [Planning & Zoning Department](#) » [Floodplain Management Planning](#). The main heading is 'FISCAL YEAR 2014/15 FLOODPLAIN MANAGEMENT PLAN UPDATING'. Below this heading are social sharing icons for 'Share & Bookmark', 'Print', and 'Feedback'. The page lists several items:

- Floodplain Management Committee Members**
- \*\*Floodplain Survey\*\***  
Survey must be completed by January 15, 2015  
E-mail survey to: [GailHambright@CollierGov.net](mailto:GailHambright@CollierGov.net) or  
Mail to: Gary McAlpin, P.E., Collier County-Growth Management Division, 2800 N. Horseshoe Drive, Naples, FL 34104
- Public & Staff Comments on the Floodplain Risk & Vulnerability Assessment**
- Documents for Public**
  - Floodplain Risk Assessment - Preliminary Draft Vulnerability Assessment
  - Review of the Hazard Identification and Hazard Vulnerability - 9/30/2014
  - Overview of Collier County Planned Stormwater Projects 9/30/2014



Collier County posted the entire Draft Floodplain Management Plan on its website for public review and comment.

**December 16, 2014 Posting of Entire Draft Floodplain Management Plan**

**Note to Reviewers: A screenshot will be inserted here once Draft plan has been posted.**

### **Planning Step 3: Coordinate**

This planning step credits the incorporation of other plans and other agencies' efforts into the development of the floodplain management plan. Other agencies and organizations must be contacted to determine if they have studies, plans and information pertinent to the floodplain management plan, to determine if their programs or initiatives may affect the community's program, and to see if they could support the community's efforts. Coordination efforts with other agencies are documented in the invitation letters below.

October 8, 2014

Mr. Steve Martin  
State Floodplain Management Office Bureau of Mitigation FDEM  
2555 Shumard Oak Boulevard  
Tallahassee, FL 32399-2100

RE: Collier County Floodplain Management

Dear Mr. Martin:

Collier County is developing a Floodplain Management Plan to address the flood hazards and associated stormwater and local drainage issues that impact the community. This planning process incorporates the 10-steps of Activity 510- Floodplain Management Planning in the National Flood Insurance Program's (NFIP) Community Rating System (CRS) Program.

Our objective in reaching out to other agencies and stakeholders is to coordinate with those who may bring additional information to the planning process and associated flood issues within Collier County. Any information, studies, etc. which may supplement the work of the established Floodplain Management Committee would be welcomed. Additionally, we invite your participation at our committee and public meetings throughout the planning process. Dates for future meeting will be sent to you by Gail Hambright and posted on the County's website: <http://www.colliergov.net/index.aspx?page=7366>



Gary McAlpin, is the program manager for this project. He can be reached at (239) 252-5342 or [garymcalpin@colliergov.net](mailto:garymcalpin@colliergov.net) Additionally you can contact our planning consultant, David Stroud with AMEC at (919) 765-9986 or [david.stroud@amec.com](mailto:david.stroud@amec.com).

Mr. Steve Martin  
October 8, 2014  
Page 2 of 2

We look forward to hearing from you and/or participation at future committee and public meetings.

Regards,

J. Gary McAlpin, P.E., CZM Manager  
Collier County Government  
Growth Management Division

October 8, 2014

Mr. Miles Anderson  
Bureau of Mitigation FDEM  
2555 Shumard Oak Boulevard  
Tallahassee, FL 32399

RE: Collier County Floodplain Management

Dear Mr. Anderson:

Collier County is developing a Floodplain Management Plan to address the flood hazards and associated stormwater and local drainage issues that impact the community. This planning process incorporates the 10-steps of Activity 510- Floodplain Management Planning in the National Flood Insurance Program's (NFIP) Community Rating System (CRS) Program.

Our objective in reaching out to other agencies and stakeholders is to coordinate with those who may bring additional information to the planning process and associated flood issues within Collier County. Any information, studies, etc. which may supplement the work of the established Floodplain Management Committee would be welcomed. Additionally, we invite your participation at our committee and public meetings throughout the planning process. Dates for future meeting will be sent to you by Gail Hambright and posted on the County's website: <http://www.colliergov.net/index.aspx?page=7366>



Gary McAlpin, is the program manager for this project. He can be reached at (239) 252-5342 or [garymcalpin@colliergov.net](mailto:garymcalpin@colliergov.net) Additionally you can contact our planning consultant, David Stroud with AMEC at (919) 765-9986 or [david.stroud@amec.com](mailto:david.stroud@amec.com).

We look forward to hearing from you and/or participation at future committee and public meetings.

Regards,

J. Gary McAlpin, P.E., CZM Manager  
Collier County Government  
Growth Management Division



October 8, 2014

Mr. Danny Hinson, CFM, FPEM, CHS-III  
FDEM  
2555 Shumard Oak Boulevard  
Tallahassee, FL 32399

RE: Collier County Floodplain Management

Dear Mr. Hinson:

Collier County is developing a Floodplain Management Plan to address the flood hazards and associated stormwater and local drainage issues that impact the community. This planning process incorporates the 10-steps of Activity 510-Floodplain Management Planning in the National Flood Insurance Program's (NFIP) Community Rating System (CRS) Program.

Our objective in reaching out to other agencies and stakeholders is to coordinate with those who may bring additional information to the planning process and associated flood issues within Collier County. Any information, studies, etc. which may supplement the work of the established Floodplain Management Committee would be welcomed. Additionally, we invite your participation at our committee and public meetings throughout the planning process. Dates for future meeting will be sent to you by Gail Hambright and posted on the County's website: <http://www.colliergov.net/index.aspx?page=7366>



Gary McAlpin, is the program manager for this project. He can be reached at (239) 252-5342 or [garymcalpin@colliergov.net](mailto:garymcalpin@colliergov.net) Additionally you can contact our planning consultant, David Stroud with AMEC at (919) 765-9986 or [david.stroud@amec.com](mailto:david.stroud@amec.com).

Mr. Danny Hinson  
October 8, 2014  
Page 2 of 2

We look forward to hearing from you and/or participation at future committee and public meetings.

Regards,

J. Gary McAlpin, P.E., CZM Manager  
Collier County Government  
Growth Management Division

October 8, 2014

Ms. Sherry Harper, AICP, CFM  
ISO Community Hazard Mitigation  
2382 Susan Drive  
Crestview, FL 32536

RE: Collier County Floodplain Management

Dear Ms. Harper:

Collier County is developing a Floodplain Management Plan to address the flood hazards and associated stormwater and local drainage issues that impact the community. This planning process incorporates the 10-steps of Activity 510-Floodplain Management Planning in the National Flood Insurance Program's (NFIP) Community Rating System (CRS) Program.

Our objective in reaching out to other agencies and stakeholders is to coordinate with those who may bring additional information to the planning process and associated flood issues within Collier County. Any information, studies, etc. which may supplement the work of the established Floodplain Management Committee would be welcomed. Additionally, we invite your participation at our committee and public meetings throughout the planning process. Dates for future meeting will be sent to you by Gail Hambright and posted on the County's website: <http://www.colliergov.net/index.aspx?page=7366>



Gary McAlpin, is the program manager for this project. He can be reached at (239) 252-5342 or [garymcalpin@colliergov.net](mailto:garymcalpin@colliergov.net) Additionally you can contact our planning consultant, David Stroud with AMEC at (919) 765-9986 or [david.stroud@amec.com](mailto:david.stroud@amec.com).

We look forward to hearing from you and/or participation at future committee and public meetings.

Regards,

J. Gary McAlpin, P.E., CZM Manager  
Collier County Government  
Growth Management Division

October 8, 2014

Ms. Lori Lehr, CFM  
Insurance Services Office  
3441 Pitman Road  
Dover, FL 33527

RE: Collier County Floodplain Management

Dear Ms. Lehr:

Collier County is developing a Floodplain Management Plan to address the flood hazards and associated stormwater and local drainage issues that impact the community. This planning process incorporates the 10-steps of Activity 510-Floodplain Management Planning in the National Flood Insurance Program's (NFIP) Community Rating System (CRS) Program.

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Regards,

J. Gary McAlpin, P.E., CZM Manager  
Collier County Government  
Growth Management Division

October 8, 2014

Ms. Susan Wilson, CFM  
FEMA Region IV  
3303 Chamblee Tucker Road  
Atlanta, GA 30341

RE: Collier County Floodplain Management

Dear Ms. Wilson:

Collier County is developing a Floodplain Management Plan to address the flood hazards and associated stormwater and local drainage issues that impact the community. This planning process incorporates the 10-steps of Activity 510- Floodplain Management Planning in the National Flood Insurance Program's (NFIP) Community Rating System (CRS) Program.

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Ms. Susan Wilson  
October 8, 2014  
Page 2 of 2

We look forward to hearing from you and/or participation at future committee and public meetings.

Regards,

J. Gary McAlpin, P.E., CZM Manager  
Collier County Government  
Growth Management Division



October 8, 2014

Ms. Janice Mitchell  
FEMA Region IV  
3303 Chamblee Tucker Road  
Atlanta, GA 30341

RE: Collier County Floodplain Management

Dear Ms. Mitchell:

Collier County is developing a Floodplain Management Plan to address the flood hazards and associated stormwater and local drainage issues that impact the community. This planning process incorporates the 10-steps of Activity 510-Floodplain Management Planning in the National Flood Insurance Program's (NFIP) Community Rating System (CRS) Program.

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Ms. Janice Mitchell  
October 8, 2014  
Page 2 of 2

We look forward to hearing from you and/or participation at future committee and public meetings.

Regards,

J. Gary McAlpin, P.E., CZM Manager  
Collier County Government  
Growth Management Division

October 8, 2014

Mr. Jason Hunter  
FEMA Region IV  
3303 Chamblee Tucker road  
Atlanta, GA 30341

RE: Collier County Floodplain Management

Dear Mr. Hunter:

Collier County is developing a Floodplain Management Plan to address the flood hazards and associated stormwater and local drainage issues that impact the community. This planning process incorporates the 10-steps of Activity 510- Floodplain Management Planning in the National Flood Insurance Program's (NFIP) Community Rating System (CRS) Program.

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Regards,

J. Gary McAlpin, P.E., CZM Manager  
Collier County Government  
Growth Management Division

October 8, 2014

Ms. Barbara Ross  
South Florida Water Management District  
P.O. Box 24680  
West Palm Beach, FL 33416-4680

RE: Collier County Floodplain Management

Dear Ms. Ross:

Collier County is developing a Floodplain Management Plan to address the flood hazards and associated stormwater and local drainage issues that impact the community. This planning process incorporates the 10-steps of Activity 510-Floodplain Management Planning in the National Flood Insurance Program's (NFIP) Community Rating System (CRS) Program.

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We look forward to hearing from you and/or participation at future committee and public meetings.

Regards,

J. Gary McAlpin, P.E., CZM Manager  
Collier County Government  
Growth Management Division

October 8, 2014

Ms Terri Bates  
South Florida Water Management District  
P.O. Box 24580  
West Palm Beach, FL 33416-4680

RE: Collier County Floodplain Management

Dear Ms Bates:

Collier County is developing a Floodplain Management Plan to address the flood hazards and associated stormwater and local drainage issues that impact the community. This planning process incorporates the 10-steps of Activity 510-Floodplain Management Planning in the National Flood Insurance Program's (NFIP) Community Rating System (CRS) Program.

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Regards,

J. Gary McAlpin, P.E., CZM Manager  
Collier County Government  
Growth Management Division



October 8, 2014

Mr. Tunis McElwain, Section Chief  
Ft. Myers Permit Section  
1520 Royal Palm Square Boulevard  
Suite 310  
Ft. Myers, FL 33919

RE: Collier County Floodplain Management

Dear Mr. McElwain:

Collier County is developing a Floodplain Management Plan to address the flood hazards and associated stormwater and local drainage issues that impact the community. This planning process incorporates the 10-steps of Activity 510- Floodplain Management Planning in the National Flood Insurance Program's (NFIP) Community Rating System (CRS) Program.

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Regards,

J. Gary McAlpin, P.E., CZM Manager  
Collier County Government  
Growth Management Division

October 8, 2014

Ms. Tracy Ferrier, Chapter Director  
the American Red Cross  
2610 Northbrooke Plaza Drive  
Naples, FL 34119

RE: Collier County Floodplain Management

Dear Ms. Ferrier:

Collier County is developing a Floodplain Management Plan to address the flood hazards and associated stormwater and local drainage issues that impact the community. This planning process incorporates the 10-steps of Activity 510-Floodplain Management Planning in the National Flood Insurance Program's (NFIP) Community Rating System (CRS) Program.

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Regards,

J. Gary McAlpin, P.E., CZM Manager  
Collier County Government  
Growth Management Division

October 8, 2014

Mr. Rusty Pfof  
Miami Field Office National Weather Service  
11691 SW 17th Street  
Miami, FL 33165

RE: Collier County Floodplain Management

Dear Mr. Pfof:

Collier County is developing a Floodplain Management Plan to address the flood hazards and associated stormwater and local drainage issues that impact the community. This planning process incorporates the 10-steps of Activity 510- Floodplain Management Planning in the National Flood Insurance Program's (NFIP) Community Rating System (CRS) Program.

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Mr. Rusty Pfof  
October 8, 2014  
Page 2 of 2

We look forward to hearing from you and/or participation at future committee and public meetings.

Regards,

J. Gary McAlpin, P.E., CZM Manager  
Collier County Government  
Growth Management Division

October 8, 2014

Dr. Kamella Patton  
Collier County Public Schools  
5775 Osceola Trail  
Naples, FL 34109

RE: Collier County Floodplain Management

Dear Dr. Patton:

Collier County is developing a Floodplain Management Plan to address the flood hazards and associated stormwater and local drainage issues that impact the community. This planning process incorporates the 10-steps of Activity 510-Floodplain Management Planning in the National Flood Insurance Program's (NFIP) Community Rating System (CRS) Program.

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Regards,

J. Gary McAlpin, P.E., CZM Manager  
Collier County Government  
Growth Management Division



October 8, 2014

Mr. Kevin Godsea  
Florida Panther National Wildlife Refuge  
3860 Tollgate Boulevard  
Suite 300  
Naples, FL 34114

RE: Collier County Floodplain Management

Dear Mr. Godsea:

Collier County is developing a Floodplain Management Plan to address the flood hazards and associated stormwater and local drainage issues that impact the community. This planning process incorporates the 10-steps of Activity 510-Floodplain Management Planning in the National Flood Insurance Program's (NFIP) Community Rating System (CRS) Program.

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We look forward to hearing from you and/or participation at future committee and public meetings.

Regards,

J. Gary McAlpin, P.E., CZM Manager  
Collier County Government  
Growth Management Division

October 8, 2014

Mr. William P. Mitchell  
City of Fort Myers  
2200 Second Street  
Ft. Myers, FL 33901

RE: Collier County Floodplain Management

Dear Mr. Mitchell:

Collier County is developing a Floodplain Management Plan to address the flood hazards and associated stormwater and local drainage issues that impact the community. This planning process incorporates the 10-steps of Activity 510- Floodplain Management Planning in the National Flood Insurance Program's (NFIP) Community Rating System (CRS) Program.

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Mr. William P. Mitchell  
October 8, 2014  
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We look forward to hearing from you and/or participation at future committee and public meetings.

Regards,

J. Gary McAlpin, P.E., CZM Manager  
Collier County Government  
Growth Management Division

October 8, 2014

The Honorable Larry Kiker, Chairman  
City of Fort Myers  
2115 Second Street  
Ft. Myers, FL 33901

RE: Collier County Floodplain Management

Dear Commissioner Kiker:

Collier County is developing a Floodplain Management Plan to address the flood hazards and associated stormwater and local drainage issues that impact the community. This planning process incorporates the 10-steps of Activity 510-Floodplain Management Planning in the National Flood Insurance Program's (NFIP) Community Rating System (CRS) Program.

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We look forward to hearing from you and/or participation at future committee and public meetings.

Regards,

J. Gary McAlpin, P.E., CZM Manager  
Collier County Government  
Growth Management Division

October 8, 2014

The Honorable Karson Turner, Chairman  
Hendry County Commissioners  
P.O. Box 1760  
La Belle, FL 33975

RE: Collier County Floodplain Management

Dear Commissioner Turner:

Collier County is developing a Floodplain Management Plan to address the flood hazards and associated stormwater and local drainage issues that impact the community. This planning process incorporates the 10-steps of Activity 510-Floodplain Management Planning in the National Flood Insurance Program's (NFIP) Community Rating System (CRS) Program.

