		Environmental Protection Agency; the Delaware Estuary Program; the National Fish and Wildlife Foundation and local communities.
Delaware Housing Search (DHS)	DSHA	Housing search that all counties and state agencies contribute funds to. Updated in 2019, DHS is an online housing locator service supported by a partnership of nonprofit and government organizations. DHS maintains over a quarter of Delaware's entire rental housing stock and is accessible online and via a toll-free bi-lingual call-center.

NCC DPS also provides education and outreach resources related to hazard mitigation and disaster planning information. The NCC DPS works to mitigate, plan, and prepare for all natural & man-made emergencies; educate the public about preparedness; coordinate emergency response and recovery efforts; and develop tools and identify resources to support the overall preparedness of NCC. The DPS also provides disaster preparedness education programs to community groups, schools, businesses, and municipalities to promote community resilience.

The County EMD also designs, develops, and implements a variety of training and exercise programs to test the capabilities of emergency responders and Municipalities Officials in NCC County.The Agency also works closely with the response community to schedule and implement the training required for all levels of emergency management certification. The Division also administers and provides outreach and training regarding the New Castle County Local Emergency Planning Committee (LEPC). The EMD also promotes and provides outreach materials for the National Flood Insurance Program.

5.2.5 Plan Integration

The purpose of a plan/ordinance review as part of this planning process was trifold:

- To identify existing County-level initiatives.
- To provide an inventory and review of sample plans and ordinances and identify sections in these documents that address hazard mitigation related issues; and
- To provide a platform to integrate plans and other documents so recommendations and strategies are not contradictory to one another.

Plans and ordinances that assist with minimizing impacts of hazards on New Castle County's residents through preventative measures include zoning ordinances, subdivision and land development ordinances, floodplain management ordinances, comprehensive plans, etc. Preventative measures are important for local communities to focus on for hazard mitigation efforts, as one of the most cost-effective means of reducing the probability of future losses to residents.

Plan Integration

The New Castle County Comprehensive Plan and 2023 State of Delaware Hazard Mitigation Plan were utilized for various sections of the 2025 New Castle County HMP Update. Existing conditions – profile and trends provided useful information on demographics, economics, housing, land use, physical features, and infrastructure. The county overview section was utilized in the development of the community profile section, including the land use profile, population trends, infrastructure profile, healthcare profile, and more.

The New Castle County Comprehensive Plan, Goals, Recommendations and Actions identified an implementation plan for various projects and actions that supported updates and growth for programs identified in the comprehensive plan. Although specific portions of the comprehensive

plan outlined projects, actions or specific planning items that would support hazard mitigation, the information will be more comprehensive with the integration of new hazard mitigation principals and data from the 2020 New Castle County HMP Update.

During discussions with county planning personnel as part of this hazard mitigation plan update, discussions about the importance of hazard mitigation integration during the next comprehensive plan update were expressed. Specifically, the risk assessment section and mitigation strategy section hold vital information that requires integration into the next plan update. Identification of hazard areas, vulnerable structures and developments and future risk is critical in the determination of and management of economic growth and development areas in the county.

New Castle County Comprehensive Plan

The NCC Department of Community Planning and Mapping Services is responsible for maintaining and updating the New Castle County Comprehensive Plan and many other regulatory tools. Technical assistance on community planning matters is provided to the New Castle County Board of Commissioners through the New Castle County Planning Commission and Planning Department. The New Castle County Planning Department administers the New Castle County Comprehensive Plan. The department also performs technical reviews of municipal subdivision and land development plans, municipal floodplain ordinances and other community planning and development matters.

New Castle County Emergency Operations Plan (EOP)

New Castle County DPS is responsible for preparing and maintaining the county's EOP, which applies to both the county and municipal emergency management operations and procedures.

The EOP is reviewed at least annually. Whenever portions of the plan are implemented in an emergency event or training exercise, a review is performed, and changes are made where necessary. These changes are then distributed to the county's municipalities.

The complete risk assessment section, mitigation actions and mitigation project opportunities identified in the New Castle County Hazard Mitigation Plan will assist with decreasing hazard specific risk and vulnerability. Understanding the risks and vulnerability in the county and municipalities will allow for emergency management and other response agencies to better direct planning, response and recovery aspects. New Castle County DPS will consider the New Castle County Hazard Mitigation Plan during its annual review of the county EOP. Recommended changes to the HMP will then be coordinated with the hazard mitigation local planning team.

University of Delaware Hazard Mitigation Plan

The Capability Assessment from the 2024 University of Delaware Hazard Mitigation Plan included a questionnaire to help document community agencies/departments/organizations and their missions, functions, programs, plans, policies, regulations, funding, etc. of each group, in order to create an inventory of resources that can be brought to bear on mitigation efforts. The questions were intended to help departments identify the regulatory, administrative, technical, and fiscal capacities and capabilities and were based on FEMA's capability assessment questionnaire. The Capability Assessment content was revisited for 2024 Plan Update by the following departments and updated, as necessary.

- Campus and Public Safety, Emergency Management
- College of Earth, Ocean, and Environment
- Delaware Geological Survey

- Employee Labor Relations
- Facilities Custodial and University Services
- Facilities Maintenance and Operations
- Facilities Planning and Construction
- Facilities/Science, Technology, and Advanced Research (STAR) Campus
- Finance and Risk Management
- Human Resources
- Information Technology
- Office of Communications and Marketing
- Office of Residence Life
- Department of Public Safety, University Police
- Office of the Provost
- Office of Student Conduct
- Student Health Services
- Office of Student Life

Plan Interrelationships

Ensuring consistency between these planning mechanisms is critical. To that end, New Castle County and its municipalities must ensure that the components of the hazard mitigation plan are integrated into existing community planning mechanisms and are generally consistent with goals, policies and recommended actions. New Castle County and the hazard mitigation planning team will utilize the existing maintenance schedule of each plan to incorporate the goals, policies and recommended actions as each plan is updated.

Conclusion

New Castle County has the initiative and drives to implement mitigation actions for a variety of hazards affecting the County, however there are still challenges to hazard mitigation at both the County and local levels. These challenges come in the form of insufficient funds available for action implementation; lack of training or education on various hazards, technologies, policies, or laws; limited emergency response staffing; insufficient or limited data and information available for various analyses; and the absence of meaningful and productive partnerships with both public and private stakeholders.

Municipalities have the opportunity to integrate these hazard mitigation actions into already existing planning mechanisms. The municipalities that have comprehensive plans can integrate these actions into different aspects of the plans. Growth management techniques, such as buffering, can be integrated into the future land use strategy, while different housing programs can be created to retrofit publicly subsidized affordable housing to reduce damage after a disaster occurs. These actions can also be integrated through municipal floodplain or zoning ordinances, which can be utilized to limit the density of development in high hazard areas, and/or through a municipal SALDO, for example, by reviewing the placement of roads, residential lots, public facilities within subdivisions that can increase natural hazard risks and evacuation/emergency access points.

6.0 CHAPTER 6 – MITIGATION STRATEGY

6.1 Update Summary Process

The mitigation strategy serves as the long-term road map to reduce the potential losses, vulnerabilities, and shortcomings identified in the Risk Assessment chapter. A typical mitigation strategy includes a list of goals and objectives, and mitigation actions to address the goals and objectives, which are then prioritized based on the community's priorities, assets, requirements, and necessities. Specific mitigation actions are developed through consultation and information exchange with the County and municipalities, and by taking into account municipal assets, such as infrastructure, transportation, businesses, as well as impacts to the environment and traditionally vulnerable and underserved or under-represented populations. The actions and implementations that are developed are a representation of the entire engagement process, as each point of engagement leads to developing an effective, appropriate, and cost-effective mitigation strategy.

The mitigation strategy in this Plan comprises the following five subsections:

- Goals and Objectives
- Identification and Analysis of Mitigation Actions (including NFIP compliance)
- Mitigation Action Plan (including implementation plan and prioritization for all County and municipal actions, as well as completed actions from the previous plan).
    - County Mitigation Actions
    - Municipal Mitigation Actions
    - 2020 County and municipal actions not being carried forward (Completed, Cancelled, N/A, Combined)

By updating the mitigation strategy (both county and municipal) and other plan components in this fashion. It shows that this plan is being revised to:

- Reflect changes in development.
- Reflect progress in local mitigation efforts.
- Reflect changes in priorities – major priorities included addressing hazard mitigation actions that have been carried forward between the last three HMP Updates. A major focus was to develop more recent and applicable county mitigation actions to reflect the current times and hazard risk and vulnerabilities.

6.2 Goals and Objectives

For this Plan, goals are defined as general policy guidelines or broad statements that represent a vision for a community. Objectives define strategies or implementation steps to attain the identified goals. Compared to goals, objectives are more specific and measurable. Using the 2020 Plan's Goals and Objectives as the basis for update, the goals for this planning process have been updated in close coordination with the Steering Committee, based on the findings of the hazard identification and risk assessment, the mitigation capability assessment, the 2023 PA State HMP, as well as the 2020 plan. The goals and objectives are also designed to serve as the basis for the mitigation actions at the county and municipal levels.

For this Plan Update, there was no major change in community priorities compared to the 2020 Update. Additionally, stakeholders and municipalities identified the continued need to mitigate

potential impacts of gas well and/or pipeline leak, explosion, or other type of emergency. Flooding is still a major concern within the County. Those in the higher elevation and/or steeper slope areas of the county expressed more concern for ensuring wind events, landslides, and wildfire events were also considered a priority. Ultimately, the County's priorities have not drastically changed since the previous plan update, although the priorities address a wide range of different community elements as assets, depending on where in the County one may be located.

Vision – "Protect the residents, their property, and reduce related costs of disaster response, recovery, and minimize the disruption that any disaster will cause to the community."

Goal 1: New Castle County and its municipalities will continue to maximize the use of technology (GIS, remote sensing, etc.) to develop sound mitigation policies and projects based upon risk and an enhanced risk assessment.

Goal 2: New Castle County and its municipalities will continue to emphasize the use of sound planning practices to reduce the impacts of natural, technological, and human-caused hazards.

Goal 3: New Castle County and its municipalities will continue to acquire or upgrade existing equipment to improve disaster readiness and implement hazard mitigation measures.

Goal 4: New Castle County and its municipalities will continue to improve communication and warning systems to better protect lives and property from the potential impacts of all hazards.

Goal 5: New Castle County and its municipalities will continue to enhance and implement local codes and ordinances at higher standards to reduce the impacts of all hazards while considering a holistic approach at the project level.

Goal 6: New Castle County and its municipalities, and the State (DELDOT) will continue to enhance measures to improve evacuation flow and operations, sheltering and security concerns.

Goal 7: New Castle County and its municipalities will continue to enhance education and outreach strategies to improve the dissemination of information to the public regarding hazards, including the steps that can be taken to reduce hazard impacts.

Goal 8: New Castle County and its municipalities will continue to adopt mitigation measures that better protect critical facilities and technology infrastructure from the impacts of all hazards.

Goal 9: New Castle County and its municipalities will continue to identify and implement sound hazard mitigation projects.

Goal 10: New Castle County and its municipalities will ensure that sound stormwater and drainage management principles are implemented throughout the County.

Goal 11: New Castle County and its municipalities will continue to identify potential funding sources and partnerships for projects.

HHPD Goal #1 (Appendix A) - Participate in FEMA's High-Hazard Potential Dam Program (HHPD).

6.3 Identification and Analysis of Mitigation Techniques

In formulating the Mitigation Strategy, the Steering Committee explored four mitigation categories for attaining the plan's goal and objectives. They include local plans and regulations, structure and infrastructure projects, natural systems protection, and education and awareness. Emergency response or operational preparedness actions are also included in this plan where relevant. This includes the four categories recognized by FEMA, as well as one additional category for ease of organization. These categories formed the basis of the mitigation actions in the Plan Update. Descriptions of these categories and examples for each category are included below:

1. Local Plans and Regulations

   These actions include government authorities, policies, or codes that influence the way land and buildings are developed and built. Examples include comprehensive plans, land use ordinances, subdivision regulations, development review, building codes and enforcement, NFIP community rating system, capital improvement programs, open space preservation plans, stormwater management regulations, and master plans, and other local plans and regulations.[36]

2. Structure and Infrastructure Projects

   These actions involve modifying existing structures and infrastructure to protect them from a hazard or remove them from a hazard area. This could apply to public or private structures as well as critical facilities and infrastructure. This type of action also involves projects to construct manmade structures to reduce the impact of hazards. Many of these types of actions are projects eligible for funding through the FEMA HMA program. Examples include acquisitions and elevations of structures in flood prone areas, utility undergrounding, structural retrofits, floodwalls and retaining walls, detention and retention structures, culverts, and safe rooms.[37]

3. Natural Systems Protection

   These are actions that minimize damage and losses and also preserve or restore the functions of natural systems. Examples include sediment and erosion control, stream corridor restoration, forest management, conservation easements, wetland restoration and preservation.

