TALBOT COUNTY HISTORIC RESOURCES SURVEY:

WATER-ORIENTED VILLAGES HISTORIC RESOURCES SURVEY FOR THE VILLAGES OF TILGHMAN ISLAND, NEAVITT, NEWCOMB, AND ROYAL OAK

Phase 2 September 5, 2017

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Introduction

In June 2017, the Talbot County Department of Planning and Zoning contracted with Vision Planning and Consulting (VPC) to conduct a Phase 2 Study of four historic water-oriented villages in Talbot County: Neavitt, Newcomb, Royal Oak, and Tilghman Island. This project is managed by the Talbot County Department of Planning and Zoning in conjunction with the Talbot County Historic Preservation Commission (TCHPC), funded by the National Park Service (NPS) Hurricane Sandy Relief Fund, and is administered by the Maryland Historical Trust (MHT).

The Phase 2 study resulted in the preparation of this report, which includes the property selection process, identifies the architectural style and character-defining features of the buildings, discusses the methodology used to determine the vulnerability to different flooding scenarios, provides maps indicating the projected sea-level rise, and identifies mitigation measures that can be implemented by property owners to minimize losses from flooding.

Project Background

Talbot County, Maryland, was founded in 1661. Since that time, Talbot County has been a major node in the Chesapeake Bay transportation system. As such, the local waterfront villages served not only as trading posts, but also major cultural centers. Residents of these historic villages spanned the gamut, from local watermen and fishermen to decorated military officers and wealthy merchant families.

This project constitutes Phase 2 of a two-part study of the water-oriented villages in Talbot County. Phase 1 was completed in 2016 and involved the identification of 57 historic properties that were sorted into Priority 1 and Priority 2 categories. Priority 1 properties were selected based on the following criteria:

1. Location in the 500-year floodplain.
2. Properties already individually listed or eligible for either the National Register of Historic Places (NRHP) or the Maryland Inventory of Historic Properties (MIHP).
3. Buildings determined to have design merit or recognized architectural styles or specific building types (such as worker housing or general stores).

Priority 1 properties merited immediate completion of the MHT's Hazard Mitigation Form. Priority 2 properties were those that were determined to merit future completion of the MHT Hazard Mitigation Form. The completed forms are available for review at the Talbot County Planning and Zoning Office.

It is important to note that some properties selected during Phase 1 are not individually listed in either the NRHP or the MIHP, but are identified as contributing resources/properties to their designated survey areas. The term contributing applies to an element within a historic district that retains integrity and can convey the historic or architectural significance of the district. A few of the properties selected will require additional study to determine eligibility for these registers.

The Phase 2 Study began with selecting 25 representative properties in the four villages. These properties span hundreds of years and offer a variety of building types and architectural styles. The purpose of the Phase 2 study is to identify hazard mitigation actions to protect each property from flooding, to expedite recovery from a flooding event, and to allow the property to be “usable” for the maximum amount of time possible, given sea-level rise projections and concerns.

Note: Hazard mitigation should not be confused with Section 106 mitigation, which may include measures to compensate for or diminish adverse effects resulting from federal undertakings. For the purposes of this document, the term mitigation will refer to hazard mitigation unless otherwise noted.

Goals

For the purposes of this project, six goals were developed by VPC, in conjunction with the Talbot County Department of Planning and Zoning, to encourage proactive planning, hazard mitigation, historic preservation, and plan integration. These goals are applicable at the County, and local levels. By empowering and encouraging hazard mitigation efforts at the local level, the historic integrity of the villages and the County will be preserved.

1. Protect each selected community’s historic character and economic vitality from flooding impacts by: minimizing loss to structures and buildings, cost to stakeholders, and impact on the economy, through hazard mitigation planning.

2. Ensure flood mitigation goals for historic properties are consistent with other Talbot County plans by encouraging integration between local hazard mitigation plans and the historic and cultural resources component of local comprehensive plans.

3. Encourage Talbot County and its communities to become more proactive and less reactive regarding the preservation of historic resources in hazard areas.

4. Minimize losses to areas of high economic value, including historic properties and local landmarks in the selected villages.

5. Recommend that historic properties are *prioritized* for hazard mitigation/risk reduction within the hazard mitigation planning process due to their historic significance and the contributions they make to their selected communities.

6. Enhance the ability of vulnerable historic properties and cultural resources to withstand the impact of hazards by identifying risk reduction measures that provide the maximum protection, yet preserve the character and integrity of the buildings, to the greatest extent possible.

Study Area

The study area for this assessment was the village zoning boundary for each of the four villages of Tilghman, Neavitt, Newcomb, and Royal Oak. Two of these villages are located on narrow peninsulas between the Chesapeake Bay and Broad Creek, and Harris Creek and Balls Creek, off the Choptank River. The two other villages are located on Oak Creek, off the Miles River in Talbot County, Maryland (**Figure 1**).

Village of Newcomb

The Village of Newcomb lies along the stretch of Maryland Route 33 (St. Michaels Road) at the mouth of Oak Creek on the Miles River. Newcomb is a rural community and lies entirely within the Chesapeake Bay critical areas.

It is primarily residential and is made up of both permanent and seasonal residents. The larger, and more historic part of the village lies to the South of MD Rt. 33 on Oak Creek. This part of the village is comprised of single-family homes, a County-owned boat ramp, a small County park, a historic cemetery, and the village post office.

Village of Royal Oak

The Village of Royal Oak lies to the South of Oak Creek and is accessed by Maryland Rt. 329 (Royal Oak Road). Royal Oak is a rural community and lies within the Chesapeake Bay critical areas. Primarily a residential community, Royal Oak is also home to antique stores, a community church, a historic general store now used as a dining establishment, and the village post office. The Village has a proud connection to both, the Revolutionary War and the War of 1812.

Village of Neavitt

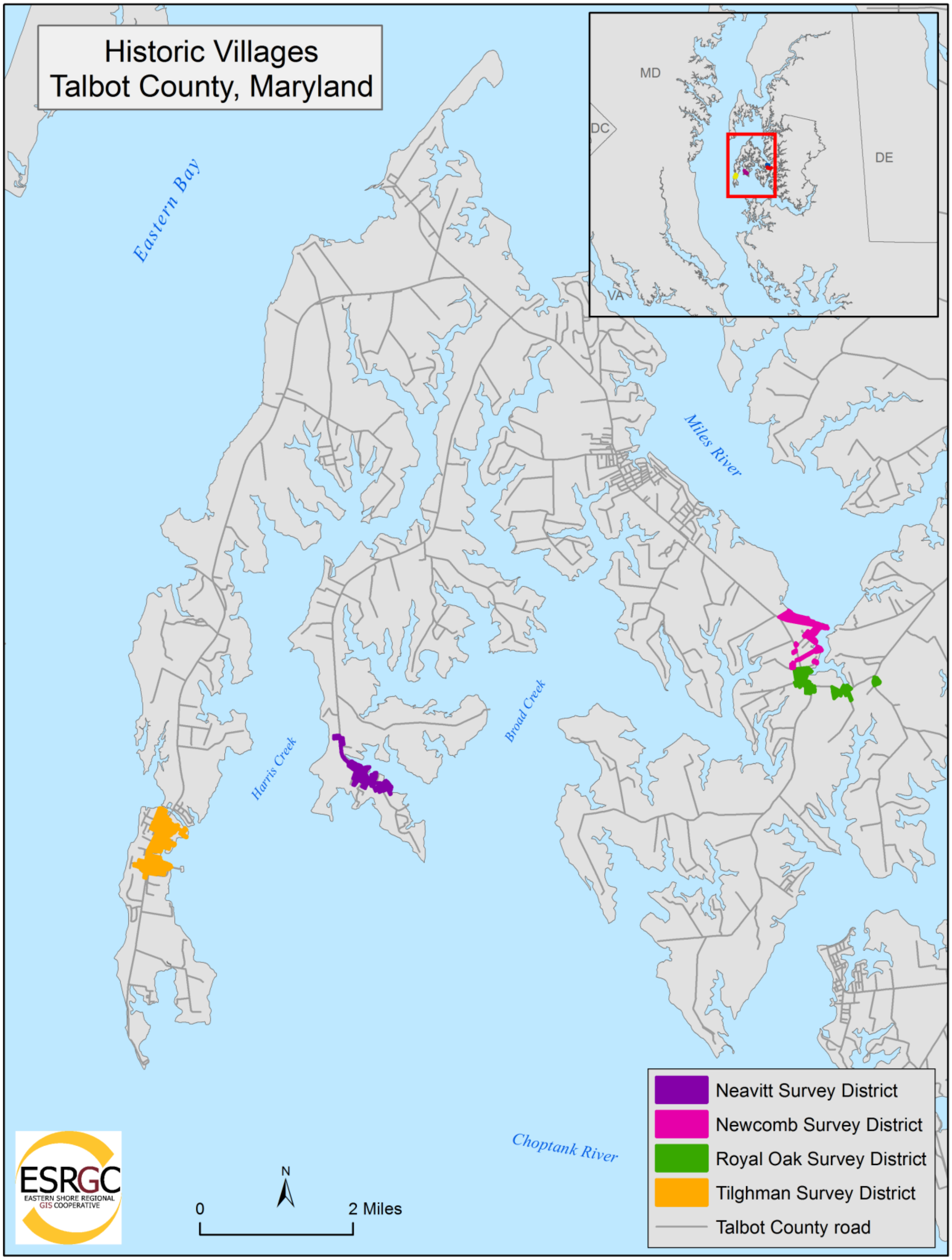
The Village of Neavitt is situated on a narrow peninsula served by Maryland Rt. 579 (Bozeman Neavitt Road). Neavitt is bordered to the North and East by Balls Creek, off Broad Creek, and to the South and West, by the Choptank River.

It is primarily residential and is made up of both permanent and seasonal residents. The village is home to a small County park, a historic church, a community center and post office, and a historic town hall.

Village of Tilghman

The Village of Tilghman Island, herein referred to as the Village of Tilghman, is located at the end of the long narrow peninsula serviced by Maryland Route 33 (Tilghman Island Road). The island is bordered by Knapp Narrows to the North, Harris Creek, off the Choptank River, to the East and South, and the Chesapeake Bay to the West. Nearly half of the residential buildings in the village are owned by part-time, or seasonal residents. Tilghman is home to a robust Fire and Rescue Department, a grade school, a post office, a County-operated wastewater treatment facility, an active drawbridge, and a historic inn.

Figure 1: Location of Historic Villages



County Flooding History

Flooding occurs when rivers, creeks, streams, ditches, or other water bodies receive more water that they can handle from rain or snowmelt. The excess water flows over adjacent banks into the adjacent floodplain. As many as 85 percent of the natural hazard disasters across the United States have been attributed to flooding.

Sources of Flooding

Talbot County experiences both riverine and coastal flooding. Riverine flooding sources for the Villages of Neavitt, Newcomb, Royal Oak, and Tilghman Island include the Miles River and tributaries of the Choptank River. Coastal flooding in Talbot County occurs when low-lying land is flooded by the Chesapeake Bay.

Riverine and Tidal Flooding

Due to the close proximity to water and the number of waterways in Talbot County, the historic Villages of Royal Oak, Tilghman, Newcomb, and Neavitt are susceptible to many types of flooding. Excess water from rivers, creeks, streams, ditches, and other water bodies flows over adjacent banks into the adjacent floodplain to cause flooding. Riverine flooding occurs when rivers and tributaries exceed their capacity due to excessive rainfall over an extended period of time. Tidal flooding is the temporary inundation of water to low lying areas along tidal areas due to high tide events. Tidal flooding in Talbot County usually occurs as a result of tropical storms (including hurricanes) as well as the combination of high astronomical tides with a northeast wind. A storm surge is the rise of sea water resulting from atmospheric pressure changes and wind associated with a storm or storm event.

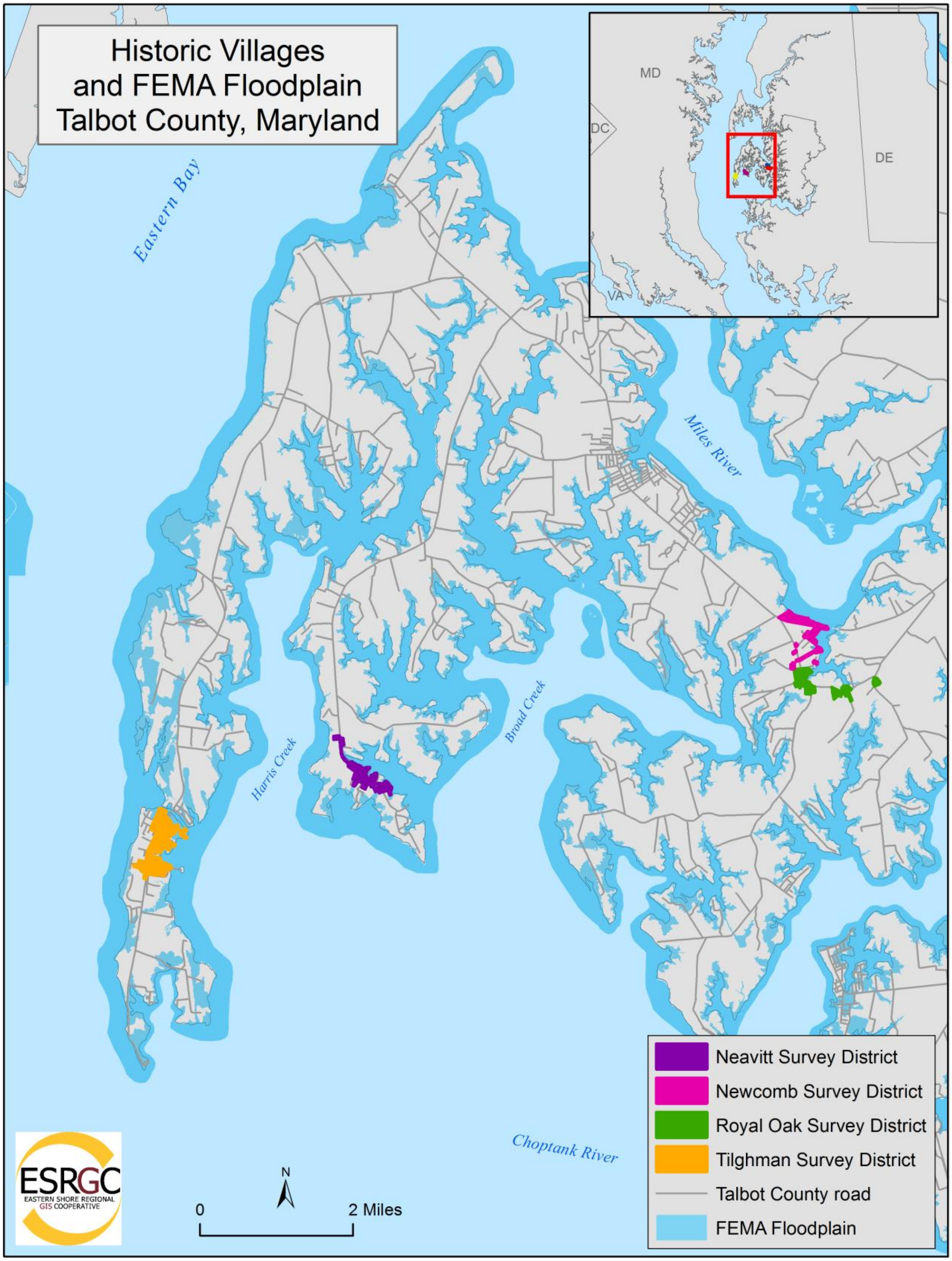
The following map (**Figure 2**) represents the 100-year floodplains within these four historic villages in Talbot County, as designated by FEMA on the Flood Insurance Rate Maps or FIRMs. The 1 percent chance flood (formerly referred to as the 100-year flood) is a flood which has a 1 percent chance of being equaled or exceeded in any given year (MDE, *Maryland Floodplain Manager's Handbook*). Talbot County can experience riverine flooding due to excessive rainfall in a matter of hours, such as from a severe thunderstorm. Additionally, some soils can become saturated over a longer period and reduce their absorption potential.

Stormwater Flooding

Finally, stormwater flooding occurs when a large amount of precipitation, in a short period of time, overwhelms a stormwater system and results in system overflow. While this type of flooding occurs more often than riverine or coastal flooding, the impacts are typically confined to a within the stormwater system drainage area. Local knowledge is a good source for identifying areas which experience stormwater flooding during heavy rain events.