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Regards,

J. Gary McAlpin, P.E., CZM Manager  
Collier County Government  
Growth Management Division



October 8, 2014

Dr. Robert Jones President  
7505 Grand Lely Drive  
Naples, FL 34113

RE: Collier County Floodplain Management

Dear Dr. Jones:

Collier County is developing a Floodplain Management Plan to address the flood hazards and associated stormwater and local drainage issues that impact the community. This planning process incorporates the 10-steps of Activity 510- Floodplain Management Planning in the National Flood Insurance Program's (NFIP) Community Rating System (CRS) Program.

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Dr. Robert Jones  
October 8, 2014  
Page 2 of 2

We look forward to hearing from you and/or participation at future committee and public meetings.

Regards,

J. Gary McAlpin, P.E., CZM Manager  
Collier County Government  
Growth Management Division

October 8, 2014

Ms. Jeanette Brock  
Hodges University  
2655 Northbrooke Drive  
Naples, FL 34119

RE: Collier County Floodplain Management

Dear Ms. Brock:

Collier County is developing a Floodplain Management Plan to address the flood hazards and associated stormwater and local drainage issues that impact the community. This planning process incorporates the 10-steps of Activity 510- Floodplain Management Planning in the National Flood Insurance Program's (NFIP) Community Rating System (CRS) Program.

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Ms. Jeanette Brock  
October 8, 2014  
Page 2 of 2

We look forward to hearing from you and/or participation at future committee and public meetings.

Regards,

J. Gary McAlpin, P.E., CZM Manager  
Collier County Government  
Growth Management Division

October 8, 2014

Mr. H. James Towey  
Ave Maria University  
5050 Ave Maria Blvd.  
Ave Maria, FL 34142

RE: Collier County Floodplain Management

Dear Mr. Towey:

Collier County is developing a Floodplain Management Plan to address the flood hazards and associated stormwater and local drainage issues that impact the community. This planning process incorporates the 10-steps of Activity 510-Floodplain Management Planning in the National Flood Insurance Program's (NFIP) Community Rating System (CRS) Program.

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We look forward to hearing from you and/or participation at future committee and public meetings.

Regards,

J. Gary McAlpin, P.E., CZM Manager  
Collier County Government  
Growth Management Division

October 8, 2014

Mr. Jon Iglehart  
FDEP  
2295 Victoria Avenue  
Suite 364  
Ft. Myers, FL 33901-3875

RE: Collier County Floodplain Management

Dear Mr. Iglehart:

Collier County is developing a Floodplain Management Plan to address the flood hazards and associated stormwater and local drainage issues that impact the community. This planning process incorporates the 10-steps of Activity 510-Floodplain Management Planning in the National Flood Insurance Program's (NFIP) Community Rating System (CRS) Program.

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We look forward to hearing from you and/or participation at future committee and public meetings.

Regards,

J. Gary McAlpin, P.E., CZM Manager  
Collier County Government  
Growth Management Division



October 8, 2014

Mr. Thomas Edison, Ph.D.  
Fl. Fish and Wildlife Conservation Commission  
620 S. Meridian Street  
Tallahassee, FL 32399

RE: Collier County Floodplain Management

Dear Mr. Edison:

Collier County is developing a Floodplain Management Plan to address the flood hazards and associated stormwater and local drainage issues that impact the community. This planning process incorporates the 10-steps of Activity 510-Floodplain Management Planning in the National Flood Insurance Program's (NFIP) Community Rating System (CRS) Program.

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Gary McAlpin, is the program manager for this project. He can be reached at (239) 252-5342 or [garymcalpin@colliergov.net](mailto:garymcalpin@colliergov.net) Additionally you can contact our planning consultant, David Stroud with AMEC at (919) 765-9986 or [david.stroud@amec.com](mailto:david.stroud@amec.com).

We look forward to hearing from you and/or participation at future committee and public meetings.

Regards,

J. Gary McAlpin, P.E., CZM Manager  
Collier County Government  
Growth Management Division

October 8, 2014

Mr. Gary Lytton  
Rookery Bay National Estuarine Research Reserve  
300 Tower Road  
Naples, FL 34113

RE: Collier County Floodplain Management

Dear Mr. Lytton:

Collier County is developing a Floodplain Management Plan to address the flood hazards and associated stormwater and local drainage issues that impact the community. This planning process incorporates the 10-steps of Activity 510- Floodplain Management Planning in the National Flood Insurance Program's (NFIP) Community Rating System (CRS) Program.

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Mr. Gary Lytton  
October 8, 2014  
Page 2 of 2

We look forward to hearing from you and/or participation at future committee and public meetings.

Regards,

J. Gary McAlpin, P.E., CZM Manager  
Collier County Government  
Growth Management Division

October 8, 2014

Ms. Margaret Wuerstle  
Southwest Florida Regional Planning Council  
1926 Victoria Avenue  
Ft. Myers, FL 33901

RE: Collier County Floodplain Management

Dear Ms. Wuerstle:

Collier County is developing a Floodplain Management Plan to address the flood hazards and associated stormwater and local drainage issues that impact the community. This planning process incorporates the 10-steps of Activity 510- Floodplain Management Planning in the National Flood Insurance Program's (NFIP) Community Rating System (CRS) Program.

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Ms. Margaret Wuerstle  
October 8, 2014  
Page 2 of 2

We look forward to hearing from you and/or participation at future committee and public meetings.

Regards,

J. Gary McAlpin, P.E., CZM Manager  
Collier County Government  
Growth Management Division

October 8, 2014

Mrs. Marissa Krueger  
Florida Fish & Wildlife Conservation Commission  
8535 Northlake Blvd.  
West Palm Beach, FL 33412

RE: Collier County Floodplain Management

Dear Mrs. Krueger:

Collier County is developing a Floodplain Management Plan to address the flood hazards and associated stormwater and local drainage issues that impact the community. This planning process incorporates the 10-steps of Activity 510-Floodplain Management Planning in the National Flood Insurance Program's (NFIP) Community Rating System (CRS) Program.

Our objective in reaching out to other agencies and stakeholders is to coordinate with those who may bring additional information to the planning process and associated flood issues within Collier County. Any information, studies, etc. which may supplement the work of the established Floodplain Management Committee would be welcomed. Additionally, we invite your participation at our committee and public meetings throughout the planning process. Dates for future meeting will be sent to you by Gail Hambright and posted on the County's website: <http://www.colliergov.net/index.aspx?page=7366>



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Mrs. Marissa Krueger  
October 8, 2014  
Page 2 of 2

We look forward to hearing from you and/or participation at future committee and public meetings.

Regards,

J. Gary McAlpin, P.E., CZM Manager  
Collier County Government  
Growth Management Division



October 8, 2014

Ms. Becky Prado  
FDEP - Coastal Zone Management Program  
3900 Commonwealth Blvd.  
M.S. 235  
Tallahassee, FL 32399

RE: Collier County Floodplain Management

Dear Ms. Prado:

Collier County is developing a Floodplain Management Plan to address the flood hazards and associated stormwater and local drainage issues that impact the community. This planning process incorporates the 10-steps of Activity 510- Floodplain Management Planning in the National Flood Insurance Program's (NFIP) Community Rating System (CRS) Program.

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Regards,

J. Gary McAlpin, P.E., CZM Manager  
Collier County Government  
Growth Management Division

October 8, 2014

Mr. James E. Billie  
Seminole Tribe of Florida  
(Immokalee Reservation)  
6300 Stirling Road  
Hollywood, FL 33024

RE: Collier County Floodplain Management

Dear Mr. Billie:

Collier County is developing a Floodplain Management Plan to address the flood hazards and associated stormwater and local drainage issues that impact the community. This planning process incorporates the 10-steps of Activity 510- Floodplain Management Planning in the National Flood Insurance Program's (NFIP) Community Rating System (CRS) Program.

Our objective in reaching out to other agencies and stakeholders is to coordinate with those who may bring additional information to the planning process and associated flood issues within Collier County. Any information, studies, etc. which may supplement the work of the established Floodplain Management Committee would be welcomed. Additionally, we invite your participation at our committee and public meetings throughout the planning process. Dates for future meeting will be sent to you by Gail Hambright and posted on the County's website: <http://www.colliergov.net/index.aspx?page=7366>



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Regards,

J. Gary McAlpin, P.E., CZM Manager  
Collier County Government  
Growth Management Division

October 8, 2014

Mr. Greg Ulrich  
Collier County Building Industry Association  
3200 Bailey Lane  
Naples, FL 34105

RE: Collier County Floodplain Management

Dear Mr. Ulrich:

Collier County is developing a Floodplain Management Plan to address the flood hazards and associated stormwater and local drainage issues that impact the community. This planning process incorporates the 10-steps of Activity 510-Floodplain Management Planning in the National Flood Insurance Program's (NFIP) Community Rating System (CRS) Program.

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Mr. Greg Ulrich  
October 8, 2014  
Page 2 of 2

We look forward to hearing from you and/or participation at future committee and public meetings.

Regards,

J. Gary McAlpin, P.E., CZM Manager  
Collier County Government  
Growth Management Division

October 8, 2014

Mr. Brian Fluech  
Collier County Extension  
14700 Immokalee Road  
Naples, FL 34120

RE: Collier County Floodplain Management

Dear Mr. Fluech:

Collier County is developing a Floodplain Management Plan to address the flood hazards and associated stormwater and local drainage issues that impact the community. This planning process incorporates the 10-steps of Activity 510-Floodplain Management Planning in the National Flood Insurance Program's (NFIP) Community Rating System (CRS) Program.

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Mr. Brian Fluech  
October 8, 2014  
Page 2 of 2

We look forward to hearing from you and/or participation at future committee and public meetings.

Regards,

J. Gary McAlpin, P.E., CZM Manager  
Collier County Government  
Growth Management Division



October 8, 2014

Ms. Sharon Trost  
South Florida Water Management District  
P.O. Box 24680  
West Palm Beach, FL 33416-4680

RE: Collier County Floodplain Management

Dear Ms. Trost:

Collier County is developing a Floodplain Management Plan to address the flood hazards and associated stormwater and local drainage issues that impact the community. This planning process incorporates the 10-steps of Activity 510- Floodplain Management Planning in the National Flood Insurance Program's (NFIP) Community Rating System (CRS) Program.

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We look forward to hearing from you and/or participation at future committee and public meetings.

Regards,

J. Gary McAlpin, P.E., CZM Manager  
Collier County Government  
Growth Management Division

October 8, 2014

Mr. Ben Nottingham  
Fl Panther National Wildlife Refuge  
3860 Tollgate Boulevard  
Suite 300  
Naples, FL 34114

RE: Collier County Floodplain Management

Dear Mr. Nottingham:

Collier County is developing a Floodplain Management Plan to address the flood hazards and associated stormwater and local drainage issues that impact the community. This planning process incorporates the 10-steps of Activity 510-Floodplain Management Planning in the National Flood Insurance Program's (NFIP) Community Rating System (CRS) Program.

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J. Gary McAlpin, P.E., CZM Manager  
Collier County Government  
Growth Management Division

# Appendix B

## Appendix B: Mitigation Strategy

### Hazard Identification & Profiles

**Table B-1 Flood Hazards Profile Summary for Collier County, FL**

Hazard	Frequency of Occurrence	Spatial Extent	Potential Magnitude	Significance
Climate Change and Sea Level Rise	Highly Likely	Limited	Negligible	Low
Coastal/Canal Bank Erosion	Highly Likely	Limited	Negligible	Medium
Dam/Levee Failure	Unlikely	Limited	Negligible	Low
Flood: 100-/500-year	Occasional	Extensive	Catastrophic	High
Flood: Stormwater/Localized Flooding	Highly Likely	Limited	Negligible	Medium
Hurricane and Tropical Storms (including Storm Surge)	Likely	Extensive	Catastrophic	High
<p><b>Guidelines:</b></p> <p><b>Frequency of Occurrence:</b>            Highly Likely: Nearly 100% probability within the next year.            Likely: Between 10 and 100% probability within the next year.            Occasional: Between 1 and 9% probability within the next year.            Unlikely: Less than 1% probability within the next year.</p> <p><b>Potential Magnitude:</b>            Catastrophic: More than 50% of the area affected.            Critical: 26 to 50% of the area affected.            Limited: 10 to 25% of the area affected.            Negligible: Less than 10% of the area affected.</p> <p><b>Spatial Extent:</b>            Limited: Less than 10% of planning area.            Moderate: 10-50% of planning area.            Extensive: 51-100% of planning area.</p> <p><b>Significance:</b>            Low            Medium            High</p>				

## B.1 Risk Assessment Methodology

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### B.1.1 Calculating Likelihood of Future Occurrence

The frequency of past events is used in this section to gauge the likelihood of future occurrences. Based on historical data, the likelihood of future occurrence is categorized into one of the following classifications:

**Highly Likely:** Near 100% chance of occurrence in next year, or happens every year.

**Likely:** Between 10 and 100% chance of occurrence in next year, or has a recurrence interval of 10 years or less.

**Occasional:** Between 1 and 9% chance of occurrence in the next year, or has a recurrence interval of 11 to 100 years.

**Unlikely:** Less than 1% chance of occurrence in next 100 years, or has a recurrence interval of greater than every 100 years.

### B.1.2 Calculating Vulnerability

Vulnerability is measured in general, qualitative terms, and is a summary of the potential impact based on past occurrences, spatial extent, and damage and casualty potential:

**Extremely Low:** The occurrence and potential cost of damage to life and property is very minimal to non-existent.

**Low:** Minimal potential impact. The occurrence and potential cost of damage to life and property is minimal.

**Medium:** Moderate potential impact. This ranking carries a moderate threat level to the general population and/or built environment. Here the potential damage is more isolated and less costly than a more widespread disaster.

**High:** Widespread potential impact. This ranking carries a high threat to the general population and/or built environment. The potential for damage is widespread. Hazards in this category may have already occurred in the past.

**Extremely High:** Very widespread and catastrophic impact.

### B.1.3 Defining Significance (Priority) of a Hazard

Defining the significance or priority of a hazard to a community is based on a subjective analysis of several factors. This analysis is used to focus and prioritize hazards and associated mitigation measures for the plan. These factors include the following:

**Past Occurrences:** Frequency, extent, and magnitude of historic hazard events.

**Likelihood of Future Occurrences:** Based on past hazard events.

**Ability to Reduce Losses through Implementation of Mitigation Measures:** This looks at both the ability to mitigate the risk of future occurrences as well as the ability to mitigate the vulnerability of a community to a given hazard event. It also considers the extent to which existing mitigation measures are in place to adequately address the hazard.

## **B.1.4 Collier County Hazard ID/Vulnerability/Priority Summary**

### **Climate Change and Sea Level Rise**

- Data shows climate change and seal level rise issues are affecting the Collier County planning area.
- LOFO: Highly Likely
- Vulnerability: High
- Priority Hazard

### **Coastal/Canal Bank Erosion**

- Data shows coastal erosion is a problem affecting the Collier County planning area. There are known local instances of canal bank erosion.
- LOFO: Highly Likely
- Vulnerability: Medium
- Priority Hazard

### **Dam/Levee Failure**

- One dam is located within Collier County (non-high hazard).
- There are two agricultural levees located on the eastern County border.
- There are no recorded dam breaches or levee failures within Collier County.
- LOFO: Unlikely
- Vulnerability: Low
- Non-Priority Hazard

### **Flood: 100-/500-year**

- Extensive 100-yr floodplain coverage within Collier County.
- LOFO: 100-Occasional; 500-Unlikely (By Definition)
- Vulnerability: Extremely High
- Priority Hazard

### **Flood: Stormwater/Localized Flooding**

- Localized flooding also occurs at various times throughout the year with several areas of primary concern to the County. Localized flooding and ponding affect streets and property.
- LOFO: Highly Likely
- Vulnerability: High
- Priority Hazard



### **Hurricane and Tropical Storm (including Storm Surge)**

- The coastal area of Collier County has been exposed to 81 hurricanes/tropical storms since 1851.
- LOFO: Likely – Hurricane; Likely – Storm Surge
- Vulnerability: Extremely High
- Priority Hazard

### **B.1.5 Collier County Priority Hazards**

#### **Priority Hazards**

- Climate Change and Sea Level Rise
- Coastal/Canal Bank Erosion
- Flood: 100/500 year
- Flood: Stormwater/ Localized Flooding
- Hurricane and Tropical Storms (including Storm Surge)

#### **Non-Priority Hazards**

- Dam/Levee Failure

## B. 2 Mitigation Goals Development

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### B.2.1 Formulating Mitigation Goals

The FMPC was very involved in collecting and providing data for the Collier County Floodplain Management Plan. From this information, a Risk Assessment was developed that describes the risk and vulnerability of the County to identified hazards and includes an assessment of the County's current capabilities for countering these threats through existing policies, regulations, programs, and projects. This analysis identifies areas where improvements could or should be made. The formulation of goals leads to incorporating these improvements into the Mitigation Strategy portion of the floodplain management plan. The planning goals provide direction for what should be done to make the planning area more disaster resistant.