4. Education and Awareness Programs

   These are actions to inform and educate citizens, elected officials, and property owners about hazards and potential ways to mitigate them. These actions may also include participation in national programs. Although this type of mitigation reduces risk less directly than structural projects or regulation, it is an important foundation. A greater understanding and awareness of hazards and risk among local officials, stakeholders, and the public is more likely to lead to direct actions. Examples include radio or television spots, websites with maps and information, real estate disclosure, presentations to school groups or neighborhood

[36] Federal Emergency Management Agency. Local Mitigation Planning Handbook https://www.fema.gov/media-librarydata/1590070172371-48e87ca446838ba81afc2aca995940bc/FEMA_Local_Mitigation_Planning_Handbook_508.pdf
[37] Ibid.

organizations, mailings to residents in hazard-prone areas, StormReady, and Firewise communities.

Mitigation actions have been developed for the entire County as well as for each municipality. While some actions may apply to more than one jurisdiction, most actions are specific to each jurisdiction.

The mitigation actions that were developed were based on results from the risk assessment, the mitigation capability analysis, input from the Steering Committee, actions that have been completed in the past, recent past hazard occurrences, and feedback from the municipal workshop, worksheets, and questionnaires. The mitigation actions that have been developed can be implemented through a variety of local tools such as changes in ordinances and policies, capital improvements budgets, and applying for grant funding.

6.4 Mitigation Action Plan

Once the mitigation actions and implementation plan were finalized, the Steering Committee developed specific criteria to prioritize the actions. The Steering Committee agreed on three criteria which involved addressing the following questions to determine the level (high, medium, and low) for the social, administrative, and economic considerations for each action. These priorities were translated into points and facilitated the ranking and identification of high priority projects as shown in Table 6.1.

Social Considerations – Life/Safety Impact

- Will the project have minimal/direct/or significant impact on the safety of businesses, residents, and properties?
- Will the proposed action adversely affect one segment of the population?
- Will the project be a proactive measure to reducing flood risk?

Administrative Considerations – Administrative/Technical Assistance

- Is there sufficient staff currently to implement the project?
- Is training required for the staff to implement this project?

Economic Considerations – Project Cost

- What is the approximate cost of the project?

Table 6.1 Evaluation Criteria for Action Prioritization

Criteria	Points	High	Points	Medium	Points	Low
Life/Safety Impact	10	Significant impact on public safety for businesses, residents, and/or properties	6	Direct impact on businesses, residents, and/ or properties	2	Minimal/negligible impact on businesses, residents, and/or properties
Administrative/ Tech. Assistance	5	No additional staff or technical support needed to implement action	3	Some administrative and technical support needed	1	Significant administrative and technical support needed to implement action

				to implement action		
Project Cost	5	Low cost (<$25,000)	3	Moderate cost ($25,000-$100,000)	1	High cost to implement (>$100,000)

It should be noted that this Plan does not include prioritization of projects within a category, i.e., there is no ranking of projects listed within the Structure and Infrastructure mitigation category. For the purposes of funding, a benefit-cost analysis will be conducted. The projects would be prioritized as individual municipalities prepare applications for specific funding agencies for particular projects.

The overall timeline for the completion of projects is dependent on available funding and involvement and commitment by the municipality. The tables that follow identify County-level and municipal-level mitigation actions. The projects are described, referring to the hazard(s) mitigated, lead agency for implementation, timeline, and possible funding sources. It is important to note that each participating jurisdiction must have at least one mitigation action for the hazards that affect their community for each hazard (some may have actions that are considered all-hazard related). Although some municipalities may not have specific actions for every hazard that may affect them, county actions will also be attributed to municipalities, allowing the municipalities to refer to and implement county-based actions within their jurisdiction. It is important to note that any revisions and updates to the county and municipal mitigation action plans were made to reflect changes in development, local mitigation efforts, and mitigation priorities in NCC.

County Mitigation Action Plan

The actions below (Table 6.2) show the updated mitigation action strategy and have been developed based on discussions at the SC meeting, discussions with municipality representatives, and based on mitigation progress reported by the county. For this plan update, there was a focus on not overdoing the number and amount of mitigation actions at the County level. Any actions from the 2020 Plan that were not given a final disposition (completed, cancelled, NA, combined, etc.) by the County, have been included in this list as not started, in progress, or ongoing.

Table 6.2 New Castle County Mitigation Action Strategy

Mitigation Actions											
Action	Action Status	Hazard Mitigated	Lead Agency for Implementation	Life/Safety Impact	Admin/Tech Assistance	Cost Ranking	Total	Possible Funding Source	Approximate Cost	Project Timeline	Action Category
Continue public education and outreach program to educate residents and business owners (who possess hazardous chemicals and compounds) about the protective actions that can be taken to eliminate or reduce property loss and injury.	Ongoing	All Hazards	NCC OEM	6	3	5	14	FEMA HMGP FEMA FMA & HMA County Funds	<$25,000	Ongoing	Education Awareness Programs
Conduct annual training exercises based on the actions recommended in the revised New Castle County Comprehensive Emergency Management Plan (CEMP) to comply with FEMA CPG 101 version 2, and HSEEP guidelines. MAY BE A NEW VERSION OF CPG	Ongoing	All Hazards	NCC OEM	2	3	3	8	FEMA HMGP FEMA FMA & HMA County Funds	$25,000-$100,000	Ongoing	Local Plans and Ordinances
Develop a Countywide uniform GIS database and use County data as a baseline, including Dam Hazards and Inundation areas and a database of stormwater and drainage, and share GIS data among the levels of government and update with all agency GIS Technicians. Data should include Dam Hazards and Inundation areas.	In Progress	Dam and Levee Failure Flood	NCC GIS	6	3	3	12	FEMA HMGP FEMA FMA & HMA County Funds	$25,000-$100,000	1-2 years	Education Awareness Programs
Conduct a study to determine the vulnerability of the CRFM sewage along the Christiana River that stretches 10 miles from I-95 to Wilmington.	Ongoing	Hazardous Materials Flood	NCC DPW	6	3	1	10	FEMA HMGP FEMA FMA & HMA County Funds	>$100,000	Ongoing	Education Awareness Programs

Mitigation Actions											
Action	Action Status	Hazard Mitigated	Lead Agency for Implementation	Life/Safety Impact	Admin/Tech Assistance	Cost Ranking	Total	Possible Funding Source	Approximate Cost	Project Timeline	Action Category
Reduce pollution discharges via storm water systems throughout New Castle County.	Ongoing	Flood	NCC DPW	6	3	1	10	FEMA HMGP FEMA FMA & HMA County Funds	>$100,000	Ongoing	Natural Systems Protection
Identify critical locations for additional environmental monitoring to aid in mitigation and response.	Ongoing	All Hazards	NCC OEM NCC DPW, DGS/DEOS	2	3	3	8	FEMA HMGP FEMA FMA & HMA County Funds	$25,000-$100,000	Ongoing	Natural Systems Protection
Integrate Functional and Access Needs into Emergency Plans and Identify mitigation measures consistent with this population.	Ongoing	All Hazards	NCC OEM and State Agencies	10	3	5	18	FEMA HMGP FEMA FMA & HMA County Funds	<$25,000	Ongoing	Local Plans and Ordinances
Explore acquisition/elevation for the DuRoss Heights properties. Have had construction since -- check with Chris on this action.	Not Started	Flood	NCC OEM and DPW Env. Section	2	5	3	10	FEMA HMGP FEMA FMA & HMA County Funds	$25,000-$100,000	2-4 years	Structure and Infrastructure Projects
Explore acquisition/elevation for properties in the Town of Christiana	Not Started	Flood	NCC OEM and DPW Env. Section	2	5	3	10	FEMA HMGP FEMA FMA & HMA County Funds	$25,000-$100,000	2-4 years	Structure and Infrastructure Projects
Support cost effective acquisition, elevation, and wet/dry floodproofing projects for all municipalities and unincorporated areas in the County.	Ongoing	Flood	NCC OEM and NCCD	6	5	5	16	FEMA HMGP FEMA FMA & HMA	<$25,000	Ongoing	Structure and Infrastructure Projects

Mitigation Actions											
Action	Action Status	Hazard Mitigated	Lead Agency for Implementation	Life/Safety Impact	Admin/Tech Assistance	Cost Ranking	Total	Possible Funding Source	Approximate Cost	Project Timeline	Action Category
								County Funds			
Ensure regular training in and compliance with all safety procedures and systems related to the manufacture, storage, transport, use, and disposal of hazardous materials.	Ongoing	Hazardous Materials	NCC OEM and NCC DPW	6	3	3	12	FEMA HMGP FEMA FMA & HMA County Funds	$25,000-$100,000	Ongoing	Education Awareness Programs
Develop higher regulatory standards for construction and substantial improvements of critical facilities in high hazard areas.	All Hazards	In Progress	NCC DLU	6	3	1	10	FEMA HMGP FEMA FMA & HMA County Funds	>$100,000	2-4 years	Local Plans and Ordinances
Work with USACE to plan, develop, and conduct an Emergency Action Plan (EAP) exercise for a high hazard dam breach in the County.	New	Dam Failure	NCC OEM DNREC USACE	6	5	5	16	FEMA HMGP FEMA FMA & HMA County Funds	<$25,000	1-2 years	Local Plans and Ordinances
Continue to routinely inspect and perform maintenance to the levee in Red Lion.	New	Dam/Levee Failure	NCC Conservation District	2	5	5	12	FEMA HMGP FEMA FMA & HMA County Funds	<$25,000	Ongoing	Structure and Infrastructure Projects
Mitigate flood prone properties along Fishers Wharf. Explore mitigation projects such as floodproofing, elevation, stormwater mgmt..	New	Flood	OEM Conservation District	2	3	1	6	FEMA HMGP FEMA FMA & HMA County Funds	>$100,000	2-4 years	Structure and Infrastructure Projects

Mitigation Actions											
Action	Action Status	Hazard Mitigated	Lead Agency for Implementation	Life/Safety Impact	Admin/Tech Assistance	Cost Ranking	Total	Possible Funding Source	Approximate Cost	Project Timeline	Action Category
Continue to work and coordinate with higher education institutions regarding emergency preparedness, response, and recovery.	New	All Hazards	NCC OEM; UDEL	6	1	3	10	FEMA HMGP FEMA FMA & HMA County Funds	$25,000-$100,000	Ongoing	Education Awareness Programs
Continue to utilize FEMA's Integrated Public Alert and Warning System (IPAWS) for sudden onset hazards such as tornados, thunderstorms, or flash floods. COUPLE with DENS	New	All Hazards	NCC OEM	10	5	5	20	FEMA HMGP FEMA FMA & HMA County Funds	<$25,000	Ongoing	Education Awareness Programs
Encourage local businesses and local industry owners located in known hazardous areas to develop a business continuity plan and provide educational materials.	New	Flood All Hazards	NCC OEM; Economic Development	2	5	5	12	FEMA HMGP FEMA FMA & HMA County Funds	<$25,000	Ongoing	Local Plans and Ordinances
Consider developing policy restricting the development of wells, pipelines, or compression stations through densely populated residential areas, commercial and historic districts, or near conservation areas such as those adjacent to the river or creeks.	New	Energy Pipeline Failures	NCC OEM; DNREC	6	3	5	14	FEMA HMGP FEMA FMA & HMA County Funds	<$25,000	1-2 years	Local Plans and Ordinances
Continue to enhance and develop mutual aid agreements with neighboring counties and state partners for response and recovery efforts.	New	All Hazards	NCC OEM	2	5	3	10	FEMA HMGP FEMA FMA & HMA County Funds	$25,000-$100,000	Ongoing	Local Plans and Ordinances
Utilize tracking reports during the annual review process to identify potential barriers or hindrances to implementation of hazard mitigation activities and projects.	New	All Hazards	NCC OEM	2	5	5	12	FEMA HMGP FEMA FMA & HMA	<$25,000	Ongoing	Local Plans and Ordinances

Mitigation Actions											
Action	Action Status	Hazard Mitigated	Lead Agency for Implementation	Life/Safety Impact	Admin/Tech Assistance	Cost Ranking	Total	Possible Funding Source	Approximate Cost	Project Timeline	Action Category
								County Funds			
Continue to educate homeowners on the potential risk of earthquakes and on safety techniques to follow during and after an earthquake.	New	Earthquake	NCC OEM	2	5	5	12	FEMA HMGP FEMA FMA & HMA County Funds	<$25,000	Ongoing	Education Awareness Programs
Continue to conduct routine inspections, regular maintenance, and annual tests on all emergency communications equipment, public address systems, and hazard alert sirens to ensure effective operation during an emergency event.	New	All Hazards	NCC OEM; NCC DPW	10	3	3	16	FEMA HMGP FEMA FMA & HMA County Funds	$25,000-$100,000	Ongoing	Structure and Infrastructure Projects
Work with local television and radio stations to promote public hazard awareness and disaster preparedness.	New	All Hazards	NCC OEM	6	5	5	16	FEMA HMGP FEMA FMA & HMA County Funds	<$25,000	Ongoing	Education Awareness Programs
Continue to promote and offer Community Emergency Response Team (CERT) training/classes to increase the number of citizen responders in the municipalities.	New	All Hazards	NCC OEM	2	3	5	10	FEMA HMGP FEMA FMA & HMA County Funds	<$25,000	Ongoing	Education Awareness Programs
Identify at-risk populations (elderly, homeless, persons with physical or mental disabilities) to various hazards and maintain records of vulnerable populations and the types of assistance needed before, during, or after a hazard.	New	Extreme Heat Winter Storms Hurricanes and Coastal Storms Tornados	NCC OEM	10	1	3	14	FEMA HMGP FEMA FMA & HMA County Funds	$25,000-$100,000	Ongoing	Education Awareness Programs

