Climate Risk Analysis and Resiliency Assessment

Delaware State Housing Authority

Rental Housing: Multifamily Management

HFA Staff Contact

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DSHA Climate Risk Analysis and Resiliency Assessment

Delaware State Housing Authority (DSHA) is committed to providing safe and healthy housing in which residents can thrive. Given the dramatic costs associated with natural disasters, and the trauma that disasters cause to everyone, particularly low- and moderate-income households, DSHA has completed a comprehensive and innovative Climate Risk Analysis and Resiliency Assessment. The assessment includes a replicable toolkit for use in asset management and emergency preparedness. Adapting to changing conditions and mitigating risks cost-effectively are the focal points of this project.

Identify the Need

Resilience planning provides tangible and intangible benefits such as safety, improved health environment outcomes, improved comfort for residents, cost-savings, and durability to vulnerable low-income communities including those in affordable housing. DSHA provides and funds affordable housing solutions that affect multifamily buildings and low- and moderate-income residents across the state of Delaware. DSHA is the asset manager for a portfolio of 215 state-assisted affordable housing properties that house families, seniors and people with disabilities.

As a largely coastal state with a history of flooding and coastal storm challenges, the expected acceleration of effects from climatic changes through this century have the potential to severely impact the safety of Delaware's population and infrastructure.

Find a Funding Partner

In 2019, DSHA leadership recognized that it would be prudent to understand the risks and vulnerabilities associated with climate change hazards across the portfolio, to inform operations and planning for capital upgrades at refinancing. DSHA launched a first-in-the-nation, comprehensive Climate Risk Analysis and Resiliency Assessment of the entire portfolio. This was done with the financial support and in partnership with the Delaware Department of Natural Resources and Environmental Control (DNREC) and the Division of Climate, Coastal and Energy, previous partners in innovative energy efficiency and green building support of housing for low- and moderate-income residents.

Find a Proven Technical Partner

DSHA selected the team of New Ecology, Inc. and Linnean Solutions, firms that are both nationally-recognized experts in resiliency planning for affordable housing and community facilities. New Ecology performed a Risk Analysis and Resiliency Assessment (RARA) that provided DSHA with up-to-date mapping of the portfolio against current and future climate risks, performed on-site resilience assessments of the most vulnerable sites, and updated DSHA's Design and Construction requirement guidelines to address resilient strategies.

Create an Innovative, Replicable, Cost-Effective Toolkit

The RARA project was conducted in several parts, focused on equipping DSHA staff with practical and cost-effective tools that will inform DSHA's investment in the portfolio and keep the resident population safe and healthy. Those parts included:

1. ***Climate hazards evaluation:*** Climate hazards relevant to DSHA properties and residents were identified and mapped through review of existing research and data for the State of Delaware. New Ecology found that, by 2060, Delaware residents are expected to face hotter summer days, increased rainfall, and rising sea levels. The top 5 hazards were: Flooding, Extreme Storms &

Hurricanes, Coastal Winds, Extreme Temperatures and Winter Storms. Some maps of the Coastal Inundation Projections and FEMA Flood Zones are shown below.

2. ***Vulnerability assessment of DSHA's portfolio:*** DSHA's portfolio of 215 properties was assessed to understand site vulnerabilities and how Delaware's climate hazards are expected to put residents and properties at risk. This process involved identifying key vulnerability variables and developing a scoring system to identify DSHA's most vulnerable properties for additional evaluation. The vulnerability assessment identified 37 properties that had points in at least 3 of the 5 hazard categories.

3. ***Resilience assessment tool development:*** A custom Excel-based resilience assessment tool was developed to evaluate key site characteristics and building components to help DSHA identify high priority resilience strategies. Going forward, the tool will be integrated into the protocols used by DSHA Asset Management staff during annual site inspections.

4. ***Physical site visits and stakeholder engagement:*** The resilience tool was piloted during site visits at 18 properties varied by site conditions, size, building age and type, and resident type. The tool allowed DSHA to engage on-site staff and residents with knowledge of the property and surrounding area and bring them along in understanding facility-level resilience issues, and how capital upgrades and operating practices can help the property adapt to climate change.

5. ***Design and Construction Standards review and recommendations:*** After the site visits, DSHA and the consultants reviewed the DSHA Design and Construction Standards for opportunities to integrate resilience planning into new construction and rehabilitation project practices. Specific amendments were revised for stormwater management, flooring materials, plumbing and HVAC guidelines.

Achieve Strategic and Practical Objectives
The outcomes of this RARA work is that DSHA is now equipped with a practical toolkit that can be used to:

- ***Provide DSHA's asset management team an assessment tool*** to annually review and evaluate current projects overseen or funded by DSHA for climate hazards and recommendations for mitigation and resiliency efforts.
- ***Incorporate resilience criteria into its Qualified Allocation Plan (QAP) scoring and ranking system,*** since these points will further incentivize applicants to consider their project's vulnerabilities and risks to climate change.
- ***Integrate elements of a resilience evaluation as part of the General Standards for each application and the Capital Needs Assessment process.*** A resilience evaluation will ensure applicants are aware of the vulnerabilities of their developments to Delaware's key climate hazards including flooding, extreme storms, coastal wind, extreme temperatures, and winter precipitation and have considered applicable mitigation strategies.
- ***Require increased resiliency measures for LIHTC developments located within a future sea level rise flood area and future flood risk*** associated with increased precipitation and extreme storms.
- ***Identify opportunities for creating "community resilience hubs" at housing developments.*** For existing building rehabilitations and proposed newly constructed developments**,** building owners should be making improvements that help residents shelter-in-place during extreme weather events and power outages. Community spaces and common areas can serve as "resilience hubs" if properly equipped with dedicated emergency power and heat/cooling, storage for medicines, and supplies of food and water.

DSHA's leadership is incorporating resilience assessments into its QAP. Design and Construction Guidelines and Asset Management practices will help its key stakeholders -- property owners, managers and residents -- take steps to mitigate the effects of a changing climate with a combination of capital upgrades, site operating practices and resident engagement.

Visual Aids

Risk Analysis and Resilience Assessment Tool | Resilience Assessment

Delaware State Housing Authority

DRAFT

INSTRUCTIONS

Use the following questions to gather information during site visits and discussions with site property managers and staff.

Answers in the YES/NO column will trigger applicable resilience strategy numbers. Refer to the Resilience Strategies tab to identify and explore potential strategies.

Property Name	
Assessment Completed By	
Date	

ASSESSMENT QUESTIONS

BUILDING EXTERIOR	YES / NO	COMMENTS
Have the buildings been damaged due to wind/ rain storms?		
Do roads around the property become impassable during extreme weather events?		
Are there vents or other penetrations in the outside walls (above or below grade) that let water into the building?		
Do the sewer and stormwater systems experience back-ups during heavy rain or flood events?		
Is there a backup generator?		
If there is a backup generator, does it ever get flooded?		
Is the generator and fuel storage below grade?		
Are stormwater and sanitary sewer systems separated at this location?		
Does the ground slope towards the building?		

COMMON AREAS	YES / NO	COMMENTS
If you have a basement or crawlspace below-grade, do they remain dry during heavy rain?		
Is the community room below grade?		
Are there backflow preventers on the floor drains and/or sewer connection?		

Are washers and dryers, or any bathrooms, mop sinks, or service sinks located below grade?		