Note: Figure 2 is only intended to serve as a general reference. To see where the floodplain extends into the village boundaries, please see village overview maps beginning on page 23.

Figure 2: Historic Villages and FEMA Floodplain



Hazards from Floods

Flooding causes $6 billion in average annual losses in the United States annually and accounts for an average of 140 casualties annually (USGS, “Flood Hazards – A National Threat,” 2006). While most people’s vision of the threat from flooding may include being swept away or buildings being structurally impacted, there are numerous hazards associated with flooding that occur both during and after an event.

Photo 1 - Sample Residential Flooding

During the Flood

While a flood event is underway, citizens may be faced with a number of threats. The hydraulic power of water is significant and walking through as little as six inches of moving water is dangerous because of the possibility of losing stable footing. Driving through flood water is the cause of many flood deaths each year. As little as one foot of water can float cars, and two feet of rushing water can carry away most vehicles. That fact, combined with an inability for drivers to judge the depth of flood water, as well as the potential for flood waters to rise quickly without warning, makes driving through flood water a very unwise action.

In addition to being swept away, flood water itself is to be avoided. Because of leaking industrial containers, household chemicals, and gas stations, it is not healthy to even touch flood water without protective equipment and clothing. Downed power lines, flooded electric breaker panels, and other sources of electricity are a significant threat during a flood. One should also be prepared for the outbreak of fire. Electric sparks often cause fire to erupt and because of the inability of firefighting personnel to respond, a fire can quickly burn out of control.

Storm surges and large waves produced by hurricanes and tropical storm systems can damage roads, buildings, bridges, and other infrastructure. Storm surges are dangerous as the repeated wave action undermines building foundations and can lead to the destruction of a home or business. These destructive forces are serious threats to the historic coastal Villages of Royal Oak, Tilghman, Newcomb, and Neavitt.

Historic Occurrences of Flood Types Affecting the Historic Villages:

Talbot County experiences many types of flooding, however, the most significant flooding events typically occurred during a tropical storm or hurricane. The National Oceanic and Atmospheric Administration’s (NOAA) National Centers for Environmental Information identifies four major flooding events that affected the historic Villages of Royal Oak, Tilghman Island, Newcomb, and Neavitt. All but one of these events, Tropical Storm Isabel, included flash flooding due to heavy rainfall.

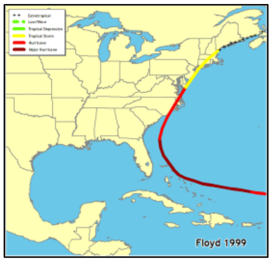


Figure 3: Hurricane Floyd Storm Track

Hurricane Floyd made landfall on the Maryland's Eastern Shore in September 1999 **(Figure 3)**, with heavy rain, damaging winds, and sudden localized flooding. While Maryland's Eastern Shore was declared a disaster area, flooding in Talbot County caused numerous road closures and the evacuation of 75 citizens from low-lying areas. Royal Oak experienced wind gusts of 50 mph and 9.16 inches of rainfall. Countywide, Hurricane Floyd caused $3.5 million of property damage, including severe damage to homes, businesses, and roadways.

Figure 4: Trop. Storm Isabel Storm Track

In September 2003, Tropical Storm Isabel brought extremely high tides and storm surges in the Chesapeake Bay **(Figure 4)**. Just north of Talbot County, Tolchester Beach in Kent County reported a record breaking high tide of 7.91 feet above mean low water and a storm surge of 6.88 feet. The storm surge was powerful enough to disrupt normal tide cycles in the bay. Although flooding was attributed to the storm surge and not heavy rains, Talbot County received 2.97 inches of rainfall during Tropical Storm Isabel.

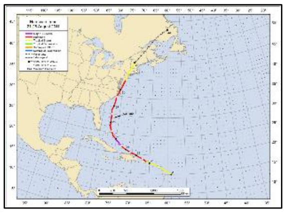


Figure 5: Hurricane Irene Storm Track

Talbot County, particularly the Village of Tilghman Island, experienced heavy flooding rain and tropical storm force wind gusts from Hurricane Irene in August 2011 **(Figure 5)**. Event precipitation totals averaged 6 to 12 inches and caused widespread field and roadway flooding across Maryland's Eastern Shore. In Talbot County, debris closed Maryland State Route 662C. Approximately 100 properties and 50 roadways and bridges were damaged countywide, by the flooding and wind.

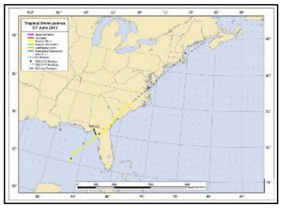


Figure 6: Trop. Storm Andrea Storm Track

Tropical Storm Andrea brought heavy rain and flash flooding to Talbot County in June 2013 **(Figure 6)**. Flash flooding along roadways lead to road closures throughout Talbot County. Event precipitation totals included 3.2 inches in the Village of Royal Oak.

Note: Storm Track images were generated by the National Hurricane Center. Some tracks may be difficult to see at this scale and should be viewed at www.nhc.noaa.gov.

Building Selection

For the purposes of this study and to provide a representative sample of various historic building types, and ensure an equitable distribution of those properties across all four villages, properties for Phase 2 were selected based on the following criteria:

- Buildings must have been constructed prior to 1967;
- Buildings must be located within the village zoning district boundaries;
- Buildings must be located within the 100 or 500-year floodplains **(Tables 3a & 3b)**; and
- Buildings must have been identified as either Priority 1 or 2 during the Phase 1 assessments **(Tables 1 & 2)**.

The following properties were selected for mitigation review;

Table 1: Priority 1 Properties

Priority 1 Properties				
Village	**MIHP Number**	**Address**	**Date**	**Architectural Style/Form**
Neavitt	N/A	6405 Bozman Neavitt Road	1900	Vernacular former town hall/post office
Neavitt	T-677	6395 Bozman Neavitt Road	1923	Vernacular Church w/ Queen Anne influences
Neavitt	N/A	6379 Thamert Road	1890	Vernacular I-House
Newcomb	N/A	7387 Station Road	c. 1890	Vernacular Form with No Discernible Style
Newcomb	N/A	7386 Back Street	c. 1890	Vernacular I-House
Royal Oak	T-915	25886 Royal Oak Road	c. 1882	Vernacular Form with No Discernible Style
Royal Oak	T-913	25900 Royal Oak Road	1883	Gothic Revival
Tilghman Island	N/A	21456 Wharf Road	1940	Craftsman
Tilghman Island	N/A	21524 Chicken Point Road	1890	Vernacular W-House
Tilghman Island	N/A	21576 Chicken Point Road	1900	Vernacular w/ Dutch Colonial Revival influences
Tilghman Island	N/A	21638 Chicken Point Road	1900	Vernacular I-House
Tilghman Island	N/A	5882 Gibsontown Road	1830	Vernacular w/ Queen Anne influences
Tilghman Island	N/A	5896 Gibsontown Road	1900	Vernacular w/ Queen Anne influences
Tilghman Island	N/A	5883 Tilghman Island Road	1900	Vernacular Form with No Discernible Style

Table 2: Priority 2 Properties

Priority 2 Properties				
Village	**MIHP Number**	**Address**	**Date**	**Architectural Style/Form**
Neavitt	N/A	22883 Balls Creek Road	1920	Bungalow
Neavitt	N/A	6340 Bozman Neavitt Road	1940	Bungalow
Neavitt	N/A	6343 Bozman Neavitt Road	1900	Bungalow
Neavitt	N/A	6403 Bozman Neavitt Road	1890	Vernacular w/ Queen Anne Influences
Neavitt	N/A	6390 Duck Cove Lane	1900	Cape Cod
Royal Oak	T-912	25910 Royal Oak Road	1877	Vernacular Form with No Discernible Style
Tilghman Island	N/A	21619 Chicken Point Road	1940	Bungalow
Tilghman Island	N/A	21457 Gibsontown Road	1900	Vernacular
Tilghman Island	N/A	6047 Knapp Street	1900	Cape Cod
Tilghman Island	N/A	6104 N Main Street	1940 / 1920	Two-Story Altered Building with No Discernible Style
Tilghman Island	N/A	5912 Tilghman Island Road	1940	Cape Cod

Both Priority 1 and Priority 2 properties were selected to represent the various building types, forms, and styles in the four villages.

Another criterion for selection was also that the building must be located within either the 100- or 500-year floodplain, **Tables 3a and 3b** identify which properties are within each floodplain. This analysis identified 14 buildings in the 100-year, or 1% annual chance, and 22 in the 500-year, or 0.2% annual chance events.

Note: Some properties not found in either the 100- or 500-year floodplains during this analysis were still included in the study as they were identified as being located in the floodplain during Phase I analysis.

100 year	Village	Address
1.	Neavitt	6390 Duck Cove Lane
2.	Tilghman	5883 Tilghman Island Road
3.	Tilghman	21638 Chicken Point Road
4.	Tilghman	21619 Chicken Point Road
5.	Tilghman	6047 Knapp St
6.	Tilghman	21576 Chicken Point Road
7.	Tilghman	21524 Chicken Point Road
8.	Neavitt	6343 Bozman Neavitt Road
9.	Neavitt	6403 Bozman Neavitt Road
10.	Neavitt	22883 Balls Creek Road
11.	Tilghman	6104 N Main St
12.	Royal Oak	25910 Royal Oak Road
13.	Neavitt	6405 Bozman Neavitt Road
14.	Royal Oak	25886 Royal Oak Road

Table 3a: Properties within the current FEMA 100-year floodplain

500 year	Village	Address		Village	Address
1.	Neavitt	6390 Duck Cove Lane	12.	Neavitt	6340 Bozman Neavitt Road
2.	Tilghman	21456 Wharf Road	13.	Neavitt	6343 Bozman Neavitt Road
3.	Tilghman	5883 Tilghman Island Road	14.	Neavitt	6379 Thamert Road
4.	Tilghman	5896 Gibsontown Road	15.	Neavitt	6403 Bozman Neavitt Road
5.	Tilghman	5912 Tilghman Island Road	16.	Neavitt	22883 Balls Creek Road
6.	Tilghman	21457 Gibsontown Road	17.	Tilghman	6104 N Main St
7.	Tilghman	21638 Chicken Point Road	18.	Royal Oak	25910 Royal Oak Road
8.	Tilghman	21619 Chicken Point Road	19.	Newcomb	7386 Back St
9.	Tilghman	6047 Knapp St	20.	Neavitt	6405 Bozman Neavitt Road
10.	Tilghman	21576 Chicken Point Road	21.	Neavitt	6395 Bozman Neavitt Road
11.	Tilghman	21524 Chicken Point Road	22.	Royal Oak	25886 Royal Oak Road

Table 3b: Properties within the current FEMA 500-year floodplain

Building Types

The villages in Talbot County showcase a wide array of building types and styles, spanning from the modest waterman's houses, commonly built in the Bungalow form, to the elaborate Victorian-era Queen Anne interpretations that were popular among the wealthy families who inhabited the villages.

To showcase a representative cross section of the buildings, this report has selected a sample of the buildings surveyed in the four villages. The styles and/or forms are as follows, and are in no particular order;

- Vernacular I-House
- Gothic Revival
- Craftsman
- Vernacular W-House
- Dutch Colonial Revival
- American Four-Square
- Queen Anne
- Bungalow
- Cape Cod

Additional buildings such as a church, a former town hall, and a local market/store have been included to highlight the diversity of the property uses and forms. **Table 4** provides common characteristics for each style or form.

The individual property chapters found at the end of this report include architectural descriptions of these 25 types/styles of buildings, and highlight some architectural details that are characteristic of those styles. Samples and brief descriptions are also highlighted below in Photo 2 through Photo 5, and in **Table 4:**

Photo 2: Tilghman Island – Queen Anne Style with Gothic Elements c. 1900

Photo 3: Royal Oak – Altered Cape Cod Cottage Style c. 1877

Photo 4: Neavitt – Bungalow Form c. 1940

Photo 5: Newcomb – Vernacular I-House Style c. 1890

Table 4: Historic Building Type and Characteristics

Building Type	Eras of Construction	Common Characteristics
Gothic Revival	1840s – 1860s	Steeply pitched roof, pointed-arch windows, sometimes stained glass, a Gothic window above the main entry, a one-story porch, and Gothic arches.
Craftsman	1900 – 1929	A low-pitched, gabled roof; wide overhanging eaves; exposed rafters; decorative brackets; a front or corner porch under the roofline; double hung sash windows; hand-crafted stone or woodwork; tapered or square columns supporting the roof or porch; and the use of mixed materials throughout the building.
Queen Anne	1880s – 1900	Steeply pitched, irregular roof shapes; dominant, front-facing gables; patterned shingles, bay windows, multi-color and decorative ornamentation; partial or full-width porches of one story; multiple gables and dormers; and occasional towers or turrets.
American Four-Square	1900 – 1920s	Generally, two-and-a-half stories; low-pitched, hipped roofs; broad eaves; long bays of windows; a full-width front porch; and the namesake floorplan of four rooms per floor.
Cape Cod	1930 – 1940	Symmetrical appearance with front entry centered; steep roof with side gables; small roof overhang; 1 or 1½ stories; wood frame with lap, shake, or shingle siding; chimney located at gable end of house; gabled dormers; multi-paned, double-hung windows; shutters; and simple exterior ornamentation.
Bungalow	1900 – 1940s	Low-pitched roof, gabled or hipped; Deep eaves with exposed rafters; Decorative knee braces; 1–1½ stories, occasionally two; large fireplace; dormers; large, covered front porches with massive columns under extension of main roof; double hung windows often seen in continuous banks.
Dutch Colonial Revival	1890 – 1930	1½ to 2 stories; clapboard or shingle siding; symmetrical façades; gable-end chimneys; round windows in gable end; porch under overhanging eaves; 8-over-8 windows; Shed, hipped, or gable dormers; and columns for porches and entry.
Vernacular W-House	1800 – 1900	A "Tilghman Island Victorian House" type, unique to area and a rare surviving form; a symmetrical form with Y- or W-shaped plan based on an L-shaped plan and central, projecting bay that contains the main entry; projecting two-story central bay with three projecting sides.
Vernacular I-House	1638 – 1950	The most common folk house along the eastern United States, the I-House commonly is two stories high; has three bays per floor; and can either have symmetrical or asymmetrical facades.