Mitigation Actions											
Action	Action Status	Hazard Mitigated	Lead Agency for Implementation	Life/Safety Impact	Admin/Tech Assistance	Cost Ranking	Total	Possible Funding Source	Approximate Cost	Project Timeline	Action Category
Continue to explore the purchase of substantially damaged and repetitive/severe repetitive loss structures in flood prone areas.	New	Flood	NCC OEM	6	3	1	10	FEMA HMGP FEMA FMA & HMA County Funds	>$100,000	Ongoing	Structure and Infrastructure Projects
Continue to work with DelDOT to educate and introduce signage to warn all traffic on road conditions/flood prone roadways.	New	Flood	NCC OEM; DelDOT	2	5	5	12	FEMA HMGP FEMA FMA & HMA County Funds	<$25,000	Ongoing	Education Awareness Programs
Continue to work with the local media and municipalities and develop information (for newspapers, websites, circulars, property owner's association newsletters) on topics related to the dangers and hazards of winter travel and other hazardous conditions. Already doing with Awareness week	New	Winter Storms Wind Events	NCC OEM	2	5	5	12	FEMA HMGP FEMA FMA & HMA County Funds	<$25,000	Ongoing	Education Awareness Programs
Identify all historic properties located in the 100-year floodplain and determine appropriate mitigation that considers both preservation and mitigation.	New	Flood	NCC OEM; NCC Planning	2	5	5	12	FEMA HMGP FEMA FMA & HMA County Funds	<$25,000	2-4 years	Education Awareness Programs
Work with DelDOT to ensure routine tree pruning/trimming along major transportation routes to avoid damages and disruptions from down limbs during winter storms/wind events. NEW CASTLE COUNTY ROADS and State ROADS	New	Storms Wind Events	DelDOT	6	3	5	14	FEMA HMGP FEMA FMA & HMA County Funds	<$25,000	Ongoing	Natural Systems Protection
Ensure the county has adequate stock a personal protective equipment (PPE) for use by essential personnel during a pandemic/infectious disease outbreak.	New	Public Health Incidents	NCC OEM; DE Dept of Health	6	3	1	10	FEMA HMGP FEMA FMA & HMA	>$100,000	Ongoing	Structure and Infrastructure Projects

Mitigation Actions											
Action	Action Status	Hazard Mitigated	Lead Agency for Implementation	Life/Safety Impact	Admin/Tech Assistance	Cost Ranking	Total	Possible Funding Source	Approximate Cost	Project Timeline	Action Category
								County Funds			
Continue to educate homeowners on the potential risk of wildfire and on safety techniques to follow for areas located at an urban-forest interface.	New	Wildfire	NCC OEM	2	3	5	10	FEMA HMGP FEMA FMA & HMA County Funds	<$25,000	Ongoing	Education Awareness Programs
Coordinate with DelDOT to conduct stream channel and erosion inspection and maintenance on areas adjacent to all County bridges.	New	Erosion	NCC OEM; DelDOT	6	5	5	16	FEMA HMGP FEMA FMA & HMA County Funds	<$25,000	Ongoing	Natural Systems Protection
Identify areas of County susceptible to sinkholes and debris pits and provide residents with educational materials on the potential dangers and impacts.	New	Sinkholes	NCC OEM; DNREC	2	5	5	12	FEMA HMGP FEMA FMA & HMA County Funds	<$25,000	1-2 years	Education Awareness Programs
Continue to educate County residents on the potential different types of terroristic threats and attacks, and ensure the County has a coordinated response should a threat or attack take place.	New	Terrorism	NCC OEM	6	5	5	16	FEMA HMGP FEMA FMA & HMA County Funds	<$25,000	Ongoing	Education Awareness Programs
Continue to work with relevant state agencies and partners to refine clear hurricane evacuation routes and designated shelters that can help people safely evacuate affected areas. CONTRAFLOW, evac that other regional states do as well.	New	Hurricanes and Coastal Storms	NCC OEM with DelDOT and DNREC and DHHS	6	3	5	14	FEMA HMGP FEMA FMA & HMA County Funds	<$25,000	Ongoing	Local Plans and Ordinances

Mitigation Actions											
Action	Action Status	Hazard Mitigated	Lead Agency for Implementation	Life/Safety Impact	Admin/Tech Assistance	Cost Ranking	Total	Possible Funding Source	Approximate Cost	Project Timeline	Action Category
Consider hazard mitigation and community resilience within the scoring criteria during capital projects selections.	New	All Hazards	NCC OEM; Public Works	6	5	5	16	FEMA HMGP FEMA FMA & HMA County Funds	<$25,000	Ongoing	Local Plans and Ordinances

Table 6.3 below lists both actions from the 2015 plan that are being carried forward to this plan update for each municipality, as well as actions that are newly developed for the plan update based on responses to the municipal survey, hazard areas identified by the municipalities, and discussions during the municipal workshop. Any actions that were not given a final disposition (completed, cancelled, etc.) by the county, and all actions included in this list have been identified as new, in progress, ongoing, not started, or carried forward.

Table 6.3 Municipal Mitigation Strategy

Municipality	Hazard Mitigated	Mitigation Action	Lead Agency	Timeline	Potential Funding Source	Cost	Action Category
Arden							
	All-Hazards	Work closely with the County and continue to improve public outreach within the community to include distributing informative pamphlets and other outreach materials and workshops to educate citizens about hazard awareness.	Municipal Council/ Leadership; NCC OEM	Ongoing	BRIC, HMGP, HHPD, CIP	$25,000-$100,000	Education Awareness Programs
	All-Hazards	Retrofit Gild Hall so that it can be used as a temporary shelter.	Municipal Council/ Leadership/ NCC OEM and DHHS	2-4 years	BRIC, HMGP, HHPD, CIP	>$100,000	Structure and Infrastructure Projects
	Flood	Implement a Water Management Plan.	Municipal Council/ Leadership	2-4 years	BRIC, HMGP, HHPD, CIP	>$100,000	Local Plans and Ordinances

Municipality	Hazard Mitigated	Mitigation Action	Lead Agency	Timeline	Potential Funding Source	Cost	Action Category
	All-Hazards	Upgrade Buzz Ware Village Center for Emergency Shelter use.	Municipal Council/ Leadership; NCC OEM	2-4 years	BRIC, HMGP, HHPD, CIP	$25,000-$100,000	Structure and Infrastructure Projects
	All-Hazards	Perform a Village Wide Tree Risk Assessment.	Municipal Council/ Leadership	2-4 years	BRIC, HMGP, HHPD, CIP	$25,000-$100,000	Local Plans and Ordinances
Ardencroft							
	Flood	Investigate appropriate mitigation measures to protect 16 lease holders adjacent to the creek. Assess Perkins Run flooding potential.	Municipal Council/ Leadership; NCC OEM	Ongoing	BRIC, HMGP, HHPD, CIP	<$25,000	Structure and Infrastructure Projects
	All-Hazards	Develop and implement an information awareness system to include notification, mail outs, recorded messages, and email during and after an event.	Municipal Council/ Leadership; NCC OEM	Ongoing	BRIC, HMGP, HHPD, CIP	<$25,000	Education Awareness Programs
	All-Hazards	Ensure adequate training and resources for emergency organizations and personnel.	Municipal Council/ Leadership; NCC OEM	Ongoing	BRIC, HMGP, HHPD, CIP	<$25,000	Education Awareness Programs
	All-Hazards	Conduct Community Emergency Response Team (CERT) classes for emergency response personnel	Municipal Council/ Leadership; NCC OEM	Ongoing	BRIC, HMGP, HHPD, CIP	<$25,000	Education Awareness Programs
	All-Hazards	Increase the number of trained citizen emergency responders.		Ongoing	BRIC, HMGP, HHPD, CIP	<$25,000	Education Awareness Programs
	Wind Event, Flood, Winter Weather	Conduct a vegetative vulnerability assessment to determine what plant types pose a wind, water, or snow hazard to private and public property.	Municipal Council/ Leadership; NCC OEM	2-4 years	BRIC, HMGP, HHPD, CIP	$25,000-$100,000	Local Plans and Ordinances

Municipality	Hazard Mitigated	Mitigation Action	Lead Agency	Timeline	Potential Funding Source	Cost	Action Category
	Flood	Conduct an assessment to determine the vulnerability if Perkins Run overtops its banks (Due to increased population growth, development, and encroachment).	Municipal Council/ Leadership; NCC OEM	2-4 years	BRIC, HMGP, HHPD, CIP	$25,000-$100,000	Local Plans and Ordinances
Ardentown							
	All-Hazards	Prepare Candlelight Theater as needed for use as a shelter or search for another location in cooperation with the State Shelter Strategy.	Municipal Council/ Leadership; NCC OEM	2-4 years	BRIC, HMGP, HHPD, CIP	<$25,000	Structure and Infrastructure Projects
	All-Hazards	Develop a call out database to notify residents in the event of a disaster.	Municipal Council/ Leadership; NCC OEM	1-2 years	BRIC, HMGP, HHPD, CIP	$25,000-$100,000	Education Awareness Programs
	Flood	Continue to conduct the Marsh Road Property Acquisition Project.	Municipal Council/ Leadership; NCCD	1-2 years	BRIC, HMGP, HHPD, CIP	>$100,000	Structure and Infrastructure Projects
	Flood	Survey Storm Water Issues throughout the Town.	Municipal Council/ Leadership; NCC OEM	Ongoing	BRIC, HMGP, HHPD, CIP	<$25,000	Local Plans and Ordinances
	All-Hazards	Scan Town Data to preserve information to prevent loss of Town Data and History.	Municipal Council/ Leadership; State Archives	1-2 years	BRIC, HMGP, HHPD, CIP	<$25,000	Education Awareness Programs
	All-Hazards	Conduct a village wide Tree Risk Assessment.	Municipal Council/ Leadership; NCC OEM	2-4 years	BRIC, HMGP, HHPD, CIP	$25,000-$100,000	Local Plans and Ordinances
Bellefonte					BRIC, HMGP, HHPD, CIP		

Municipality	Hazard Mitigated	Mitigation Action	Lead Agency	Timeline	Potential Funding Source	Cost	Action Category
	All Hazards	Work closely with and obtain assistance from the County to implement an information awareness system to include notification, mail outs, recorded messages, and email during and after an event. Continue to send out hazard notifications via the State/County Police Alert System and through the Brandywine Hundred Fire Company.	Municipal Council/ Leadership	Ongoing	BRIC, HMGP, HHPD, CIP	$25,000-$100,000	Education Awareness Programs
Delaware City							
	All Hazards	Create displays for use at public events (health fair, public awareness day, county fair, etc.). DC Main Street, DCFC, Town.	DC Main Street/DCFC/Town	Ongoing	BRIC, HMGP, HHPD, CIP	<$25,000	Education Awareness Programs
	Flood	Construct flood barrier, drainage improvements, and wetlands enhancements for Dragon Run.	Town Admin	4+ years	BRIC, HMGP, HHPD, CIP	>$100,000	Structure and Infrastructure Projects
	Flood	Evaluate solutions for flooding of Route 9 at Dragon Run which is a major evacuation route out of Delaware City.	DELDOT/Town	1-2 years	BRIC, HMGP, HHPD, CIP	$25,000-$100,000	Structure and Infrastructure Projects
	All-Hazards	Provide training for Delaware City Town Council on the CRS program and encourage residents to participate.	Town Admin	Ongoing	BRIC, HMGP, HHPD, CIP	<$25,000	Education Awareness Programs
	Flood	Construct flood barrier and drainage improvements along C&D Canal and evaluate wetlands enhancements.	ACE	2-4 years	BRIC, HMGP, HHPD, CIP	>$100,000	Structure and Infrastructure Projects
	Eco	Develop a Phragmites elimination program. ACE, Town Admin.	ACE/Town Admin	1-2 years	BRIC, HMGP, HHPD, CIP	<$25,000	Local Plans and Ordinances
	Flood	Replace or eliminate tidal flushing pipe and valve at Old Locks.	Town Admin	2-4 years	BRIC, HMGP, HHPD, CIP	$25,000-$100,000	Structure and Infrastructure Projects