APARTMENTS	YES / NO	COMMENTS
If you have units at or below-grade, do they remain dry during heavy rain?		
Do any units or other areas have evidence of mold?		
Are there residents with mobility issues?		

PROPERTY MANAGER	YES / NO	COMMENTS
Does the building have an emergency management plan on site, covering staff, residents, and business operations continuity?		
Are staff and residents familiar with the emergency management plan?		
Is there a nearby public facility where residents can go during power outages, storms or extreme heat or cold?		

PROPERTY INFORMATION	YES / NO	COMMENTS
Is the building located in a FEMA flood zone?		
Does the building have an existing battery backup system?		
If so, what is supported by the backup battery?		
Does the property have sump pumps?		
Are the sump pumps provided with back-up batteries?		
How often are the sump pump batteries tested replaced?		

Risk Analysis and Resilience Assessment Tool | Resilience Strategies

Delaware State Housing Authority

DRAFT

INSTRUCTIONS

Use the strategy ID number below to match applicable strategies as identified during the Resilience Assessment. Refer to the Funding tab for potential funding opportunities.

STRATEGY CATEGORIES

- PROTECTION
- ADAPTATION
- BACK UP
- COMMUNITY

STRATEGY ID	STRATEGY NAME	STRATEGY DETAILS
1	**Wet Floodproofing**	FEMA defines wet floodproofing as "Permanent or temporary measures applied to a structure or its contents that prevent or provide resistance to damage from flooding while allowing floodwater to enter the structure or area. Generally, this includes properly anchoring the structure, using flood resistant materials below the Base Flood Elevation (BFE), protection of mechanical and utility equipment, and use of openings or breakaway walls."
2	**Dry Floodproofing (Building)**	Dry floodproofing of a building is installing measures applied to a structure to prevent damage from flooding by preventing floodwater from entering the structure. There are two types of dry floodproofing: active and permanent. Active measures require removable elements to be put into place before an anticipated flood. Permanent measures are fixtures and systems integrated into the structure itself, which do not need to be manually deployed in the event of an emergency. Dry floodproofing is prone to a high risk of failing, however, and is not recommended for residential building exteriors or openings per FEMA guidance. FEMA does not permit dry floodproofing of substantially damaged or substantially improved residential buildings, and dry floodproofing measures will not reduce a building's National Flood Insurance Program premium.
3	**Stabilize Slopes**	Slopes stabilized with retaining walls, terraces, or plantings, will be less likely to erode over time or to erode suddenly in the event of a flood, potentially destabilizing part of the building or adding debris to floodwaters. Engage a civil engineer to identify steep slopes on site and stabilize with terracing, ground cover, structural wall or other method to reduce erosion and prevent the movement of materials on site during a flood.
4	**Site Perimeter Floodproofing**	Temporary or permanent barriers surrounding the site and preventing floodwaters from entering building. Requires management of rain water and storm drain water entering the enclosure either by storage and infiltration, pumping it out, or providing an outlet.
5	**Resilient Elevators**	Protect elevator shafts below the BFE and design shaft walls to resist the hydrostatic pressure of floodwater, program elevator controls to return car to flood safe floor in the event of flooding and to shut down all but one elevator in the event of a power outage, install flood alarms in pits, and keep controls and equipment above the BFE.
6	**Backwater Valves**	Backwater valves are installed where the wastewater pipe exits the building, so sewage only flows outward. Valves have a hinged flapper that remains open to allow outward flow, but seals tightly if there is backpressure. Install individual backwater valves on the lowest fixtures in the building, or whole-building backwater valves for storm sewer and sewer lines. Will require incorporation into an emergency plan to ensure proper operation during an extreme event.
7	**Sump Pumps**	Sump pumps are submersible pumps set in sump pits and designed to remove water from the lowest point in a building as water accumulates during minor or moderate flood events. Sumps are typically built in sump basins in basement floors but can also be incorporated into slab-on-grade floors and elevator pits. Sump pumps are designed for intermittent use. Chronic water problems require repairing the drainage system in addition to or in lieu of installing a pump.

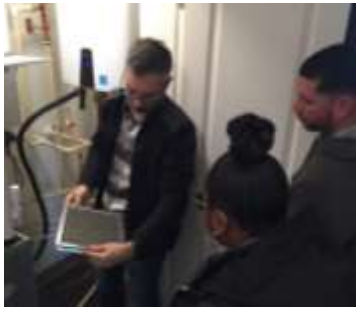
	8	**Component Protection Floodproofing**	Component protection dry floodproofing is installing measures applied to a piece of equipment or location within a building to prevent damage from flooding by preventing floodwater from reaching the equipment or entering the confined location. Using component protection dry floodproofing, mechanical and electrical equipment is protected by surrounding the equipment in a waterproof basin, with a low wall, or by using a waterproof enclosure, rather than waterproofing the entire basement or first floor of the building. If equipment cannot be elevated, critical building systems can be floodproofed in this manner, allowing the rest of the space to flood. Due to hydrostatic pressure, these enclosures are recommended only for shallow floodwaters up to 3 ft.
	9	**Quick Connects for Mobile Heating, Cooling, and Power**	Quick connects are connection points on the exterior of the building for hooking up temporary backup heating, cooling, or electrical equipment. Quick connects to hot water piping, chilled water piping, or electrical panels allow temporary mobile heating, cooling, and power equipment to connect to the building and provide services in the event of damage to permanently installed equipment. Install quick connects for power, heat, and cooling such that temporary equipment can be connected at the street in the event of an extended outage.
	10	**Elevated Equipment**	Elevating mechanical and electrical equipment above the base flood elevation reduces the risk that the equipment will be damaged or destroyed in the event floodwaters enter the lowest level of the building and increases the likelihood that the building will remain operational even if the building floods. Critical equipment can be elevated in place by moving it off the floor to a wall or by moving it onto a platform and out of harm's way. Equipment that is replaced as a result of elevating it should be replaced with and energy efficient alternative. Engage an engineer or contractor with experience designing and specifying efficient equipment.
	11	**Elevated Living Spaces**	Convert residential units on floors below the BFE to parking, storage, common rooms and community space, or entryways. Ensure equipment in these areas is portable and can be moved to safety before anticipated flooding.
	12	**Window Shading**	Shading windows reduces the amount of solar heat gain in the interior of the building, thereby reducing cooling loads during the summer months and leading to lower indoor temperatures during power outages when the cooling system is not operational. Add overhangs to south-facing windows or awnings to east- or west-facing windows. Or, add interior window shading treatments
	13	**Cool Roof**	A cool roof is a reflective, light colored roof that reduces the amount of solar energy a building absorbs by reflecting the solar energy back into the atmosphere. Cool roofs can be a painted-on or membrane product and reduce the building's cooling load and allowing the interior to remain comfortable longer in the event of a power outage on a hot day. Cool roofs also reduce local heat island effects.
	14	**Maintaining Backup Power to Critical Systems**	Backup power can allow building elevators, heating, cooling, ventilation, lighting, refrigeration, and other electrically powered systems to operate in the event of a power outage, depending on the capacity of the backup power system. Provide a generator or other backup system sized to meet critical loads and with fuel capacity for expected power outage duration. Critical loads could include elevators, fire pumps, sump pumps, water booster pumps, emergency outlets, fans, pumps, and controls for heating and cooling systems, alarms and security systems, food and medicine refrigeration, telecommunications, or others. An elevator may require its own backup generator to continue operating during a power outage.
	15	**Access to Potable Water**	Provide potable water storage in a central system or portable potable water storage containers: 1 gal/person/day for 1 day in stored bottled water, plus 1 gal/person/day for 6 days in collapsable storage capacity.
	16	**Safeguard Fuel Storage**	Secure fuel storage fixed and portable tanks and containers to prevent spillage and movement in case of a flood. Perform this task as necessary during routing operations and maintenance.
	17	**Develop Emergency Management Manual**	A disaster can come at any time or can progress more slowly, but one of the most crucial factors in protecting the safety and well-being of housing residents is the coordination of the housing management staff in responding to the event. Using best practices developed for a wide range of emergency responses to prepare and respond to disasters, guided by an emergency management plan, housing management staff can respond quickly and effectively when disaster strikes. Provide a plan and contact list for staff, leadership, and residents to communicate effectively throughout a disaster. Follow the Enterprise Disaster Staffing Toolkit guide to creating an organization- and building -level coordination, communication, and information sharing emergency plan.
	18	**Properly Vent or Eliminate Combustion Appliances**	Combustion appliances must all be properly vented to the exterior to prevent combustion byproducts from entering the indoor air of apartments and common spaces. Provide battery operated or battery back-up carbon monixide detectors in each apartment.
	19	**Remediate Mold and Use Mold Resistant Replacement Material**	Mold growth can lead to asthma and other respiratory impairments. Mold should be removed and moldy materials should be replaced with mold-resistant materials. If possible, identify and remove the source of the moisture that has led to mold.