**GOALS:** Goals are stated without regard for implementation; that is, implementation cost, schedule, and means are not considered. Goals are defined before considering how to accomplish them so that the goals are not dependent on the means of achievement. Goals are public policy statements that:

- Represent basic desires of the jurisdiction;
- Encompass all aspects of planning area, public and private;
- Are nonspecific, in that they refer to the quality (not the quantity) of the outcome;
- Are future-oriented, in that they are achievable in the future; and
- Are time-independent, in that they are not scheduled events.

### B.2.2 Goal Development

The Collier County FMPC conducted an exercise to outline its goals for this floodplain management plan. The goal setting exercise is covered in detail in Section 5. At the end of the exercise, the FMPC agreed upon five general goals for this planning effort. The goals were refined and include:

- Goal 1:** Reduce vulnerability and exposure to flood hazards in order to protect the health, safety and welfare of residents and guests.
- Goal 2:** Encourage property owners, through education and outreach measures, to protect their homes and businesses from flood damage.
- Goal 3:** Reduce the vulnerability of critical facilities and infrastructure from the effects of flood hazards.
- Goal 4:** Protect natural resources by employing watershed-based approaches that balance environmental, economic and engineering considerations.
- Goal 5:** Minimize the adverse impacts to surrounding areas and watershed functions.

The FMPC also included objectives in support of the goals. The objective numbers relate to the goal numbers above. The objectives include:

**Objective 1.1:** Maintain a database of flood problems and hazards.

**Objective 1.2:** Maintain a database of repetitive loss claim history and mitigation activities.

**Objective 1.3:** Review the Growth Management Plan, Land Development Code, and Ordinances for compatibility with these goals and objectives, and revise where appropriate and financially feasible.

**Objective 1.4:** Develop more comprehensive evacuation plans.

**Objective 1.5:** Review the adequacy of emergency procedures for flood events and coastal storm surge through training and exercises.

**Objective 1.6:** Update FEMA designated flood zones based on the best available technical data and analysis.

**Objective 1.7:** Enforce code requirements of the National Flood Insurance Program.

**Objective 1.8:** Conduct site investigations, research exposure and hazard data, and evaluate proposed modifications to repair and mitigate stormwater management problems.

**Objective 1.9:** Develop projects to reduce deficiencies within the stormwater management system as part of the Annual Update and Inventory Report (AUIR) and budget development process.

**Objective 2.1:** Educate property owners, including repetitive loss properties, on FEMA grant programs and other methods in order to mitigate possible flood damage.

**Objective 2.2:** Provide the current floodproofing and retrofitting information to property owners.

**Objective 2.3:** Effectively communicate flood risk to residents, businesses, contractors, realtors and prospective buyers.

**Objective 2.4:** Enhance community websites to provide comprehensive flood protection and flood preparedness information.

**Objective 3.1:** Ensure protection standards for critical facilities meet Florida Building Code standards.

**Objective 3.2:** Work with appropriate personnel to prioritize critical and essential facilities in need of protection from potential flood damage.

**Objective 3.3:** Implement flood mitigation measures or strategies, as necessary, to protect critical facilities.

**Objective 4.1:** Maintain and enforce regulations to protect and restore wetlands and ecological functions for long-term environmental, economic and recreational values.

**Objective 4.2:** Continue beach re-nourishment and dune construction programs for the protection of marine habitat, environmentally sensitive lands and other coastal resources.

**Objective 4.3:** Pursue water management approaches and techniques that improve water quality and protect public health.

**Objective 4.4:** Preserve and maintain open space in flood prone areas to reduce flood damage to buildings and to provide recreational benefits.

**Objective 4.5:** Continue to protect aquifers and environmentally sensitive lands from encroachment of development by requiring buffers and other setbacks mechanisms.

**Objective 5.1:** Reduce stormwater runoff through adequate stormwater management, flood control, on-site retention and best management practices to mitigate impacts associated with incremental construction and redevelopment projects.

**Objective 5.2:** Evaluate funding mechanisms to increase stormwater capital improvement programs.

**Objective 5.3:** Ensure floodplain compensation is provided as established in the Growth Management Plan and Land Development Code.

### **B.3 Categories of Mitigation Measures Considered**

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Once it was determined which flood hazards warranted the development of specific mitigation actions, the FMPC analyzed viable mitigation options that supported the identified goals and objectives. The FMPC was provided with the following list of mitigation categories which are utilized as part of the CRS planning process.

- Prevention
- Property Protection
- Natural Resource Protection
- Emergency Services
- Structural Projects
- Public Information

### **B.4 Alternative Mitigation Measures per Category**

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Note: the CRS Credit Sections are based on the 2013 CRS Coordinator's Manual.

#### **B.4.1 Prevention Measures**

Prevention measures are designed to keep a problem - such as flooding - from occurring or from getting worse. The objective of preventive measures is to ensure that future development is not exposed to damage and does not cause an increase in damages to other properties. Building, zoning, planning and code enforcement offices usually administer preventive measures. Some examples of types of preventive measures include:

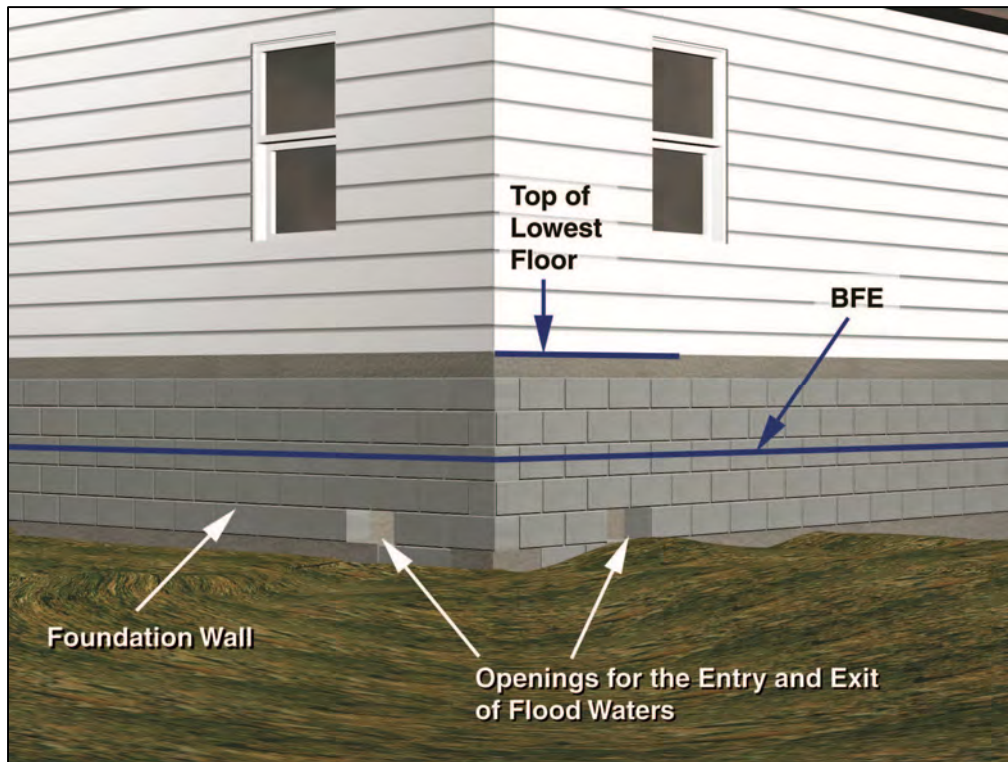
- Building codes
- Planning and zoning
- Open space preservation
- Floodplain regulations
- Stormwater management

#### **Building Codes**

Building codes provide one of the best methods of addressing natural hazards. When properly designed and constructed according to code, the average building can withstand many of the impacts of natural hazards. Hazard protection standards for all new and improved or repaired buildings can be incorporated into the local building code. Building codes can ensure that the first floors of new buildings are constructed to be higher than the elevation of the 100-year flood (the flood that is expected to have a one percent chance of occurring in any given year). This is shown in Figure B.1.

Just as important as having code standards is the enforcement of the code. Adequate inspections are needed during the course of construction to ensure that the builder understands the requirements and is

following them. Making sure a structure is properly elevated and anchored requires site inspections at each step.



Source: FEMA Publication: *Above the Flood: Elevating Your Floodprone House, 2000*

**Figure B.1 – Building Codes and Flood Elevations**

### **Local Implementation**

Starting with the 2010 edition, the Florida Building Code (FBC) includes flood provisions that are consistent with the NFIP requirements for buildings and structures. All counties, cities and towns are required to enforce the FBC. Collier County is working to adopt the State’s “model” ordinance that is compliant with the 2010 FBC and crafted to meet NFIP requirements. The code includes some added height for buildings through reference to ASCE 24.

Communities that are in the NFIP Community Rating System are required to use the NFIP Elevation Certificate. The FBC does not specify use of the NFIP Elevation Certificate, which means documentation of as-built lowest floor elevations may be submitted in a different format. However, use of the Elevation Certificate is recommended.

### **Reducing Future Flood Losses**

Future flood losses will be reduced through the implementation and enforcement of the 2010 Florida Building Code. The 2010 FBC refers to local floodplain management ordinances for adoption of flood hazard maps and gives communities the opportunity to adopt higher standards. Collier County might consider an additional freeboard requirement in the future which will provide an extra level of protection to buildings constructed in the County.

### **CRS Credit**

The CRS encourages strong building codes. It provides credit in two ways: points are awarded based on the community's Building Code Effectiveness Grading Schedule (BCEGS) classification and points are awarded for adopting the International Code series. Collier County and the City of Marco Island both have a BCEGS rating of Class 4 for both residential and commercial. The City of Naples's BCEGS rating is a Class 3 for both residential and commercial. All three communities have adopted or are in the process of adopting the *2010 Florida Building Code* which is based on national model building codes and national consensus standards which are amended where necessary for Florida's specific needs. The Florida Building Code is updated every three years.

## **Planning and Zoning**

Building codes provide guidance on how to build in hazardous areas. Planning and zoning activities direct development away from these areas, particularly floodplains and wetlands. They do this by designating land uses that are compatible with the natural conditions of land that is prone to flooding, such as open space or recreation. Planning and zoning activities can also provide benefits by simply allowing developers more flexibility in arranging improvements on a parcel of land through the planned development approach.

### **Local Implementation**

#### **Comprehensive Plan**

A Comprehensive Plan, in broad terms, is a policy statement to guide the future placement and development of community facilities. It is the basis for a community's zoning, subdivision and design regulations and a community's official maps and amendments to the zoning, subdivision and design ordinances. The future land use element of the plan represents the community's vision for its development and redevelopment during the subject planning period. The future land use maps serve as the foundation for subsequent development of more detailed Land Development Regulations and special area plans. These regulations and plans must be consistent with and further the implementation of the future land use element of the Comprehensive Growth Management Plan and its goals, objectives and policies.

Florida's Growth Management Act requires the state's counties and municipalities to adopt Comprehensive Plans that guide future growth and development. The Collier County Growth Management Plan was most recently amended in 2014; the City of Marco Island Comprehensive Plan is dated 2009; and the City of Naples Comprehensive Plan was updated in December 2013. The goals and objectives from each Plan are summarized in Section 4.4.

#### **Zoning Regulations**

The Land Development Code (LDC) is the principal regulatory tool for implementing a community's Growth Management Plan. The State of Florida requires all counties, cities and towns to create and abide by the Land Development Code. The LDC contains land use and zoning standards, site design standards, and environmental regulations that development must meet in the community. Criteria are provided to ensure that all growth meets the objectives of the Growth Management Plan. Collier County, the City of Marco Island and the City of Naples all enforce a LDC ordinance.

#### **Capital Improvement Plan**

The Community Planning Act of 2011 requires local governments to review the Capital Improvement Element of the GMP on an annual basis and to update the 5-year capital improvement schedule. The GMP for Collier County, the City of Marco Island and the City of Naples all include a Capital Improvement Element that is updated annually. The Capital Improvement Plan is essential for funding and implementing structural mitigation projects.

### **Reducing Future Flood Losses**

Zoning and comprehensive planning should work together to reduce future flood losses by directing development away from hazard prone areas as well as funding mitigation projects.

### **Open Space Preservation**

Keeping the floodplain and other hazardous areas open and free from development is the best approach to preventing damage to new developments. Open space can be maintained in agricultural use or can serve as parks, greenway corridors and golf courses.

Comprehensive and capital improvement plans should identify areas to be preserved by acquisition and other means, such as purchasing an easement. With an easement, the owner is free to develop and use private property, but property taxes are reduced or a payment is made to the owner if the owner agrees to not build on the part set aside in the easement.

Although there are some federal programs that can help acquire or reserve open lands, open space lands and easements do not always have to be purchased. Developers can be encouraged to dedicate park land and required to dedicate easements for drainage and maintenance purposes. These are usually linear areas along property lines or channels. Maintenance easements also can be donated by streamside property owners in return for a community maintenance program.

### **Local Implementation**

The State of Florida Local Government Comprehensive Planning and Land Development Regulation Act requires a "recreation and open space element indicating a comprehensive system of public and private sites for recreation, including but not limited to: natural reservations, parks and playgrounds, parkways, beaches and public access to beaches, open spaces and other recreational facilities."

The purpose and intent of the Collier County conservation zoning district "CON" is to conserve, protect, and maintain vital natural resource lands within unincorporated Collier County that are owned primarily by the public. All native habitats possess ecological and physical characteristics that justify attempts to maintain these important natural resources. Barrier Islands, coastal bays, wetlands, and habitat for listed species receive particular attention because of their ecological value and their sensitivity to perturbation. All proposals for development in the CON district must be subject to rigorous review to ensure that the impacts of the development do not destroy or unacceptably degrade the inherent functional values. The CON district includes such public lands as Everglades National Park, Big Cypress National Preserve, Florida Panther National Wildlife Refuge, portions of the Big Cypress Area of Critical State Concern, Fakahatchee Strand State Preserve, Collier-Seminole State Park, Rookery Bay National Estuarine Sanctuary Research Reserve, Delnor-Wiggins State Park, and the National Audubon's Corkscrew Swamp Sanctuary (privately owned), and C.R.E.W. It is the intent of the CON district to require review of all development proposed within the CON district to ensure that the inherent value of the County's natural resources is not destroyed or unacceptably altered. The CON district corresponds to and implements the conservation land use designation on the future land use map of the Collier County GMP.

The citizens of Collier County approved a referendum to enact an increase to the property tax millage rate (0.250) for the purpose of acquiring —Environmentally Sensitivel lands that would further greenways, habitat area, and the natural heritage of the County. The Conservation Collier Department contacts owners of properties having environmentally sensitive or other spatially significant characteristics to the goals of the program. Properties of willing seller are then evaluated against the goals of the program, then ranked on an acquisition list, and a recommendation by the Conservation Collier Land Acquisition Advisory Committee is given to the BCC for its action. Properties selected by the BCC for acquisition through the

Conservation Collier program are approved by ordinance and a management plan is prepared for each property.

The adopted goal of the City of Marco Island's Park and Open Space Element reads, "To enhance Marco Island's open space and recreational opportunities while maintaining its tropical, small town character." In furtherance of this goal there are four objectives and fifteen (15) policies. The City has successfully acquired numerous sites for new and expanded recreational opportunities such as "the Glon" property (Veteran's Park), strategic lots and parcels along a 1.5 mile pathway corridor, and a waterfront lot at the Factory Bay Bridge. Significant park renovations/enhancement projects at Winterberry and Mackle parks have either been completed or in final design stages, with identified capital improvement funding. And most importantly the City has established a fully functioning Park and Recreation Department. With an inventory of over 100 acres of total community parkland, the adopted LOS standard of 1.2882 acres/1,000 residents there is sufficient active parkland acreage to support both projected permanent and peak season populations well into the future.