Figure 7: Risk and Vulnerability for High Priority Historic Buildings in the Village of Newcomb

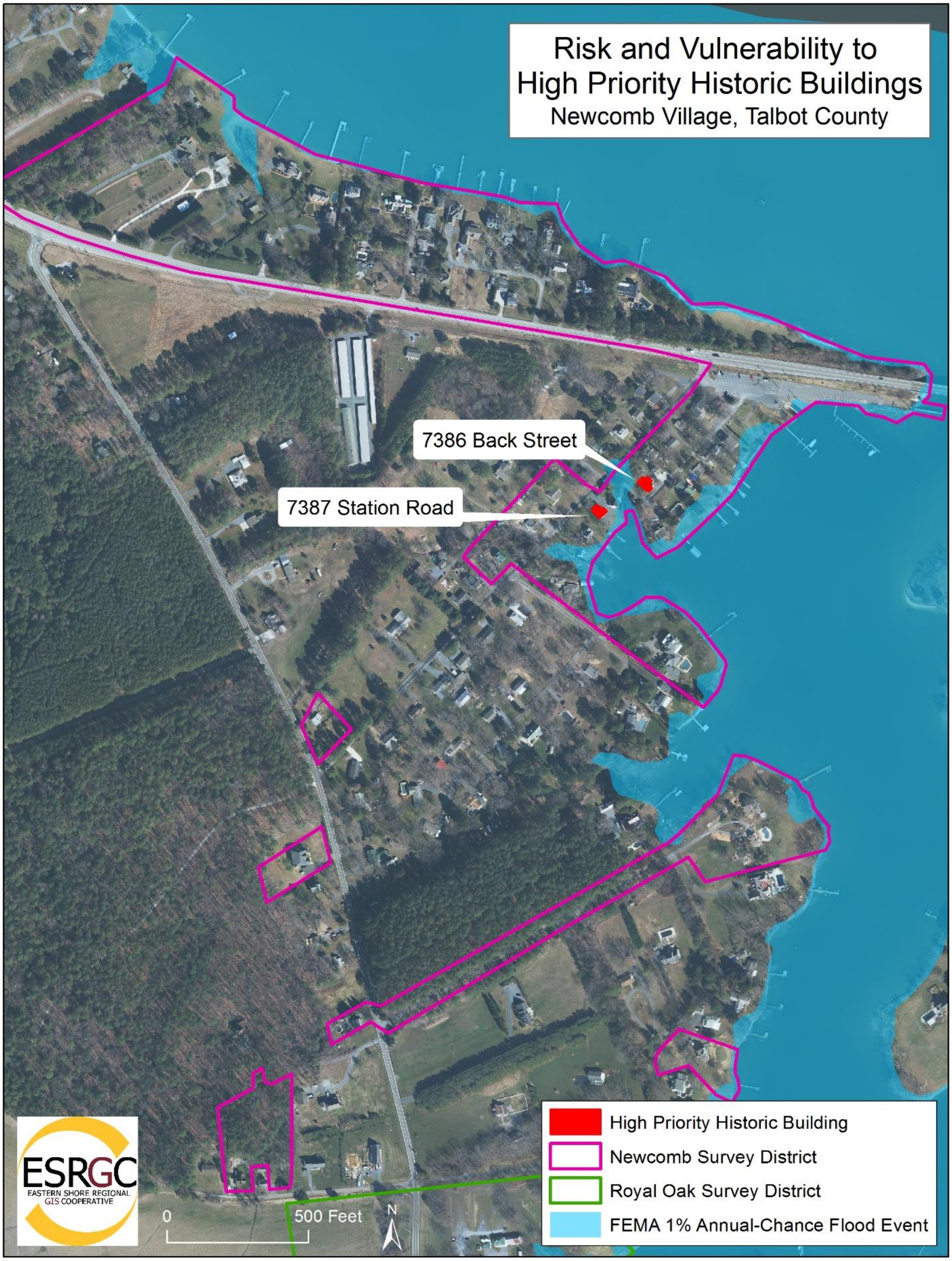


Figure 8: Risk and Vulnerability for High Priority Historic Buildings in the Village of Royal Oak

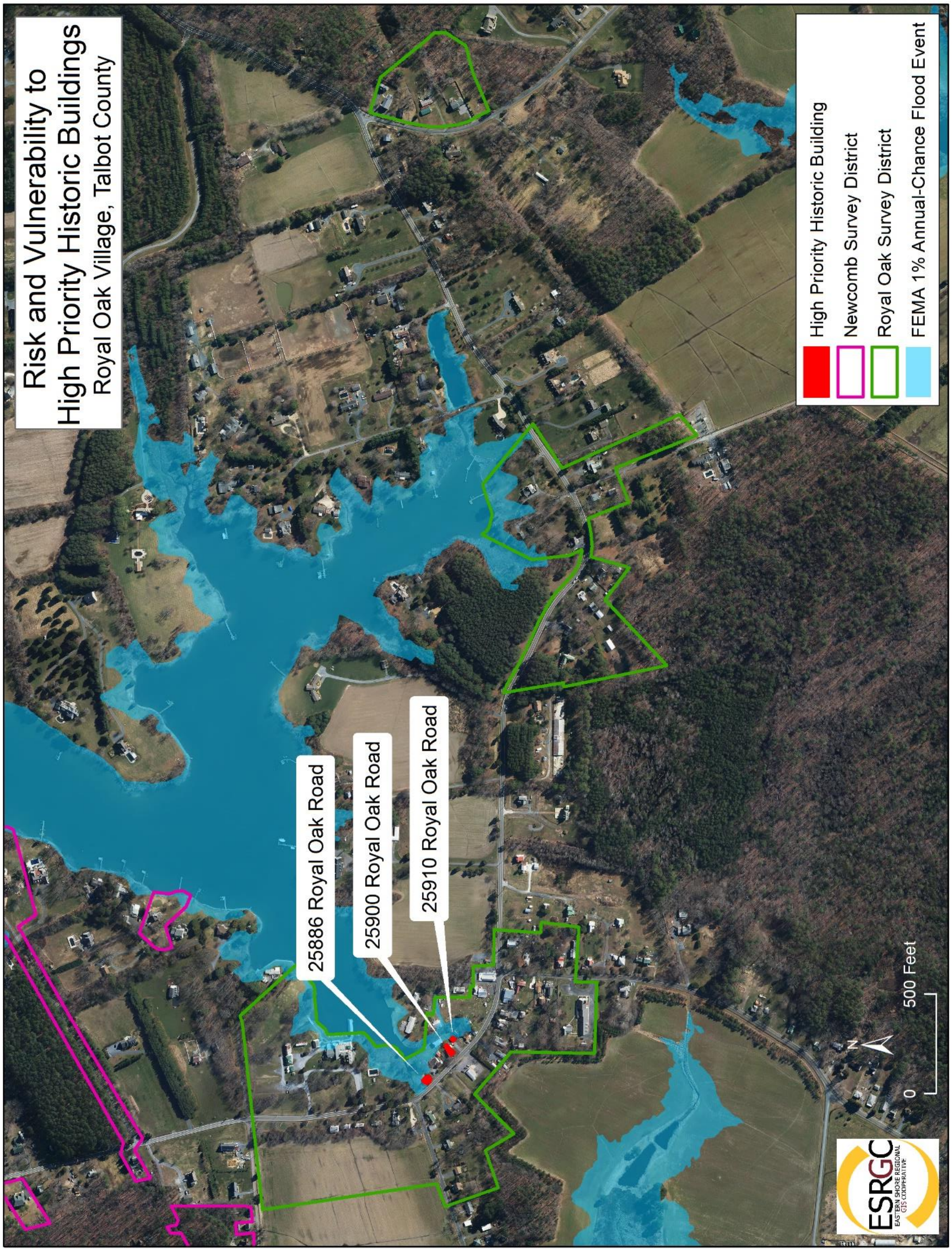


Figure 9: Risk and Vulnerability for High Priority Historic Buildings in the Village of Tilghman

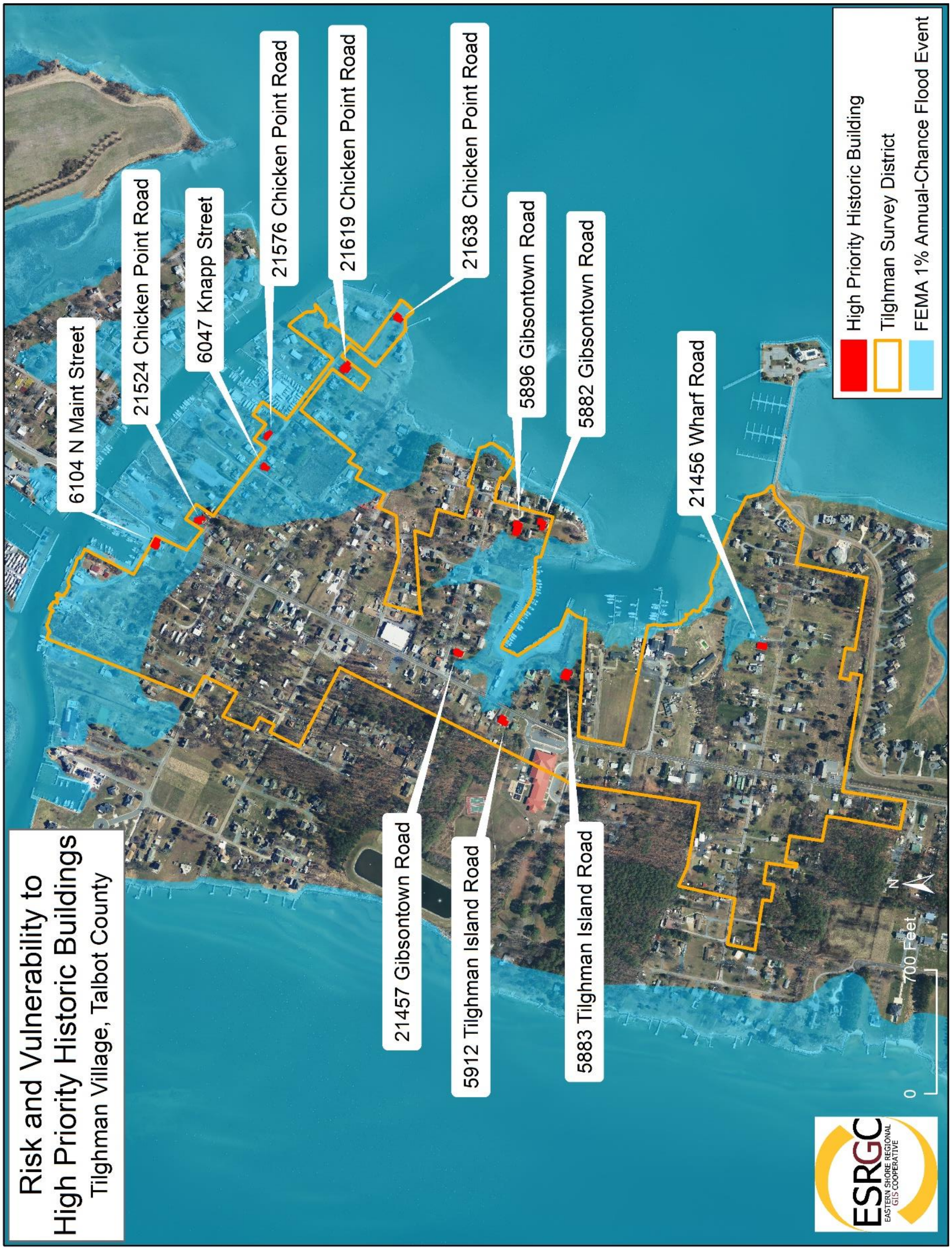
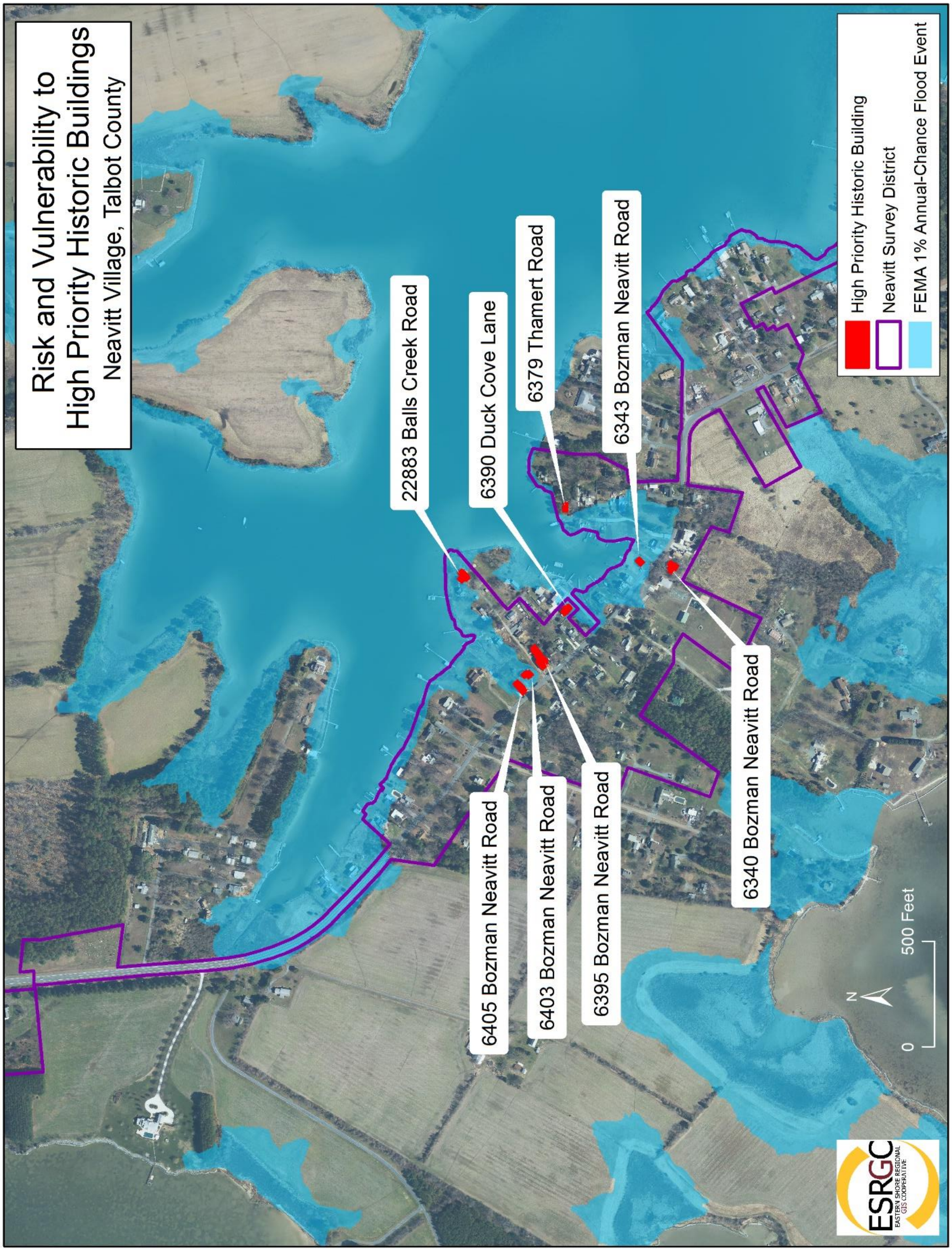


Figure 10: Risk and Vulnerability for High Priority Historic Buildings in the Village of Neavitt



Flood Depth Estimates

Methodology

For various flood scenarios, the following methodology was followed to determine first finished floor flooding and its corresponding damage to buildings in Talbot County's historic Villages of Neavitt, Newcomb, Royal Oak, and Tilghman. The process utilizes U.S. Army Corps of Engineers (USACE) Sea Level Change (SLC) estimates, Federal Emergency Management Agency (FEMA) forecast periodic flooding, Maryland Department of Planning (MDP) recorded parcel information, Talbot County addressed building footprints, HAZUS–MH damage curve coefficients, and LiDAR collected land elevations, to model potential loss.

Photo 6 – Sample home experiencing first finished floor flooding

Periodic flood estimates (10%-, 4%-, 2%-, 1%-, and 0.2%-annual chance) provided through FEMA's Flood Insurance Study for Talbot County (#24041CV000B) are modeled over observed land elevations to return inundation levels for the study year. Inundation levels were overlaid on county building footprints to determine the maximum flooding observed within each building.

Flooding of the buildings' first finished floors was established by subtracting recorded foundation heights from maximum flood depths. A damage rate for each building was then determined by applying the HAZUS damage curve which made use of the buildings descriptions and its first finished floor flooding. Financial loss estimates were produced by multiplying parcels' improved value and the corresponding building damage rate.

The process was repeated, but land elevations were adjusted using USACE SLC values to simulate forecast changes to base water levels for the 2050 and 2100 scenarios.

The end products addressed building footprints within the four historic villages of Talbot County's Historic Building Risk Assessment study, with damage and loss assessment based on projected SLC, forecast periodic flooding, building description, estimated first finished floor flooding, and the corresponding damage curve.

Detailed data analysis methodology can be found in Appendix E of this report.

The following sections summarize the findings of this methodology for each Village.

Village of Neavitt

The Village of Neavitt is predicted to experience significant inundation due to sea level change and annual-chance flood events in 2050 and 2100. The values used in this study are based on the USACE projected sea level change of 2.11 feet by 2050, and 5.78 feet for the study year 2100. The source of flood influence for the Village of Neavitt is Broad Creek. The 2050 sea level change, with no flood event, is projected to result in minimal flooding along the coastal area, as inundation is not observed within the existing buildings of the historic Village of Neavitt. By 2050, however, the majority of the Village of Neavitt will be inundated by the 10% annual-chance flood, and inundation will increase during less frequent flooding events. Sea level change by 2100 greatly inundates existing buildings within the historic Village of Neavitt. The 2100 sea level forecast predicts the Village of Neavitt will completely inundated during the 2100 10% annual-chance flood. All subsequent periodic events will continue to further inundate the Village of Neavitt.