Municipality	Hazard Mitigated	Mitigation Action	Lead Agency	Timeline	Potential Funding Source	Cost	Action Category
	Flood	Conduct the Washington Street Flood Mitigation Project	Town Admin	1-2 years	BRIC, HMGP, HHPD, CIP	>$100,000	Structure and Infrastructure Projects
Elsmere							
	Flood	Implement stormwater study recommendations.	Town Admin	1-2 years	BRIC, HMGP, HHPD, CIP	>$100,000	Local Plans and Ordinances
	Flood	Increase the storage capacity of the Little Mill, Chestnut Run, Silverbrook, Derrickson Run and other creeks throughout the Town.	Town Admin	4+ years	BRIC, HMGP, HHPD, CIP	>$100,000	Structure and Infrastructure Projects
	Flood	Evaluate storm water management infrastructure.	Town Admin	1-2 years	BRIC, HMGP, HHPD, CIP	>$100,000	Structure and Infrastructure Projects
	Flood	Study and recommend solutions to alleviate the periodic flooding threat on Chestnut Run at Kirkwood Hwy (SR-2) , added in 2020 - Chestnut Run at VA Hospital, and Little Mill by Fuel station. / DELDOT and Elsmere	DELDOT/Town Admin	1-2 years	BRIC, HMGP, HHPD, CIP	$25,000-$100,000	Local Plans and Ordinances
	Fire	Enable Water Supply to the CSX Wilsmere Rail Yard for Fire Protection	Town Admin	1-2 years	BRIC, HMGP, HHPD, CIP	>$100,000	Structure and Infrastructure Projects
Middletown							
	All-Hazards	Conduct a vulnerability assessment of the Town's water distribution system, to identify measures designed to reduce the potential impacts of natural hazards./ Middletown DPW	DPW	1-2 years	BRIC, HMGP, HHPD, CIP	$25,000-$100,000	Local Plans and Ordinances

Municipality	Hazard Mitigated	Mitigation Action	Lead Agency	Timeline	Potential Funding Source	Cost	Action Category
	Drought	Develop a water restriction policy that can be implemented during drought conditions.	DPW	1-2 years	BRIC, HMGP, HHPD, CIP	<$25,000	Education Awareness Programs
	All-Hazards	Develop an Emergency Operations Plan with an integrated evacuation procedure for the Town in cooperation with DELDOT's NCC Evacuation Plan. / Town Manager, Town Planner, NCC OEM, DELDOT	Town Manager, Town Planner/NCC OEM/DELDOT	1-2 years	BRIC, HMGP, HHPD, CIP	$25,000-$100,000	Local Plans and Ordinances
	All-Hazards	Develop a website to notify residents of important information before, during and after emergencies, storms, etc. (include links to other major sources of information: DEMA, FEMA, DELDOT and the weather channel).	DEMA/FEMA/DELDOT	1-2 years	BRIC, HMGP, HHPD, CIP	<$25,000	Education Awareness Programs
	Flood	Perform Sharondale outfall rehabilitation to eliminate erosive velocities of stormwater runoff in the outfall.	Town Admin	2-4 years	BRIC, HMGP, HHPD, CIP	>$100,000	Natural Systems Protection
	Flood	Develop and Establish a Drainage Code.	Town Admin	1-2 years	BRIC, HMGP, HHPD, CIP	<$25,000	Local Plans and Ordinances
	Flood	Consider participation in the NFIP's Community Rating System (CRS).	Town Admin	Ongoing	BRIC, HMGP, HHPD, CIP	<$25,000	Education Awareness Programs
	All-Hazards	Coordinate with Emergency Services to identify available resources and increase preparedness awareness.	Town Admin	Ongoing	BRIC, HMGP, HHPD, CIP	<$25,000	Education Awareness Programs
	All-Hazards	Identify an Alternate location for Middletown Town Hall to provide continuity of operations in the event of a disaster or the building is compromised.	Town Admin	1-2 years	BRIC, HMGP, HHPD, CIP	<$25,000	Structure and Infrastructure Projects
New Castle City							

Municipality	Hazard Mitigated	Mitigation Action	Lead Agency	Timeline	Potential Funding Source	Cost	Action Category
	Transportation	Introduce railroad crossings at main highway intersections with gate and better signals (three major roadways cross the railroad near schools, businesses and residential areas).	Town Admin	1-2 years	BRIC, HMGP, HHPD, CIP	<$25,000	Education Awareness Programs
	Flooding	Develop a detailed flood vulnerability study for the entire City along the Delaware River and Bay to focus on coastal/riverine flooding from severe storm events and sea level rise.	Town Admin	1-2 years	BRIC, HMGP, HHPD, CIP	$25,000-$100,000	Local Plans and Ordinances
	HazMat	Work with railroad lines to notify citizens of hazardous shipments that run through the City of New Castle.	Town Admin	Ongoing	BRIC, HMGP, HHPD, CIP	<$25,000	Education Awareness Programs
	Flooding	Expand the flooding aspect – inland flooding that comes from dykes and roadway flooding going over bridges.	Town Admin	2-4 years	BRIC, HMGP, HHPD, CIP	$25,000-$100,000	Natural Systems Protection
Newark							
	All-Hazards	Assess damages sustained to city property following a disaster.	EM	Ongoing	BRIC, HMGP, HHPD, CIP	$25,000-$100,000	
	Flooding	Retrofit storm sewer system.	DPW	2-4 years	BRIC, HMGP, HHPD, CIP	>$100,000	Structure and Infrastructure Projects
	Flooding	Preserve riparian buffer along White Clay Creek.	DPW	Ongoing	BRIC, HMGP, HHPD, CIP	<$25,000	
	Flooding	Inspect stormwater outfalls and maintain stormwater management facilities annually.	DPW		BRIC, HMGP, HHPD, CIP	<$25,000	Structure and Infrastructure Projects

Municipality	Hazard Mitigated	Mitigation Action	Lead Agency	Timeline	Potential Funding Source	Cost	Action Category
	Flooding	Conduct six inspections of creek annually.	DPW	Ongoing	BRIC, HMGP, HHPD, CIP	<$25,000	Structure and Infrastructure Projects
	Flooding	Continue storm drain spill response.	DPW	Ongoing	BRIC, HMGP, HHPD, CIP	<$25,000	Natural Systems Protection
	All-Hazards	Continue tree maintenance program.	DPW	Ongoing	BRIC, HMGP, HHPD, CIP	<$25,000	Structure and Infrastructure Projects
	All-Hazards	Own generation back up power at varied voltages and place at critical loads and substations.	DPW	Ongoing	BRIC, HMGP, HHPD, CIP	$25,000-$100,000	Structure and Infrastructure Projects
	All-Hazards	Manage storage area at designated parkland for debris composting.	DPW	Ongoing	BRIC, HMGP, HHPD, CIP	<$25,000	Structure and Infrastructure Projects
	Flooding	Keep Christina Creek clear of obstruction, including 11 bridge culverts.	DPW	Ongoing	BRIC, HMGP, HHPD, CIP	<$25,000	Natural Systems Protection
	Flooding	Clean catch basins and grates three times a year.	DPW	Ongoing	BRIC, HMGP, HHPD, CIP	<$25,000	Natural Systems Protection
	All-Hazards	Routinely inspect all construction E & S measures	DPW	Ongoing	BRIC, HMGP, HHPD, CIP	<$25,000	Structure and Infrastructure Projects
	Flooding	Study and recommend solutions to alleviate the periodic flooding threat on the Christina River at Nottingham Road (SR-273), Barksdale Road, near the Christina River at the Newark CSX rail line and Casho Mill Road, on the Christina River at W Chestnut Hill Road/Rittenhouse	Multiple Depts..	Ongoing	BRIC, HMGP, HHPD, CIP	$25,000-$100,000	Local Plans and Ordinances

Municipality	Hazard Mitigated	Mitigation Action	Lead Agency	Timeline	Potential Funding Source	Cost	Action Category
		Park, on the Christina River at Welsh Track Road, and on White Clay Creek at Paper Mill Road, ADDED and on Julie Lane near Casho Mill Road.					
	Flooding	Support cost effective property acquisitions through Federal grants.	EM	Ongoing	BRIC, HMGP, HHPD, CIP	<$25,000	Structure and Infrastructure Projects
	All-Hazards	Install a Backup Generator to NW Booster Station	DPW	1-2 years	BRIC, HMGP, HHPD, CIP	<$25,000	Structure and Infrastructure Projects
	Flooding	Construct Stormwater Management facility at previous site of UD Rodney Dorm acquired by City, into a park.	DPW	Ongoing	BRIC, HMGP, HHPD, CIP	>$100,000	Structure and Infrastructure Projects
	Flood	Investigate use of previously abandoned sanitary sewer force main at Silverbrook pump station for emergency bypass.	DPW	1-2 years	BRIC, HMGP, HHPD, CIP	<$25,000	Structure and Infrastructure Projects
Newport							
	Flooding	Work with the County to conduct a detailed flood vulnerability study for the entire Town.	Town / NCC DLU	1-2 years	BRIC, HMGP, HHPD, CIP	$25,000-$100,000	Local Plans and Ordinances
	Flooding	Install catch basins throughout Town.	Town Admin	Ongoing	BRIC, HMGP, HHPD, CIP	>$100,000	Structure and Infrastructure Projects
	Flood	Install two (2) new sewer pump stations in the Industrial Park	Town Admin	1-2 years	BRIC, HMGP, HHPD, CIP	<$25,000	Structure and Infrastructure Projects
Odessa							

Municipality	Hazard Mitigated	Mitigation Action	Lead Agency	Timeline	Potential Funding Source	Cost	Action Category
	All-Hazards	Educate residents on hazards that can impact the community.	Town Admin	Ongoing	BRIC, HMGP, HHPD, CIP	<$25,000	Education Awareness Programs
	All-Hazards	Develop an evacuation policy for the Town.	Town Admin	1-2 years	BRIC, HMGP, HHPD, CIP	<$25,000	Local Plans and Ordinances
	Flood	Study and recommend solutions to alleviate the periodic flooding threat on Appoquinimink River at Main Street (SR-299)	DELDOT	1-2 years	BRIC, HMGP, HHPD, CIP	$25,000-$100,000	Local Plans and Ordinances
	Flood	Address flood concerns and handicapped accessibility at Cantwell Tavern	Town Admin	1-2 years	BRIC, HMGP, HHPD, CIP	>$100,000	Structure and Infrastructure Projects
	Flood	Develop mitigation measures to reduce the flooding occurrences and impacts on Main Street in Odessa	Town Admin	1-2 years	BRIC, HMGP, HHPD, CIP	$25,000-$100,000	Structure and Infrastructure Projects
Townsend							
	All-Hazards	Develop an educational and outreach program for residents, business owners and government employees to include specific actions that can be taken to reduce the impact of natural hazards.	Town Admin	Ongoing	BRIC, HMGP, HHPD, CIP	<$25,000	Education Awareness Programs
	Flood	Research and Consider adoption into the NFIP.	Townsend / DNREC & NCC OEM, NCC DLU	Ongoing	BRIC, HMGP, HHPD, CIP	<$25,000	Education Awareness Programs
	All-Hazards	Evacuation Flow Study for Town due to limited outlets	Townsend / DELDOT & NCC OEM	1-2 years	BRIC, HMGP, HHPD, CIP	$25,000-$100,000	Local Plans and Ordinances
Wilmington							

Municipality	Hazard Mitigated	Mitigation Action	Lead Agency	Timeline	Potential Funding Source	Cost	Action Category
	Flood	Educate and encourage citizens to purchase and install backflow preventers in flood-prone homes.	Wilm. DPW	Ongoing	BRIC, HMGP, HHPD, CIP	<$25,000	Education Awareness Programs
	All-Hazards	Continue to increase public education, people should be ready to survive for three days without power.	Wilm. OEM	Ongoing	BRIC, HMGP, HHPD, CIP	<$25,000	Education Awareness Programs
	All-Hazards	Continue to increase public education for all hazards.	Town Admin	Ongoing	BRIC, HMGP, HHPD, CIP	<$25,000	Education Awareness Programs
	Severe Weather	Evaluate the adequacy of existing code to address potential wind-related damages	Wilm. L & I	Ongoing	BRIC, HMGP, HHPD, CIP	<$25,000	Local Plans and Ordinances
	Flood	Reduce the likelihood of sewer overflow during flood events through real-time control (RTC).	Wilm. DPW	Ongoing	BRIC, HMGP, HHPD, CIP	>$100,000	Structure and Infrastructure Projects
	All-Hazards	Develop building construction code requiring shatter-proof glass for new city buildings.	Wilm L&I	1-2 years	BRIC, HMGP, HHPD, CIP	<$25,000	Local Plans and Ordinances
	All-Hazards	Establish a citywide disaster recovery/business continuity plan.	Wilm. OEM and all departments	1-2 years	BRIC, HMGP, HHPD, CIP	<$25,000	Local Plans and Ordinances
	All-Hazards	Coordinate with the Department of Public Works to apply traffic flow study to evacuation procedures.	Wilm. OEM and DPW	1-2 years	BRIC, HMGP, HHPD, CIP	$25,000-$100,000	Local Plans and Ordinances
	All-Hazards	Evaluate Comprehensive Plan to check for hazard mitigation elements.	Town Admin	Ongoing	BRIC, HMGP, HHPD, CIP	<$25,000	Local Plans and Ordinances