The City of Naples Growth Management Plan includes a Parks, Recreation and Open Space Element. Existing public recreation facilities within the City of Naples include seven neighborhood and linear parks, 13 mini-parks, four community parks, two natural resource areas, the Naples Pier, and the City Dock. The Collier County School Board provides recreation facilities within the City limits at four schools. Collier County provides facilities at Bayview Park and at Gulfview Middle School. In addition, there are approximately 9.1 miles of beaches. Naples Bay, Gordon River, Moorings Bay, and the Gulf of Mexico provide many water-oriented recreation opportunities. The City maintains an additional one-hundred-one 101 acres of open space parkway area, including beach ends and access points, street islands and medians, cul-de-sacs and rights-of-way.

### **Reducing Future Flood Losses**

Creating or maintaining open space is the primary way to reduce future flood losses. Collier County, the City of Marco Island and the City of Naples have many open space and natural parcels which serve to reduce future flood losses by remaining open. These parks and natural preserved areas create opportunities for the public to benefit from education and recreation while eliminating potential for future flooding.

### **CRS Credit**

Preserving flood prone areas as open space is one of the highest priorities of the Community Rating System. The credits in the 2013 manual have doubled for OSP (Open Space Preservation). Credit is based on the area of the floodplain that is designated as public undeveloped properties, parks, wildlife refuges, golf courses, or other uses that can be kept vacant through ownership or regulations.

### **Floodplain Regulations**

The National Flood Insurance Program (NFIP) is administered by the Federal Emergency Management Agency (FEMA). As a condition of making flood insurance available for their residents, communities that participate in the NFIP agree to regulate new construction in the area subject to inundation by the 100-year (base) flood. The floodplain subject to these requirements is shown as an A or V Zone on the Flood Insurance Rate Map (FIRM).

There are five major floodplain regulatory requirements. Additional floodplain regulatory requirements may be set by state and local laws.

1) All development in the 100-year floodplain must have a permit from the community. The NFIP regulations define "development" as any manmade change to improved or unimproved real estate, including



but not limited to buildings or other structures, mining, dredging, filling, grading, paving, excavation or drilling operations or storage of equipment or materials.

2) Development along a river or other channel cannot obstruct flows so as to cause an increase in flooding on other properties. An analysis must be conducted to demonstrate that the cumulative effect of the proposed development, when combined with all other existing and anticipated development, will not increase the water surface elevation of the base flood more than one foot at any point within the community.

3) New buildings may be built in the floodplain, but they must be protected from damage from the base flood. In riverine floodplains, the lowest floor of residential buildings must be elevated to be at or above the base flood elevation (BFE). Nonresidential buildings must be either elevated or floodproofed.

4) Under the NFIP, a "substantially improved" building is treated as a new building. The NFIP regulations define "substantial improvement" as any reconstruction, rehabilitation, addition, or other improvement of a structure, the cost of which equals or exceeds 50% of the market value of the structure before the start of construction of the improvement. This requirement also applies to buildings that are substantially damaged.

5) Communities are encouraged to adopt local ordinances that are more comprehensive or provide more protection than the federal criteria. The NFIP's Community Rating System provides insurance premium credits to recognize the additional flood protection benefit of higher regulatory standards.

#### **Local Implementation**

Collier County and the Cities of Marco Island and Naples updated their ordinances after a new Digital Flood Insurance Rate Map (DFIRM) became effective in 2012. The new map is based on updated topographical and hydrological data and now identifies the risk from coastal storm surge flooding as well as rainfall from the coastline to roughly State Route 29. Many areas of the county that had been exempt under previous flood zone mapping (D-Zones) are now included, such as the Golden Gate Estates area up to Immokalee in the northern portion of the County; this area is now largely shown as the AH-Zone. There were also changes in X-Zones, which cover much of the urban area of the County. BFEs range from 8.5 feet along the coast to 37.5 feet further inland.

#### ***Collier County Flood Damage Prevention Ordinance***

Collier County's current Flood Damage Prevention Ordinance was adopted in 2011 and amended in 2013. The ordinance reduces flood losses by:

- Restricting or prohibiting uses which are dangerous to health, safety and property due to water or erosion hazards, which result in damaging increases in erosion or in flood heights and velocities;
- Requiring that uses vulnerable to floods including facilities which serve such uses be protected against flood damage throughout their intended life span;
- Controlling the alteration of natural floodplains, stream channels, and natural protective barriers which are involved in the accommodation of floodwaters;
- Controlling filling, grading, dredging and other development which may increase erosion or flood damage; and
- Preventing or regulating the construction of flood barriers which will unnaturally divert floodwaters or which may increase flood hazards to other lands.

The ordinance requires the following in Special Flood Hazard Areas where base-flood elevation data have been provided:

- **Residential Construction.** New construction and substantial improvement of any residential building (including manufactured home) shall have the lowest floor, including basement, **elevated**

- to no lower than the BFE.** Should solid foundation perimeter walls be used to elevate a structure, there must be a minimum of two openings on different sides of each enclosed area sufficient to facilitate automatic equalization of flood hydrostatic forces in accordance with the ordinance.
- **Non-Residential Construction.** New construction and substantial improvement of any commercial, industrial, or non-residential building (including manufactured home) shall have the lowest floor, including basement, **elevated to no lower than the BFE.** All commercial, industrial, or non-residential buildings located in A-Zones may be floodproofed, in lieu of being elevated.
  - **Enclosures below the Lowest Floor.** New construction and substantial improvements that include fully enclosed areas formed by foundation and other exterior walls below the lowest floor elevation shall be designed to preclude finished living space and designed to **allow for the entry and exit of floodwaters to automatically equalize hydrostatic flood forces on exterior walls.**
    - Designs shall meet or exceed the following minimum criteria:
      - Provide a minimum of two openings on different sides of each enclosed area having a total net area of not less than one square inch for every square foot of enclosed area subject to flooding;
      - The bottom of all openings shall be no higher than one foot above adjacent interior grade (which must be equal to or higher in elevation than the adjacent exterior grade); and
      - Openings may be equipped with screens, louvers, valves, or other coverings or devices provided they provide the required net area of the openings and permit the automatic flow of floodwaters in both directions.
    - Fully enclosed areas below the lowest floor shall solely be used for parking of vehicles, storage, and building access.
    - The interior portion of such enclosed area shall not be finished, partitioned into separate rooms, or temperature-controlled (air conditioned).
  - Adequate drainage paths around structures shall be provided on slopes to guide water away from structures within areas of shallow flooding.
  - Standards for Waterways with established BFEs, but without Regulatory Floodways. Located within the SFHA, where Watercourses exist for which BFE data has been provided by FEMA without the delineation of the Regulatory floodway (Zones AE and A1-30), the following provisions shall also apply.
    - Until a regulatory floodway is designated, no new construction, substantial improvements, or other development, including fill, shall be permitted within the SFHA, unless it is demonstrated that the cumulative effect of the proposed development, when combined with all other existing and anticipated development, will not increase the water surface elevation of the base flood more than one foot at any point within the community.
    - Development activities which increase the water surface elevation of the base flood by more than one foot may be allowed, provided that the developer or applicant first applies — with the community's endorsement — for a conditional FIRM revision, and receives the approval of FEMA.
  - For all structures located **seaward of the Coastal Construction Control Line (CCCL)**, the lowest floor of all new construction and substantial improvements shall be elevated to **no lower than the 100-year flood elevation** established by the Florida Department of Environmental Protection or by FEMA. All non-elevation design requirements of the ordinance shall apply.
  - Accessory structures shall be constructed and placed on the building site so as to offer the minimum resistance to the flow of floodwaters. They shall be firmly anchored to prevent flotation which may result in damage to other structures. Service facilities such as electrical and heating equipment shall be elevated at or above the BFE or floodproofed. Openings to automatically equalize flood

hydrostatic forces on exterior walls during the base flood shall be provided below BFE in conformance with 44 CFR Section 60.3(c)(5).

The ordinance requires specific standards for coastal high hazard areas (V-zones):

- All new construction and substantial improvements in Zones V1-V30, VE, and V (with BFE) shall be elevated on pilings or columns so that:
  - The bottom of the lowest horizontal structural member of the Lowest floor (excluding the pilings or columns) is elevated to no lower than the BFE whether or not the structure contains a basement; and
  - The pile or column foundation and structure attached thereto is anchored to resist floatation, collapse and lateral movement due to the effects of wind and water loads acting simultaneously on all building components. Water loading will be those values associated with the base flood.
  - For all structures located seaward of the CCCL, the bottom of the lowest horizontal structural member of the lowest floor shall be elevated to the 100-year flood elevation established by the Florida Department of Environmental Protection or the BFE, whichever is the higher.
- Obtain the elevation (in relation to Mean sea level NAVD) of the bottom of the lowest horizontal structural member of the lowest floor (excluding pilings and columns) of all new and substantially improved structures.
- All new construction and substantial improvements shall be located landward of the reach of mean high tide.
- All new construction and substantial improvements have the space below the lowest floor either free of obstruction or constructed with non-supporting breakaway walls, open wood lattice-work, or insect screening intended to collapse under wind and water loads without causing collapse, displacement, or other structural damage to the elevated portion of the building or supporting foundation system. Such enclosed space shall be usable solely for parking of vehicles, building access, or storage.
- Prohibit the use of fill for structural support. No development permit shall be issued for Development involving fill in Coastal high hazard areas unless it has been demonstrated through appropriate engineering analyses that the subject fill does not cause any adverse impacts to the Structure on-site or other properties.
- Prohibit man-made alteration of sand dunes and mangrove stands that would increase potential flood damage.
- For all structures located seaward of the CCCL, the bottom of the lowest horizontal structural member of the lowest floor of all new construction and substantial improvements shall be elevated to the flood elevation established by the Florida Department of Environmental Protection or the BFE, whichever is the higher.
- When fill is proposed, in accordance with the permit issued by the Florida Department of Health, in a coastal high hazard area, the development permit shall be issued only upon demonstration by appropriate engineering analyses that the proposed fill will not increase the water surface elevation of the base flood nor cause any adverse impacts to the structure on-site or other properties by wave ramping and deflection.
- Accessory structures must be constructed with flood damage-resistant materials below the BFE and used only for storage. The structural system shall utilize pilings, adequately embedded to resist scour and lateral deflection. The lowest horizontal structural member of roof systems, including

plates and beams connecting the upright supports of the structure, shall be placed at or above the BFE. Any small accessory structure enclosure below the BFE shall be constructed with breakaway walls.

Other standards in the ordinance address manufactured homes and recreational vehicles, A-zones without base flood elevations and regulatory floodways, and subdivision requirements.

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***Marco Island Floodplain Management Ordinance (amended 2012)***

***Naples Flood Floodplain Management Ordinance (amended 2012)***

The ordinances for the Cities of Marco Island and Naples generally contain the same language, including the following requirements for flood resistant development:

- Design and construction of buildings, structures and facilities exempt from the Florida Building Code shall be designed and constructed in accordance with the flood load and flood resistant construction requirements of ASCE 24.
- If extending, in whole or in part, seaward of the coastal construction control line (CCCL) and also located in whole or in part, in a flood hazard area:
  - Buildings and structures shall be designed and constructed to comply with the more restrictive applicable requirements of the Florida Building Code, Building Section 3109 and Section 1612 or Florida Building Code, Residential Section R322
  - Minor structures and non-habitable major structures are defined in F.S. § 161.54, shall be designed and constructed to comply with the intent and applicable provisions of this article and ASCE 24.
- All public utilities and facilities such as sewer, gas, electric, communications, and water systems shall be located and constructed to minimize or eliminate flood damage.
- All new and replacement sanitary sewage facilities, private sewage treatments plants (including all pumping stations and collector systems), and on-site waste disposal systems shall be designed in accordance with the standards for onsite sewage treatment and disposal systems in Chapter 64E-6, F.A.C. and ASCE 24 Chapter 7 to minimize and eliminate infiltration of floodwaters into the facilities and discharge from the facilities into floodwaters, and impairment of the facilities and systems.
- All new and replacement water supply facilities shall be designed in accordance with the water well construction standards in Chapter 62-532.500, F.A.C. and ASCE 24 Chapter 7 to minimize or eliminate infiltration of floodwaters into the system.
- *Limitations on sites in regulatory floodways.* No development, including but not limited to site improvements, and land disturbing activity involving fill or re-grading, shall be authorized in the regulatory floodway unless the floodway encroachment analysis demonstrates that the proposed development or land disturbing activity will not result in any increase in the base flood elevation.
- *Limitations on placement of fill.* Subject to the limitations of this article, fill shall be designed to be stable under conditions of flooding including rapid rise and rapid drawdown of floodwaters, prolonged inundation, and protection against flood-related erosion and scour. In addition to these requirements, if intended to support buildings and structures (Zone A only), fill shall comply with the requirements of the Florida Building Code.

- *Limitations on sites in coastal high hazard areas (Zone V).* In coastal high hazard areas, alteration of sand dunes and mangrove stands shall be permitted only if such alteration is approved by the Florida Department of Environmental Protection and only if the engineering analysis required by this article demonstrates that the proposed alteration will not increase the potential for flood damage. Construction or restoration of dunes under or around elevated buildings and structures shall comply with this article.
- *Other development.*
  - All development, including man-made changes to improved or unimproved real estate for which specific provisions are not specified in this article or the Florida Building Code, shall:
    - Be located and constructed to minimize flood damage.
    - Be anchored to prevent flotation, collapse or lateral movement resulting from hydrostatic loads, including the effects of buoyancy, during conditions of design flood;
    - Be constructed of flood-damage resistant materials; and
    - Have mechanical, plumbing, and electrical systems above the design flood elevation, except that minimum electric service required to address life safety and electric code requirements is permitted below design flood elevation provided it conforms to the provisions of the electrical part of building code for wet locations.
  - All new development and substantial improvements shall be located landward of the reach of mean high tide.
  - *Other development in coastal high hazard areas (Zone V).* Development activities other than building and structures shall be permitted only if also authorized by the appropriate state or local authority; if located outside the footprint of, and not structurally attached to buildings and structures; and if analyses prepared by qualified registered design professionals demonstrate no harmful diversion of floodwaters or wave run-up and wave reflection that would increase damage to adjacent buildings and structures. Such other development activities include but are not limited to:
    - Bulkheads, seawalls, retaining walls, revetments, and similar erosion control structures.
    - Solid fences and privacy walls, and fences prone to trapping debris, unless designed and constructed to fail under flood conditions less than the design flood or otherwise function to avoid obstruction of floodwaters; and
    - On-site sewage treatment and disposal systems defined in 64E-6.002 F.A.C., as filled systems or mound systems.
  - *Nonstructural fill in coastal high hazard areas (Zone V).* In coastal high hazard areas:
    - The use of fill for structural support is prohibited.
    - Minor grading and placement of minor quantities of nonstructural fill shall be permitted for landscaping and for drainage purposes under and around buildings.

- Nonstructural fill with finished slopes that are steeper than one unit vertical to five units horizontal shall be permitted only if an analysis prepared by a qualified registered design professional demonstrates no harmful diversion of floodwaters or wave run-up and wave reflection that would increase damage to adjacent buildings and structures.
- Where authorized by the Florida Department of Environmental Protection or applicable local approval, sand dune construction and restoration of sand dunes under or around elevated buildings are permitted without additional engineering analysis or certification of the diversion of floodwater or wave run-up and wave reflection if the scale and location of the dune work is consistent with local beach-dune morphology and the vertical clearance is maintained between the top of the sand dune and the lowest horizontal structural member.
- *Other restrictions in coastal high hazard areas (Zone V).* Single story detached garages and accessory buildings are prohibited.

The cities' ordinances also address tanks (above and underground), subdivision requirements, and other development (e.g. fences, septic systems, permanent erosion control structures, parking pads, decks, and patios) in coastal high hazard areas.

#### **CRS Credit**

Collier County, Marco Island and Naples currently receive credit for Activity 430 – Higher Regulatory Standards. This credit is provided for enforcing regulations that require freeboard for new and substantial improvement construction, cumulative substantial improvement, lower substantial improvement, other higher regulatory standards, and state mandated regulatory standards. Credit is also provided for BCEGS classifications, staff education and certifications of floodplain managers.