Figure 11: Risk and Vulnerability for High Priority Historic Buildings and 2050 Annual-Chance Flood Predictions in the Village of Neavitt

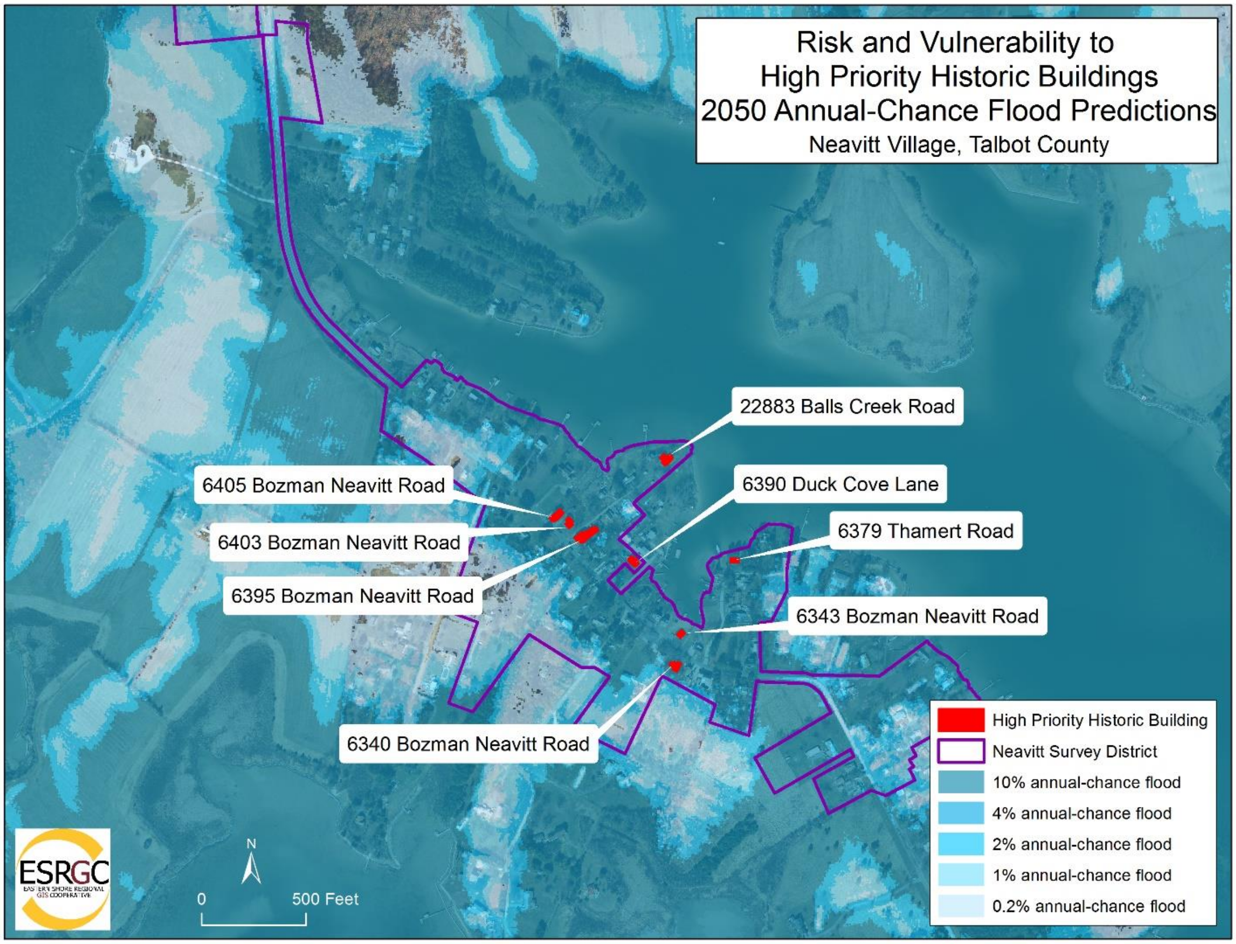
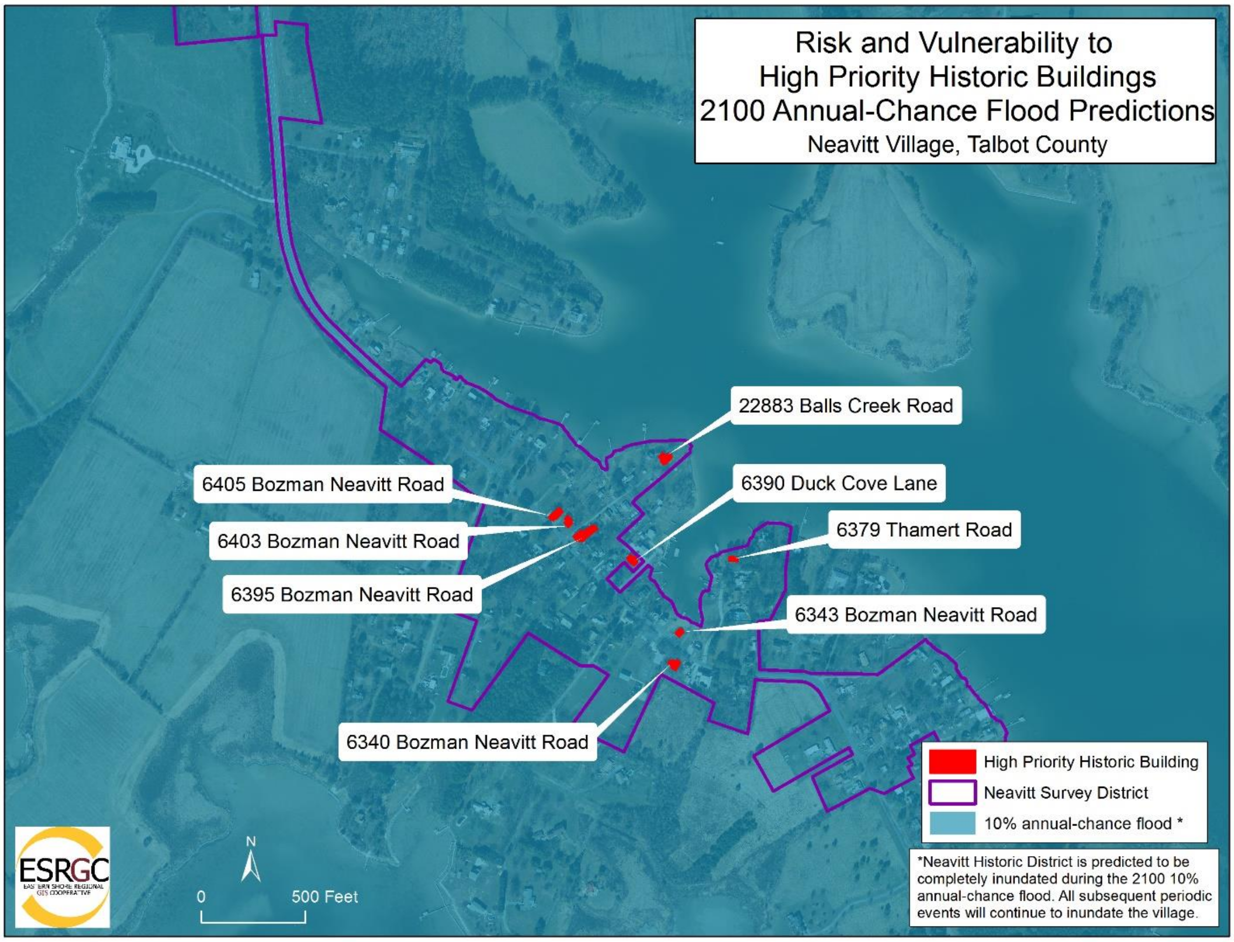


Figure 12: Risk and Vulnerability for High Priority Historic Buildings and 2100 Annual-Chance Flood Predictions in the Village of Neavitt



Village of Newcomb

The Village of Newcomb is predicted to experience significant inundation due to sea level change and annual-chance flood events in 2050 and 2100. The values used in this study are based on the USACE projected sea level change of 2.11 feet by 2050, and 5.78 feet for the study year 2100. The source of flood influence for the Village of Newcomb is the Miles River. The 2050 sea level change, with no flood event, is projected to result in minimal flooding along the coastal area, as inundation is not observed within the existing buildings of the historic Village of Newcomb. By 2050, select coastal buildings will be inundated during 10% annual-chance and additional less frequent flooding events, while many buildings in Newcomb Village are predicted to remain free from inundation. Sea level change by 2100 greatly inundates existing buildings within the historic Village of Newcomb. With the exception of one building, the Village of Newcomb 2100 sea level forecast is predicted to be completely inundated during the 2100 10% annual-chance flood. All subsequent periodic events will continue to further inundate the Village of Newcomb and all buildings.

Figure 13: Risk and Vulnerability for High Priority Historic Buildings and 2050 Annual-Chance Flood Predictions in the Village of Newcomb

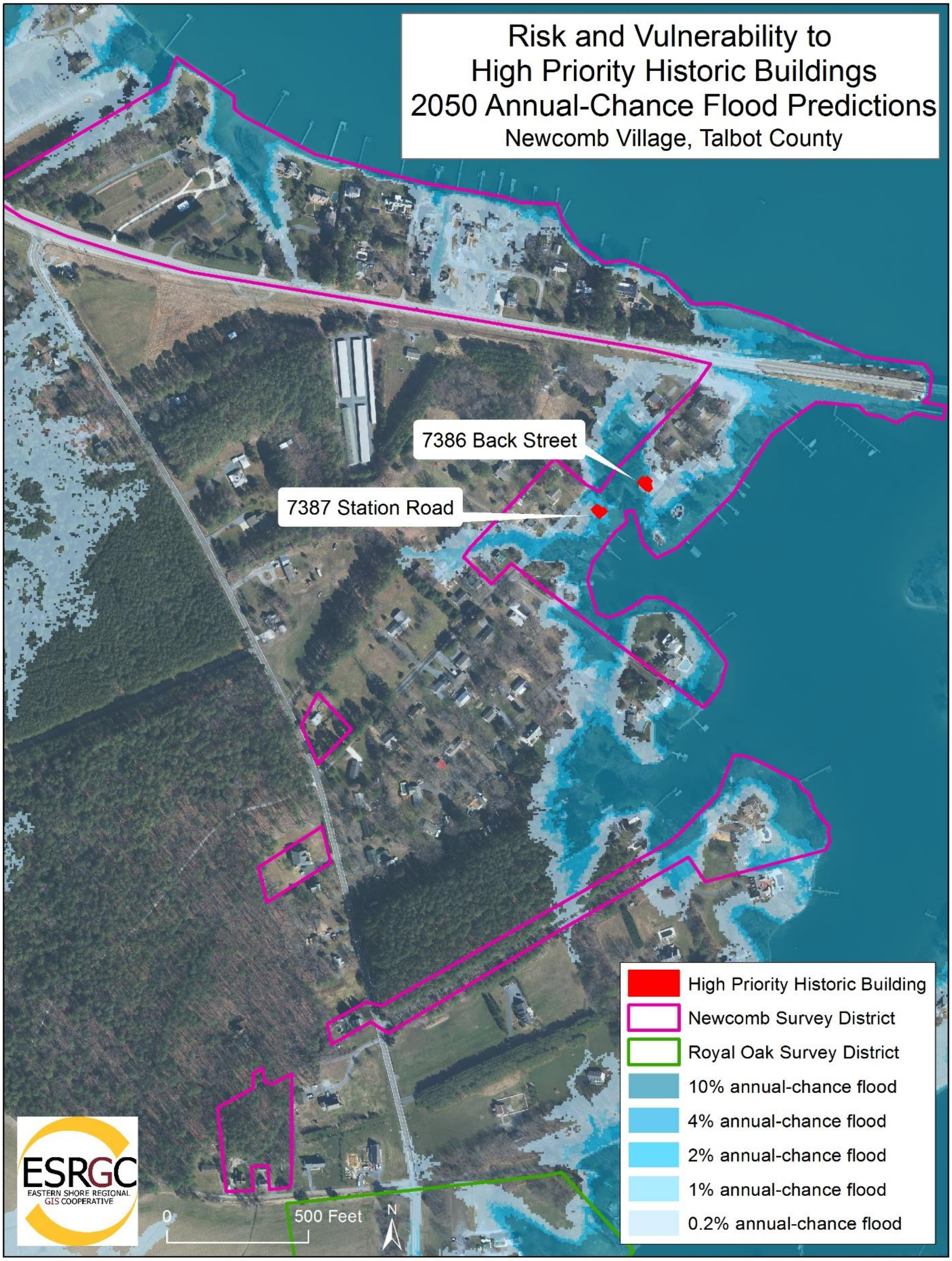
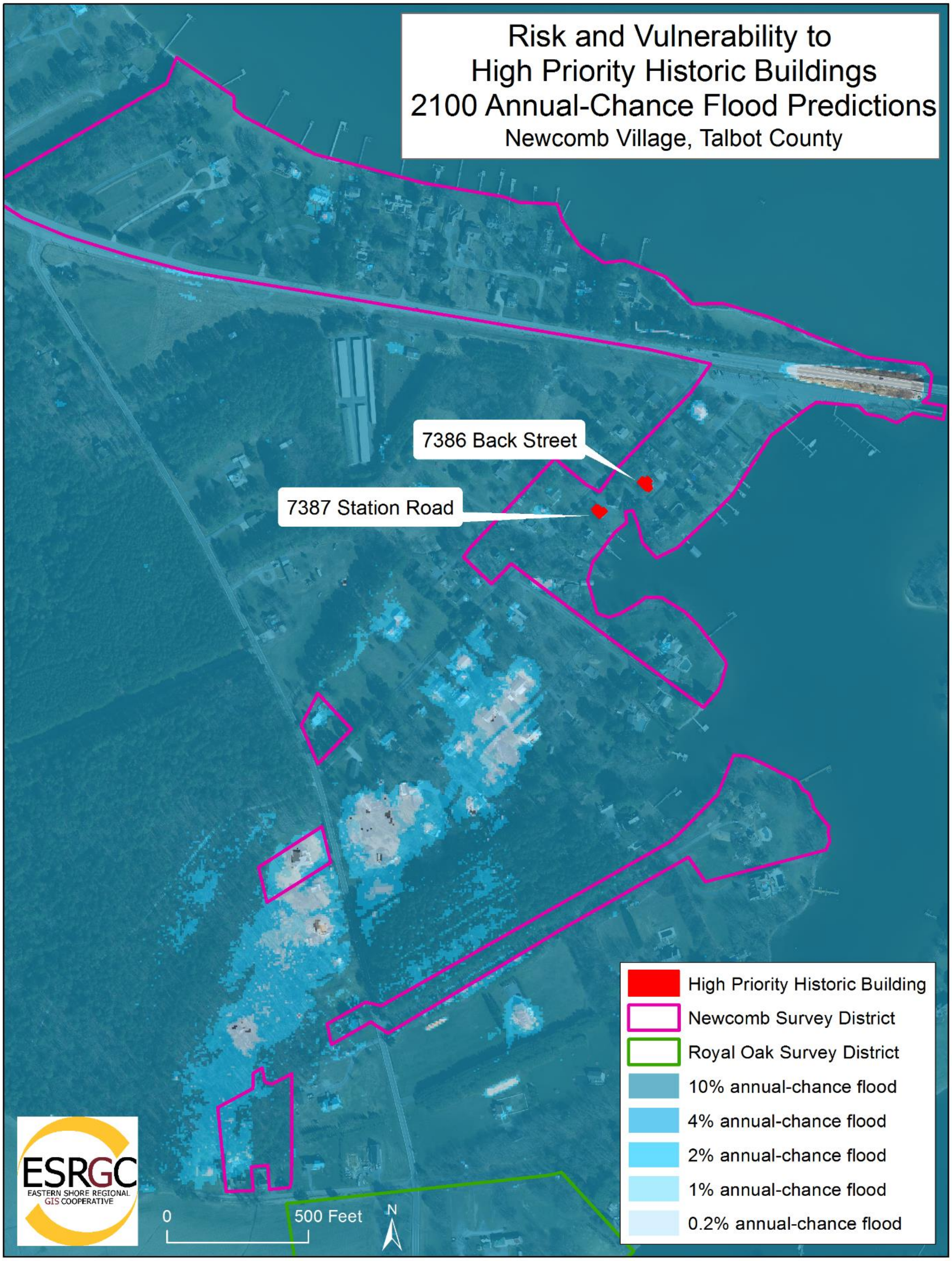


Figure 14: Risk and Vulnerability for High Priority Historic Buildings and 2100 Annual-Chance Flood Predictions in the Village of Newcomb



Village of Royal Oak

The Village of Royal Oak is predicted to experience significant inundation due to sea level change and annual-chance flood events in 2050 and 2100. The values used in this study are based on the USACE projected sea level change of 2.11 feet by 2050, and 5.78 feet for the study year 2100. The sources of flood influence for the Village of Royal Oak is the Miles River and Harris Creek. The 2050 sea level change, without periodic flood, is projected to result in minimal flooding along the coastal area, as inundation is not observed within the existing buildings of the historic Village of Royal Oak. By 2050, however, many of the buildings in Village of Royal Oak are inundated by the 10% annual-chance flood, and inundation will increase during less frequent flooding events. Sea level change by 2100 greatly inundates existing buildings within the historic Village of Royal Oak. With the exception of four buildings, the Village of Royal Oak 2100 sea level forecast is predicted to be completely inundated during the 2100 10% annual-chance flood. All subsequent periodic events will continue to further inundate the village and all buildings.