Municipality	Hazard Mitigated	Mitigation Action	Lead Agency	Timeline	Potential Funding Source	Cost	Action Category
	All-Hazards	Ensure NIMS training for all appropriate City personnel and engage in tabletop exercises.	Wilm. OEM	Ongoing	BRIC, HMGP, HHPD, CIP	<$25,000	Education Awareness Programs
	Flood	On South Wilmington Wetland Park - Reestablish wetland to process stormwater from South Wilmington Area east of Walnut Street, south of A street; Partial separation of stormwater in Southbridge and from Garaches Lane	Wilm. DPW	1-2 years	BRIC, HMGP, HHPD, CIP	>$100,000	Natural Systems Protection
	Flood	Reestablish drainage along RR property between New Castle Avenue and Christiana Avenue to relieve street flooding on New Castle Avenue and to create a drainage path for the redevelopment of the Southbridge Extension area.	Wilm. DPW	1-2 years	BRIC, HMGP, HHPD, CIP	>$100,000	Natural Systems Protection
	All-Hazards	Develop an Emergency Management GIS training program (including hardware and software).	Wilm. OEM and DPW	1-2 years	BRIC, HMGP, HHPD, CIP	<$25,000	Education Awareness Programs
	Flood	Study and recommend solutions to alleviate the periodic flooding threat on Brandywine Creek at E 12th Street/Wilmington Industrial Park and on Shellpot Creek at Governor Printz Blvd (US 13).	DPW	1-2 years	BRIC, HMGP, HHPD, CIP	$25,000-$100,000	Local Plans and Ordinances
	All-Hazards	Implement a Tree Maintenance Program.	Wilm. DPW	1-2 years	BRIC, HMGP, HHPD, CIP	<$25,000	Local Plans and Ordinances
	Flood	Educate and encourage citizens to purchase and install backflow preventers in flood-prone homes.	Wilm. DPW	Ongoing	BRIC, HMGP, HHPD, CIP	<$25,000	Education Awareness Programs

Past Actions Not Carried Forward

Action items from the 2020 HMP that have been completed, deemed infeasible, not applicable or merged/combined with another action item have been removed from this plan. Those actions are itemized, described, and justified in Table 6.5 for County actions, and in Table 6.6 for municipal actions.

The Steering Committee reviewed the actions in the 2020 Plan and each action from the original plan was discussed and categorized based on definitions given in Table 6.4. Municipalities not completing any actions since 2020 or not providing updates have been left blank.

Table 6.4 Hazard Status Definitions

Status	Definition
Completed	The lead department has completed the action since the development of the 2012 plan.
Not Applicable	Actions that were deemed by the Steering Committee to not apply to the HMP.
Cancelled	Officials have decided to terminate the project.
Infeasible	After further study this project was deemed to be infeasible based on benefit/cost analysis, engineering study, or another criterion.
Combined	The action has been merged with another existing action or new action.

Table 6.5 New Castle County 2020 Actions Completed, Cancelled, or Not Applicable

Action	Hazard Mitigated	Lead Agency for Implementation	Status	Notes
Elevate homes within the Bayview Beach community as funding allows.	Flood	NCC OEM	Complete	Was completed up to what homeowners want. 4 homes left to elevate but homeowners declined.
Study and recommend solutions to alleviate the stormwater flooding threat on Fox Run Shopping Center on Pulaski Highway near Glasgow.	Flood	NCC OEM	N/A	This is a DelDOT concern.
Evaluate solutions for flooding of Route 72 between the refinery and Route 13 which is major evacuation route out of Delaware City.	Flood	DelDOT	Cancelled	No identified project in DelDOT future, comm property dev may consider drainage improvement.
Implement the 25 specific recommendations by the Delaware Sea Level Rise Advisory	Flood; Coastal Storms	Various	Complete	Various lead agencies per Report

Action	Hazard Mitigated	Lead Agency for Implementation	Status	Notes
Committee per the 2014 Report, for all municipalities.				
Encourage all municipalities to use the LIMWA (Limited Wave Action) to adjust mitigation projects to a higher elevation level in A zones, for sea level rise and better protection. Ordinance 14-126 requires structures built within the LimWA be constructed to Coastal High Hazard or V zone standards per 40.10.320 E	Flood (Storm Surge)	NCC DLU	Complete	2022 – incorporated into NCC 2022 Comp plan – for revisions now for 2050 – also in flood ordinance. Already encouraged the Munis – NCC has developed flood ready ordinance/document with critical needs.
Evaluate and develop actions to mitigate the following areas that are vulnerable to flooding: Delmarva Power, Christina Crescent, Dupont on Powder Mill Road, Delaware Steeplechase Racetrack Property, Port of Wilmington, 350 Anchor Mill Road, 115 Christina Landing, 1237 Sussex Avenue, and 1301 E Twelfth Street.	Flood	Various Lead Agencies	N/A	This is a DelDOT/DNREC project
Encourage the adoption of building codes to require residential sprinkler systems installed in new construction.	Infrastructure Issues	DE Fire Sprinkler Coalition	Infeasible	Project is no longer feasible.

Table 6.6 2020 Municipal Actions Completed, Cancelled, or Not Applicable

Hazard Mitigated	Mitigation Action	Lead Agency	Action Status	Notes
Past Municipal Actions Completed, Cancelled, or N/A				
Arden				
HAZMAT	Establish emergency notification procedures for rail and Interstate HAZMAT incidents and chemical facilities.	Village of Arden	Complete	OEM did demonstration – will continue to find audiences for County OEM.
Flood	Create a Storm Water Management Plan / Arden & DNREC	Village of Arden	Complete	Engineering firm came out and helped with plan.
Ardencroft				
None				
Ardentown				
None				
Bellefonte				
None				
Delaware City				
None				

Hazard Mitigated	Mitigation Action	Lead Agency	Action Status	Notes
Elsmere				
None				
Middletown				
None				
New Castle City				
None				
Newark				
None				
Newport				
Flooding	Initiate wetlands protective measures along the Christina River.	Unknown	Not Applicable	Not relevant or priority
Flooding	Study and recommend solutions to alleviate the periodic flooding threat on the Christina River at Interstate 95/US 141/202.	Unknown	Cancelled	No lead agency or if this is a thing.
Odessa				
All-Hazards	Establish a comprehensive all-hazards warning system.	Town	Complete	DelDOT installed flood warning system – signage throughout area. Flashing signs on bridge
Flood	Update the local Flood Damage Prevention Ordinance.		Complete	If requirement for updating, will be let know
Flood	Encourage citizens to purchase flood insurance.	Town Admin	Not Applicable	Action is now N/A.
All Hazards	Identify and evaluate shelters.		Not Applicable	Red Cross – Odessa does not have this
All Hazards	Develop and Improve Public Water Distribution system.	Town Admin	Complete	Now have an agreement with Artesian – have to hook up City Water, city water is available.
Townsend				
None				
Wilmington				
None				

Benefits Maximization versus Cost

A benefit-cost analysis determines the cost-effectiveness of a project to minimize damage or prevent future damage from future hazard events. By determining the benefit-cost of the proposed mitigation projects, it will provide the communities as well as project developers with additional knowledge about the feasibility of the proposed mitigation alternative. If the costs outweigh the benefits, then other alternatives that are more effective can be identified to accomplish the Plan's goals.

7.0 CHAPTER 7 – PLAN MAINTENANCE

7.1 Update Process Summary

Once this Plan has received approval from DEMA and FEMA, the Plan will be adopted by New Castle County and its participating jurisdictions. This County HMP Update is intended to be a 'living document.' Plan adoption is not considered the final step in the planning process, but rather as a first step to 'realization.' The plan monitoring and maintenance schedule is a cycle of events that involve periodic review, adjustments, and improvement. This Chapter establishes a method to monitor how the Plan will be evaluated and maintained in the future.

7.2 Monitoring, Evaluating, and Updating the Plan

This 2025 HMP Update will be monitored by the County for several related purposes:

1. Maintain the currency of hazard and risk information.
2. Ensure mitigation projects and actions reflect the priorities of the County, the HMP Steering Committee, and the general public.
3. Comply with Federal Emergency Management Agency (FEMA) and Delaware Emergency Management Agency (DEMA) requirements for HMP maintenance, and to maintain eligibility for Federal disaster assistance and mitigation grants.

There are several criteria that should be evaluated as part of the annual review process. Annual reviews should take place every year during the same month in which the Plan was adopted, and/or within 30 days of a declared disaster. During the annual review process, the following criteria should be evaluated for any changes, and adjustments made to the Plan accordingly:

- Changes in the risk assessment (hazard rankings)
- Changes in priorities
- Hazard event occurrences and impacts
- Relevance of Plan Goals
- Status of mitigation actions (completed, ongoing, in progress, not started, not applicable)

In addition to conducting an annual review of the plan, the Steering Committee will review the Plan within 30 days after a disaster. Each goal and objective will be examined for its relevance and validity to the changing situation in each municipality and the mitigation actions will be reviewed to ensure that it addresses any recent issues that may have stemmed from disaster events. During periods without hazard events, the Plan will be updated every five years to reflect the current risk, vulnerabilities, development trends and as mitigation actions are implemented. While an annual report will be completed each year, any state and federal mandates from DEMA and FEMA respectively, will be addressed in the five-year update. The municipalities will not be responsible for making any changes to the HMP based on DEMA or FEMA requirements in between the five-year update.

The New Castle County EMA is responsible for coordinating the Steering Committee, and the Committee shall monitor and maintain the HMP Update. The EMA and Steering Committee shall continuously monitor the HMP for the purposes noted above and with respect to the update triggers discussed in the section below.

Plan integration updates should also take place as part of plan maintenance. As the HMP is updated every five years, an inventory of County plans/ordinances with relevance to hazard mitigation, resilience, and/or risk reduction should be taken, a review of the plans should be completed if there

has been an update since the previous HMP update, and any relevant information should be integrated back into the HMP Update. This requires coordination and engagement between plans and departments. As one plan is updated, other county staff tasked with developing plans should be informed so they can identify potential points of integration into their respective written plans.

On the other hand, information from the HMP should be integrated back into other County Plans, creating on ongoing cycle for integration. For guidance on integrating other planning mechanism considerations into the HMP, as integrating HMP principles into other planning mechanisms, please refer to FEMA's Plan Integration Guide, titled: Plan Integration: Linking Local Planning Efforts.

Upon adoption of this plan, the EMA will annually convene a meeting of representatives from the Steering Committee to discuss and determine implementation accomplishments and/or implementation obstacles and recommended solutions. Although the individuals filling the positions may change from year to year, future Steering Committee members will continue to be comprised of the same departments and organizations involved in this current update. The EMA will also be responsible for monitoring and preparing the annual progress reports and will utilize the data obtained from the annual meeting to note the progress made on mitigation action items in annual progress reports. Circumstances or conditions under which New Castle County will initiate HMP reviews and updates:

1. On the recommendation of the County Executive, or on its own initiative, the County may initiate an HMP review at any time.
2. At approximately the one-year anniversary of the HMP's re-adoption, and approximately at the same anniversary every year thereafter.
3. After a natural hazard event that appears to significantly change the apparent risk to County assets, operations and/or citizens, and/or after Presidentially declared disasters.
4. Upon receipt of new or updated data or information that may affect the HIRA (ex. New FEMA FIRM).
5. When activities within the County, Region, or State significantly alter the potential effects of natural hazards on County assets, operations and/or citizens. Examples include completed mitigation projects that reduce risk, actions or circumstances that increase risk.

In addition to the circumstances listed above, revisions that warrant changing the text of this HMP or incorporating new information may be prompted by a number of circumstances, including identification of specific new mitigation projects, completion of several mitigation actions, or requirements for qualifying for specific funding. Minor revisions may be handled by addenda. Major comprehensive review of and revisions to the New Castle County HMP will be conducted on a five-year cycle. This 2025 HMP Update will be posted on New Castle County's website under the Department of Emergency Services tab.

HMP Update Standard Operating Procedure (SOP)

This SOP establishes a consistent, repeatable process for updating the County HMP in accordance with FEMA requirements and applicable state hazard mitigation guidance. The SOP ensures the County maintains an approved and actionable plan to reduce risk to life, property, infrastructure, and the environment.