#### **Reducing Future Flood Losses**

Examples of additional higher regulatory approaches and the benefits they could provide to Collier County, Marco Island and Naples include:

- Requiring compensatory storage preserves areas of the floodplain that can store flood water and minimizes increases in flood heights due to development
- Requiring the lowest floors of residences to be higher than the base flood elevation protects buildings from higher floods
- Requiring full compliance with floodplain management regulations when proposed improvements or repairs are less than 50% of a building's value brings more nonconforming buildings up to current flood protection standards
- Protecting critical facilities to higher levels reduces damage to those facilities and improves the community's ability to respond to the needs of citizens during a disaster
- Standards for protecting buildings from local drainage problems reduce flood losses and flood insurance claims, especially outside the floodplain
- Requiring new manufactured housing in existing manufactured housing parks to meet the same level of protection as is required for other new buildings reduces flood losses and flood insurance claims
- Requiring new construction in the coastal A Zone to meet the same standards as V Zone buildings protects it from a known, but unmapped, breaking wave hazard

## **Stormwater Management**

Stormwater runoff is increased when natural ground cover is replaced by urban development. Development in the watershed that drains to a river can aggravate downstream flooding, overload the community's drainage system, cause erosion, and impair water quality.

There are three ways to prevent flooding problems caused by stormwater runoff:

- 1) Regulating development in the floodplain to ensure that it will be protected from flooding and that it won't divert floodwaters onto other properties, and
- 2) Regulating all development to ensure that the post-development peak runoff will not be greater than it was under pre-development conditions.
- 3) Set construction standards so buildings are protected from shallow water.

### **Local Implementation**

A County-wide Stormwater Master Plan was prepared in 1988. The Master Plan reflected a broad watershed planning philosophy, as well as a scope of service for detailed individual basin studies with a multi-disciplinary objective of appropriate land use and natural resource management as well as traditional flood protection. The Master Plan study was used to develop the Drainage Sub-Element of the County's Growth Management Plan, which was updated in 2013. The City of Marco Island also addresses stormwater management in its comprehensive plan (the Stormwater Management Sub-Element). The City of Naples has a stand-alone Stormwater Master Plan that was updated in 2007. The purpose of the plan is to compile existing stormwater data, alternative analyses, cost, and recommendations into a master plan with focus on improving flood control, improving pollution control, and improving Naples Bay on a regional level.

The development of Watershed Management Plans (WMPs) is specifically recommended in Collier County's Growth Management Plan. WMP goals include addressing the effects on natural floodplains, stream channels, native vegetative communities and natural protective barriers which are involved in the accommodation of flood waters and identifying non-structural methods of surface water management, such as the following specific initiatives that are included in the WMP that has been completed to date:

- Low Impact Development (LID) Program
- Stormwater Retrofit Program
- Fee-Based Stormwater Utility Incentive Program
- Allowable Maximum Site Discharges
- Stormwater Runoff Volume Control
- Verification of No Floodplain Impact
- Flood Protection Levels of Service (FPLOS) Criteria
- Golden Gate Estates Transfer of Development
- Rights Program
- Golden Gate Estates Watershed Mitigation Program
- Modified Operations of Water Control Structures
- Stormwater System Maintenance and Certification

### **Reducing Future Flood Losses**

Stormwater management and the requirement that post development runoff cannot exceed pre-development conditions is a great way to prevent future flood losses. Low Impact Development (LID) credits the

community's regulatory language that requires the implementation of LID techniques when new development occurs. LID techniques can significantly reduce or eliminate the increase in stormwater runoff created by traditional development, encourage aquifer recharge, and promote better water quality. Communities are encouraged to use these techniques to minimize the need for more traditional stormwater management.

### **CRS Credit**

Collier County, Marco Island and Naples currently receive credit for Activity 450 – Stormwater Management. The community enforces regulations for stormwater management, watershed master planning, soil and erosion control and water quality.

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### **Prevention Measures Recommendations:**

- Collier County, Marco Island and Naples should continue to maintain or work to improve their BCEGS ratings.
- Collier County, Marco Island and Naples should consider adding additional higher regulatory standards to flood damage prevention ordinances.
- Collier County, Marco Island and Naples should consider implementing LID principles and practices to new development, redevelopment and retrofits to existing development.
- Collier County, Marco Island and Naples should continue to identify “conservation” lands with no development allowed in those designated areas.

### **B.4.2 Property Protection Measures**

Property protection measures are used to modify buildings or property subject to damage. Property protection measures fall under three approaches:

- Modify the site to keep the hazard from reaching the building,
- Modify the building (retrofit) so it can withstand the impacts of the hazard, and
- Insure the property to provide financial relief after the damage occurs.

Property protection measures are normally implemented by the property owner, although in many cases technical and financial assistance can be provided by a government agency.

### **Keeping the Hazard Away**

Generally, natural hazards do not damage vacant areas. As noted earlier, the major impact of hazards is to people and improved property. In some cases, properties can be modified so the hazard does not reach the damage-prone improvements. For example, a berm can be built to prevent floodwaters from reaching a house.

### **Flooding**

There are five common methods to keep a flood from reaching and damaging a building:

- Erect a barrier between the building and the source of the flooding.
- Move the building out of the floodprone area.
- Elevate the building above the flood level.
- Demolish the building.
- Replace the building with a new one that is elevated above the flood level.



## **Barriers**

A flood protection barrier can be built of dirt or soil (a "berm") or concrete or steel (a "floodwall"). Careful design is needed so as not to create flooding or drainage problems on neighboring properties. Depending on how porous the ground is, if floodwaters will stay up for more than an hour or two, the design needs to account for leaks, seepage of water underneath, and rainwater that will fall inside the perimeter. This is usually done with a sump or drain to collect the internal groundwater and surface water and a pump and pipe to pump the internal drainage over the barrier.

Barriers can only be built so high. They can be overtopped by a flood higher than expected. Barriers made of earth are susceptible to erosion from rain and floodwaters if not properly sloped, covered with grass, and properly maintained. A berm can also settle over time, lowering its protection level. A floodwall can crack, weaken, and lose its watertight seal. Therefore, barriers need careful design and maintenance (and insurance on the building, in case of failure).

## **Relocation**

Moving a building to higher ground is the surest and safest way to protect it from flooding. While almost any building can be moved, the cost increases for heavier structures, such as those with exterior brick and stone walls, and for large or irregularly shaped buildings. However, experienced building movers can handle any job. In areas subject to flash flooding, deep waters, or other high hazard, relocation is often the only safe approach. Relocation is also preferred for large lots that include buildable areas outside the floodplain or where the owner has a new flood-free lot (or portion of the existing lot) available.

## **Building Elevation**

Raising a building above the flood level can be almost as effective as moving it out of the floodplain. Water flows under the building, causing little or no damage to the structure or its contents. Raising a building above the flood level is cheaper than moving it and can be less disruptive to a neighborhood. Elevation has proven to be an acceptable and reasonable means of complying with floodplain regulations that require new, substantially improved, and substantially damaged buildings to be elevated above the base flood elevation.

## **Demolition**

Some buildings, especially heavily damaged or repetitively flooded ones, are not worth the expense to protect them from future damages. It is cheaper to demolish them and either replace them with new, flood protected structures, or relocate the occupants to a safer site. Demolition is also appropriate for buildings that are difficult to move - such as larger, slab foundation or masonry structures - and for dilapidated structures that are not worth protecting. Generally, demolition projects are undertaken by a government agency, so the cost is not borne by the property owner, and the land is converted to public open space use, like a park.

## **Pilot Reconstruction**

If a building is not in good shape, elevating it may not be worthwhile or it may even be dangerous. An alternative is to demolish the structure and build a new one on the site that meets or exceeds all flood protection codes. FEMA funding programs refer to this approach as "pilot reconstruction." It is still a pilot program, and not a regularly funded option. Certain rules must be followed to qualify for federal funds for pilot reconstruction:

- Pilot reconstruction is only possible after it has been shown that acquisition or elevation are not feasible, based on the program's criteria.

- Funds are only available to people who owned the property at the time of the event for which funding is authorized.
- It must be demonstrated that the benefits exceed the costs.
- The new building must be elevated to the advisory base flood elevation.
- The new building must not exceed more than 10% of the old building's square footage.
- The new building must meet all flood and wind protection codes.
- There must be a deed restriction that states the owner will buy and keep a flood insurance policy.
- The maximum federal grant is 75% of the cost, up to \$150,000. FEMA is developing a detailed list of eligible costs to ensure that disaster funds are not used to upgrade homes.

### **Local Implementation**

Collier County and Marco Island do not currently receive credit for Activity 520 – Acquisition and Relocation or Activity 530 – Flood Protection. Naples does not currently receive credit for Activity 520, but does receive credit for Activity 530.

### **CRS Credit**

The CRS provides the most credit points for acquisition and relocation under Activity 520, because this measure permanently removes insurable buildings from the floodplain. The CRS credits barriers and elevating existing buildings under Activity 530. Elevating a building above the flood level will also reduce the flood insurance premiums on that individual building. Because barriers are less secure than elevation, not as many points are provided. Higher scores are possible, but they are based on the number of buildings removed compared to the number remaining in the floodplain.

## **Retrofitting**

An alternative to keeping the hazard away from a building is to modify or retrofit the site or building to minimize or prevent damage. There are a variety of techniques to do this, as described below.

### ***Dry Floodproofing***

Dry floodproofing means making all areas below the flood protection level watertight. Walls are coated with waterproofing compounds or plastic sheeting. Openings, such as doors, windows and vents, are closed, either permanently, with removable shields, or with sandbags. Dry floodproofing of new and existing nonresidential buildings in the regulatory floodplain is permitted under state, FEMA and local regulations. Dry floodproofing of existing residential buildings in the floodplain is also permitted as long as the building is not substantially damaged or being substantially improved. Owners of buildings located outside the regulatory floodplain can always use dry floodproofing techniques.

Dry floodproofing is only effective for shallow flooding, such as repetitive drainage problems. It does not protect from the deep flooding along lakes and larger rivers caused by hurricanes or other storms.

### ***Wet Floodproofing***

The alternative to dry floodproofing is wet floodproofing: water is let in and everything that could be damaged by a flood is removed or elevated above the flood level. Structural components below the flood level are replaced with materials that are not subject to water damage. For example, concrete block walls are used instead of wooden studs and gypsum wallboard. The furnace, water heater and laundry facilities are permanently relocated to a higher floor. Where the flooding is not deep, these appliances can be raised on blocks or platforms.

### **Local Implementation**

Naples currently receives credit for Activity 530 – Flood Protection. Collier County and Marco Island do not currently receive credit for this activity.

### **CRS Credit**

The credit for Activity 530 is based on the number of insurable buildings in the regulatory floodplain that have been retrofitted since the date of the community's original Flood Insurance Rate Map (FIRM). For the purposes of this activity, an accessory structure such as a garage or shed is not counted as an insurable building. Extra credit is given for protecting buildings on FEMA's repetitive loss list and for protecting buildings that are critical facilities. Flood protection techniques that are recognized by this activity include retrofitting projects and structural flood control projects. The credit points are based on the effectiveness of the technique in preventing flood damage.

### **Insurance**

Technically, insurance does not mitigate damage caused by a natural hazard. However, it does help the owner repair, rebuild, and hopefully afford to incorporate some of the other property protection measures in the process. Insurance offers the advantage of protecting the property, as long as the policy is in force, without requiring human intervention for the measure to work.

### ***Private Property***

Although most homeowner's insurance policies do not cover a property for flood damage, an owner can insure a building for damage by surface flooding through the NFIP. Flood insurance coverage is provided for buildings and their contents damaged by a "general condition of surface flooding" in the area. Most people purchase flood insurance because it is required by the bank when they get a mortgage or home improvement loan. Usually these policies just cover the building's structure and not the contents. Contents coverage can be purchased separately. Renters can buy contents coverage, even if the owner does not buy structural coverage on the building. Most people don't realize that there is a 30-day waiting period to purchase a flood insurance policy and there are limits on coverage.

### ***Public Property***

Governments can purchase commercial insurance policies. Larger local governments often self-insure and absorb the cost of damage to one facility, but if many properties are exposed to damage, self-insurance can drain the government's budget. Communities cannot expect federal disaster assistance to make up the difference after a flood.

Under Section 406(d) of the Stafford Act:

"If an eligible insurable facility damaged by flooding is located in a [mapped floodplain] ... and the facility is not covered (or is underinsured) by flood insurance on the date of such flooding, FEMA is required to reduce Federal disaster assistance by the maximum amount of insurance proceeds that would have been received had the buildings and contents been fully covered under a National Flood Insurance Program (NFIP) standard flood insurance policy. [Generally, the maximum amount of proceeds for a non-residential property is \$500,000.]

[Communities] Need to:

- Identify all insurable facilities, and the type and amount of coverage (including deductibles and policy limits) for each. The anticipated insurance proceeds will be deducted from the total eligible damages to the facilities.
- Identify all facilities that have previously received Federal disaster assistance for which insurance was required. Determine if insurance has been maintained. A failure to maintain the required

insurance for the hazard that caused the disaster will render ineligible for Public Assistance funding...

- [Communities] must obtain and maintain insurance to cover [their] facility - buildings, equipment, contents and vehicles - for the hazard that caused the damage in order to receive Public Assistance funding. Such coverage must, at a minimum, be in the amount of the eligible project costs. FEMA will not provide assistance for that facility in future disasters if the requirement to purchase insurance is not met. - FEMA Response and Recovery Directorate Policy No. 9580.3, August 23, 2000
- In other words, the law expects public agencies to be fully insured as a condition of receiving federal disaster assistance.

### **Local Implementation**

Flood insurance information for the Town is provided in Section 4.3.4. A Program for Public Information is proposed as a new mitigation action for 2015.

### **CRS Credit**

There is no credit for purchasing flood insurance, but the CRS does provide credit for local public information programs that explain flood insurance to property owners. Collier County, Marco Island and Naples all currently receive credit for Activity 330 – Outreach Projects.

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### **Property Protection Measures Conclusions:**

- There are several ways to protect properties from flood damage. The advantages and disadvantages of each should be carefully examined for that particular situation.
- Property owners can implement some property protection measures at little cost, especially for sites in areas of low level flooding.
- The local government can promote and support property protection through outreach and financial incentives.
- Property protection measures can protect the most flood-prone buildings in the County such as those which are repetitively flooded.

### **Property Protection Measures Recommendations:**

- Encourage homeowners to take responsibility for protecting their own properties by providing retrofitting advice and assistance.
- Encourage the promotion of flood insurance to increase the policy base in Collier County, Marco Island and Naples.
- Develop a Program for Public Information involving Collier County, Marco Island and Naples.
- Target Repetitive loss properties by leveraging, local, state, and federal funding opportunities.

## **B.4.3 Natural Resource Protection**

Resource protection activities are generally aimed at preserving (or in some cases restoring) natural areas. These activities enable the naturally beneficial functions of fields, floodplains, wetlands, and other natural lands to operate more effectively. Natural and beneficial functions of watersheds, floodplains and wetlands include:

- Reduction in runoff from rainwater and snow melt in pervious areas
- Infiltration that absorbs overland flood flow
- Removal and filtering of excess nutrients, pollutants and sediments

- Storage of floodwaters
- Absorption of flood energy and reduction in flood scour
- Water quality improvement
- Groundwater recharge
- Habitat for flora and fauna
- Recreational and aesthetic opportunities

As development occurs, many of the above benefits can be achieved through regulatory steps for protecting natural areas or natural functions. This section covers the resource protection programs and standards that can help mitigate the impact of natural hazards, while they improve the overall environment. Seven areas are reviewed:

- Wetland protection
- Erosion and sedimentation control
- Stream restoration
- Best management practices
- Dumping regulations
- Urban forestry
- Farmland protection

### **Wetland Protection**

Wetlands are often found in floodplains and topographically depressed areas of a watershed. Many wetlands receive and store floodwaters, thus slowing and reducing downstream flows. They also serve as a natural filter, which helps to improve water quality, and they provide habitat for many species of fish, wildlife and plants.

#### **Local Implementation**

Goal 6 of the Conservation and Coastal Management Element of the County's Comprehensive Growth Management Plan is to "identify, protect, conserve and appropriately use its native vegetative communities and wildlife habitat. Objective 6.2 under this goal is to protect and conserve wetlands and the natural functions of wetlands. As the principal regulatory tool for implementing the objectives and policies in the Growth Management Plan, the County's Land Development Code contains wetland protection and preservation standards.