	20	**Exterior Pathways**	Safe site circulation is important even without a power outage or extreme weather event. Provide well lit, clear walkways on the property.
	21	**Wayfinding Signage**	Wayfinding is signage instructing residents how to safely evacuate a building by pointing the way to the nearest exit. Wayfinding also includes signage indicating the location of fire extinguishers, first aid kits, and other emergency supplies. In addition to code-required exit signs, add wayfinding maps and reflective strips on the edge of stairs and ramps to enable safe egress from the building. To improve energy efficiency, swap out existing non-LED exit signs with low wattage LED signs.
	22	**Organizing for Community Resilience**	Organizing local housing, community, and disaster recovery groups can lead to the connections and resources that help most during the immediate and longer term aftermath of a disaster. Community resources could include organizations providing shelter, food, water, medical care, or counseling programs. Develop infrastructure to support community engagement and interaction and reach out to local disaster recovery groups and other housing organizations to jointly conduct resilience planning. Set aside common space for posting information, convening meetings and hosting parties and other group activities.
	23	**Creating Community Resiliency Spaces**	Community spaces should offer a safe and secure environment for residents and a central location for emergency services. Existing community, dining, or multi-purpose rooms could provide this space.
	24	**Building Community Ties**	When residents have strong ties to each other, communities can better weather a storm event and the aftermath, especially when first responders are unable to access the community. Often, neighbors become the most important source of support and information.
	25	**Flood Damage Resistant Siding**	Wood or composite siding can be damaged by flood waters and require replacement. When renovating a property, consider replacing siding with fiber cement board (FCB). FCB can also be a good solution in high wind areas.
	26	**Solar Photovoltaic (PV) Systems + Storage**	Solar PV can be located on a roof with southern exposure and no shading from rooftop equipment to offset common area electric consumption. Solar PV fesibility should be provided by a PV installer or investigated using Helioscope - or PV Watts to estimate power production based on the roof area and orientation. Properties with existing solar photovoltaic (PV) systems may be able install battery storage and make the the PV system islandable for use in a power outage. A battery could be located inside or outside and connected to the PV array through an islandable inverter(s) to provide backup power capacity for a community resiliency space and other critical loads. Battery feasibility analysis should be provided by a battery designer/installer or investigated using the Geli tool – geli.net or REopt Lite – reopt.nrel.gov/tool.



DE State Housing Authority
March 31, 2020

Resilience Assessment Tool



Who We Are

NEW ECOLOGY
Community-Based Sustainable Development

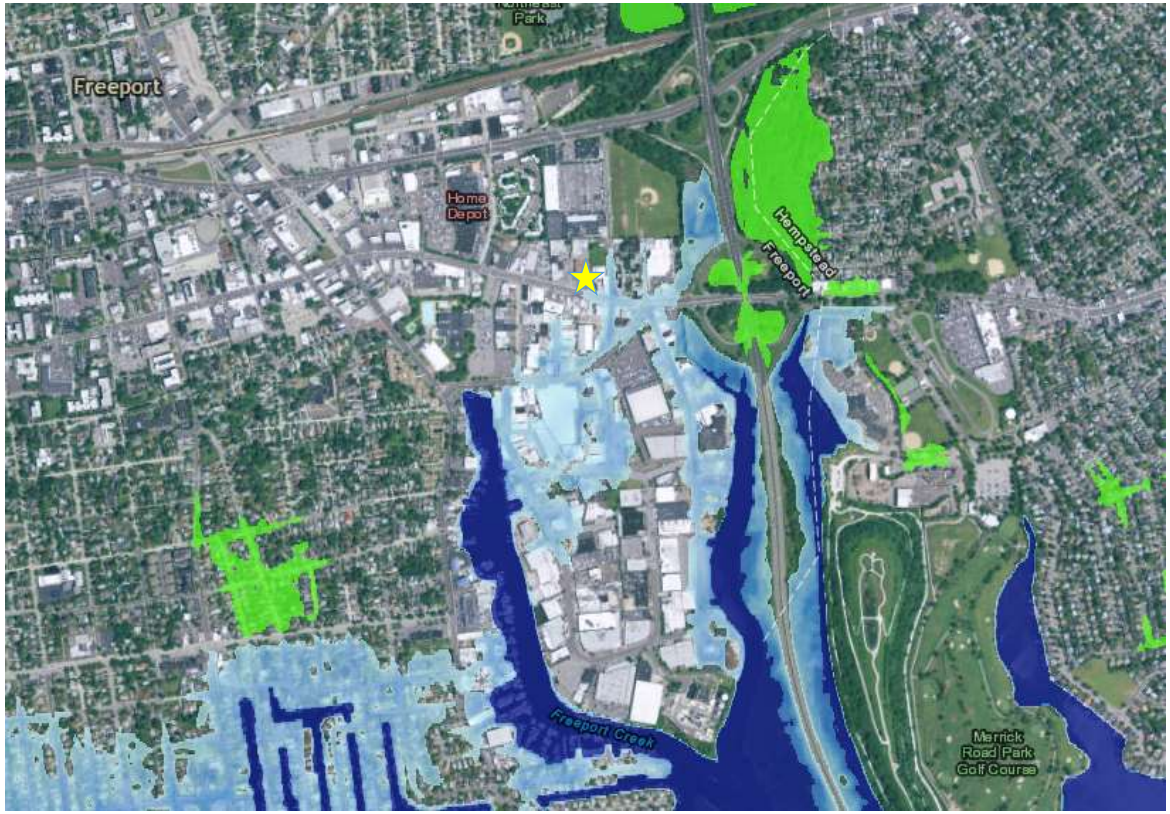
LINNEAN SOLUTIONS

What is Resilience?