Update Cycle Overview

The County Hazard Mitigation Plan shall be:

- Updated every five (5) years

- Reviewed annually for relevance and progress
- Formally adopted by the County governing body prior to FEMA approval

Roles and Responsibilities

Emergency Management Department (Lead Agency)

- Serves as Plan Administrator
- Manages the overall update schedule and deliverables
- Coordinates with state and FEMA reviewers
- Maintains official plan records

Hazard Mitigation Steering Committee (HMSC)

- Provides technical input and local knowledge
- Represents key sectors and jurisdictions
- Reviews draft plan components
- Assists with public engagement

County Departments & Agencies

- Provide data, project updates, and future mitigation needs
- Identify critical facilities and infrastructure
- Participate in risk assessment and strategy development

Municipalities & Partner Jurisdictions

- Submit jurisdiction-specific data and mitigation actions
- Participate in meetings and reviews
- Adopt the final plan by resolution

Public & Stakeholders

- Provide input on local hazards, vulnerabilities, and priorities
- Participate through surveys, meetings, or public comment periods

Five-Year Update Process

Phase 1: Initiation & Scoping (Months 1–3)

- Confirm update timeline and funding sources
- Reconstitute or update the HMPC membership
- Review FEMA and state planning guidance
- Develop a public participation strategy
- Conduct a plan kick-off meeting

Phase 2: Data Collection & Risk Assessment (Months 4–9)

- Update hazard profiles using latest data
- Review disaster history since last plan update

- Assess changes in population, land use, and development
- Update vulnerability assessments for people, buildings, critical facilities, and infrastructure
- Incorporate climate and future conditions, as applicable

Phase 3: Mitigation Strategy Development (Months 10–15)

- Evaluate progress on existing mitigation actions
- Identify new mitigation actions and projects
- Prioritize actions using agreed-upon criteria
- Align mitigation actions with:
    - Comprehensive Plan
    - Capital Improvement Program (CIP)
    - Climate or resilience plans

Phase 4: Draft Plan Development & Review (Months 16–20)

- Compile full draft HMP
- Conduct internal and HMPC reviews
- Release draft for public review and comment
- Incorporate feedback and revisions

Phase 5: Adoption & Approval (Months 21–24)

- Submit plan to State Emergency Management Agency
- Address state and FEMA review comments
- Obtain local adoption resolutions
- Receive FEMA approval

Annual Plan Maintenance

Each year, the Emergency Management Department shall:

- Convene at least one HMPC meeting
- Review mitigation action status
- Identify changes in hazards or development
- Document funding opportunities pursued
- Update contact lists and appendices as needed

7.3 Continued Public Involvement

The preparation of this Plan has involved the municipalities and public throughout the process. New Castle County is dedicated to continuing to solicit municipal and public participation during the five-year update as required by FEMA. Copies of the HMP Update will be placed on the EMA website, along with a mechanism for submission for comments. Additionally, annual update meetings should be open to the public and all municipalities, and an advertising and outreach campaign should be undertaken to encourage the public to attend and provide comments. Upon adoption of the updated 2025 HMP, the public will be notified of any substantial changes to the document prior to the next scheduled update in 2030. Any changes proposed by the Steering Committee that are considered significant will be distributed to the list of stakeholders identified in the Planning Process chapter of

this Plan. Future County HMP Updates will also consider accessible formats, such as plain language summaries, translations, ADA-compliant postings. The Steering Committee will then review any and all suggested changes and make recommendations for revisions to the plan as deemed appropriate and/or necessary.

8.0 CHAPTER 8 – PLAN ADOPTION

Adoption by the County Governing Body

Include adoption resolution from New Castle County here.

Adoption by the Local Governing Bodies

Include adoption resolution(s) from adopting municipalities here.

Adoption Status Tracking Table

Jurisdiction	Adoption Date	Adoption Resolution Link
New Castle County		
Arden		
Ardencroft		
Ardentown		
Bellefonte		
Delaware City		
Elsmere		
Middletown		
New Castle City		
Newark		
Newport		
Odessa		
Townsend		
Wilmington		

APPENDIX A – NEW CASTLE COUNTY HIGH HAZARD POTENTIAL DAM ANALYSIS

Dam failure is a collapse or breach in a dam. In recent years, aging infrastructure and population growth in floodplain areas downstream from dams and near levees have resulted in an increased emphasis on safety, operation, and maintenance of dams. While some dams have storage volumes small enough that failures have little or no repercussions, dams with large storage volumes can cause significant downstream flooding in the event of a breach.

Several dams exist to serve mostly recreational functions within New Castle County. Other uses for dams in the County include irrigation and fish or wildlife ponds. In some cases, a single dam structure serves multiple functions.

HHPD Planning Process

For this HHPD Analysis, the County EMA and the DNREC Dam Coordinator were involved in overseeing and providing insight. Information and data developed and provided by the DNREC, as well as the National Inventory of Dams (NID), were utilized to inform this Analysis. Additionally, this Analysis utilizes products developed by other stakeholders, such as those who are responsible for county engineering tasks and overseeing the development of Emergency Action Plans for high-hazard dams. The entire steering committee, DNREC, and other county and state stakeholders were involved and informed at Steering Committee and municipality meetings and will continue to be involved to improve this Analysis with every subsequent Plan Update.

In addition to the stakeholders involved in the development of this Plan Amendment, the following resources, studies, reports, and information related to HHPDs have been used:

In addition to the stakeholders involved in the development of this Analysis, the following resources, studies, reports, and information related to HHPDs have been used:

- FEMA Rehabilitation of High Hazard Potential Dams: Grant Program Guidance, June 2020
- Emergency Action Plans for the high-hazard dams in the County (inundation maps and population at risk)
- Operations and Maintenance Inspection Reports for high-hazard dams
- FEMA Region 3 High Hazard Potential Dams: State Mitigation Planning Tips

HHPD Risk Assessment

Dam failure is a collapse or breach in a dam. In recent years, aging infrastructure and population growth in floodplain areas downstream from dams and near levees have resulted in an increased emphasis on safety, operation, and maintenance of dams. While some dams have storage volumes small enough that failures have little or no repercussions, dams with large storage volumes can cause significant downstream flooding in the event of a breach. Several dams exist to serve mostly water supply and recreation functions within New Castle County. Other uses for dams in the County include fish or wildlife ponds and flood risk reduction.

The failure or partial failure of a High-Hazard Potential Dam can have impacts that affect many different jurisdictions across New Castle County and counties adjacent to New Castle County. A failure at any of the dams in New Castle County would result in some inundation in at least those

municipalities adjacent to the dam in question. This HHPD Risk Assessment provides a comprehensive examination of risk inundation areas from the 16 High-Hazard Potential Dams in New Castle County.

However, each of the municipalities that could be affected by the failure of a High Hazard Potential Dam could result in the inundation of critical facilities such as police stations and fire departments, critical infrastructure facilities, and community lifeline locations like medical facilities, power and energy facilities, and schools, nursing homes, and senior care and long-term care facilities. It is also important to note that the high-hazard dams' flooding potential can be elevated due to cascading impacts from other hazard events, such as seismic events or wildfires. New Castle County is at risk when high-hazard potential dams are considered. There are three types of risk related to high-hazard potential dams, and they are listed below:

High Hazard Potential Dam Risk Types

High Hazard Potential Dam Risk Types	
Type of Risk	Description
Incremental Risk	The risk (likelihood and consequences) to the pool area and downstream floodplain occupants that can be attributed to the presence of the dam should the dam breach prior or subsequent to overtopping, or undergo component malfunction or mis-operation, where the consequences considered are over and above those that would occur without dam breach. The consequences typically are due to downstream inundation, but loss of the pool can result in significant consequences in the pool area upstream of the dam.
Non-breach Risk	The risk in the reservoir pool area and affected downstream floodplain due to 'normal' dam operation of the dam (e.g., large spillway flows within the design capacity that exceed channel capacity) or 'overtopping of the dam without breaching' scenarios.
Residual Risk	The risk that remains after all mitigation actions and risk reduction actions have been completed. With respect to dams, FEMA defines residual risk as "risk remaining at any time" (FEMA, 2015, p A-2). It is the risk that remains after decisions related to a specific safety issue are made and prudent actions have been taken to address the risk. It is the remote risk associated with a condition that was judged to not be a credible dam safety issue.
Source: "Rehabilitation of High Hazard Potential Dams Grant Program Guidance," June 2020	

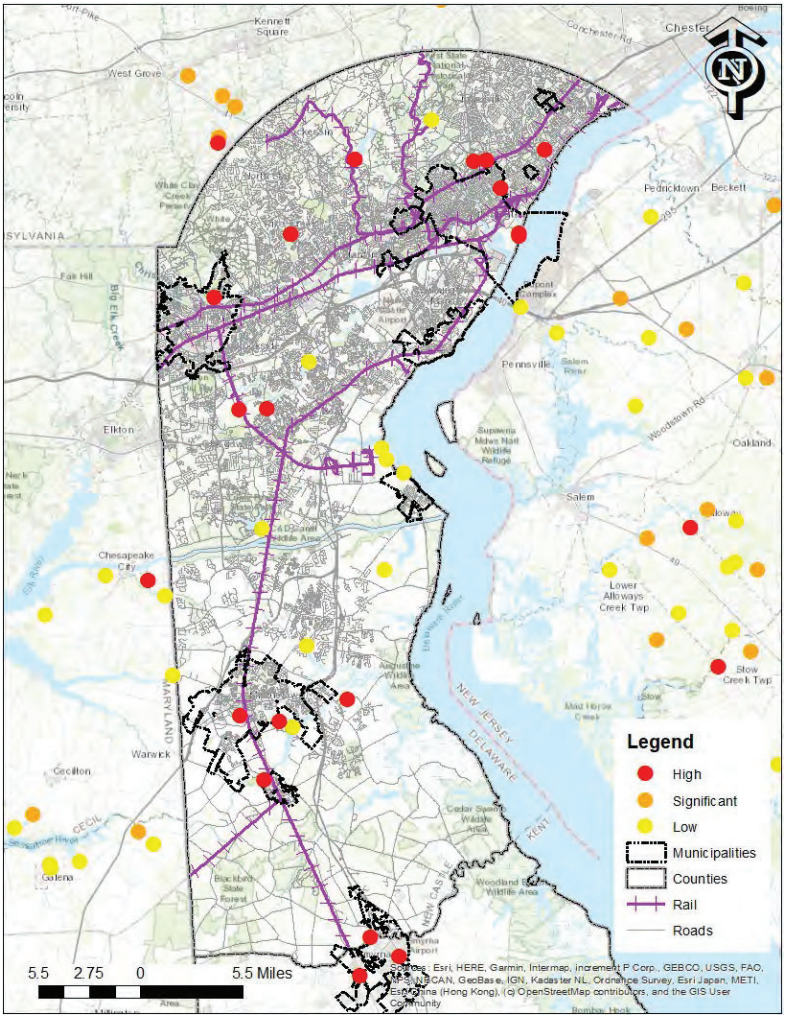
This Analysis involved obtaining the Emergency Action Plans for each HHPD, which provide information on projected dam breach inundation areas and downstream flood zones. Upon obtaining the inundation information from dam owners and DNREC, data on building inventories were then obtained from the County GIS department and freely available data sources. Through this process, the analysis identifies the number of structures at risk, the total structure value at risk, and the total content value of those structures at risk. This analysis also provides a breakdown of the building occupancy of all structures impacted. Information from this analysis is then digitized on individual maps for the respective HHPDs.

These maps and analyses are depicted and provided within the Analysis. With digitized data, the County and municipalities can now make informed decisions on the dam breach mitigation priorities. It is a desire of the County to continue to refine the digitized HHPD data and update the data as development occurs in the future; therefore, it has been included as a mitigation action for this hazard. The current HHPD analysis was performed based on data from Emergency Action Plans from the HHPDs, as well as data provided by the DNREC Dam Safety Coordinator. The next Plan

Update will provide additional analysis related to total population at risk (PAR). A specific mitigation measure has been included to pursue additional data and perform a more in-depth analysis to understand the population at risk, including any vulnerable populations, for all HHPDs.

Location and Extent

The federal and most state governments regulate certain impounding structure (dam) planning, construction, operation, maintenance, and repair. On the state level, The Dam Safety & Encroachments Act (Act 325 of 1978) and the Amendment for "High-Hazard Dam" Act 325 provides for the regulation of dams and reservoirs, water obstructions and encroachments in the Commonwealth, in order to protect the health, safety and welfare of the people and property. In Delaware, the Division of Dam Safety, under the Bureau of Waterways Engineering and Wetlands, which is part of the Department of Environmental Protection provides for the regulation and safety of dams and reservoirs throughout the Commonwealth to protect the health, safety and welfare of its citizens and their property.



This division is required to ensure proper planning, design review, construction review, maintenance monitoring and supervision of dams and reservoirs. The division directs and coordinates field investigations with regional offices on authorized projects during construction; provides program guidance and coordination to regional program staff in the periodic inspection of all existing dams to determine their condition and safety; and directs, coordinates and develops policies and technical standards in the area of dam safety for the Department.

There are twenty-seven dams in New Castle County and the locations of those dams are depicted below.

Range of Magnitude

The hazard potential classification of dams is high, significant, and low. The classification is based on a determination of the effects that a dam failure would likely have on people and property in the downstream area, or inundation zone. Hazard potential classifications descend in order from high to low, having the greatest potential for adverse downstream impacts in the event of failure.

Classification is unrelated to the physical condition of the dam or the probability of its failure. The hazard potential classifications provided in Table 1 are described by the USACE as follows:

Low Hazard Potential: Dams assigned the low hazard potential classification are those where failure or mis-operation results in no probable loss of human life and low economic and/or environmental losses. Losses are principally limited to the owner's property.