Goal 1 of the Conservation and Coastal Management Element of the City of Marco Island's Comprehensive Growth Management Plan is to continue to protect, promote, and enhance the coastal and natural resources in and around the Marco Island community through prudent management, public education, appropriate regulations and enforcement, and active partnerships with all other interested parties. Objective 1.8 under this goal is to ensure identified and potential wetlands are protected from unlawful, intrusive actions which could result in environmental damage or degradation. The Plan contains 12 policies and measurement criteria to meet this Objective. The City of Marco Island's Land Development Code contains wetland protection standards that implement the GMP policies and objectives.

Goal 1 of the Conservation and Coastal Management Element of the City of Naples Comprehensive Plan is to preserve, protect, and, where necessary, restore or enhance the resources of the City's coastal zone. Policy 1-8 under this goal is to continue to implement the Naples Land Conservation Program using the Naples Land Conservation Trust Fund to acquire lands for conservation, preservation, restoration and maintenance of vital and significant resources and their biodiversity. These lands include: threatened natural

lands, forest, upland and wetland communities, environmentally sensitive lands, lands that have been altered but are capable of being restored, improved or unimproved lands that may be useful and lands that contain conservation easements, scenic easements or any other similar designations, located within and adjacent to the City, for the benefit of present and future generations. The City of Naples's Land Development Code contains wetland protection standards that implement the GMP policies and objectives.

### **CRS Credit**

There is credit for preserving open space in its natural condition or restored to a state approximating its natural condition. The credit is based on the percentage of the floodplain that can be documented as wetlands protected from development by ownership or local regulations. Collier County, Marco Island and Naples currently receive credit for Activity 420 – Open Space Preservation.

### **Erosion and Sedimentation Control**

Construction sites typically contain large areas of bare exposed soil. Surface water runoff can erode soil from these sites, sending sediment into downstream waterways. Erosion also occurs along stream banks and shorelines as the volume and velocity of flow or wave action destabilize and wash away the soil.

Sediment suspended in the water tends to settle out where flowing water slows down. This can clog storm drains, drain tiles, culverts and ditches and reduce the water transport and storage capacity of river and stream channels, lakes and wetlands. When channels are constricted and flooding cannot deposit sediment in the bottomlands, even more sediment is left in the channels. The result is either clogged streams or increased dredging costs.

Not only are the drainage channels less able to perform their job, but the sediment in the water reduces light, oxygen and water quality, and often carries chemicals, heavy metals and other pollutants. Sediment has been identified by the US EPA as the nation's number one nonpoint source pollutant for aquatic life.

There are two principal strategies to address these problems: minimize erosion and control sedimentation. Techniques to minimize erosion include phased construction, minimal land clearing, and stabilizing bare ground as soon as possible with vegetation and other soil stabilizing practices.

If erosion occurs, other measures are used to capture sediment before it leaves the site. Silt fences, sediment traps and vegetated filter strips are commonly used to control sediment transport. Runoff from the site can be slowed down by terraces, contour strip farming, no-till farm practices, hay or straw bales, constructed wetlands, and impoundments (e.g., sediment basins and farm ponds). Slowing surface water runoff on the way to a drainage channel increases infiltration into the soil and reduces the volume of topsoil eroded from the site.

Erosion and sedimentation control regulations mandate that these types of practices be incorporated into construction plans. The most common approach is to require applicants for permits to submit an erosion and sediment control plan for the construction project. This allows the applicant to determine the best practices for the site.

### **Local Implementation**

Since June 2003 all sites disturbing 1 or more acres must have an "NPDES Construction General Permit" through the Florida Department of Environmental Protection. FDEP has been delegated authority by the EPA to administer and enforce the program. A Notice of Intent (NOI) must be filed with FDEP, and a copy of the NOI must be sent to Collier County Engineering Services Department at least 2 days before ground breaking for construction. Collier County also regulates and enforces control of sediment and other

pollutants on construction sites under County Land Development Code, Division 3 with provision for site compliance inspections. Unlike the NPDES permit, County enforcement includes sites disturbing under 1 acre.

### **CRS Credit**

Credit is available for the Erosion and Sediment Control (ESC) element under Activity 450 if the community requires that erosion and sediment control measures be taken on land that is disturbed during development. To receive ESC credit, the community's regulations must apply to all construction sites within the community. Collier County, Marco Island and Naples do currently receive credit under the ESC element for Activity 450 – Stormwater Management.

### **Stream Restoration**

There is a growing movement that has several names, such as "stream conservation," "bioengineering," or "riparian corridor restoration." The objective of these approaches is to return streams, stream banks and adjacent land to a more natural condition, including the natural meanders. Another term is "ecological restoration," which restores native indigenous plants and animals to an area.

A key component of these efforts is to use appropriate native plantings along the banks that resist erosion. This may involve retrofitting the shoreline with willow cuttings, wetland plants, or rolls of landscape material covered with a natural fabric that decomposes after the banks are stabilized with plant roots.

In all, restoring the right vegetation to a stream has the following advantages:

- Reduces the amount of sediment and pollutants entering the water
- Enhances aquatic habitat by cooling water temperature
- Provides food and shelter for both aquatic and terrestrial wildlife
- Can reduce flood damage by slowing the velocity of water
- Increases the beauty of the land and its property value
- Prevents property loss due to erosion
- Provides recreational opportunities, such as hunting, fishing and bird watching
- Reduces long-term maintenance costs

### **Local Implementation**

The following restoration based goals can be found in the community's Comprehensive Growth Management Plan. Each goal has supporting objectives and policies upon which regulations can be based:

#### **Collier County Conservation and Coastal Management Element**

- To plan for the protection, conservation, management and appropriate use of the county's natural resources.
- To protect the county's surface and estuarine water resources.
- To conserve, protect and appropriately manage the county's fresh water resources.
- To protect, conserve and appropriately use the county's mineral and soil resources.
- To identify, protect, conserve and appropriately use the county's native vegetative communities and wildlife habitat.
- To appropriately manage hazardous materials and waste to protect the county's populous and natural resources and to ensure the highest environmental quality.

#### **City of Marco Island Conservation and Coastal Management Element**

- To conserve and manage the environmental resources and man-made uses in the coastal area of Marco Island.
- To conserve and manage the environmental resources and man-made uses in the coastal area of Marco Island.

#### City of Naples Conservation and Coastal Management Element

- Preserve, protect, and, where necessary, restore or enhance the resources of the coastal zone. Permit non-destructive uses of coastal resources only upon consideration of ecological, historical, cultural, and aesthetic factors, as well as the protection of human life and the limitation of public expenditures in areas subject to destruction by natural disasters.

The Land Development Code Ordinances for Collier County, Marco Island and Naples contain natural resource protection and preservation standards which prevent vegetation removal and require setbacks and buffers. The Land Development Code is used to implement the policies and objectives set forth in the Growth Management Plan.

#### CRS Credit

Collier County, Marco Island and Naples currently receive credit for Activity 420 – Open Space Preservation. The CRS provides credit for preserving open space in its natural condition or restored to a state approximating its natural condition. There are also credits for channel setbacks, buffers and protecting shorelines.

#### **Best Management Practices**

Point source pollutants come from pipes such as the outfall of a municipal wastewater treatment plant. They are regulated by the US EPA. Nonpoint source pollutants come from non-specific locations and harder to regulate. Examples of nonpoint source pollutants are lawn fertilizers, pesticides, other chemicals, animal wastes, oils from street surfaces and industrial areas, and sediment from agriculture, construction, mining and forestry. These pollutants are washed off the ground's surface by stormwater and flushed into receiving storm sewers, ditches and streams.

The term "best management practices" (BMPs) refers to design, construction and maintenance practices and criteria that minimize the impact of stormwater runoff rates and volumes, prevent erosion, protect natural resources and capture nonpoint source pollutants (including sediment). They can prevent increases in downstream flooding by attenuating runoff and enhancing infiltration of stormwater. They also minimize water quality degradation, preserve beneficial natural features onsite, maintain natural base flows, minimize habitat loss, and provide multiple usages of drainage and storage facilities.

#### Local Implementation

Collier County's stormwater collection system (called a Municipal Separate Storm Sewer System, or MS4) is covered under an NPDES Phase II MS4 Stormwater Permit (Permit ID FLR04E037). Elements of the Permit require the County to have a "Stormwater Management Program" (SWMP) that reasonably attempts to prevent pollution from entering the stormwater collection system from non-point sources. Elements of the NPDES SWMP cover 6 Minimum Control Measures (MCM). Each MCM has BMPs with measurable goals, schedule for implementation and completion. Construction site BMPs are required as part of the NPDES Construction General Permit on all sites disturbing 1 or more acres. Collier County also regulates and enforces control of sediment and other pollutants on construction sites under County Land Development Code, Division 3 with provision for site compliance inspections.



The City of Naples is also covered under an NPDES Phase II MS4 Stormwater Permit (Permit ID FLR04E080) which is managed under the City's Streets and Stormwater Department. Construction site BMPs are required as part of the NPDES Construction General Permit on all sites disturbing 1 or more acres. Furthermore, the City's Stormwater Ordinance establishes BMP guidelines in order to meet established pollutant removal standards as well as retention and detention standards in order to reduce the volume of stormwater runoff.

### **CRS Credit**

Collier County, Marco Island and Naples do currently receive credit under the Water Quality (WQ) element for Activity 450 – Stormwater Management. To receive WQ credit, under Activity 450, the community's stormwater management regulations must either specify one or more measures or refer to BMPs as published in an official government reference.

### **Dumping Regulations**

BMPs usually address pollutants that are liquids or are suspended in water that are washed into a lake or stream. Dumping regulations address solid matter, such as shopping carts, appliances and landscape waste that can be accidentally or intentionally thrown into channels or wetlands. Such materials may not pollute the water, but they can obstruct even low flows and reduce the channels' and wetlands' abilities to convey or clean stormwater.

Many cities have nuisance ordinances that prohibit dumping garbage or other "objectionable waste" on public or private property. Waterway dumping regulations need to also apply to "non-objectionable" materials, such as grass clippings or tree branches, which can kill ground cover or cause obstructions in channels. Regular inspections to catch violations should be scheduled.

Many people do not realize the consequences of their actions. They may, for example, fill in the ditch in their front yard without realizing that is needed to drain street runoff. They may not understand how regarding their yard, filling a wetland, or discarding leaves or branches in a watercourse can cause a problem to themselves and others. Therefore, a dumping enforcement program should include public information materials that explain the reasons for the rules as well as the penalties.

### **Local Implementation**

Collier County, Marco Island and Naples do have ordinances in place which make it unlawful for anyone to deposit waste, grass, weeds, brush or other refuse in any street, ditch or watercourse, or on others' property, or on public property. It is also illegal to dispose of certain wastes in public sewers.

### **CRS Credit**

Collier County, Marco Island and Naples do currently receive credit for Activity 540 – Drainage System Maintenance. Credit is provided under the Stream Dumping Regulations (SDR) element if the community has and publicizes regulations prohibiting dumping in streams and ditches.

### **Farmland Protection**

Farmland protection is an important piece of comprehensive planning and zoning throughout the United States. The purpose of farmland protection is to provide mechanisms for prime, unique, or important agricultural land to remain as such, and to be protected from conversion to nonagricultural uses.

Frequently, farm owners sell their land to residential or commercial developers and the property is converted to non-agricultural land uses. With development comes more buildings, roads and other

infrastructure. Urban sprawl occurs, which can lead to additional stormwater runoff and emergency management difficulties.

Farms on the edge of cities are often appraised based on the price they could be sold for to urban developers. This may drive farmers to sell to developers because their marginal farm operations cannot afford to be taxed as urban land. The Farmland Protection Program in the United States Department of Agriculture's 2002 Farm Bill (Part 519) allows for funds to go to state, tribal, and local governments as well as nonprofit organizations to help purchase easements on agricultural land to protect against the development of the land. Eligible land includes cropland, rangeland, grassland, pastureland, or forest land that is part of an agricultural operation. Certain lands within historical or archaeological resources are also included.

The hazard mitigation benefits of farmland protection are similar to those of open space preservation:

- Farmland is preserved for future generation,
- Farmland in the floodplain keeps damageable structures out of harm's way
- Farmland keeps more stormwater on site and lets less stormwater runoff downstream
- Rural economic stability and development is sustained
- Ecosystems are maintain, restored or enhanced
- The rural character and scenic beauty of the area is maintained

#### **Local Implementation**

The Rural Land Stewardship Area (RLSA) program was established by Collier County's Land Development Code 4.08.00 in conformity with the Growth Management Plan. The purpose of the program is to encourage smart growth patterns in rural areas of the county per the GMP. Collier County's objective is to create an incentive based land use overlay system, referred to as the Collier County Rural Lands Stewardship Area Overlay, based on the principles of rural land stewardship as defined in Chapter 163.3177.(11), Florida Statutes. Group 2 Policies protect agricultural lands from premature conversion to other uses and continue the viability of agricultural production through the Collier County Rural Lands Stewardship Area Overlay.

According to the Future Land Use Element of the City of Naples Growth Management Plan, there is no agricultural land within the City.

#### **CRS Credit**

Collier County, Marco Island and Naples do currently receive credit for Activity 420 – Open Space Preservation. The CRS provides credit for preserving open space in its natural condition or restored to a state approximating its natural condition.

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#### **Natural Resource Protection Measures Conclusions:**

- A hazard mitigation program can use resource protection programs to support protecting natural features that can mitigate the impacts of flooding.
- Collier County, Naples and Marco Island ordinances prohibit illicit discharges into public drainage areas or onto public or private property.
- Preserving open space and natural areas will serve to benefit the natural resource areas and protect natural occurring processes and help to protect certain species of plants and animals.

#### **Natural Resource Protection Measures Recommendations**

- Collier County, Marco Island and Naples should identify additional parcels that will not be well suited for development and encourage a public/private partnership to maintain them as open space.

- Collier County, Marco Island and Naples should target outreach to its residents on the benefits of natural resource protection including nonpoint source pollution prevention.
- Collier County, Marco Island and Naples should require landscaper certification and require that landscapers be registered with the community.

#### **B.4.4 Emergency Services Measures**

Emergency services measures protect people during and after a disaster. A good emergency management program addresses all hazards, and it involves all local government departments. At the state level, emergency services programs are coordinated by the Florida Department of Emergency Management (FDEM). Locally, Collier County's emergency services are coordinated by the Collier County Emergency Management Department and Bureau of Emergency Services.

This section reviews emergency services measures following a chronological order of responding to an emergency. It starts with identifying an impending problem (threat recognition) and continues through post-disaster activities.

#### **Threat Recognition**

The first step in responding to a flood is to know when weather conditions are such that an event could occur. With a proper and timely threat recognition system, adequate warnings can be disseminated.

The National Weather Service (NWS) is the prime agency for detecting meteorological threats. Severe weather warnings are transmitted through NOAA's Weather Radio System. Local emergency managers can then provide more site-specific and timely recognition after the Weather Service issues a watch or a warning. A flood threat recognition system predicts the time and height of a flood crest. This can be done by measuring rainfall, soil moisture, and stream flows upstream of the community and calculating the subsequent flood levels.

On smaller rivers and streams, locally established rainfall and river gauges are needed to establish a flood threat recognition system. The NWS may issue a "flash flood watch." This is issued to indicate current or developing hydrologic conditions that are favorable for flash flooding in and close to the watch area, but the occurrence is neither certain nor imminent. These events are so localized and so rapid that a "flash flood warning" may not be issued, especially if no remote threat recognition equipment is available. In the absence of a gauging system on small streams, the best threat recognition system is to have local personnel monitor rainfall and stream conditions. While specific flood crests and times will not be predicted, this approach will provide advance notice of potential local or flash flooding.