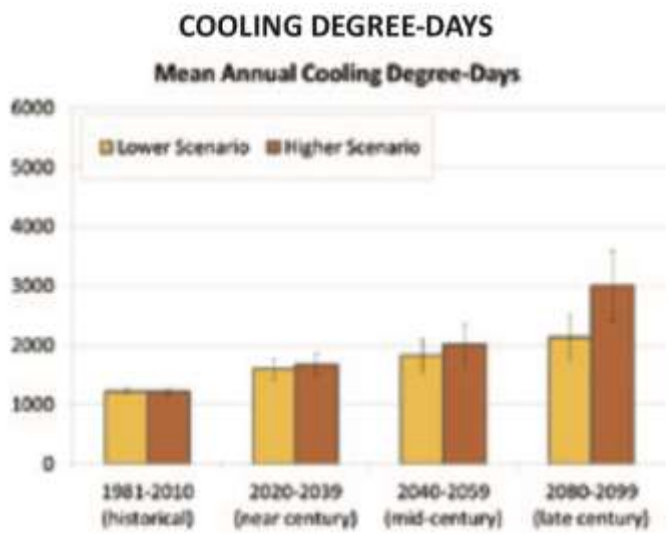
Adapting to a changing climate.

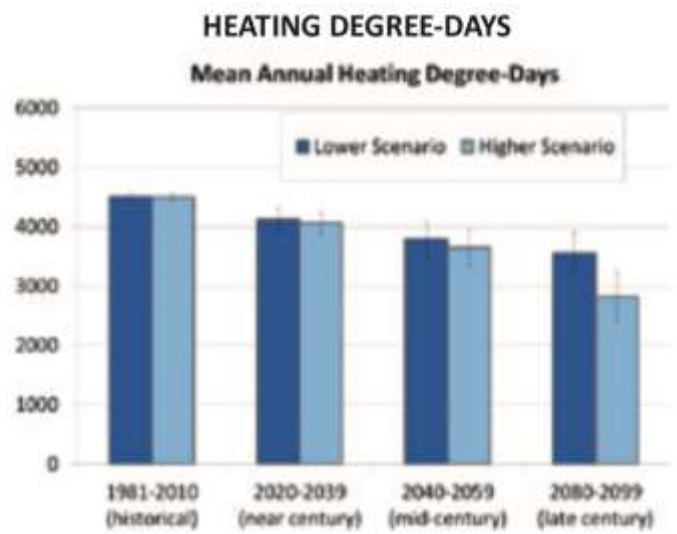
Why now?

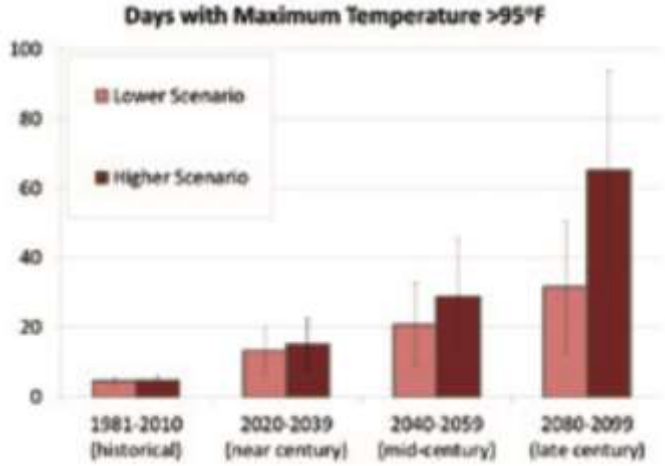
Abnormal is the new normal.


Freeport
Home Depot
Hempstead Freeport
Freeport Creek
Merrick Road Park Golf Course

More Heat





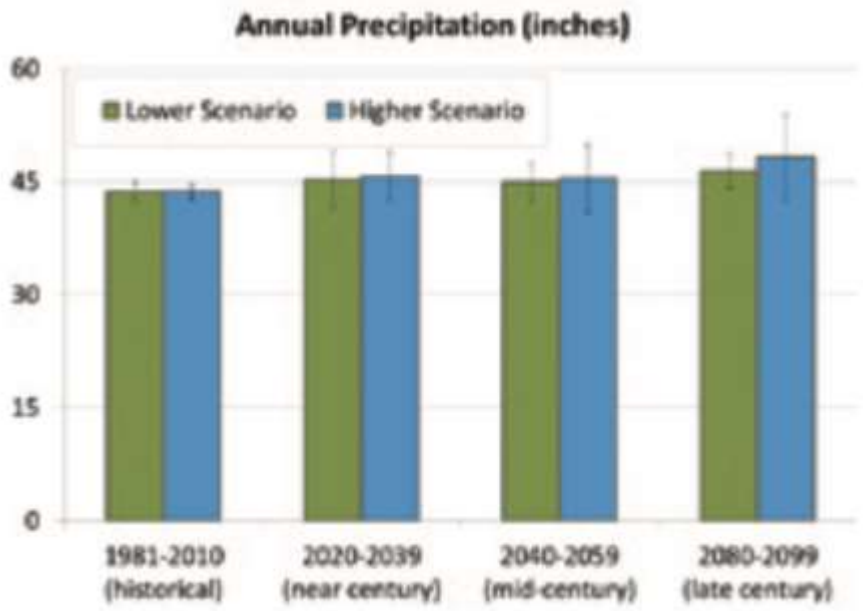


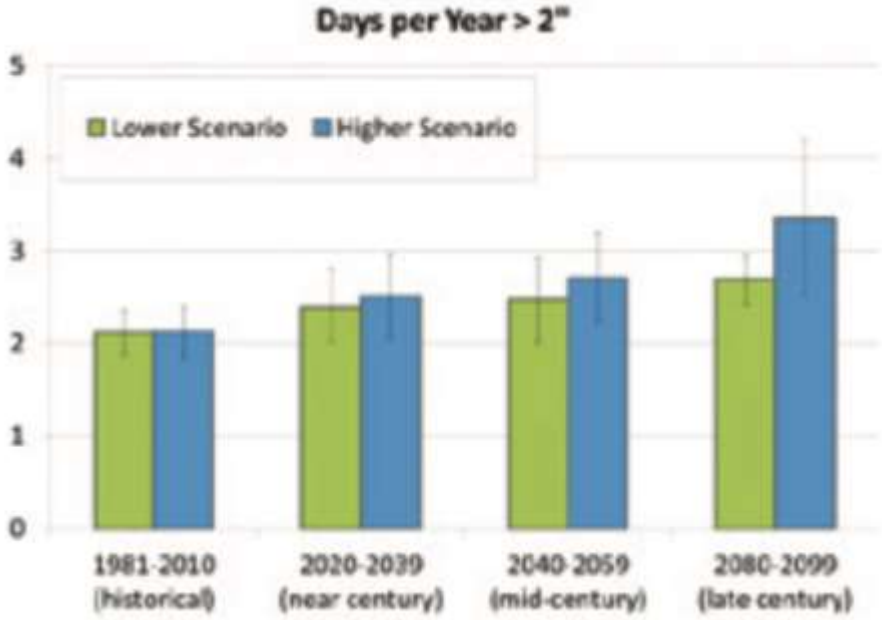
Source: Delaware Climate Change Impact Assessment, 2014

NEW ECOLOGY
Community-Based Sustainable Development

LINNEAN SOLUTIONS

More Water





Source: Delaware Climate Change Impact Assessment, 2014

Binghamton, NY
(1 Development)

New York, NY
(60 Developments)

Washington, DC
(20 Developments)