Figure 15: Risk and Vulnerability for High Priority Historic Buildings and 2050 Annual-Chance Flood Predictions in the Village of Royal Oak

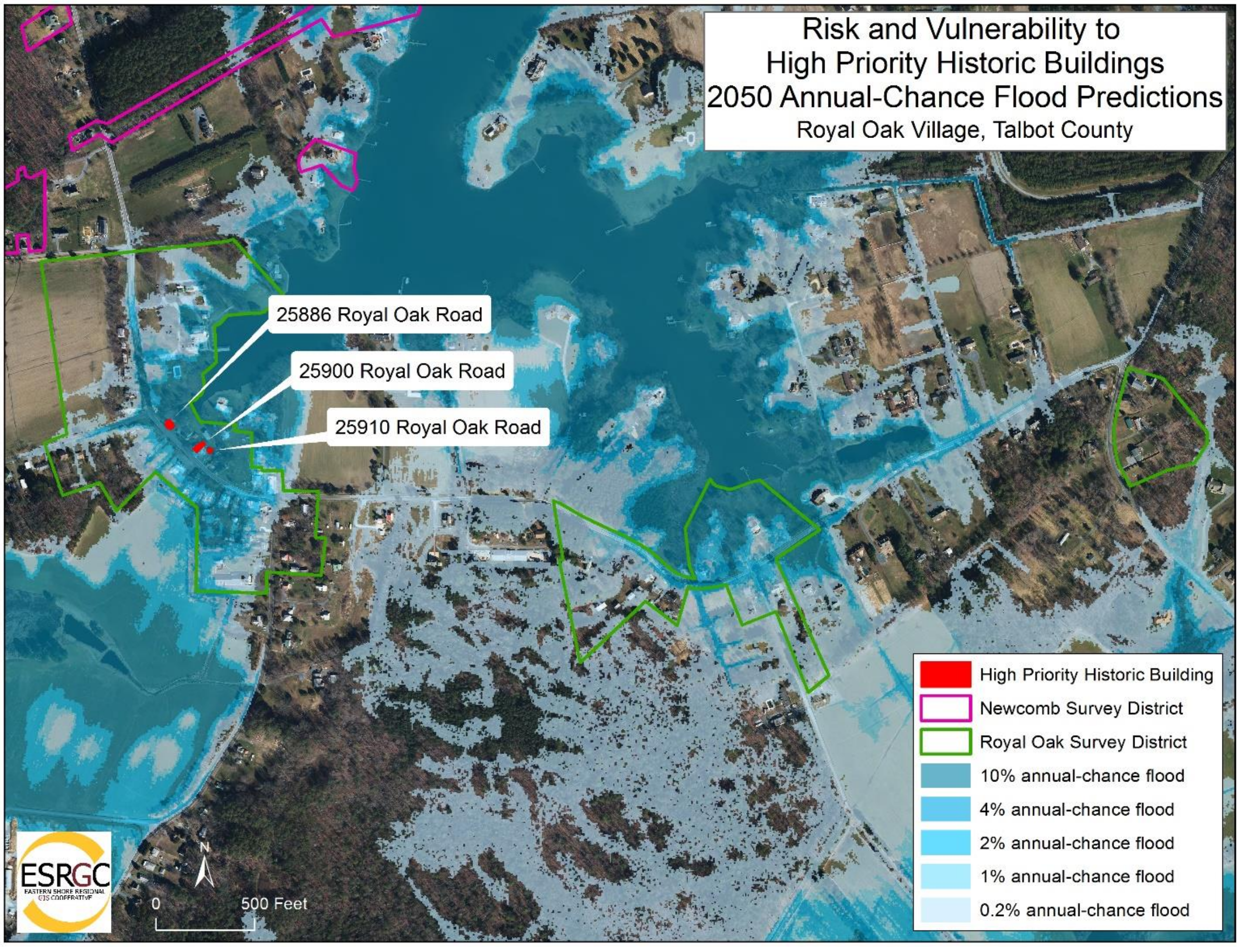
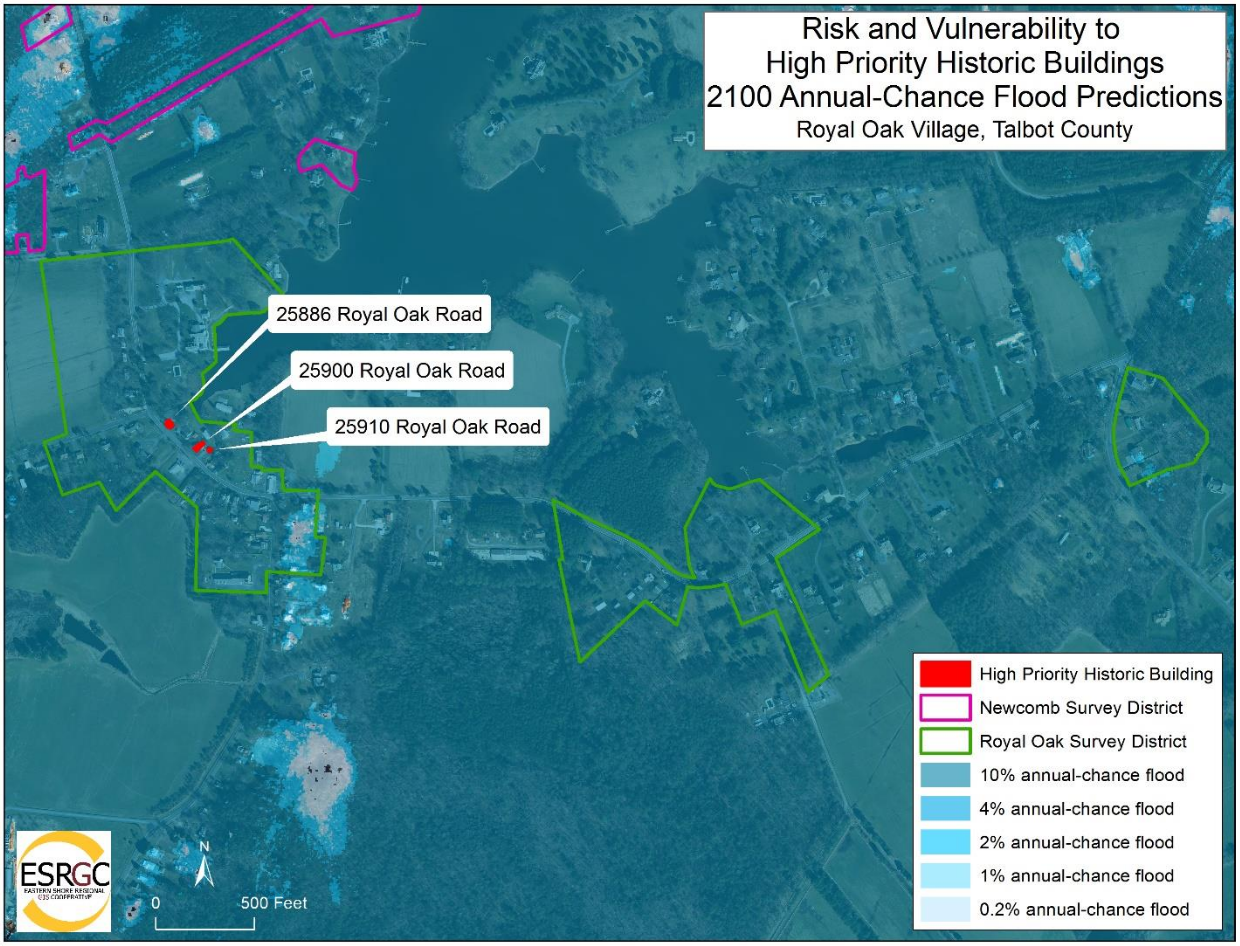


Figure 16: Risk and Vulnerability for High Priority Historic Buildings and 2100 Annual-Chance Flood Predictions in the Village of Royal Oak



Village of Tilghman

The Village of Tilghman is predicted to experience significant inundation due to sea level change and annual-chance flood events in 2050 and 2100. The values used in this study are based on the USACE projected sea level change of 2.11 feet by 2050, and 5.78 feet for the study year 2100. The source of flooding for the Village of Tilghman is the Chesapeake Bay. The 2050 sea level change, without periodic flooding, is projected to result in minimal inundation along the coastal area, as inundation is not observed within the existing buildings of the historic Village of Tilghman. By 2050, however, a significant number of buildings in the Village of Tilghman will be inundated by the 10% annual-chance flood, and inundation will further increase during less frequent flooding events. Sea level change by 2100 greatly inundates existing buildings within the historic Village of Tilghman. The 2100 sea level forecast predicts that the Village of Tilghman will be completely inundated during the 2100 10% annual-chance flood. All subsequent periodic events will continue to further inundate the Village of Tilghman and all buildings.

Figure 17: Risk and Vulnerability for High Priority Historic Buildings and 2050 Annual-Chance Flood Predictions in the Village of Tilghman

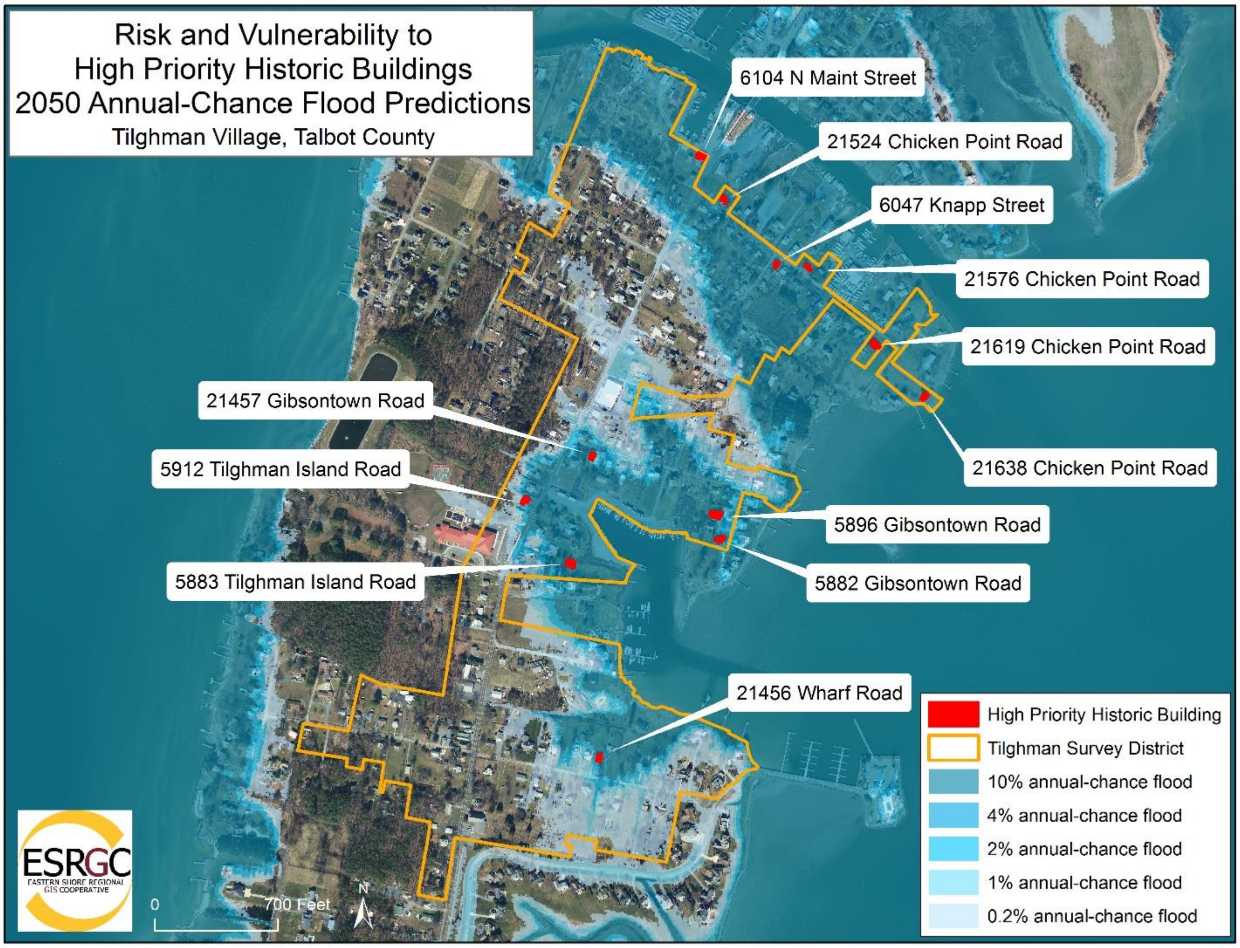
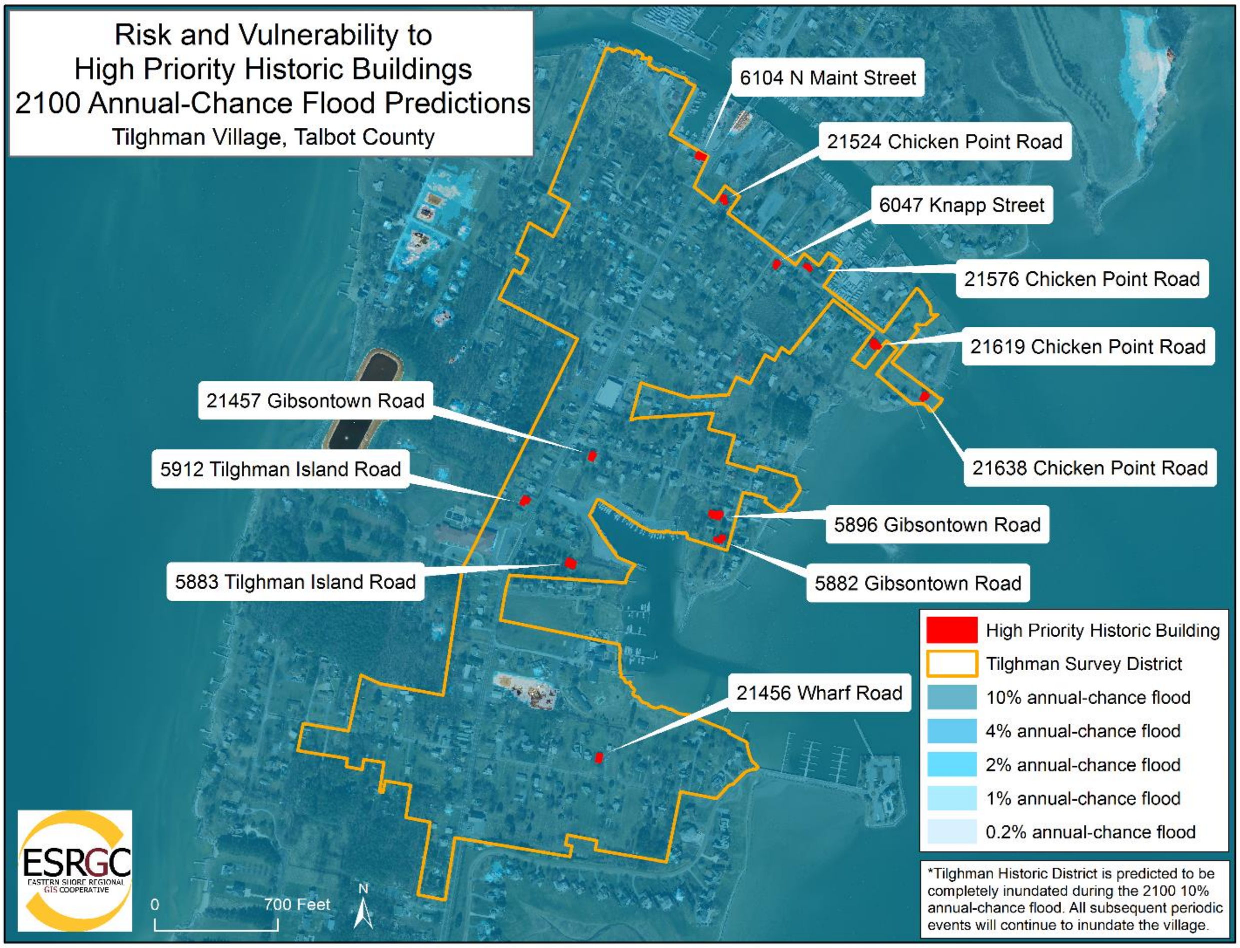


Figure 18: Risk and Vulnerability for High Priority Historic Buildings and 2100 Annual-Chance Flood Predictions in the Village of Tilghman



Description of Mitigation Actions

The individual Property chapters included at the end of this report showcase various hazard mitigation actions for specific building types. It is logical, and even recommended, that any actions applicable to a specific building type, e.g. Bungalow, Cape Cod, etc., would be applicable to any building of similar form, style, and circumstance. However, there are general hazard mitigation actions such as good maintenance and upkeep, that can be applicable to all properties within the study areas, and beyond.