#### **Local Implementation**

Flood Threat Recognition comes to the Emergency Management Department via several sources:

1. Through the National Weather Service Office via its products: Flash Flood Warning and Flood Warning. The difference between "Flash Flood" and "Flood" is that the first is for flooding which occurs within 6 hours of the causative event (rain), while the second is for residual flooding greater than 6 hours after the end of the rain.
2. South Florida Water Management District's Big Cypress Basin - In order to provide more efficient flood protection services to residents, Big Cypress Basin staff worked with modeling, scientific data and information systems staff together developed a real-time flood modeling and decision-making support system for operation of the water control gates. The project uses the Basin's real-time meteorological and hydrologic data for surface and groundwater levels and gate positions to model and forecast both surface water and groundwater stages, and provide flood

warning and real-time decision-making information to the field staff to operate the control gates accordingly. The information on real-time surface and ground water levels, flows, rainfall, gate positions and forecasted water levels are available through the following URL:

<http://my.sfwmd.gov/floodwatch/index.htm>.

3. Florida Division of Emergency Management (FDEM), the State Watch Office (SWO): FDEM has a staff meteorologist who could also be made available to the county and/or who also would issue flood –threat advisories to affected counties.

### **CRS Credit**

Collier County, Marco Island and Naples do currently receive credit for Activity 610 – Flood Warning Program. Credit can be received for using National Hurricane Center warnings and river flood stage predictions for the NWS's gages. The actual score is based on how much of the community's floodplain is affected by these systems.

### **Warning**

The next step in emergency response following threat recognition is to notify the public and staff of other agencies and critical facilities. More people can implement protection measures if warnings are early and include specific detail.

The NWS issues notices to the public using two levels of notification:

- Watch: conditions are right for flooding, thunderstorms, tornadoes or winter storms.
- Warning: a flood, tornado, etc., has started or been observed.

A more specific warning may be disseminated by the community in a variety of ways. The following are the more common methods:

- Commercial or public radio or TV stations
- The Weather Channel
- Cable TV emergency news inserts
- Telephone trees/mass telephone notification
- NOAA Weather Radio
- Tone activated receivers in key facilities
- Outdoor warning sirens
- Sirens on public safety vehicles
- Door-to-door contact
- Mobile public address systems
- Email notifications

Multiple or redundant systems are most effective - if people do not hear one warning, they may still get the message from another part of the system. Each has advantages and disadvantages:

- Radio and television provide a lot of information, but people have to know when to turn them on. They are most appropriate for hazards that that develop over more than a day, such as a tropical storm, hurricane, or winter storm.
- NOAA Weather Radio can provide short messages of any impending weather hazard or emergency and advise people to turn on their televisions for more information, but not everyone has a Weather Radio.

- Outdoor warning sirens can reach many people quickly as long as they are outdoors. They do not reach people in tightly-insulated buildings or those around loud noise, such as at a factory, during a thunderstorm, or in air conditioned homes. They do not explain what hazard is coming, but people should know to turn on a radio or television when they hear the siren.
- Automated telephone notification services are also fast, but can be expensive and do not work when phone lines are down. Nor do they work for unlisted numbers, call screening services, or cellular service, unless people sign up for notifications.

Just as important as issuing a warning is telling people what to do in case of an emergency. A warning program should include a public information component.

### **Local Implementation**

The Collier County Flood Warning Program describes the various types of flooding that could occur and provides procedures for disseminating warning information and for determining, assessing and reporting the severity and magnitude of flooded areas. The County Emergency Management Office administers/disseminates flood warning information to the municipalities and all response operations are conducted under the authority of the Collier County Comprehensive Emergency Management Plan.

The National Weather Service Office (NWSO), Miami, will issue flood advisory, watches and warning information to both Government and the citizens. The State Watch Office will follow-up the NWSO's warning information with direct contact with the local Emergency Management Office (duty hours) or the Collier Sheriff's Office (non-duty hour warning point).

South Florida Water Management District's Big Cypress Basin office possesses real-time hydrologic data on its canal system so as to enable it run real-time flood modeling and decision-making support system for operation of the water control gates. Collier County does not have any major rivers, there are no stream profiles on the FEMA Digital Flood Insurance Rate Map (DFIRM), and rainfall-induced flooding produces very slow moving sheet-flow conditions that are shallow but can be broad in aerial extent.

### **CRS Credit**

Collier County, Marco Island and Naples do currently receive credit for Activity 610 – Flood Warning Program. Community Rating System credits are based on the number and types of warning media that can reach the community's flood prone population. Depending on the location, communities can receive credit for the telephone calling system and more credits if there are additional measures, like telephone trees.

### **StormReady**

The National Weather Service established the StormReady program to help local governments improve the timeliness and effectiveness of hazardous weather related warnings for the public. To be officially StormReady, a community must:

- Establish a 24-hour warning point and emergency operations center
- Have more than one way to receive severe weather warnings and forecasts and to alert the public
- Create a system that monitors weather conditions locally
- Promote the importance of public readiness through community seminars
- Develop a formal hazardous weather plan, which includes training severe weather spotters and holding emergency exercises

Being designated a StormReady community by the National Weather Service is a good measure of a community's emergency warning program for weather hazards. It is also credited by the CRS.

### **Local Implementation**

Collier County and the City of Marco Island are currently designated as StormReady communities.

### **CRS Credit**

Collier County, Marco Island and Naples do currently receive credit for Activity 610 – Flood Warning Program. Being designated as a StormReady community can provide additional credits.

### **Response**

The protection of life and property is the most important task of emergency responders. Concurrent with threat recognition and issuing warnings, a community should respond with actions that can prevent or reduce damage and injuries. Typical actions and responding parties include the following:

- Activating the emergency operations center (emergency preparedness)
- Closing streets or bridges (police or public works)
- Shutting off power to threatened areas (utility company)
- Passing out sand and sandbags (public works)
- Holding children at school or releasing children from school (school superintendent)
- Opening evacuation shelters (the American Red Cross)
- Monitoring water levels (public works)
- Establishing security and other protection measures (police)

An emergency action plan ensures that all bases are covered and that the response activities are appropriate for the expected threat. These plans are developed in coordination with the agencies or offices that are given various responsibilities.

A flood stage forecast map shows areas that will be under water at various flood stages. Different flood levels are shown as color coded areas, so the emergency manager can quickly see what will be affected. Emergency management staff can identify the number of properties flooded, which roads will be under water, which critical facilities will be affected, and who to warn. With this information, an advance plan can be prepared that shows problem sites and determines what resources will be needed to respond to the predicted flood level.

Emergency response plans should be updated annually to keep contact names and telephone numbers current and to ensure that supplies and equipment that will be needed are still available. They should be critiqued and revised after disasters and exercises to take advantage of the lessons learned and of changing conditions. The end result is a coordinated effort implemented by people who have experience working together so that available resources will be used in the most efficient manner possible.

### **Local Implementation**

The County bears the initial responsibility for warning the public of a threat, disaster response and recovery operations. As a corollary to this principal, each level within local government will accomplish the functions for which it is responsible, requesting relief from the next higher level of government only after resources at that level are inadequate to respond to the flood emergency or disaster. Requests for assistance will be made to the Florida Division of Emergency Management only after the Board of County Commissioners has declared a State of Local Emergency.

When conditions are favorable for flooding from either storm surge flooding or from fresh water flooding from abnormally high amount of precipitation over a short period of time, the following actions will be taken by the agencies listed below:

**Agency**

**Action Responsibility**

***SFWMD's Big Cypress Office***

1. Monitor and/or run the Real-time Hydrologic Monitoring & Modeling system.
2. Keep the EOC informed of flooding threats and trends as they occur.

***Emergency Management (ESF-5)***

1. To staff the Emergency Operations Center as the situation dictates.
2. Maintain the emergency contact name/number listing for those responsible for day-to-day operation of a facility/activity.
3. To notify all primary respondents as the situation dictates.
4. To advise the public of the situation through local radio and TV announcements.
5. To keep the Division of Emergency Management and other state agencies and adjacent counties informed of the situation.
6. Establish/maintain communications and warning capabilities with Collier County's Critical Facilities.

***School Board (ESF-6)***

1. To provide shelter and bus transportation upon request from the Emergency Operations Center.

***American Red Cross (ESF-6)***

1. To provide damage assessment information.
2. To provide manpower and supplies for opening and operation of shelters and to coordinate with Emergency Management Department regarding the timing of such openings consistent with the dangers facing the people who will occupy the shelter.
3. To provide Mobile Feeding.
4. To provide immediate human needs relief, e.g., shelter, food, clothing etc.

***Collier County Sheriff's Office (ESF-16)***

1. To provide traffic control and security for those in the flood threatened area and shelter security.

***Fire/Rescue Districts (ESF-4)***

1. To provide fire control and suppression throughout the County.
2. To provide rescue service as needed.
3. To provide fire safety control at each shelter.
4. To alert and coordinate Community Emergency Response Team (CERT) responses.

- Collier County EMS (ESF-8)**
1. To provide ambulance/rescue service.
  2. To provide first-aid support at each shelter.

**Growth Management Division (Traffic Operations) (ESF-3)**

1. To assist in traffic control from the threatened area to safe refuge.
2. To assist in performing flood control measures.
3. To install traffic barriers to prevent non-essential traffic from entering flooded areas.

**Growth Management Division (Storm Water Management) (ESF-3)**

1. To control water flow levels in all canals maintained by the County.
2. To conduct post-flooding analysis/mapping.

**Collier County Health Dept. (ESF-8)**

1. To provide health and environmental health services

**ESF-2 (Communications)**

1. To provide emergency communications support between the E.O.C., hospitals, and public shelters.

**Salvation Army (ESF-6)**

1. To provide mobile feeding sites.

**Other Response Elements**

1. SkyWarn Spotter Network: In support of the National Weather Service Office, Miami, Collier County conducts hazardous weather spotter training to residents annually, or upon special request of the Emergency Management Office. At this time, there are over 150 trained spotters. The spotters receive regular weather information updates from the EOC, via E-mail, and through the other media.
2. Emergency Email Network ([www.emergencyemail.org](http://www.emergencyemail.org)): This service automatically retransmits the NWS's text weather warning products related to Collier County. Recipients of this free service can subscribe any or all their electronic instruments to it. Additionally, the EOC has the ability to transmit special statements via this service to all subscribers.
3. Emergency Alerting System: The EOC has drafted an operating procedure, agreed upon by the NWS, Miami, for activating the Emergency Alerting System and thereby transmits warning and instructions via the weather radio, TV, radio, and cable media. Not only is the general public alerted, so are the specialized teams, e.g., SkyWarn and Amateur radio, CERTs.

**CRS Credit**

Collier County, Marco Island and Naples currently receive credit for Activity 610 – Flood Warning Program. Flood Response Operations (FRO) credit is based on the extent of coverage and level of detail that the community's flood warning and response plan provides for the flood response operations. For full credit, the plan needs to a) describe the actions to be taken, b) identify the office or official responsible for the action, c) define the time needed to carry out the activity, and d) contain other critical information that designated agencies and organizations will need in order to perform their assigned responsibilities. Bonus credit is provided if there is a list of the personnel, equipment, facilities, supplies and other resources needed to complete each task.



## Evacuation and Shelter

There are six key components to a successful evacuation:

- Adequate warning
- Adequate routes
- Proper timing to ensure the routes are clear
- Traffic control
- Knowledgeable travelers
- Care for special populations (e.g., the handicapped, prisoners, hospital patients, and schoolchildren)

Those who cannot get out of harm's way need shelter. Typically, the American Red Cross will staff a shelter and ensure that there is adequate food, bedding, and wash facilities. Shelter management is a specialized skill. Managers must deal with problems like scared children, families that want to bring in their pets, and the potential for an overcrowded facility.

### Local Implementation

There are no permanently established evacuation zones in Collier County. Evacuation zone information is communicated to the public based on a real-time storm's threat using Collier County's roadways for mandatory evacuation zone reference. The *Collier County 2014 All Hazards Guide* encourages residents to stay tuned to local radio & TV for the list of shelters to be opened and the time of opening. Refuges will generally open concurrent with evacuation orders. The Collier Area Transit (CAT) mass transportation system will be made available to transport people to shelters using the established routes & stops. Collier County emergency shelters are shown in the figure below.

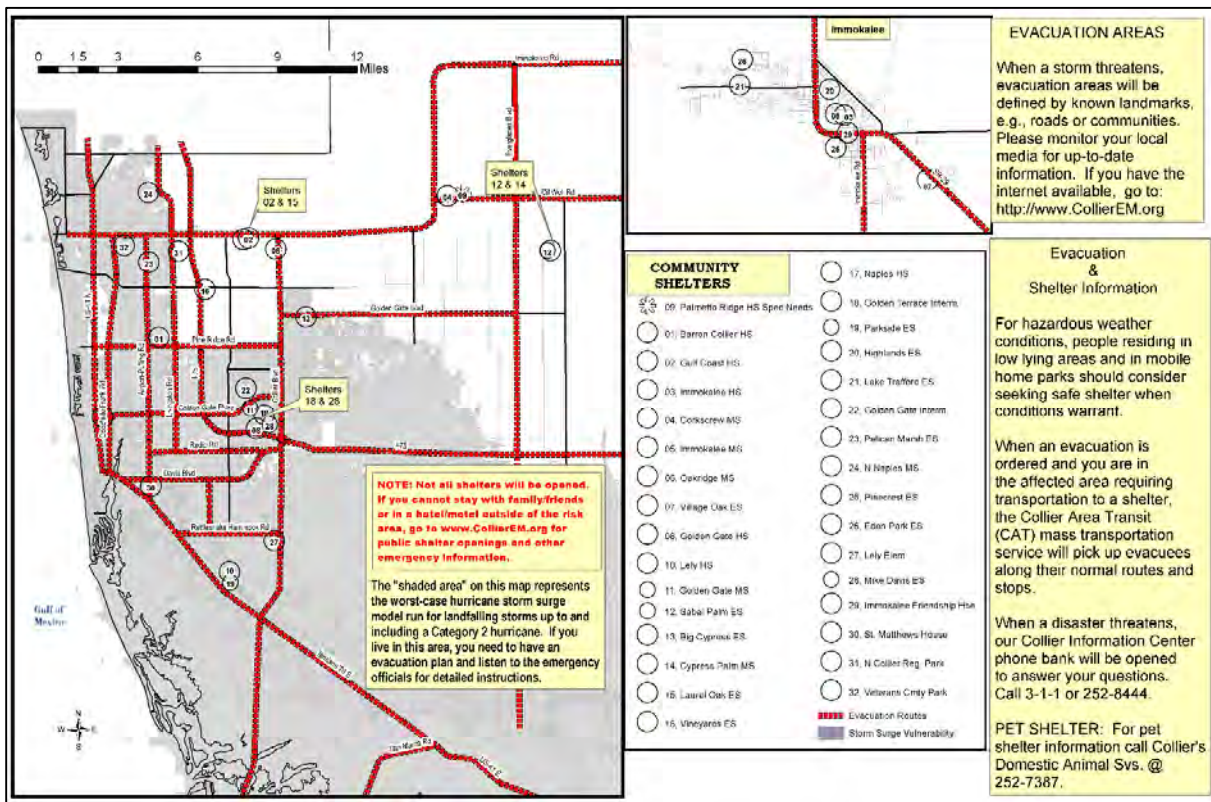


Figure B.2 – Collier County Emergency Shelters

### **CRS Credit**

Because it is primarily concerned with protecting insurable buildings, the CRS does not provide any special credit for evacuation or sheltering of people (minimal credit is given in Activity 510 - Floodplain Management for evacuation policies and procedures). It is assumed that the emergency response plan would include all necessary actions in response to a flood.

### **Post-Disaster Recovery and Mitigation**

After a disaster, communities should undertake activities to protect public health and safety and facilitate recovery. Appropriate measures include:

- Patrolling evacuated areas to prevent looting
- Providing safe drinking water
- Monitoring for diseases
- Vaccinating residents for tetanus and other diseases
- Clearing streets
- Cleaning up debris and garbage

Following a disaster, there should be an effort to help prepare people and property for the next disaster. Such an effort would include:

- Public information activities to advise residents about mitigation measures they can incorporate into their reconstruction work
- Evaluating damaged public facilities to identify mitigation measures that can be included during repairs
- Identifying other mitigation measures that can lessen the impact of the next disaster
- Acquiring substantially or repeatedly damaged properties from willing sellers
- Planning for long-term mitigation activities
- Applying for post-disaster mitigation funds

### **Local Implementation**

The *Collier County 2014 All Hazards Guide* provides post-disaster recovery considerations including safety precautions and storm debris cleanup guidelines.