Significant Hazard Potential: Dams assigned to the significant hazard potential classification are those dams where failure or mis-operation results in no probable loss of human life but can cause economic loss, environment damage, disruption of lifeline facilities, or impact other concerns. Significant hazard potential classification dams are often located in predominantly rural or agricultural areas but could be in areas with population and significant infrastructure.

High Hazard Potential: Dams assigned the high hazard potential classification are those where failure or mis-operation will probably cause loss of human life.

Potential	Loss of Human Life	Economic, Environmental, Lifeline Losses
Low	None expected.	Low and generally limited to owner.
Significant	None expected.	Yes.
High	Probable. One or more expected.	Yes (but not necessary for this classification).

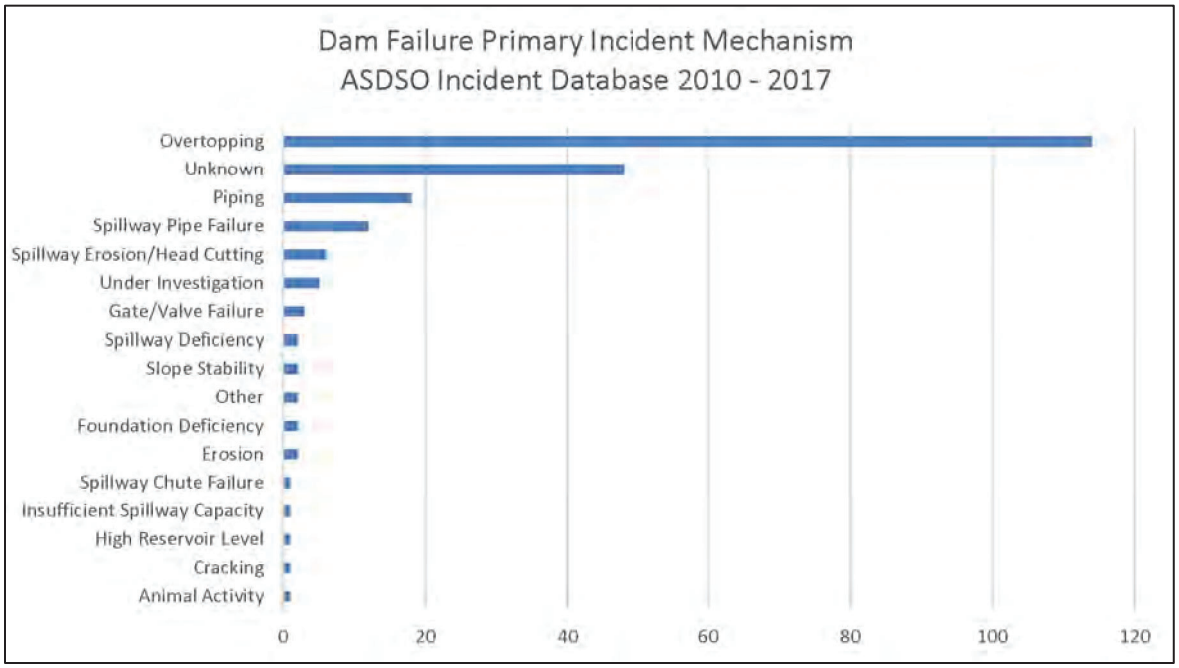
The State also classifies the hazard potential by loss of life and economic loss similar to the USACE classification. Table 3 describes the three potential hazard categories defined by the State.

Potential	Description
Class III - Low Hazard Potential	This classification includes any dam whose failure or mis operation is unlikely to cause loss of human life but may cause minor economic and/or environmental losses. This classification applies to rural or agricultural areas where failure may damage farm buildings other than residences, agricultural lands, or non-major roads. Class III dams are exempted from the requirements of these Regulations.
Class II - Significant Hazard Potential	This classification includes any dam whose failure or mis operation will cause possible loss of human life, economic loss, environmental damage, and disruption of lifeline facilities, or can impact other concerns. This classification applies to predominantly rural agricultural areas, where dam failure may damage isolated homes, major highways, or railroads or cause interruption of service of relatively important public utilities.
Class I - High Hazard Potential	This classification includes any dam whose failure or mis operation will cause probable loss of human life. The existence of normally occupied homes in the area that are susceptible to significant damage in the event of a dam failure will be assumed to mean "probable loss of life." Recreational facilities below a dam, such as a campground or recreation area, may be sufficient reason to classify a dam as having a high-hazard potential.

Past Occurrence

There are no comprehensive databases of historical dam failures or flooding following a dam failure in the area. Most failures occur due to lack of maintenance of dam facilities in combination with major precipitation events, such as hurricanes and thunderstorms.

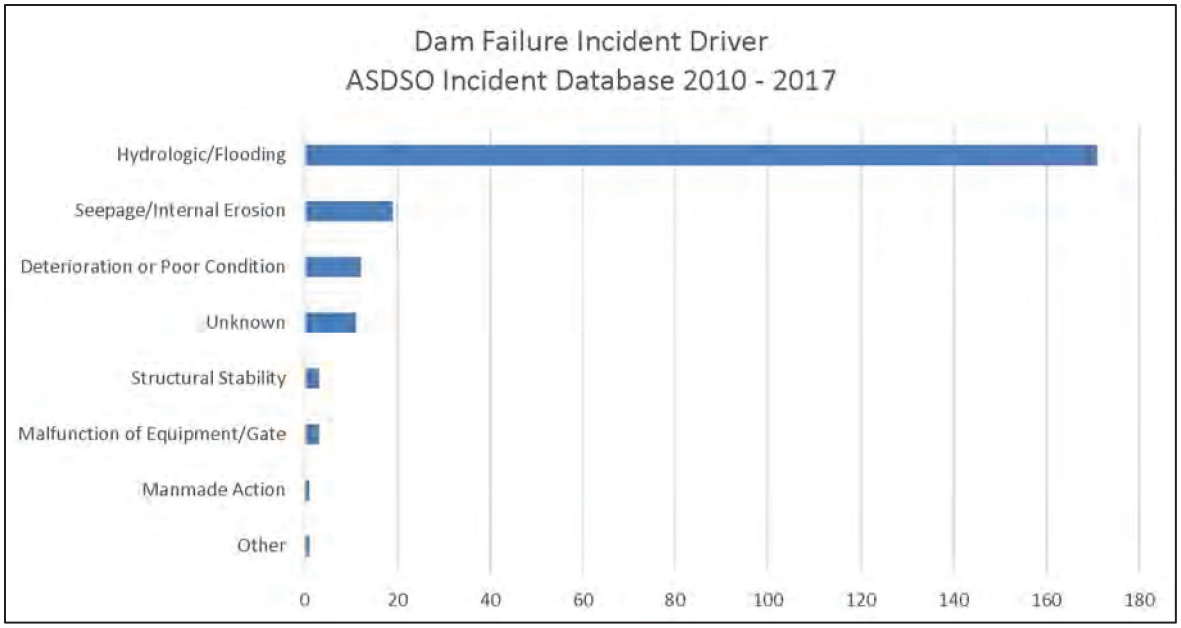
Dam failures are most likely to happen for one of five reasons: overtopping, foundation defects, cracking, inadequate maintenance and upkeep, and piping.[38] Flood or overtopping is one of the most common causes of dam failure and occurs when the dam's spillway is inadequate for dealing with excess water. During flood events, too much water to be properly handled by the spillway may rush to the dam site and flow over the top of the dam. Improper building construction, including using easily eroded construction materials, also frequently leads to the slow structural failure of dams. This failure can be compounded by underlying geological factors such as porous bedrock that lose structural integrity when saturated. Figure 1 and Figure 2 summarize the most common causes of dam failure between 2010 and 2017.



Dam failure primary incident mechanism (Source: ASDSO Incident Database, 2010 - 2017) [39].

[38] Association of State Dam Safety Officials (ASDSO). Dam Failures and Incidents. https://www.damsafety.org/dam-failures

[39] The dam failure incident data derive from the ASDSO Dam Incident Database, dam failure incidents for the years 2010 through 2017. Incident data mostly obtained from the state dam safety programs and/or media reports. The incident data is not inclusive of all dam safety incidents.



Dam failure incident driver (Source: ASDSO Incident Database, 2010 - 2017).

Future Occurrence

Predicting the probability of flooding due to dam failure requires a detailed, site-specific engineering analysis for each dam in question. Failure may result from hydrologic and hydraulic design limitations, or from geotechnical or operational factors. The data and time necessary to perform a probabilistic failure analysis for each dam in the region are beyond the scope of this plan.

Vulnerability Assessment

Dam failure has the potential to cause direct or indirect economic impacts, significant and long-term social effects, and negative environmental impacts. Impound water upstream of a dam, when released uncontrollably, may threaten lives in the downstream flow path or cause damage to homes, roads, bridges, and any other infrastructure in its way. Direct economic impacts appear immediately following a dam failure and typically include the need to repair and rebuild structures and infrastructure and reopen businesses. Indirect economic impacts may include unemployment leading to population shifts, difficulty in attracting new business to the area, lower local property tax revenues, etc. Social impacts may include changes in quality of life in the affected community, loss of the public's confidence in public officials, difficulty delivering resources and services to the community, etc. Environmental impacts of dam failure may include the pollution of surface or groundwater, air, and soil; the release of hazardous materials; or the destruction of environmentally sensitive areas. [40]

Inventory and Summary of Vulnerable Assets

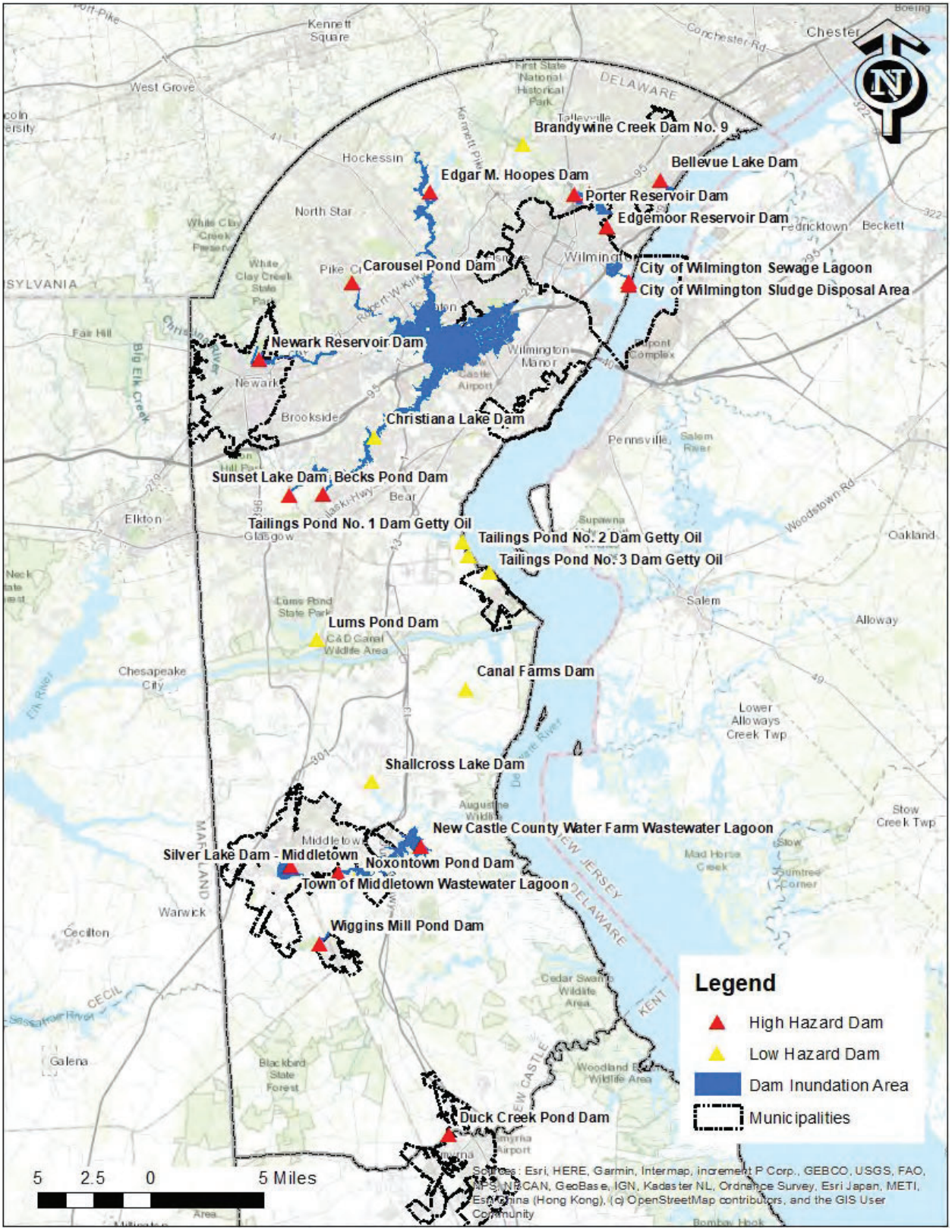
[40] https://damsafety.org/sites/default/files/files/FEMA%20TM%20AssessingtheConsequencesofDamFailure%20March2012.pdf

There are sixteen high hazard dams in New Castle County, no significant hazard dams, and nine low hazard dams. Information concerning the dams is provided in Table 4 and shown in Figure 3. High hazard dams have been labeled on the map.