Cambridge, MA and Statewide
(1,400+ Developments)

Stamford, CT and Statewide
(5 Buildings)

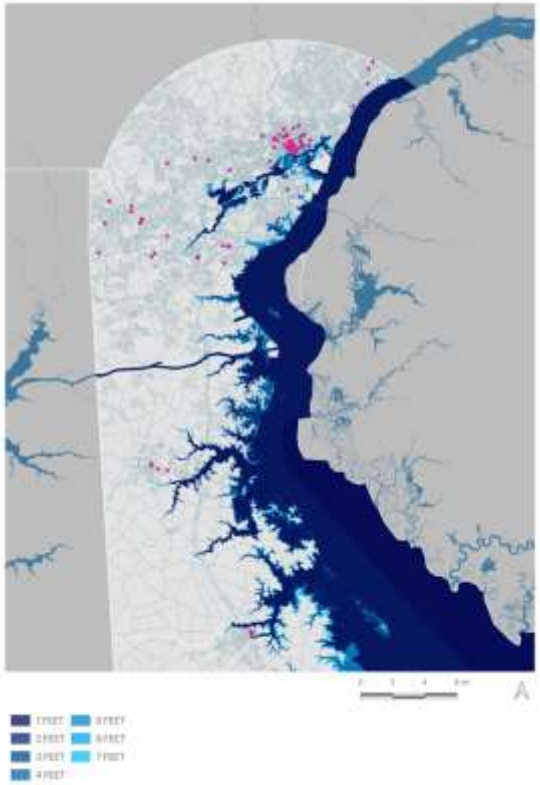
Long Island, NY
(4 Developments)

Delaware
(186 Developments)

BOSTON | PROVIDENCE | BALTIMORE | WILMINGTON

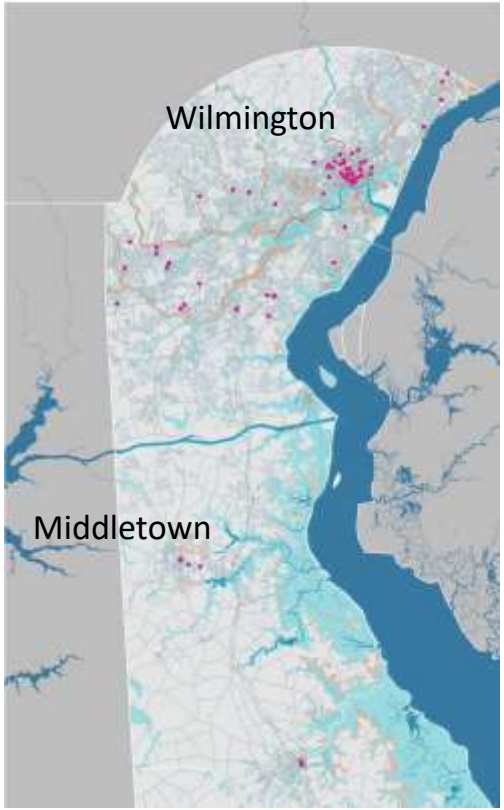
Process

- Desk Assessment
- Scoring Methodology
- Stakeholder Meetings
- Targeted Site Assessments
- Finalize Resilience Assessment Tool
- Review and Recommendations on Policies and Programs
- Final Report