A property in good condition is more likely to withstand, and recover from a hazard more quickly, than one with structural deficiencies such as crumbling foundation and masonry, cracked or leaking windows and doorways, or a leaking roof. Unoccupied, abandoned, or derelict buildings are more likely to suffer severe losses from a flood hazard event. Additionally, owners of waterfront properties with bulkheads or jetties on site should ensure these protection measures are kept in good repair.

Structural Projects

There are two basic types of hazard mitigation actions, structural and non-structural. Structural projects such as reservoirs, levees and floodwalls, channel improvements, crossings and roadways, drainage and storm sewer improvements, and drainage system maintenance are designed to control floodwaters. Based on their magnitude and complexities, these types of structural flood control projects are ranked high in terms of installation costs, maintenance requirements and environmental impacts, and therefore, require considerable thought and analysis before a structural project is selected. Since these projects often have regional or watershed-wide implications, an engineering or hydrology study is usually required. These projects could be planned, funded and implemented by regional agencies such as watershed authorities. While flood control projects can be beneficial, there are also some disadvantages.

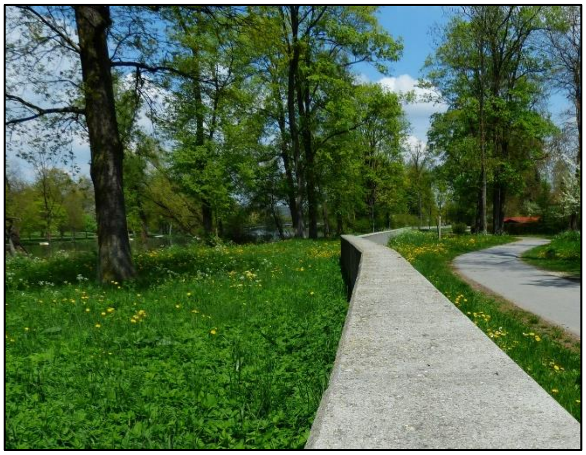


Photo 7: Sample of a floodwall.

Photo 8: Sample of a drainage channel.

Advantages

- Flood control projects can provide the greatest amount of protection for the subject land area.
- Due to land limitations in some cases, structural projects may be the only practical solution.
- They can also be beneficial to the community for water supply and recreational uses.
- Regional detention may be more cost-efficient and more effective than requiring numerous small detention basins.

Disadvantages

Structural projects could:

- Require regular maintenance in order to function properly.
- Cause disturbance of the land and disruption of natural water flows, often destroying wildlife habitat.
- Be built only to a certain flood protection level that can be exceeded by larger floods, causing extensive damage.
- Create a false sense of security as residents protected by a levee or floodwall may assume that they are not vulnerable to any type of flooding.

Non-Structural Projects

Non-structural projects sound counter intuitive, in that, they are actions that are performed to the building itself. They include those techniques used to modify existing buildings that are subject to flood damage. Typically, these protection measures do not affect the appearance or primary use of a building. Examples of property protection measures include: acquisition, building elevation, flood-proofing, sewer backup protection, and potentially, relocation.

Structural and non-structural projects can be further broken down into temporary and permanent actions.

Photo 9: Sample of temporary sandbag barrier.

Photo 10: Sample of temporary earthen floodwall.

Temporary Actions

From a historic preservation perspective, temporary or reversible actions are preferred. Actions such as pre-fit closures, sandbagging, temporary floodwalls, etc., are ideal measures to protect a

historic building as they do not modify the building itself, but direct the water around the building, or, at the minimum, prevent it from getting in. As a rule, temporary measures do not affect a building's character-defining features. Also, hazard mitigation measures that do not touch the building, such as temporary floodwalls, are preferable to any measures that do touch the building

Advantages
- The appearance of the building is not altered.
- Recommended where floodwaters are less than three feet and slow moving or for buildings where elevation is cost prohibitive (e.g., a slab building).

Disadvantages
- Dependent on human action for the installation of closures on windows and doorways.
- FEMA does not provide funding for temporary actions.

One of the best rules to remember throughout the hazard mitigation process is to avoid making changes that require additional changes. A corollary to this statement is that multiple temporary actions may not be preferable to one permanent action.

Permanent Actions

Building Elevation

One of the most effective hazard mitigation measures is the elevation of the building above the base flood elevation (BFE). However, in some parts of the villages this would require an elevation more than six (6) feet, thus severely altering the façade of the building. An intermediary elevation of one or two feet would help alleviate *some* flooding issues, but will not prevent major losses in the aftermath of the 500-year storm, nor in the sea-level rise projection scenarios. Minimization measures such as strategic landscaping or an integrated entryway can help to mask the appearance of raising a building by using various plantings or architectural details to reduce the visual impact of the elevation.

Photo 11: Elevated house without landscaping.

Photo 12: Elevated house with landscaping.

This non-structural technique lifts an existing building to an elevation which is at least equal to or greater than the 1 percent annual chance flood elevation. In many elevation scenarios, the cost of elevating a building an extra foot or two is less expensive than the first foot, due to the cost incurred for mobilizing equipment.

Any elevation projects undertaken are recommended to be on piers, as this is the least expensive method, and the preferred historic preservation method, especially for any buildings originally set on piers. Elevating on an open foundation is an appropriate retrofitting technique for houses in coastal high hazard areas (v zones). Elevation on piers allows the water to flow freely under the building and around the piers. It also allows for ventilation after the flooding event while keeping the main living portion of the building above potential flood levels. In some cases, open pier foundations may be fitted with non-structural, porous, architectural screening panels through which rising water levels can flow without restriction. As some elevation projects could diminish the historic integrity of a building and possible change its eligibility status for local designation, it is advisable to homeowners, to consult with local planning officials and/or the local historic preservation commission to discuss plans prior to undertaking any elevation project.

Advantages

- Elevating your house reduces the flood risk to the house and contents, and eliminates the need to move vulnerable and valuable contents to areas above the water level during flooding
- Elevating a building above the BFE is cheaper than relocating it, and can be less disruptive to a neighborhood, especially a neighborhood of historic significance.
- Elevation is an acceptable and reasonable means of complying with NFIP regulations, as well as the community's floodplain management ordinance or law, that require new, substantially improved, and substantially damaged buildings to be elevated above the base flood elevation.
- Elevating your house often reduces flood insurance premiums.

Disadvantages

- The cost of elevating your house may be prohibitive.
- The appearance of the house, and access to the house, may be adversely affected.
- Additional costs are likely if the house must be brought into compliance with current code requirements for plumbing, electrical, and energy systems.
- Special measures must be taken in areas of high velocity flows, waves, fast-moving ice, debris flows, or erosion.

Utility Elevation

The elevation of utilities is another commonly suggested mitigation action. The utilities should be raised above BFE as well, and this should be done on the sides or rear of the building. Minimization measures such as strategic landscaping or placing the elevated utilities in a cabinet which reflects the buildings style and character are also acceptable, where utilities cannot be relocated.

Although utilities are recommended to be moved to the back of a building in some circumstances, there are special considerations for historic waterfront buildings. Typically, the street facing façade is the protected façade of the building; however, in these historic waterfront villages, the river facing side was the primary façade as opposed to the roadway facing side. Therefore, the front *and* the back of the building may both need to be maintained.

Photo 13: Sample of elevated utilities mounted to the building.

Photo 14: Sample of elevated utilities on a platform.

Dry and Wet Flood-proofing

Dry Floodproofing

The dry flood-proofing technique involves using measures to seal a building to prevent water from entering it. All areas below the flood protection level are made watertight. Walls are coated with waterproofing compounds or plastic sheeting and openings such as doors, windows, and vents are closed, either permanently, with removable shields, or with sandbags. Generally, a building can only be dry flood proofed up to 3-feet in elevation. A structural analysis of the wall strength would be required if it was desired to achieve higher protection. Examples of dry flood-proofing modifications include the following:

- Installing watertight shields over doors and windows.
- Reinforcing walls to withstand floodwater pressures and impact forces generated by floating debris.
- Using membranes and other sealants to reduce seepage of floodwater through walls and wall penetrations.
- Installing drainage collection systems and sump pumps to control interior water levels, collect seepage, and reduce hydrostatic water pressures on the floor slab and walls.
- Installing backflow valves to prevent the entrance of floodwater or sewage flows through utilities.
- Anchoring the building to resist flotation, collapse, and lateral movement.

Advantages

- The appearance of the building is not altered.
- Appropriate for buildings on concrete slab floors (without basements) and for those without cracks.
- Recommended where floodwaters are less than three feet and slow moving or for buildings that are too expensive to elevate (e.g., a slab building).

Photo 15: Flood vents installed on an elevated home.

Photo 16: Sandbags installed at a below-grade entryway.

Disadvantages

- The waterproofing compounds can deteriorate over a period of time.
- Dependent on human action for the installation of closures on windows and doorways.
- Cannot be used if the building has a basement.
- Achieves flood risk reduction but it is not recognized by the National Flood Insurance Program for any flood insurance premium rate reduction if applied to a residential building.

Wet Floodproofing

Wet floodproofing is a process that prepares the building to allow floodwaters in, as opposed to keeping it out. This technique is beneficial in preventing the build-up of hydrostatic pressure on the walls or supports of the foundation, which can cause cracks or even collapse should the pressure become too great. Additionally, this measure can combat buoyancy, should uplift forces become too great. This nonstructural technique is applicable as either a stand-alone measure or as a measure combined with other measures, such as elevation. Wet floodproofing can involve:

- Relocating appliances, utilities, ductwork, and electrical outlets to a higher location.
- Installing flood vents to allow water into the lower level or crawlspace.
- Removing water-vulnerable building materials such as wood, carpet, and drywall.
- Installing water-resistant materials such as concrete, brick, ceramic, or tile.

Advantages

- Wet floodproofing measures are often less costly than other hazard mitigation measures.
- Allows internal and external hydrostatic pressures to equalize, thereby lessening the loads on walls and floors.

Disadvantages

- May be used to bring a substantially damaged or substantially improved building into compliance with the community's floodplain management ordinance or law, only if the enclosed areas of the building below the BFE are above grade on at least one side and used solely for parking, storage, or building access.
- Extensive clean-up may be necessary if the building becomes wet inside and possibly contaminated by sewage, chemicals, and other materials borne by floodwaters.
- Pumping floodwaters out of a basement too soon after a flood may lead to structural damage.
- Periodic maintenance may be required.
- Does not minimize the potential damage from high-velocity flood flow and wave action.
- Does not reduce flood insurance premiums for residential buildings.

Interior Actions

Interior actions tend to be acceptable so long as they do not impact the appearance of the building or other contributing architectural features. Generally, historic designation status and designation are based on exteriors only. Actions such as using waterproof/water-resistant wainscoting can provide an additional 3-4 feet of protection to the interior first floor of the building. Most interior hazard mitigation actions do not affect the eligibility of the building; however, before beginning major renovations, it is best to consult with the County's planning officials and the Talbot Historic Preservation Commission.

Additional Actions

Additional recommended actions for all historic property owners include;

1) Encourage historic property owners located in the flood zone to purchase flood insurance.

2) Relocate valuable contents, including family heirlooms or other historic items to a location that is above the BFE.

3) Use outreach activities to highlight technical assistance programs that address measures that citizens can take or facilitate funding for certain hazard mitigation measures.

4) Ensure proper protection for any outbuildings on property as well, including barns, workshops, sheds, boathouses, etc.

Hazard mitigation actions should take into consideration the age of the building, the number of properties for sale in the area, properties occupied by temporary or seasonal residents, and the age of the property owner or resident. For example, elderly residents may not be able to stack sandbags at low door and window openings, or have the ability to install the pre-fit gate closures. Additionally, for-sale properties or vacation properties that are not occupied full time would not have someone available on short notice to install or prepare the hazard mitigation measures. Also, buildings of a certain age may not be able to withstand the pressures and forces associated with the elevation process. A link to the US Army Core of Engineers Mitigation Actions Quick Reference Guide is included at the end of this report to provide a quick comparison of the various mitigation actions, potential implementation costs, and optimal implementation scenarios, for the actions recommended in this report.

All recommendations in this report have been developed prior to the release of MHT's Mitigation for Historic Properties planning document. Any actions found to be inconsistent or contradictory to the State Hazard Mitigation for Historic Properties planning document may need to be reviewed and modified.

Building Relocation

Examples of Historic Structure Relocation

Cape Hatteras Light Station, Hatteras, NC

Photo 17: Cape Hatteras Light Station

One of the most well-known examples of the relocation of an historic structure is the Cape Hatteras Light Station. The lighthouse had been threatened by shoreline erosion as early as the 1930s; however, serious discussion about preservation and mitigation actions did not take place until the 1980s. Measures such as groin walls and beach nourishment had been attempted but the land around the lighthouse was eroding at an alarming rate. For years, from the late 1980s to the mid-1990s, relocation was argued against based upon reasons ranging from infeasibility to public outcry. Finally, a study completed in 1995 by the North Carolina State University formally endorsed a 1988 engineering study proclaiming relocation to be the most cost effective and least environmentally damaging method, compared to other mitigation actions such as constructing a seawall or installing artificial reefs offshore. The lighthouse was moved to a nearby location that is set back from but still close to the Atlantic Ocean, maintaining the lighthouse's historic relationship with the water. The lighthouse is an excellent example of relocating and mitigating a historic structure because it shows

that moving listed buildings happens rarely, and only after a lot of thought, study, and consideration. The lighthouse has remained listed because it retained its location both near water, and close to its original location (i.e., not somewhere else in the state). Its surrounding buildings were moved along with it and reconfigured in a similar way.

Federal, State, and Local Designation Processes

County and Local Zoning and Historic Preservation Commission Authority

While federal guidelines are implemented at the state level through the State Historic Preservation Office, perhaps more critical are the local policies, particularly those stated in the Talbot County Zoning Ordinance, as well as the by-laws and authority of the Talbot County Historic Preservation Commission. If property owners wish to keep their homes or buildings eligible for listing in the National Register of Historic Places, they should implement mitigation measures that do not include relocation. However, for some buildings that are at risk, it is possible that property owners may have to accept the potential reality of losing the property and building to the local waterways in the not-too-distant-future if relocation is not an option. On the other hand, if property owners wish to save the building from rising waters and flood events by relocating the building, it is possible that the property or building may no longer be eligible for listing in either the MIHP or NRHP. Property owners may likely care more about saving their buildings, whether motivated by historic preservation or economic investment or other reasons. Most would likely be willing to forego National Register listing and move their buildings if that was the only alternative to preventing repeated flood events.

The 2009 Talbot County Zoning Ordinance indicates that the Villages of Newcomb, Neavitt, Royal Oak, and Tilghman Island are each zoned as a village center district, and not designated historic districts. Although not listed in the National Register, each village center district provides for limited development in scale with the existing character of the village. The policies for Talbot County's village center districts ensure that growth be consistent with historic patterns of modest scale, and timing of development.

§ 190-12 of the Talbot County Zoning Ordinance titled '*Decisionmaking bodies and officials*', states that the Historic Preservation Commission has the following powers and duties:

1. Decide applications for the construction, alteration, reconstruction, moving or demolition of any structure within a designated historic district.
2. Make recommendations to the County Council on the establishment of Historic District Overlay Districts and Historic Rehabilitation Overlay Districts.
3. Provide comments to the Planning Director on site plans and subdivision plans affecting an historic resource identified in the Comprehensive Plan.