Dam Name	Owner Types	Primary Purpose	Dam Height (Ft)	Year Completed	Hazard Potential Classification	Conditional Assessment
Becks Pond Dam	State	Fish and Wildlife Pond	21	Not Available	High	Fair
Bellevue Lake Dam	Private	Water Supply	15	1933	High	Not Rated
Carousel Pond Dam	Local Government	Recreation	36.28	Not Available	High	Satisfactory
City of Wilmington Sewage Lagoon	Local Government	Other	20.95	Not Available	High	Fair
City of Wilmington Sludge Disposal Area	Local Government	Other	20	Not Available	High	Fair
Duck Creek Pond Dam	Private	Recreation	9.33	Not Available	High	Not Rated
Edgar M. Hoopes Dam	Local Government	Water Supply	0	1932	High	Satisfactory
Edgemoor Reservoir Dam	Private	Water Supply	13.43	1908	High	Not Rated
New Castle County Water Farm Wastewater Lagoon	Local Government	Other	28.86	Not Available	High	Fair
Newark Reservoir Dam	Local Government	Water Supply	50.5	2005	High	Fair
Porter Reservoir Dam	Local Government	Water Supply	11.8	1909	High	Fair
Rock Manor Golf Course Dam	Local Government	Flood Risk Reduction	23.94	2007	High	Fair
Silver Lake Dam - Middletown	State	Recreation	18	1931	High	Poor
Sunset Lake Dam	Private	Recreation	13.29	1900	High	Not Rated
Brandywine Creek Dam No. 9	State	Recreation	9.19	1800	Low	Not Rated
Canal Farms Dam	Private	Flood Risk Reduction	13	1962	Low	Not Rated
Christiana Lake Dam	Private	Water Supply	17	1907	Low	Not Rated
Lums Pond Dam	State	Recreation	10	Not Available	Low	Not Rated
Noxontown Pond Dam	State	Recreation	14	1966	Low	Not Rated
Shallcross Lake Dam	State	Recreation	8	Not Available	Low	Not Rated
Tailings Pond No. 1 Dam Getty Oil	Private	Other	15	1960	Low	Not Rated

Dam Name	Owner Types	Primary Purpose	Dam Height (Ft)	Year Completed	Hazard Potential Classification	Conditional Assessment
Tailings Pond No. 2 Dam Getty Oil	Private	Other	15	1960	Low	Not Rated
Tailings Pond No. 3 Dam Getty Oil	Private	Other	20	1960	Low	Not Rated
Chesapeake City East Disposal Area, Bethel Road*	Federal	Recreation	42	1968	High	Not Rated
Lake Como Dam*	State	Recreation	15	1938	High	Fair
Lake Somerset*	Private	Recreation	32	1969	High	Fair
Wheatley Pond Dam*	Private	Recreation	8	Not Available	High	Fair

*Located outside the county boundary, but could impact the county.



New Castle County Dams

There are 16 high-hazard dams in New Castle County. This HHPD Risk Assessment provides potential impact maps for each of the 16 high-hazard dams, depicting the location of the dam, the dam breach inundation area, and the building occupancy in the potentially impacted area. Additionally, specific tables are provided for each dam indicating the estimated types and number of buildings impacted in the event a dam breach were to occur, as well as the structure value, content value, and total value for buildings exposed to inundation impacts and within the inundation areas.

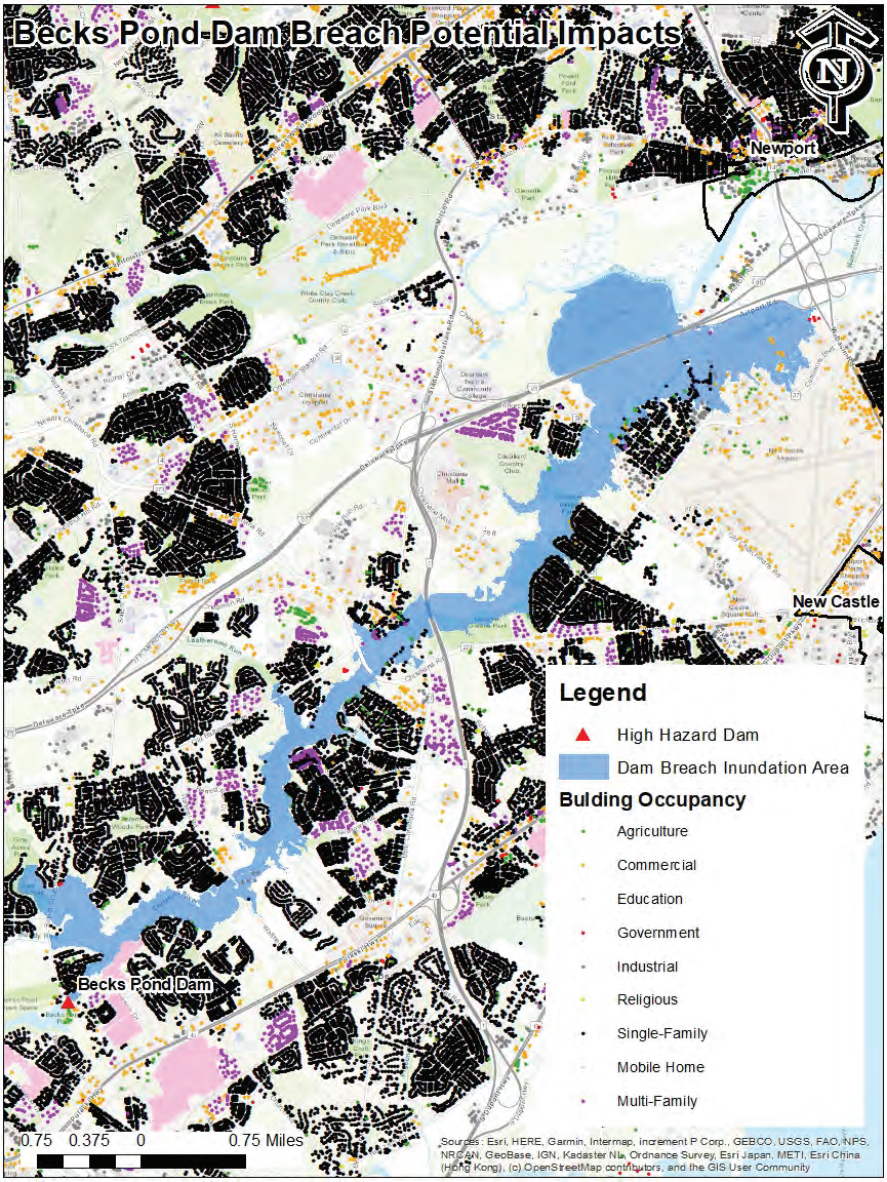
Esbmabon of Losses

To estimate losses, the inventory developed for the Hazus flood model using building footprints and parcel data was used along with the dam inundation areas. This was completed for each high hazard dam in the County and by each jurisdiction within the County. If a critical facility is located in the dam inundation area, they are identified in the text.

Potential Impacts

To help determine potential impacts from the high hazard dams, the dam inundation maps were digitized from the Emergency Action Plans (EAP) and overlaid with maps and inventory data. These maps and descriptions are provided below.

Becks Pond Dam Breach Impacts



Estimated population at risk from Becks Pond Dam: 307

Becks Pond Dam Losses
Municipality: Unincorporated

Occupancy	Number of Buildings	Structure Loss ($)	Content Loss ($)	Total Loss($)
Single Family	123	$14,710,931	$14,710,931	$29,421,863
Multi Family	5	$27,494,719	$13,747,360	$41,242,079
Agriculture	23	$2,135,184	$2,135,184	$4,270,368
Commercial	31	$3,902,439	$3,902,439	$7,804,878
Government	1	$59,587	$89,380	$148,966

Industrial	10	$7,589,927	$11,384,891	$18,974,818

Bellevue Lake Dam Breach Impacts

Estimated population at risk from Bellevue Lake Dam: 314

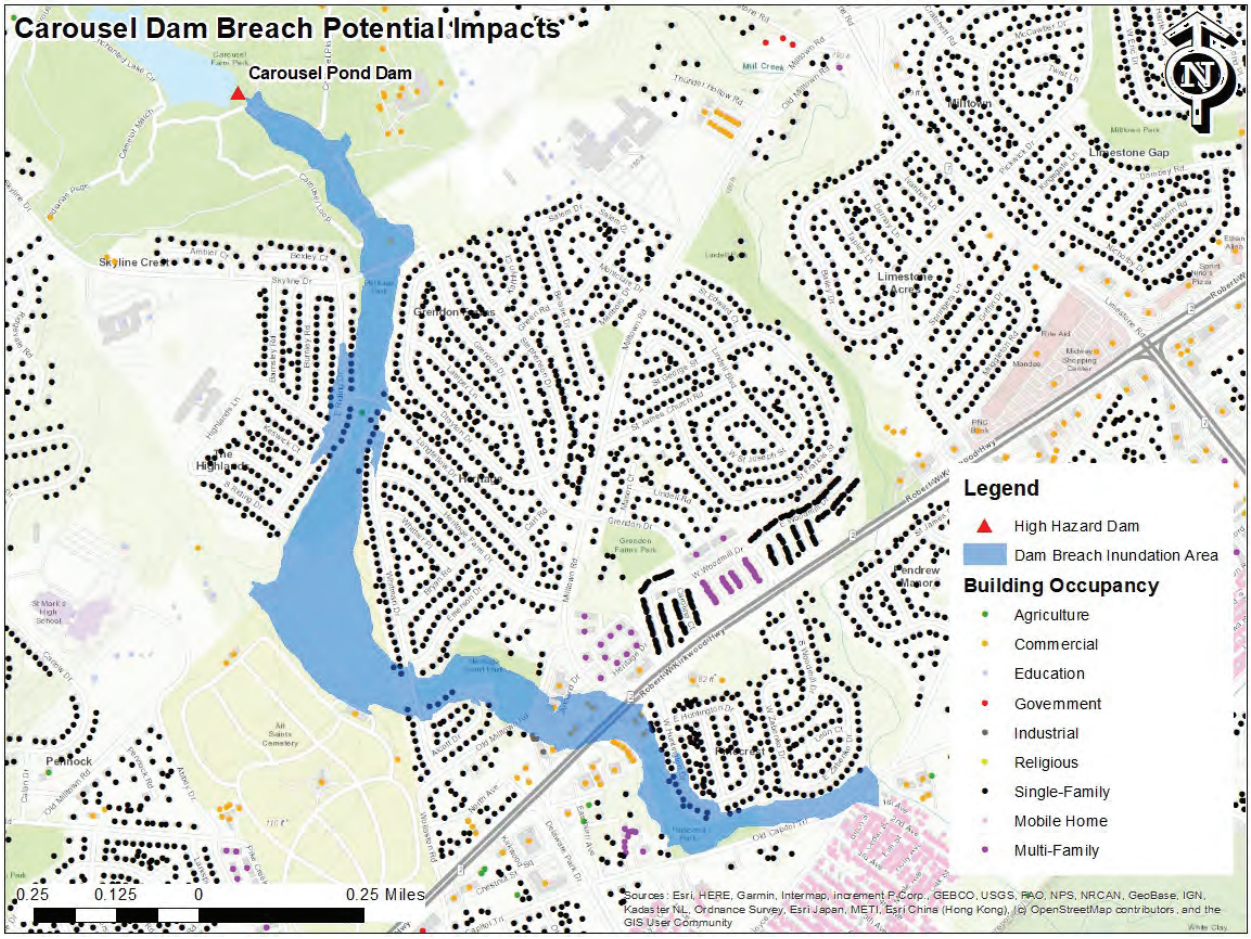
Bellevue Lake Dam Losses

Municipality: Unincorporated

Occupancy	Number of Buildings	Structure Loss ($)	Content Loss ($)	Total Loss($)
Single Family	3	$742,938	$742,938	$1,485,875

Agriculture	1	$266,131	$266,131	$532,261
Commercial	3	$1,750,633	$1,750,633	$3,501,266
Government	3	$843,187	$843,187	$1,686,374
Industrial	3	$3,038,200	$3,697,840	$6,736,039

Carousel Dam Breach Impacts



Estimated population at risk from Carousel Dam: 308

Carousel Dam Losses

Municipality: Unincorporated

Occupancy	Number of Buildings	Structure Loss ($)	Content Loss ($)	Total Loss($)
Single Family	40	$9,177,053	$9,177,053	$638,276
Agriculture	1	$56,612	$56,612	$210,214
Commercial	8	$4,855,171	$6,000,001	$301,324