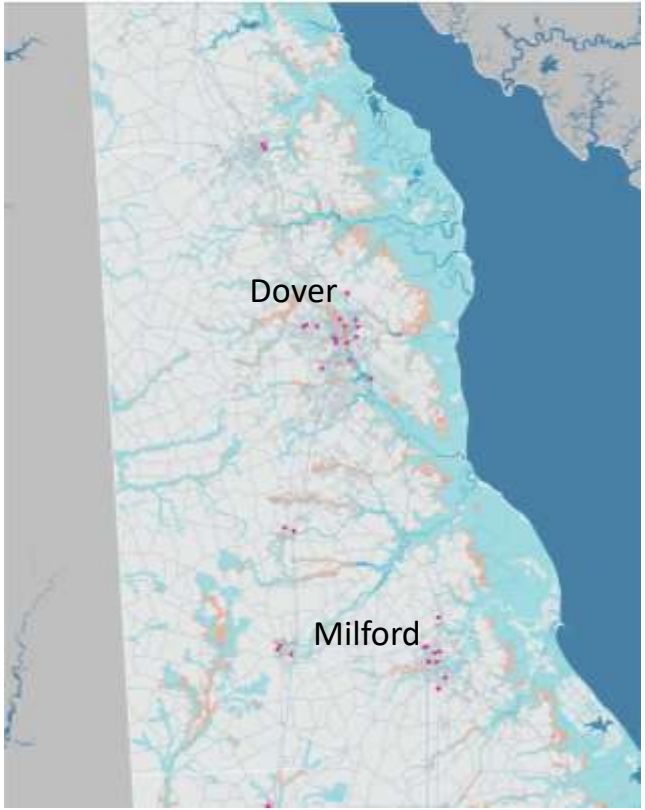


Delaware Coastal Inundation

FEMA NATIONAL FLOOD HAZARD LAYER
NEW CASTLE

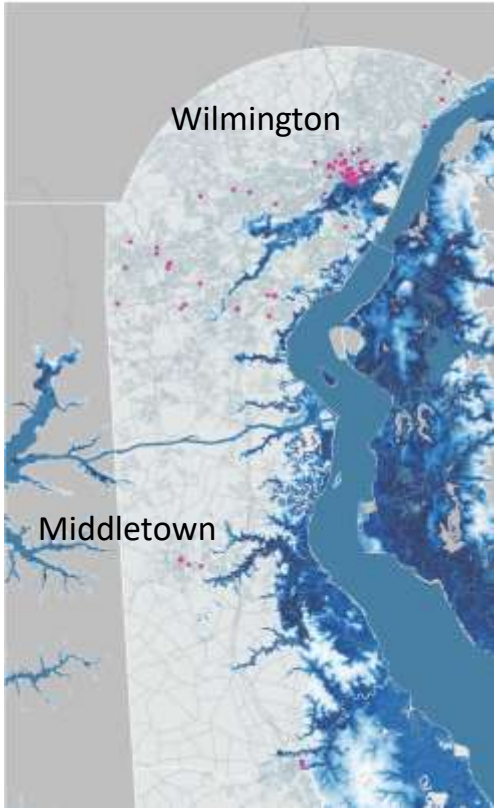


FEMA NATIONAL FLOOD HAZARD LAYER
KENT



FEMA NATIONAL FLOOD HAZARD LAYER
SUSSEX

STORM SURGE CATEGORY 4 HURRICANE
NEW CASTLE



STORM SURGE CATEGORY 4 HURRICANE
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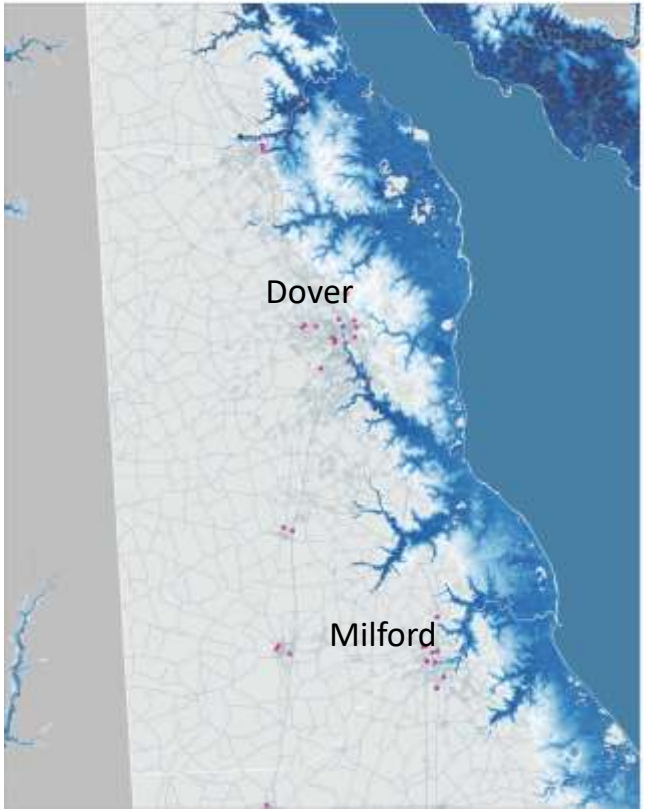
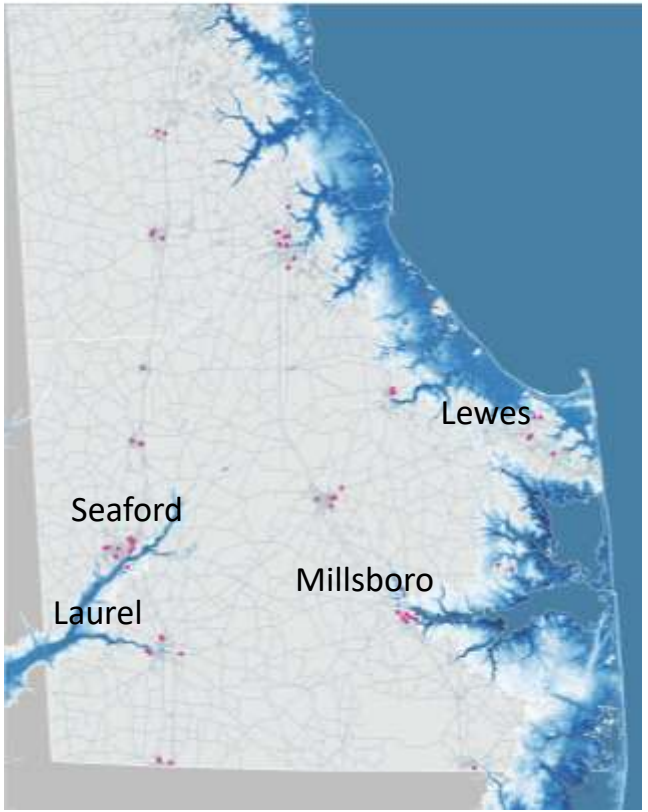
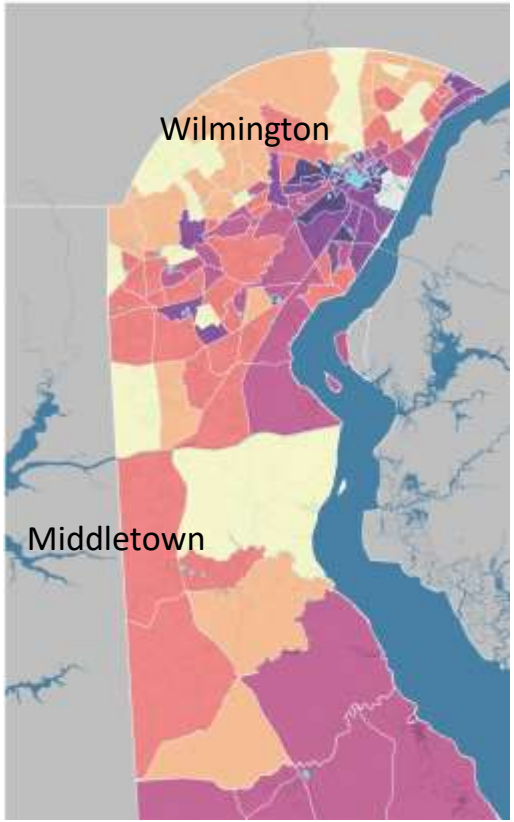


STORM SURGE CATEGORY 4 HURRICANE
SUSSEX



SOCIAL VULNERABILITY INDEX
NEW CASTLE



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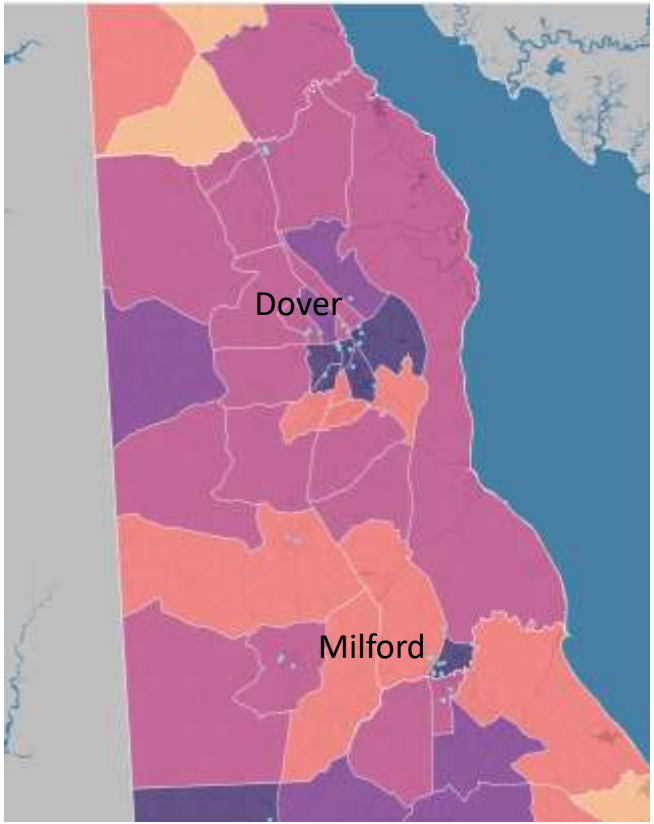

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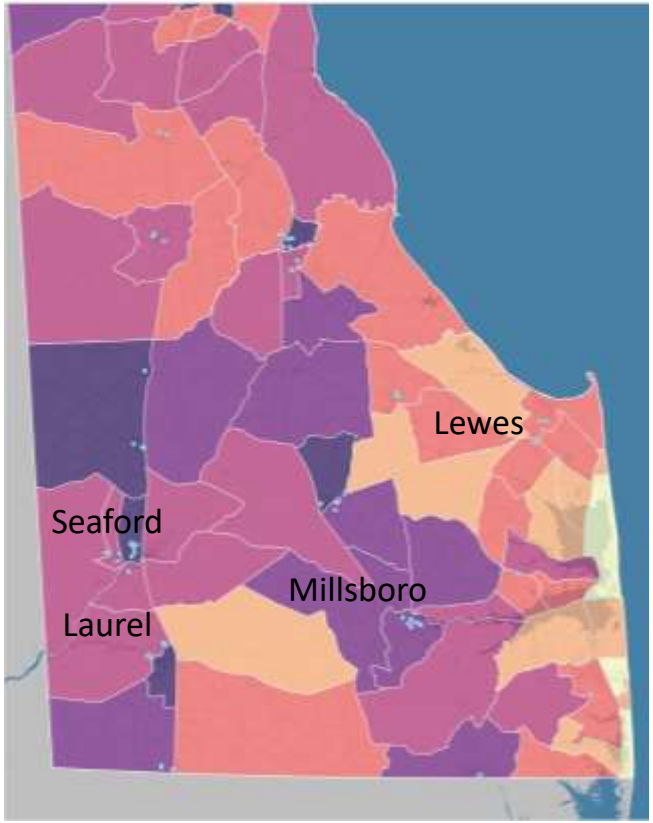