Source: 2009 Talbot County Zoning Ordinance, § 190-12.

The County's Zoning Ordinance identifies the decision to move a structure as one of the powers of the Talbot County Historic Preservation Commission (TCHPC). This is a power they may need to exercise more and more in the coming years. While the villages are not designated historic districts, property owners should still contact the TCHPC with any questions regarding implementing hazard mitigation actions to historic buildings, including building relocation and/or elevation. It is recommended that the TCHPC's powers and duties encompass those historic properties found outside of designated historic districts and that they have the authority to decide applications for historic resources county-wide.

While implementing specific hazard mitigation actions, it is important to take into account the eligibility of a building and understand existing eligibility guidelines, as well as federal, state, and local laws, processes, and regulations.

National Register of Historic Places Criteria Consideration B: Moved Properties

According to the National Register of Historic Places, "[t]he National Register criteria limit the consideration of moved properties because significance is embodied in locations and settings as well as in the properties themselves. Moving a property destroys the relationships between the property and its surroundings and destroys associations with historic events and persons. A move may also cause the loss of historic features such as landscaping, foundations, and chimneys, as well as loss of the potential for associated archeological deposits." For buildings that have been moved prior to determinations of eligibility or listing in the National Register of Historic Places, formal guidance exists that assists historic preservation professionals in their evaluations. If moved properties meet at least one of the standard National Register Criteria (A-D), they can be listed under Criterion Consideration B if the buildings derive their significance primarily for architectural value or are the surviving property most importantly associated with a historic person or event. The moved buildings must retain historic features that continue to convey their significance and also retain their integrity of design, materials, workmanship, feeling, and association. It is generally difficult and only about one (1) percent of all listed properties reach this standard.

National Register of Historic Properties (NRHP) Relocation Guidelines

There is currently a process in place to maintain listing for historic properties that are listed in the National Register of Historic Places that are proposed to be moved. It should be noted that these rules are only for formally listed properties and not those that have been determined eligible or will be evaluated in the future. The requirements for listing a moved property are stringent and the property must be assessed by a qualified historic preservation professional. For properties that are already listed, careful consideration and cooperation between the State Historic Preservation Office, Maryland Historical Trust, but also the Keeper of the National Register of Historic Places should be conducted prior to undertaking a relocation project. The rules and regulations identified in *36 CFR 60.14 - Changes and revisions to properties listed in the National Register*, are as follows:

Title 36 of the CFR, Section 60.14 says the following about moved properties:

(b) Relocating properties listed in the National Register.

(1) Properties listed in the National Register should be moved only when there is no feasible alternative for preservation. When a property is moved, every effort should be made to reestablish its historic orientation, immediate setting, and general environment.

(2) If it is proposed that a property listed in the National Register be moved and the State Historic Preservation Officer, Federal agency for a property under Federal ownership or control, or person or local government where there is no approved State Historic Preservation Program, wishes the property to remain in the National Register during and after the move, the State Historic Preservation Officer or Federal Preservation Officer having ownership or control or person or local government where there is no approved State Historic Preservation Program, should submit documentation to NPS prior to the move. The documentation should discuss:

(i) The reasons for the move;

(ii) The effect on the property's historical integrity;

(iii) The new setting and general environment of the proposed site, including evidence that the proposed site does not possess historical or archeological significance that would be adversely affected by the intrusion of the property; and

(iv) Photographs showing the proposed location.

(3) Any such proposal with respect to the new location shall follow the required notification procedures, shall be approved by the State Review Board if it is a State nomination and shall continue to follow normal review procedures. The Keeper shall also follow the required notification procedures for nominations. The Keeper shall respond to a properly documented request within 45 days of receipt from the State Historic Preservation Officer or Federal Preservation Officer, or within 90 days of receipt from a person or local government where there is no approved State Historic Preservation Program, concerning whether or not the move is approved. Once the property is moved, the State Historic Preservation Officer, Federal Preservation Officer, or person or local government where there is no approved State Historic Preservation Program shall submit to the Keeper for review:

(i) A letter notifying him or her of the date the property was moved;

(ii) Photographs of the property on its new site;

(iii) Revised maps, including a U.S.G.S. map;

(iv) Acreage; and

(v) Verbal boundary description.

The Keeper shall respond to a properly documented submittal within 45 days of receipt with the final decision on whether the property will remain in the National Register. If the Keeper approves the move, the property will remain in the National Register during and after the move unless the integrity of the property is in some unforeseen manner destroyed. If the Keeper does not approve the move, the property will be automatically deleted from the National Register when moved. In cases of properties removed from the National Register, if the State, Federal agency, or person or local government where there is no approved State Historic Preservation Program has neglected to obtain prior approval for the move or has evidence that previously unrecognized significance exists, or has accrued, the State, Federal agency, person or local government may resubmit a nomination for the property.

(4) In the event that a property is moved, deletion from the National Register will be automatic unless the above procedures are followed prior to the move. If the property has already been moved, it is the responsibility of the State, Federal agency or person or local government which nominated the property to notify the National Park Service. Assuming that the State, Federal agency or person or local government wishes to have the structure reentered in the National Register, it must be nominated again on new forms which should discuss:

> (i) The reasons for the move;
>
> (ii) The effect on the property's historical integrity, and
>
> (iii) The new setting and general environment, including evidence that the new site does not possess historical or archeological significance that would be adversely affected by intrusion of the property. In addition, new photographs, acreage, verbal boundary description and a U.S.G.S. map showing the structure at its new location must be sent along with the revised nomination. Any such nomination submitted by a State must be approved by the State Review Board.

(5) Properties moved in a manner consistent with the comments of the Advisory Council on Historic Preservation, in accord with its procedures (36 CFR part 800), are granted as exception to Sec. 60.12(b). Moving of properties in accord with the Advisory Council's procedures should be dealt with individually in each memorandum of agreement. In such cases, the State Historic Preservation Officer or the Federal Preservation Officer, for properties under Federal ownership or control, shall notify the Keeper of the new location after the move including new documentation as described above.

Relocation Recommendations

The issue of relocation or moving properties is a complex one: Is it preferable to move a historic property to protect it from repeated flooding, thereby destroying its historic context and potentially rendering it ineligible for the NRHP? Or is it preferable to preserve a historic building

in its original location while risking its long-term existence to maintain its integrity? There is no easy or correct answer to these questions. Compounding the complexity is that the guidance on moving properties comes from a federal agency, while the problems with flood-prone historic properties are local in nature. It is recommended to consider approaches that address the issues at both the federal and local levels.

The TCHPC should reconsider its approach to property relocation and require a thorough review of applications to move buildings. It should commit to working closely with residents of locally designated properties who propose to move their buildings to find an appropriate location and determine if enhancements to the setting could minimize the loss of integrity that will result from the move. Holding workshops or seminars to explain the best practices of hazard mitigation measures and the benefits of local historic preservation designation is a good first step.

It is recommended that the TCHPC be allowed to move buildings. The local law has more ‘teeth’ in its ordinances, so even if the National Register doesn’t change its policies, homeowners can perform the needful actions, to protect their properties if they don’t care about designation. The TCHPC should become more lenient and not apply fines and perhaps allow listings to remain in place if certain standards are met for the move and the “new” location.

While changing federal guidelines is more difficult to implement, it should be considered in the long-term. The federal designation is to some degree “honorary” except when Section 106 is applied or tax credits are in play. It is recommended for a study to be conducted for reconsideration of the National Register policies. An in-depth review at the federal level of Criteria Consideration B and the general National Register of Historic Places approach to assessing moved buildings, should be conducted. These guides and criteria warrant additional study and perhaps reconsideration. This study should occur at the national level given that the current guidance is from a federal agency and that guidance is applied nationwide by State Historic Preservation Offices.

The development of a panel of experienced and highly qualified cultural resources professionals can be created to study both successful and unsuccessful listings for moved properties and also collect data on historic properties that are no longer extant due to flood events. The professional panel could receive oversight from a Blue-Ribbon panel of experts that could include National Register of Historic Places and Advisory Council on Historic Preservation staff, federal historic preservation officers as well as State Historic Preservation Office staff. Depending on findings, National Register of Historic Preservation guidance may need to be revised. Considerations may include certain minimum qualifications for relocation and a scoring mechanism to be implemented to ensure buildings are not moved arbitrarily. Additionally, conditions such as ensuring the building is moved to a site that is still within the village center or historic district, if applicable, or setting a maximum allowable radius from the original site, could be implemented to ensure the building is not too far removed from the original historic location and thus preserving as much integrity of feeling and association as possible.

Moving historic buildings should be a last resort because the setting and context are critical to understanding a built resource. Property owners should be informed that moving should not be considered lightly if they care about designating their building, so if it is already listed on the National Register, they should go through the process previously described, to maintain the listing (to be done prior to the move). If it is locally designated, property owners will need approval from the TCHPC to move it.

It is important to remember that if the concern is more about saving the building (for financial reasons), property owners must be made aware that they may not be able to list in the National Register unless Criteria Consideration B is applied successfully or list it locally if the TCHPC makes an exception for local designation per its process. The designation information for both listed and not listed properties matters if the property owner is receiving or intended to apply for historic preservation tax credits at the federal, state, and/or local level.

Summary

It is the intention of this project to identify a sample of historic properties at risk from current, and projected future flooding hazards based on expert sea level change (SLC) projections. Every effort has been made to present an equitable representation of building types, flood hazard occurrence intervals, and the selected study area of waterfront villages. The Villages of Neavitt, Newcomb, Royal Oak, and Tilghman Island contain vibrant examples of various building styles, forms, and trends and are valuable representations of the lifestyle and character of Chesapeake Bay living.

Photo 18: View from Tilghman Island Drawbridge.

Although future SLC estimates provide a bleak picture of what may become of these charming historic communities, this document attempts to guide property owners and planning and historic preservation officials in various actions that can be undertaken to maintain the historic integrity of the building, while protecting the building and ensuring the usability of the property for as long as possible. The most recent USACE projections posit at least a two-foot increase in sea-level measurements by the year 2050, and a nearly six-foot increase by the year 2100 for all four villages. It is important to note that these projections are stillwater measurements with no event, which are the baseline sea levels without any flooding occurrences or storm surge. These levels will only increase in the event of a 1% and .02% storm.

While the projections are for the years 2050 and 2100, looking ahead and laying the groundwork in the villages and county’s long-range plans will help protect these valuable historic resources in the short term, and will pave the way for preservation efforts in the long term.

The following property chapters present the 25 selected representative properties. Each chapter is comprised of:

- An architectural analysis, from Phase 1 if an MHT Hazard Mitigation Form was completed, or an analysis by the VPC Team's Architectural Historians if an MHT form was not completed.
- A description of the nearest flooding hazard and the types of flooding the property was determined to face.
- A brief selection of property photos.
- Damage estimates for current and projected flood occurrence intervals.
- A select list of mitigation actions identified for that building.
- A property summary.

The following table presents the set of hazard mitigation actions for the 25 representative properties identified within the four historic Villages of Newcomb, Neavitt, Royal Oak, and Tilghman. Hazard mitigation actions were selected by the Consultant's Team's review of: previous local hazard mitigation actions; flood damage assessments for each village; any completed MHT Architectural Survey for Hazard Mitigation Planning Forms; observations during fieldwork; and careful architectural analysis. Hazard mitigation actions were selected for individual properties, although many of the actions are repeated for several other representative properties.

General hazard mitigation actions are summarized in **Table 5**. Hazard mitigation actions were developed to be compatible with Section 106 Guidelines of the Historic Preservation Act and every effort has been made to provide alternatives to such aggressive hazard mitigation actions, such as buyout, relocation, or demolition.

Table 5 – Recommended Hazard Mitigation Actions

List of Hazard Mitigation Actions
Structural and Permanent Actions
1. Construct a permanent flood wall with materials or ornamentation that reflects a context-sensitive design.
2. Repair the protective bulkhead and augment riprap to adequately perform its protective purpose.
Non-Structural Permanent Actions
3. Where historic materials have been replaced with modern materials, wet floodproof first floor with flood damage-resistant materials and install "check valves" to prevent water from backing into the drains of the building to prevent reverse-flow flood damage.
4. Elevate building and/or utilities to at least 2 feet above the BFE and install minimization measures to reduce the visual impact.
5. It is not recommended that property owners replace historic windows and doors. Historic windows and doors should be kept in good repair and painted to keep them water-resistant. Where historic windows and doors have been replaced with modern materials, it may be prudent to replace them with flood-resistant materials if they have reached, or are near, the end of their expected useful life.
6. Install flood vents within the entire exposed foundation.

7. Evaluate the functionality of the connections of drainage features including gutters/downspouts to prolong the longevity of prominent wood features and other historic structural features.
8. Keep exterior envelope water resistant. Apply paint to surfaces that were historically painted or are paintable. For masonry buildings, repoint masonry with materials compatible to historic masonry. In rare cases, it may be appropriate to apply a water-repellent coating to masonry surfaces per NPS Preservation Brief No. 1, however, MHT should be consulted during the planning process prior to the application of the coating.
9. Replace any rotted wood features in kind and paint to keep them water resistant.
10. Patch and repair the foundation in kind, where materials are available and with appropriate materials that are compatible with historic materials if kind materials are not available.
11. Evaluate the functionality of the siding-to-foundation connection and repair as necessary using corrosion-resistant materials.
12. Elevate fuel tanks to be positioned above the BFE, anchor to prevent flotation, and develop a protocol for shutting down fuel tanks/pumps when flooding is expected.
13. Consider relocation to a less vulnerable area within the village survey district.
Non-Structural Temporary Actions
14. When flooding is expected, install a temporary flood shield to reinforce the side access door.
15. Install a floodproof shield around the chimney to a height that is above the BFE, to create a waterproof seal.
16. Develop a procedure for installing temporary protection measures such as sandbagging and a removeable floodwall to be assembled when flooding is expected.
17. Have a pre-sized closure (ex. Small gate) stored in a readily accessible location to be placed in front of the bottom floor openings, providing a way for it to be closed quickly and have a watertight seal OR Construct a low wall around the window using materials compatible with the historic building.
Landscaping Actions
18. Consider constructing landscape solutions such as swales or berms to direct water flow away from the building.
19. Evaluate the structure’s drainage patters to ensure water is not being directed towards the building and rotting historic wood or other building features and adjust the grade of the yard to ensure that water flows away from the building.
20. Replace paved driveway/walk-up sidewalk with a permeable surface allowing for higher capacity of ground filtration.
21. Plant native vegetation along the sides of the building vulnerable to floodwaters to further protect the building's foundation and enhance water absorption.

APPENDICES

Appendix A - Acronyms

AOI – Area of Interest

BFE – Base Flood Elevation

DEM – Digital Elevation Model

DFIRM – Digital Flood Insurance Rate Map

FEMA – Federal Emergency Management Agency

FIS – Flood Insurance Study

FFF – First-Floor Flooding

MHT – Maryland Historical Trust

MIHP – Maryland Inventory of Historic Properties

MOA – Memorandum of Agreement

MSL – Mean Sea Level

NAVD88 – North American Vertical Datum of 1988

NED – National Elevation Dataset

NOAA – National Oceanic and Atmospheric Administration

NPS – National Park Service

NRHP – National Register of Historic Properties

SHPO – State Historic Preservation Officer

SLC – Sea Level Change

TCHPC – Talbot County Historic Preservation Commission

USACE – United States Army Corps of Engineers

USGS – United State Geological Survey

VC – Vertical Calibration

Appendix B - Additional Documentation

TALBOT COUNTY DEPARTMENT OF PLANNING AND ZONING

215 BAY STREET, SUITE 2

EASTON, MARYLAND 21601

PHONE: 410-770-8030 FAX: 410-770-8043

TTY: 410-822-8735

April 24, 2017

To Whom It May Concern:

Vision Planning and Consulting, LLC (VPC) was contracted by the Talbot County Council, through a grant from the Maryland Historical Trust, to conduct risk assessment surveys of historic structures threatened by flooding, storm surge threats and sea level rise in the unincorporated villages of Neavitt, Newcomb, Royal Oak and Tilghman in Talbot County, Maryland. The risk assessment surveys will assist in providing recommendations to enhance the capability of the most vulnerable historic properties and cultural resources to withstand the impact of these hazards while maintaining their cultural integrity.