### **Regulating Reconstruction**

Requiring permits for building repairs and conducting inspections are vital activities to ensure that damaged structures are safe for people to reenter and repair. There is a special requirement to do this in floodplains, regardless of the type of disaster or the cause of damage. The NFIP requires that local officials enforce the substantial damage regulations. These rules require that if the cost to repair a building in the mapped floodplain equals or exceeds 50% of the building's market value, the building must be retrofitted to meet the standards of a new building in the floodplain. In most cases, this means that a substantially damaged building must be elevated above the base flood elevation.

### **Local Implementation**

The Floodplain Management Ordinances for Collier County, Marco Island and Naples require that substantial improvement of any residential building (including manufactured home) shall have the lowest floor, including basement, elevated to no lower than the BFE.

### CRS Credit

The CRS does credit post-disaster mitigation procedures if the policies and procedures are incorporated into a flood mitigation or multi-hazard plan through Activity 510 - Floodplain Management Planning.

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#### **Emergency Services Measures Conclusions:**

- The Collier County Emergency Management Department performs most emergency management functions for the County.
- The 2012 Collier County Comprehensive Emergency Management Plan has been adopted by resolution by Collier County, City of Marco Island and City of Naples.

#### **Emergency Services Measures Recommendations:**

- The Collier County Emergency Management Department should work to identify vulnerable populations for evacuation purposes.
- The Collier County Emergency Management Department should work to identify and protect critical facilities and infrastructure that are potentially exposed to flood damage.

### **B.4.5 Structural Projects**

Four general types of flood control projects are reviewed here: levees, reservoirs, diversions, and dredging. These projects have three advantages not provided by other mitigation measures:

- They can stop most flooding, protecting streets and landscaping in addition to buildings
- Many projects can be built without disrupting citizens' homes and businesses
- They are constructed and maintained by a government agency, a more dependable long-term management arrangement than depending on many individual private property owners

However, as shown below, structural measures also have shortcomings. The appropriateness of using flood control depends on individual project area circumstances.

- Advantages
  - They may provide the greatest amount of protection for land area used
  - Because of land limitations, they may be the only practical solution in some circumstances
  - They can incorporate other benefits into structural project design, such as water supply and recreational uses
  - Regional detention may be more cost-efficient and effective than requiring numerous small detention basins
- Disadvantages
  - They can disturb the land and disrupt the natural water flows, often destroying wildlife habitat
  - They require regular maintenance
  - They are built to a certain flood protection level that can be exceeded by larger floods
  - They can create a false sense of security
  - They promote more intensive land use and development in the floodplain

### **Levees and Floodwalls**

Probably the best known flood control measure is a barrier of earth (levee) or concrete (floodwall) erected between the watercourse and the property to be protected. Levees and floodwalls confine water to the

stream channel by raising its banks. They must be well designed to account for large floods, underground seepage, pumping of internal drainage, and erosion and scour. Key considerations when evaluating the use of a levee include:

- Design and permitting costs
- Right of way acquisition
- Removal of fill to compensate for the floodwater storage that will be displaced by the levee
- Internal drainage of surface flows from the area inside the levee
- Cost of construction
- Cost of maintenance
- Mitigation of adverse impacts to wetlands and other habitats
- Loss of river access and views
- Creating a false sense of security, because while levees may reduce flood damage for smaller more frequent rain events, they may also overtop or breach in extreme flood events and subsequently create more flood damage than would have occurred without the levee

### **Reservoirs and Detention**

Reservoirs reduce flooding by temporarily storing flood waters behind dams or in storage or detention basins. Reservoirs lower flood heights by holding back, or detaining, runoff before it can flow downstream. Flood waters are detained until the flood has subsided, and then the water in the reservoir or detention basin is released or pumped out slowly at a rate that the river can accommodate downstream.

Reservoirs can be dry and remain idle until a large rain event occurs. Or they may be designed so that a lake or pond is created. The lake may provide recreational benefits or water supply (which could also help mitigate a drought).

Flood control reservoirs are most commonly built for one of two purposes. Large reservoirs are constructed to protect property from existing flood problems. Smaller reservoirs, or detention basins, are built to protect property from the stormwater runoff impacts of new development.

### **Diversion**

A diversion is a new channel that sends floodwaters to a different location, thereby reducing flooding along an existing watercourse. Diversions can be surface channels, overflow weirs, or tunnels. During normal flows, the water stays in the old channel. During floods, the floodwaters spill over to the diversion channel or tunnel, which carries the excess water to a receiving lake or river.

### **Dredging**

Dredging is often viewed as a form of conveyance improvement. However, it has the following problems:

- Given the large volume of water that comes downstream during a flood, removing a foot or two from the bottom of the channel will have little effect on flood heights.
- Dredging is often cost prohibitive because the dredged material must be disposed of somewhere.
- Unless in-stream or tributary erosion is corrected upstream, the dredged areas usually fill back in within a few years, and the process and the expense have to be repeated.
- If the channel has not been disturbed for many years, dredging will destroy the habitat that has developed.

To protect the natural values of the stream, federal law requires a U.S. Army Corps of Engineers permit before dredging can proceed. This can be a lengthy process that requires a lot of advance planning and many safeguards to protect habitats, which adds to the cost of the project.

### **Local Implementation**

Collier County, Marco Island and Naples do not currently receive credit for Activity 530 - Flood Protection.

### **CRS Credit**

Structural flood control projects that provide 100-year flood protection and that result in revisions to the Flood Insurance Rate Map are not credited by the CRS in order to avoid duplicating the larger premium reduction provided by removing properties from the mapped floodplain.

The CRS credits smaller flood control projects that meet the following criteria:

- They must provide protection to at least the 25-year flood
- They must meet certain environmental protection criteria
- They must meet federal, state and local regulations, such as the Corps of Engineers' 404 permit and State dam safety rules
- They must meet certain maintenance requirements

These criteria ensure that credited projects are well-planned and permitted. Any of the measures reviewed in this section would be recognized under Activity 530 - Flood Protection. Credit points are based on the type of project, how many buildings are protected, and the level of flood protection provided.

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### **Structural Projects Measures Conclusions:**

- Canal diversion projects and levees can be used to reduce over-drainage and improve water quality
- Canal bank erosion can affect adjacent properties and create a situation where the canal does not function properly
- Installing new outfalls can improve local street drainage in certain areas

### **Structural Projects Measures Recommendations:**

- Improve drainage through the implementation of projects identified in the Capital Improvement Element of the Growth Management Plan
- Work with the South Florida Water Management District and the Army Corps of Engineers on the Picayune Strand Restoration Project

## **B.4.6 Public Information**

### **Outreach Projects**

Outreach projects are the first step in the process of orienting property owners to the hazards they face and to the concept of property protection. They are designed to encourage people to seek out more information in order to take steps to protect themselves and their properties.

Awareness of the hazard is not enough; people need to be told what they can do about the hazard. Thus, projects should include information on safety, health and property protection measures. Research has shown that a properly run local information program is more effective than national advertising or publicity campaigns. Therefore, outreach projects should be locally designed and tailored to meet local conditions.

Community newsletters/direct mailings: The most effective types of outreach projects are mailed or distributed to everyone in the community. In the case of floods, they can be sent only to floodplain property owners.

News media: Local newspapers can be strong allies in efforts to inform the public. Local radio stations and cable TV channels can also help. These media offer interview formats and cable TV may be willing to broadcast videos on the hazards.

Other approaches: Examples of other outreach projects include:

- Presentations at meetings of neighborhood, civic or business groups
- Displays in public buildings or shopping malls
- Signs in parks, along trails and on waterfronts that explain the natural features (such as the river) and their relation to the hazards (such as floods)
- Brochures available in municipal buildings and libraries
- Special meetings, workshops and seminars

### **Local Implementation**

A community brochure is included in the local phone book and is mailed to all properties in the County on an annual basis. An outreach brochure is mailed annually to all properties in the SFHA. Repetitive Loss Properties have specific Flood Hazard information mailed to them annually. Properties in the vicinity of the Repetitive Loss Properties are also annually mailed Flood Hazard information. The County also displays flood information in public buildings and prints flood information in the phone book.

An "All Hazards Guide" is updated and reprinted during May of each year for distribution to residents and guests of Collier County. Approximately 70,000 copies of this pamphlet are printed and distributed annually. Every effort is made to deliver this information to people living in flood-prone areas. Disaster related information is also provided to recipients of the local telephone system in their books.

Special information programs have been established for people with special needs such as the elderly and the handicapped. These individuals are encouraged to pre-register with the Emergency Management Department who will advise them of their vulnerability to flooding and items that they should bring to a shelter in the event of an evacuation. The Emergency Management Department will also arrange for transportation to shelter if needed.

### **CRS Credit**

Collier County, Marco Island and Naples currently receive credit under Activity 330 – Outreach Projects as well as Activity 350 – Flood Protection Information.

### **Real Estate Disclosure**

Many times after a flood or other natural disaster, people say they would have taken steps to protect themselves if they had known they had purchased a property exposed to a hazard. There are some federal and state requirements about such disclosures:

- Federal law: Federally regulated lending institutions must advise applicants for a mortgage or other loan that is to be secured by an insurable building whether the property is in a floodplain as shown on the Flood Insurance Rate Map. If so, flood insurance is required for buildings located within the floodplain if the mortgage or loan is federally insured.

- State law: State laws set standards for real estate sales and licensing of agents and brokers.

### **Local Implementation**

Collier County does not currently receive credit under Activity 340 – Hazard Disclosure for requiring local real estate agents to disclose flood hazards to prospective buyers.

The City of Naples receives credit under the Real Estate Agents’ Brochure (REB) element which provides points if real estate agents are providing brochures or handouts that advise potential buyers to investigate the flood hazard for a property. Additional points are provided if the disclosure program is part of a Program for Public Information.

The City of Marco Island also receives credit under the REB element as well as the Disclosure of the Flood Hazard (DFH) element which provides points if real estate agents notify those interested in purchasing properties located in the Special Flood Hazard Area (SFHA) about the flood hazard and the flood insurance purchase requirement. Additional points are provided if the disclosure program is part of a Program for Public Information.

### **Libraries and Websites**

The two previous activities tell people that they are exposed to a hazard. The next step is to provide information to those who want to know more. The community library and local websites are obvious places for residents to seek information on hazards, hazard protection, and protecting natural resources. Books and pamphlets on hazard mitigation can be given to libraries, and many of these can be obtained for free from state and federal agencies. Libraries also have their own public information campaigns with displays, lectures and other projects, which can augment the activities of the local government. Today, websites are commonly used as research tools. They provide fast access to a wealth of public and private sites for information. Through links to other websites, there is almost no limit to the amount of up to date information that can be accessed on the Internet.

In addition to online floodplain maps, websites can link to information for homeowners on how to retrofit for floods or a website about floods for children.

### **Local Implementation**

Four of the ten public libraries in Collier County contain publications relating to flooding and flood protection, which include the Flood Insurance Study for Collier County and FIRMs. The four libraries are: Main (Headquarters) - 2385 Orange Blossom Drive, Naples Regional - 650 Central Avenue, Marco Island – 210 Heathwood Drive, South County Regional – 8065 Lely Cultural Parkway. These locations were selected because of their proximity to the coastal region and greater number of properties and persons.

The Collier County, Marco Island and Naples’s websites provide an extensive amount of information on hazards, hazard protection, and protecting natural resources.

### **CRS Credit**

Collier County, Marco Island and Naples currently receive credit under Activity 350 – Flood Protection Information. The Community Rating System provides credits for having a variety of flood references in the local public library and for providing similar material on municipal websites.

## **Technical Assistance**

### ***Hazard Information***

Residents and business owners that are aware of the potential hazards can take steps to avoid problems or reduce their exposure to flooding. Communities can easily provide map information from FEMA's Flood Insurance Rate Maps (FIRMs) and Flood Insurance Studies. They may also assist residents in submitting requests for map amendments and revisions when they are needed to show that a building is located outside the mapped floodplain.

Some communities supplement what is shown on the FIRM with information on additional hazards, flooding outside mapped areas and zoning. When the map information is provided, community staff can explain insurance, property protection measures and mitigation options that are available to property owners. They should also remind inquirers that being outside the mapped floodplain is no guarantee that a property will never flood.

### ***Property Protection Assistance***

While general information provided by outreach projects or the library is beneficial, most property owners do not feel ready to retrofit their buildings without more specific guidance. Local building department staffs are experts in construction. They can provide free advice, not necessarily to design a protection measure, but to steer the owner onto the right track. Building or public works department staffs can provide the following types of assistance:

- Visit properties and offer protection suggestions
- Recommend or identify qualified or licensed contractors
- Inspect homes for anchoring of roofing and the home to the foundation
- Explain when building permits are needed for home improvements.

### ***Local Implementation***

FEMA's floodplain maps are available on Collier County's website, and the County responds to requests on whether a property is located in a Special Flood Hazard Area. Property protection measures are also included on the County's website. The County participates in a variety of Public Outreach Seminars, Exercises, Meetings and Training for various hazards that could impact Collier County property and citizens. County staff offer technical assistance and make site visits to review local flood concerns and drainage complaints.

### ***CRS Credit***

Collier County currently receives credit under Activity 360 – Flood Protection Assistance for providing site specific flood and flood related data to interested property owners and annually publicizing the service.

### **Program for Public Information**

A Program for Public Information (PPI) is an ongoing public information effort to design and transmit the messages that the community determines are most important to its flood safety and the protection of its floodplains' natural functions. It is a review of local conditions, local public information needs, and a recommended plan of activities. A PPI consists of the following parts:

- The local flood hazard
- The property protection measures appropriate for the flood hazard
- Flood safety measures appropriate for the local situation
- The public information activities currently being implemented within the community, including those being carried out by non-government agencies
- Goals for the community's public information program
- The outreach projects that will be done each year to reach the goals



- The process that will be followed to monitor and evaluate the projects

**Local Implementation**

The development of a PPI for Collier County including the City of Marco Island and the City of Naples is a newly proposed Mitigation Action as part of this 2015 FMP.

**CRS Credit**

The CRS provides credit for a PPI under Activity 330 – Outreach Projects.

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**Public Information Measures Conclusions:**

- Collier County, Marco Island and Naples have aggressive public awareness and outreach programs.
- Collier County, Marco Island and Naples target citizens through their websites, news media, public meetings, neighborhood meetings, special events and mailings.

**Public Information Measures Recommendations:**

- Collier County should prepare a Program for Public Information (PPI) in conjunction with Marco Island and Naples.
- Collier County should work to improve flood insurance coverage in the community.
- Collier County should work with Insurance and Real Estate Agents to educate them on flood risk.

## **B.5 Mitigation Alternative Selection Criteria**

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The process for evaluating mitigation alternatives is located in section 5.3. The following criteria were used to select and prioritize proposed mitigation measures:

### **STPLE/E**

- Social: Does the measure treat people fairly? (different groups, different generations)
- Technical: Will it work? (Does it solve the problem? Is it feasible?)
- Administrative: Do you have the capacity to implement and manage project?
- Political: Who are the stakeholders? Did they get to participate? Is there public support? Is political leadership willing to support?
- Legal: Does the organization have the authority to implement? Is it legal? Are there liability implications?
- Economic: Is it cost-beneficial? Is there funding? Does it contribute to the local economy or economic development?
- Environmental: Does it comply with environmental regulations?

### **Sustainable Disaster Recovery**

- Quality of life
- Social equity
- Hazard mitigation
- Economic development
- Environmental protection/enhancement
- Community participation

### **Smart Growth Principles**

- Infill versus sprawl
- Efficient use of land resources
- Full use of urban resources
- Mixed uses of land
- Transportation options
- Detailed, human-scale design

### **Other**

- Does measure address area with highest risk?
- Does measure protect...
  - The largest # of people exposed to risk?
  - The largest # of buildings?
  - The largest # of jobs?
  - The largest tax income?
  - The largest average annual loss potential?
  - The area impacted most frequently?
  - Critical infrastructure
- What is timing of available funding?

- What is visibility of project?
- Community credibility

### **Prioritization Process**

A thorough discussion of each mitigation category occurred. Then within each specific mitigation category, a variety of projects were discussed and debated.

Consensus was reached on the specific projects identified in the mitigation action plan. The prioritization of High, Medium, and Low was reached based on the significance of the project and the overall impact to the goals and objectives of the plan. The FMPC was given this guidance for prioritization:

### **Priority Classification**

**Short Range** = Project should be completed in less than one year

**Medium Range** = Project should be completed in two to three years

**Long Range** = Project should be completed in more than four years

Appendix C

### Appendix C: References

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