Physical Vulnerability	LOW	MEDIUM	HIGH	
Flooding	172	5	9	Total of 14 sites in 100 or 500 year zones
High Wind Zone	111	72	3	Highest wind zones in Sussex beaches area
Wind Damage	41	54	80	134 sites built before 2000, 80 without indication of renovation
Elevated Heat	108	42	36	Approx. 17% of sites in fully impervious, urban areas
Exterior Shading	32	98	51	Approx. 70% of sites have some exterior shading from trees
Social Vulnerability				
Elderly/Disabled Tenants	115		71	Approx. 40% of site have vulnerable tenants
On-site Community Space	94		92	On-site community centers available at 50% of sites
External Issues				
Public Transit	117	46	23	

Site Visits – Where did we go?

High risk

2	Huling Cove	Lewes
3	Huling Cove Annex	Lewes
1	East Atlantic Apartments	Rehoboth Beach
4	Claymont St Apartments	Wilmington

DSHA staff knowledge

5	Lincoln Tower	Wilmington
51	Walnut Court (Jazz Court)	Wilmington

Coming close to year 15

16	Capitol Green Apartments	Dover
121	Coachman's Manor	New Castle
39	Antonian	Wilmington

Site Visits – Key Findings

Knowledgeable staff

Strong connections to local services

Well maintained properties

Well drained sites

Very little wind damage

Site Visits – Key Findings

Site Visits - Challenges

Site Flooding

Flooding in below grade apartments

Inconsistent Emergency Management Plans

- Plan in Main Office
- Plan in File
- Plan in Process

Sewer back-ups in Apartments

Site Visits - Challenges

Resiliency Assessment Tool

Tool – Series of Questions – Potential Hazards and Risks

Property Staff Interview

Site visit

Assessment ‘Report’

Intended Users - Development/ Construction/ A. Management/ Compliance

Risk Analysis and Resilience Assessment Tool | Project Information

DRAFT

Delaware State Housing Authority

INTRODUCTION

This assessment tool is a guide for a walkthrough audit and staff interview to identify potential ***r esilience preparedness, healthy housing, energy and water efficiency strategies to best protect vulnerable residents, reduce operating costs , and improve building durability***. Potential funding and financing streams to aid in the implementation of the resiliency and efficiency strategies are provided. The tool is intended for use by DSHA staff, Regional Property Managers…., but several items will require input from facility staff and leadership.

ASSESSMENT INSTRUCTIONS

Step One: Complete the basic contact information, building information, and resilience issues included below.

Step Two: Answer the yes/no questions on the Resilience Assessment tab as you walk through the building with the property manager or head of maintenance.

Step Three: Use your answers to the yes/no questions on the Resilience Assessment tab to explore potential applicable strategies on the Resilience Strategies tab.

Property Name	
Assessment Completed By	
Date	

CONTACT INFORMATION

Property Address	
Property Manager	
Property Manager Phone	
Property Manager Email	
Maintenance Technician	
Management Company	
Owner	

1 - Project Information | 2 - Resilience Assessment | 3 - Resilience Strategies | 4 - Funding Resources

Risk Analysis and Resilience Assessment Tool | Resilience Assessment

DRAFT

Delaware State Housing Authority

INSTRUCTIONS

Use the following questions to gather information during site visits and discussions with site property managers and staff.
Answers in the YES/NO column will trigger applicable resilience strategy numbers. Refer to the Resilience Strategies tab to identify and explore potential strategies.

Property Name	
Assessment Completed By	
Date	

ASSESSMENT QUESTIONS

BUILDING EXTERIOR	YES / NO	COMMENTS	APPLICABLE RESILIENCE STRATEGIES
Have the buildings been damaged due to wind/ rain storms?	YES		1, 2
Do roads around the property become impassable during extreme weather events?	YES		17, 22, 23, 24
Are there vents or other penetrations in the outside walls (above or below grade) that let water into the building?	YES		1, 2, 7
Do the sewer and stormwater systems experience back-ups during heavy rain or flood events?	YES		6
Is the roof material white or a light color?	NO		13
Is there a backup generator?			
If there is a backup generator, does it ever get flooded?			
Is the generator and fuel storage below grade?			
Are stormwater and sanitary sewer systems separated at this location?			
Is exterior signage easy to read, with property sign and address lit adequately from the street?			

1 - Project Information | 2 - Resilience Assessment | 3 - Resilience Strategies | 4 - Funding Resources

Risk Analysis and Resilience Assessment Tool | Resilience Strategies

DRAFT

Delaware State Housing Authority

INSTRUCTIONS

Use the strategy ID number below to match applicable strategies as identified during the Resilience Assessment. Refer to the Funding tab for potential funding opportunities.

STRATEGY CATEGORIES

- PROTECTION
- ADAPTATION
- BACK UP
- COMMUNITY

STRATEGY ID	STRATEGY NAME	STRATEGY DETAILS
1	Wet Floodproofing	FEMA defines wet floodproofing as "Permanent or temporary measures applied to a structure or its contents that prevent or provide resistance to damage from flooding while allowing floodwater to enter the structure or area. Generally, this includes properly anchoring the structure, using flood resistant materials below the Base Flood Elevation (BFE), protection of mechanical and utility equipment, and use of openings or breakaway walls."
2	Dry Floodproofing (Building)	Dry floodproofing of a building is installing measures applied to a structure to prevent damage from flooding by preventing floodwater from entering the structure. There are two types of dry floodproofing: active and permanent. Active measures require removable elements to be put into place before an anticipated flood. Permanent measures are fixtures and systems integrated into the structure itself, which do not need to be manually deployed in the event of an emergency. Dry floodproofing is prone to a high risk of failing, however, and is not recommended for residential building exteriors or openings per FEMA guidance. FEMA does not permit dry floodproofing of substantially damaged or substantially improved residential buildings, and dry floodproofing measures will not reduce a building's National Flood Insurance Program premium.
3	Stabilize Slopes	Slopes stabilized with retaining walls, terraces, or plantings, will be less likely to erode over time or to erode suddenly in the event of a flood, potentially destabilizing part of the building or adding debris to floodwaters. Engage a civil engineer to identify steep slopes on site and stabilize with terracing, ground cover, structural wall or other method to reduce erosion and prevent the movement of materials on site during a flood.