Ashley Samonisky, Project Manager and Cultural Resources Specialist for VPC, and her team will be conducting site visits to flood-prone historic properties for purposes of investigation and documentation to assess the risk of vulnerable structures. The field visits will be conducted from May 1st through May 31st of 2017.

If you have any questions about the field visit, or would like more details on the overall project, please feel free to contact Miguel Salinas 410-770-8045 at the Talbot County Department of Planning and Zoning. Thank you for your support in this very important project.

Sincerely,

Miguel Salinas

Talbot County Assistant Planning Officer

Appendix C - References

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Appendix D - Additional Guides, Resources, and Links

Elevation Design Guidelines
http://www.nj.gov/dep/hpo/hrrcn_sandy_pdf%20files/mississippi.pdf

https://www.crt.state.la.us/Assets/OCD/hp/uniquely-louisiana-education/Disaster-Recovery/Final%20Elevation%20Design%20Booklet%2012-07-15%20v2.pdf

Floodplain Management Bulletin - Historic Structures
http://www.nj.gov/dep/hpo/Index_HomePage_images_links/FEMA/FEMA%20historic_structures.pdf

Historic Structures and the Biggert - Waters Flood Insurance Reform Act of 2012
https://www.fema.gov/media-library-data/1389204656960-d8d62a77fde51036c4a7157ec6ba1577/Historic_Structures_FS_2013_v01_08_2014.pdf

The Maryland Resiliency Partnership
http://www.resiliencypartnership.com/wecanhelp.html

Mitigation Action Floodproofing Table
https://www.ncpc.gov/floodseminar/handouts/Nonstructral_Floodproofing_Measures_Matrix.pdf

Protecting Building Utilities from Flood Damages
https://www.fema.gov/pdf/fima/pbuffd_complete_book.pdf

Things You Can Do to Mitigate Against Flooding
https://www.fema.gov/blog/2012-03-14/things-you-can-do-mitigate-against-flooding

Variances and the National Flood Insurance Program
http://dos.myflorida.com/media/697187/fema-floodplain-management-bulletin-variances-and-the-national-flood-insurance-program.pdf

Wet Floodproofing
https://www.fema.gov/media-library-data/20130726-1608-20490-7205/fema551_ch_06.pdf

Water-Repellent Coatings and Waterproof Coatings

https://www.nps.gov/tps/how-to-preserve/briefs/1-cleaning-water-repellent.htm#Water-Repellent

Controlling Unwanted Moisture in Historic Buildings

https://www.nps.gov/tps/how-to-preserve/briefs/39-control-unwanted-moisture.htm

Appendix E - GIS Analysis Methodology and Data Setup

Sea-Level Change Projections

The following methodology was used to determine inundation at Mean Seal Level (MSL) for 2050 and 2100. The process utilizes observed tides, land elevations, and Sea Level Change (SLC) estimates to determine the future coastline.

Source for *SLC rates - US Army Corp of Engineers (USACE).*

Data Setup

Working in the ESRI ArcGIS environment, the best available LiDAR product (Table 6) is used to generate a County-wide Digital Elevation Model (DEM) for the study region. This DEM, in ESRI GRID format, serves as the base from which SLC is adjusted.

Table 6: Source LiDAR

LiDAR					
County	**Published**	**Source**	**Project Partners**	**Vertical Accuracy**	**Resolution**
Talbot	2015	ESRGC	United States Geological Survey	15.6cm RMSE	1 meter

Tidal reference stations throughout Maryland's Chesapeake Bay, having captured the industry standard 40+ years of historic data, contribute to establishing water levels during benchmark period (Table 7). A vertical calibration (VC) brings water elevations observed at tidal stations in line with land elevations representing the North American Vertical Datum of 1988 (NAVD88). A final correction (yr2015) for glacial isostatic adjustment and land subsidence brings the tidal stations observations current to the official project year, 2015. *Tidal stations and their measurements are the work of the National Oceanic and Atmospheric Administration*.

Table 7: Maryland Tidal Reference Stations

Tidal Reference Stations							
Station ID	**Station Name**	**Lat**	**Lon**	**MSL**	**NAVD88**	**VC**	**yr2015**
8573927	Chesapeake City	39.52667	-75.81	4.7	0	-0.07	0.23
8570283	Ocean City Inlet	38.32833	-75.0917	9.31	9.67	-0.36	0.33
8571892	Cambridge	38.57333	-76.0683	3.48	3.57	-0.09	0.27
8574680	Baltimore	39.26667	-76.5783	4.9	4.94	-0.04	0.23
8575512	Annapolis	38.98333	-76.48	5.24	5.29	-0.05	0.25
8577330	Solomons Island	38.31667	-76.4517	4.48	4.57	-0.09	0.27
8594900	Washington DC	38.87333	-77.0217	6.1	5.95	0.15	0.23

Talbot County is assigned a representing tidal station, creating a locally observed MSL. Thiessen polygons generated from tidal stations around the Chesapeake Bay act as areas of influence. The County receives its assigned station based on which station's area of influence it's most in.

Using the tidal station's values and the USACE SLC, SLC Values are created to reclassify the present-day DEM to be DEMs for both 2050 and 2100, MSL. SLC Values (Table 8):

2050 MSL = USACE 2050 + VC + yr2015

2100 MSL = USACE 2100 + VC + yr2015

Table 8: Sea Level Change Values

SLC Values			
County	**Tidal Station**	**2050**	**2100**
Talbot	Cambridge	2.11	5.78

Data Processing

Working in the ESRI ArcGIS environment, the county's DEM is reclassified twice using the appropriate SLC Values. The DEM reclassification is: minimum value to less than or equal to SLC Value = 1; values greater than SLC value = NoData. The resulting grid depicts elevations potentially vulnerable to SLC.

To exclude vulnerable elevations free from SLC, the raster grid is converted to polygon (polygon simplification disabled to preserve area). ArcGIS's Network Analyst extension supports the creation of a network dataset from countywide hydrologic flow lines. Surrounding Bay and tidal tributaries are identified, allowing network junctions intersecting the Bay and its tidal waters to be selected. The selected nodes generate a network solution. The network solution's lines represent a Bay connected river system

A final selection is made from the inundation polygons where intersect the lines of the network solution. This selection represents vulnerable elevations that are Bay connected and thus, subject to SLC. The closing selection becomes the area of inundation for that year.

A depth grid is created for each area of inundation by extracting elevation data from the respective DEM. The extracted values have the corresponding SLC value subtracted and then multiplied by negative one (-1).

Coastal Flood Modeling

The following methodology is to determine periodic flooding at Mean Sea Level (MSL) for both 2050 and 2100. The process utilizes land elevations, Sea Level Change (SLC) estimates, and forecast inundation to model various scenarios.

Data Setup

A new region is created in HAZUS software. The hazard of interest: Flood. Each scenario is run at a countywide level. Scenarios are configured to be Coastal Only. The in-software tool is used to determine the source Digital Elevation Model's (DEM) required extent. Through the software a direct navigation to National Elevation Dataset (NED) provides a download of the necessary DEM.

In the ESRI ArcGIS environment, the NED download fulfills the DEM extent; however, its resolution is not superior. Therefore, a DEM made from the best available LiDAR (Table 1) which does not fulfill the required extent is mosaicked on top of the NED DEM. During the mosaic process the best available data are preserved and the finished dataset is resampled to 2m cells. The outputted dataset fulfills the required extent and offers a resolution greater than made available through the NED. The mosaicked dataset becomes the current DEM for Talbot County, capable of running present day flood scenarios.

To model future flood events (2050 MSL and 2100 MSL) we subtract established SLC values (Table 8) from the current DEM. All negative values are then reclassified to zero. The resulting DEMs represent future elevations for their respective year.

Data Processing

In HAZUS, DEMs are loaded and the metadata defined (Vertical Units: Feet; Vertical Datum: NAVD88). Once the DEM is accepted a new scenario is created. The shorelines are chosen for the region in question. The most recent Federal Emergency Management Agency (FEMA) Flood Insurance Study (FIS) for Talbot County (#24041CV000B) is referenced to create shoreline breaks. Again, referring to the FIS, corresponding stillwater elevations for the four flood events (10-, 50-, 100-, and 500-year) at each break in the coastline is entered. Likely wave setup is calculated by HAZUS-MH from the stillwater elevations. Finally, the vertical datum is set to be NAVD88.

The floodplain is delineated with full suite return periods (10-, 25-*, 50-, 100-, and 500-year).

A successfully delineation produces the desired stillwater depth grids for the entire county, for that year (e.g. Talbot County 2015 MSL, Talbot County 2050 MSL, Talbot County 2100 MSL).

* Interpreted value returned.

Building Flooding and Corresponding Damage

The following methodology is to determine First Floor Flooding (FFF) and its corresponding damage to buildings in Talbot County's historic Villages of Neavitt, Newcomb, Royal Oak, and Tilghman, during various flood scenarios. The process utilizes SLC estimates, forecast periodic flooding, addressed building footprints, recorded parcel information, and damage curve estimates to model potential loss.

Data Setup

Using ESRI ArcGIS, all raster depth grids (18 total) derived in the **Sea Level Change** and **Coastal Flood Modeling** portion of the study are converted to point feature classes. The conversion from raster to vector preserves depth values while enhancing spatial analyses.

The outlining boundaries of the historic Villages of Neavitt, Newcomb, Royal Oak, and Tilghman are merged into a single, multipart, polygon feature (Area of Interest). The AOI will serve to extract points from the converted depth grids. To ensure a more complete extraction the AOI is buffered outward 1,000 meters.

The buffered AOI is overlaid each point feature class (converted depth grid) and all points intersect the AOI are extracted as that scenario's depth points.

Parcel data (polygon feature class) collected from Maryland Property View (2013) provides account ID, Address, Parcel Number, Improved Value, Year Built, and Building Description Style for recorded properties in the AOI.

Talbot County GIS Department provides addressed building footprints (polygon feature class) representing physical buildings in AOI (417 total buildings).

The building footprint and parcel layer are spatially joined. The resulting overlay returns footprints within the AOI with the associated parcel information (e.g. Account ID, Address, etc.…). A summarization counts the appearance of unique Account IDs, effectively returning the number of buildings on each parcel. Parcels having a building count greater than 1 receive further inspection during planned site visits to confirm: building exists, building is not outbuilding and/or building footprint assigned correct parcel.

A Foundation Height field is added to the footprint feature class with default value: 0 (zero). Staff conduct site visits to each addressed building and record the estimated height of building's foundation – height recorded at half-foot interval (e.g. 0', 0.5', 1.0', 1.5', etc.). The recorded heights populate the Foundation Height field in the footprints feature class. Four foundations unobserved by the field crew received the average foundation height of buildings on their adjacent parcels.

Data Processing

Using ESRI ArcGIS, each extracted point feature class representing flood depths for a given scenario is spatially joined to its own copy of the building footprint layer. The overlay analysis returns maximum flood depths observed within each building footprint for that scenario. Flooding of the first finished floors is established by subtracting foundation heights from maximum flood depths. A damage rate for each building is then determined by applying the HAZUS damage curve **(Table 9)** making use of the buildings building descriptions and observed flooding of first finished floor.

A financial loss valuation is produced multiplying the improved values and building damage rates.

Table 9: HAZUS Damage Curve

Damage Curves

Residential 1-1

When description style: ("STRY 1 Story No Basement" , "STRY 1 Story With Basement" , "STRY 1 1/2 Story No Basement" , "STRY 1 1/2 Story With Basement"):

if Flooding of First Finished Floor >= -1 and Flooding of First Finished Floor <0:
  building damage rate = (18 + 18*Flooding of First Finished Floor)
if Flooding of First Finished Floor >= 0 and Flooding of First Finished Floor <1:
  building damage rate = (18 + 4*Flooding of First Finished Floor)
if Flooding of First Finished Floor >= 1 and Flooding of First Finished Floor <2:
  building damage rate = (19 + 3*Flooding of First Finished Floor)
if Flooding of First Finished Floor >= 2 and Flooding of First Finished Floor <3:
  building damage rate = (19 + 3*Flooding of First Finished Floor)
if Flooding of First Finished Floor >= 3 and Flooding of First Finished Floor <4:
  building damage rate = (22 + 2*Flooding of First Finished Floor)
if Flooding of First Finished Floor >= 4:
  building damage rate = (26 + 1*Flooding of First Finished Floor)
otherwise:
  building damage rate = (0)

Residential 1-2

When description style: ("STRY 2 Story No Basement" , "STRY 2 Story With Basement" , "STRY 2 1/2 Story No Basement" , "STRY 2 1/2 Story With Basement" , "HOUSING Residential/Retail Mixed"):

if Flooding of First Finished Floor >= -1 and Flooding of First Finished Floor <0:
  building damage rate = (11 + 11*Flooding of First Finished Floor)
if Flooding of First Finished Floor >= 0 and Flooding of First Finished Floor <1:
  building damage rate = (11 + 1*Flooding of First Finished Floor*Flooding of First Finished Floor)
if Flooding of First Finished Floor >= 1 and Flooding of First Finished Floor <2:
  building damage rate = (10 + 2*Flooding of First Finished Floor)
if Flooding of First Finished Floor >= 2 and Flooding of First Finished Floor <3:
  building damage rate = (6 + 4*Flooding of First Finished Floor)
if Flooding of First Finished Floor >= 3 and Flooding of First Finished Floor <4:
  building damage rate = (12 + 2*Flooding of First Finished Floor)
if Flooding of First Finished Floor >= 4:
  building damage rate = (12 + 2*Flooding of First Finished Floor)
otherwise:
  building damage rate = (0)

Residential 1-3

When description in ("STRY 3 Story No Basement" , "STRY 3 Story With Basement" , "STRY 3 1/2 Story No Basement" , "STRY 3 1/2 Story With Basement"):

if Flooding of First Finished Floor >= -1 and Flooding of First Finished Floor <0:
building damage rate = (5 + 5*Flooding of First Finished Floor)
if Flooding of First Finished Floor >= 0 and Flooding of First Finished Floor <1:
building damage rate = (5 + 4*Flooding of First Finished Floor)
if Flooding of First Finished Floor >= 1 and Flooding of First Finished Floor <2:
building damage rate = (4 + 4*Flooding of First Finished Floor)
if Flooding of First Finished Floor >= 2:
building damage rate = (7 + 3*Flooding of First Finished Floor)
otherwise:
building damage rate = (0)

Commercial 1

When description style: ("AUTO Service Garage" , "AUTO Service Storage Garage" , "BANK Bank Branch" , "OFFICE Building" , "REC Club House" , "RESTAURANT" , "STORE Convenience" , "STORE Retail"):

if Flooding of First Finished Floor >= -1 and Flooding of First Finished Floor <2:
building damage rate = (2 + 7*Flooding of First Finished Floor)
if Flooding of First Finished Floor >= 2:
building damage rate = (10 + 2*Flooding of First Finished Floor)
otherwise:
building damage rate = (0)

Commercial 2

When description in ("WAREHOUSE Storage"):
if Flooding of First Finished Floor >= -1:
building damage rate = (5 + 3*Flooding of First Finished Floor)
otherwise:
building damage rate = (0)

Community 1

When description style: ("COMMUNITY Post Office Branch" , "SAFETY Fire Station Volunteer" , "SCHOOL Elementary"):
if Flooding of First Finished Floor >= -1:
building damage rate = (5 + 2*Flooding of First Finished Floor)
otherwise:
building damage rate = (0)

Community 2

When description in ("COMMUNITY Church"):
 	
if Flooding of First Finished Floor >= -1 and Flooding of First Finished Floor <1:
building damage rate = (0 + 10*Flooding of First Finished Floor)
if Flooding of First Finished Floor >= 1:
building damage rate = (10 + 1*Flooding of First Finished Floor)
otherwise:
building damage rate = (0)

The end products are addressed building footprints within the four historic villages of Talbot County's Historic Building Risk Assessment study with damage and lose assessment based on projected SLC, forecast periodic flooding, building description, estimated first floor flooding, and the corresponding damage curve.

Note: The damage estimates are based on 2013 dollars, therefore future damage values shown in the 2050 and 2100 projections are likely to increase. Additionally, these estimates are for damages to the building directly, and not to that of its contents. Finally, the estimates are based on the percentage of damage to the property and the assessed value of the property, therefore damage to 10% of the building is only going to be represented as 10% of the buildings assessed value, not the buildings replacement value, which will vary.

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