Risk Analysis and Resilience Assessment Tool | Funding Resources DRAFT

Delaware State Housing Authority

SOLAR PV AND BATTERY FUNDING AND FINANCING RESOURCES

NAME	INCENTIVE TYPE
Federal Investment Tax Credit programs.dsireusa.org/system/program/detail/658	Federal; PV, solar water heating, hybrid solar lighting, fuel cells, small wind, geothermal, combined Heat and Power (CHP)
Modified Accelerated Cost-Recovery System (MACRS) programs.dsireusa.org/system/program/detail/676	Federal; Corporate depreciation
Net Metering https://programs.dsireusa.org/system/program/detail/43	Delaware; Net metering
Peak Demand Reduction www.pjm.com/markets-and-operations/demand-response.aspx	Federal; Corporate depreciation
Property Assessed Clean Energy Financing (Delaware C-PACE) https://www.delawarecpace.org/about/	Delaware
Green Energy Program (GEP) https://dnrec.alpha.delaware.gov/climate-coastal-energy/renewable/assistance/ https://www.energizedelaware.org/renewable-energy	Renewable energy assistance
Renewable Energy Assistance https://dnrec.alpha.delaware.gov/climate-coastal-energy/renewable/assistance/	Delaware

RESILIENCY FUNDING OPPORTUNITIES

1 - Project Information | 2 - Resilience Assessment | 3 - Resilience Strategies | 4 - Funding Resources

Assessment Tool - Users

DSHA Development

Incorporate resilience elements into QAP to guide LIHTC applications

DSHA Construction

Assist with DSHA plan review during LIHTC applications

DSHA Compliance

Use tool at each property at least once
Renew inspection after a catastrophic storm/ event
Incorporate resiliency elements into 1-5 year property inspections
Renew inspections every ten years with new climate projections

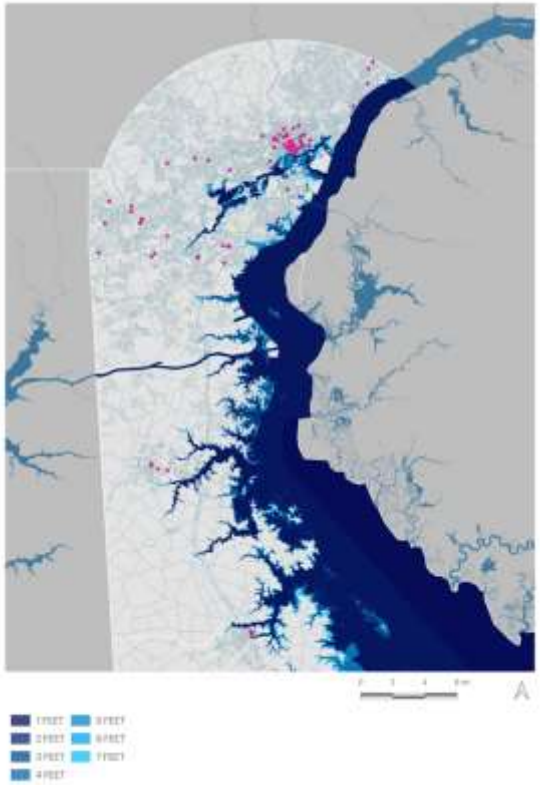
DSHA Asset Management

Replacement reserve planning

Assessment Tool - Questions

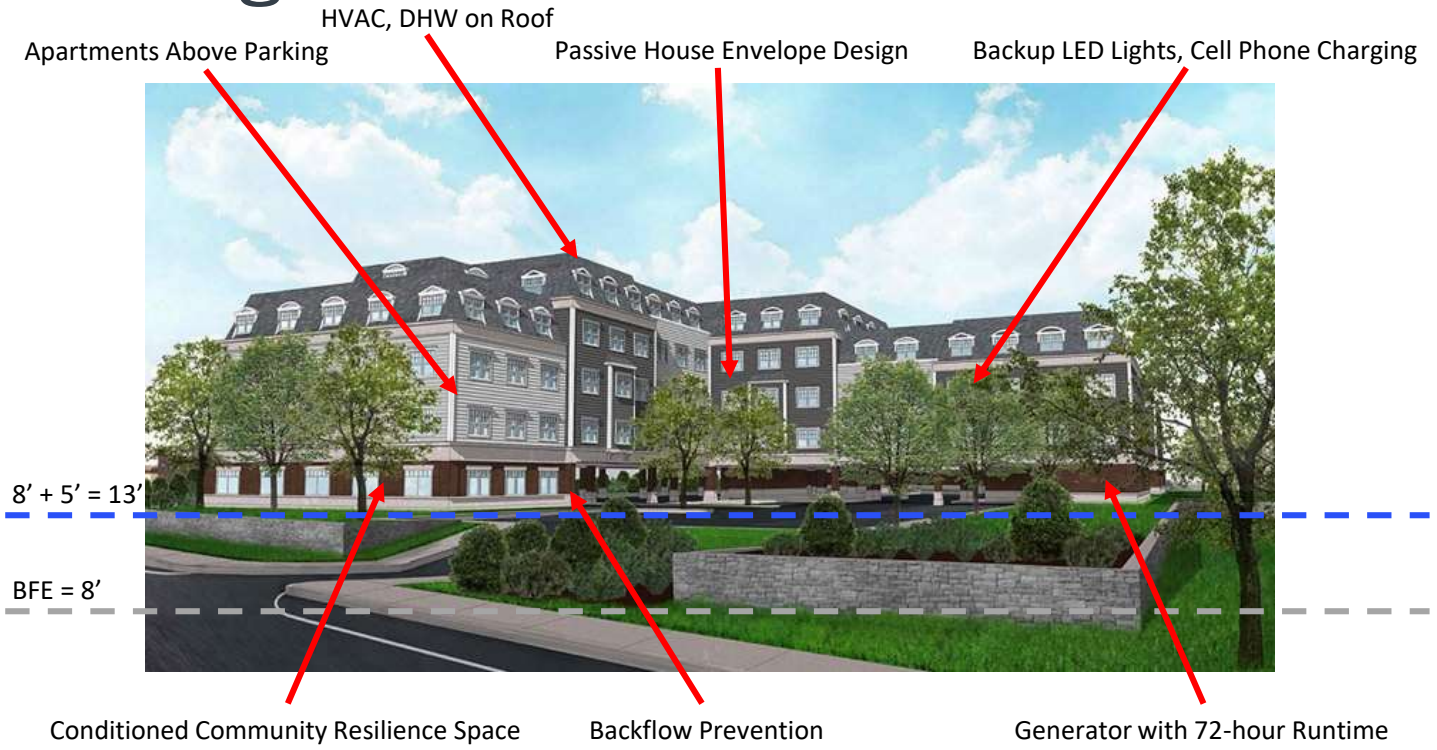
Process

- Desk Assessment
- Scoring Methodology
- Stakeholder Meetings
- Targeted Site Assessments
- Finalize Resilience Assessment Tool
- Review and Recommendations on Policies and Programs
- Final Report



Delaware Coastal Inundation

Incorporating Resilience in Future Work



Properties Visited

RANKING	NAME	CITY
2	Huling Cove	Lewes
3	Huling Cove Annex	Lewes
1	East Atlantic Apartments	Rehoboth Beach
4	Claymont St Apartments	Wilmington
5	Lincoln Tower	Wilmington
11	Hampton Circle	Seaford
8	Seaford Meadows	Seaford
22	Brandywine III Apartments	Millsboro
129	Millford Crossing	Milford
6	Villas at Milford Crossing	Milford
15	GARRETT HOUSE	Wilmington
12	Lofts at Clifford Brown Walk	Wilmington
51	Walnut Court (Jazz Court)	Wilmington
20	Carvel Gardens	Laurel
21	Carvel Gardens Annex	Laurel
16	Capitol Green Apartments	Dover
121	Coachman's Manor	New Castle
39	Antonian	Wilmington

Thank You!