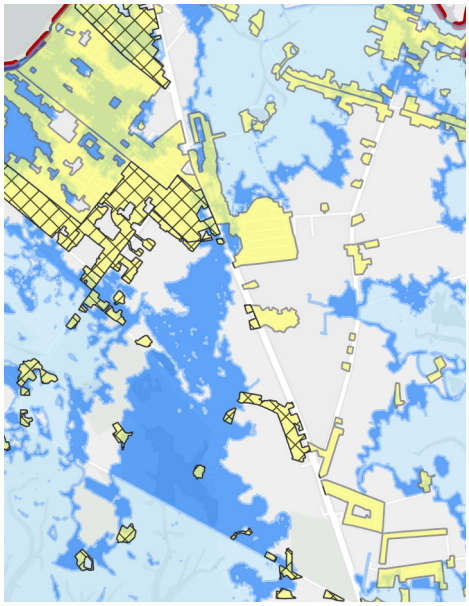
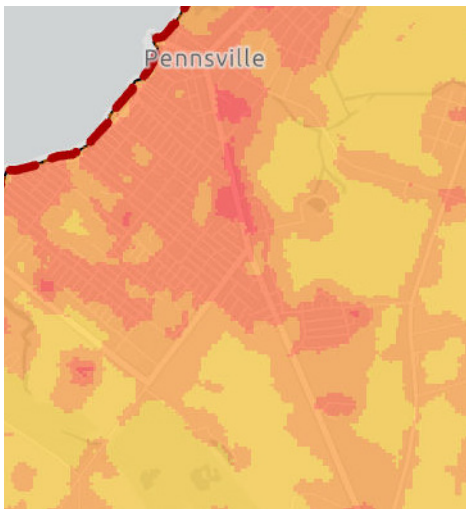
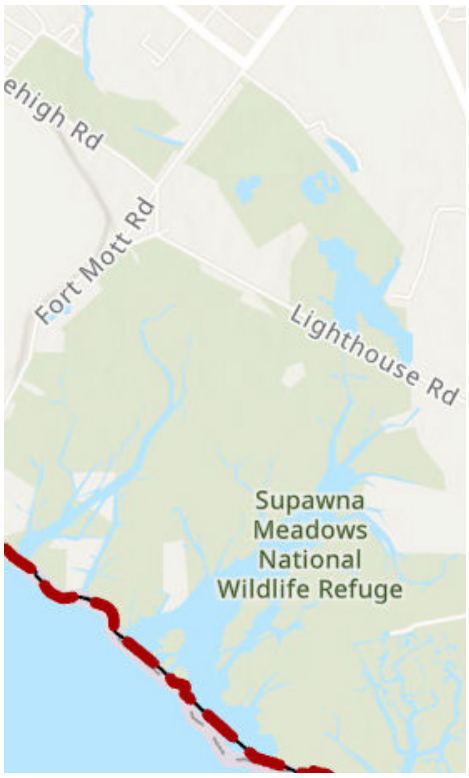






September 2026

Climate Change-Related Hazard Vulnerability Assessment

Pennsville Township

RUTGERS–NEW BRUNSWICK
New Jersey Climate Change Resource Center

RESILIENT NJ

This Climate Change-Related Hazard Vulnerability Assessment (CCRHVA) was prepared by the NJ Climate Change Resource Center in collaboration with the Township of Pennsville and was funded by the New Jersey Department of Environmental Protection through the American Rescue Plan Act. This analysis was conducted in the summer and fall of 2025 and relies upon the best available data and local plans at that time. The version of CCRHVA adopted by the Township may be different than this document based on updated data and local plans, which may occur through their local master plan update process.

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I. Introduction

The New Jersey (NJ) Municipal Land Use Law (MLUL) requires NJ municipalities to include a Climate Change-Related Hazard Vulnerability Assessment (CCRHVA) in the Land Use Element of the Municipal Master Plan. The New Jersey Climate Change Resource Center (NJCCRC) at Rutgers University, with funding from the New Jersey Department of Environmental Protection (NJDEP), developed this CCRHVA in coordination with Pennsville Township in accordance with the requirements of the MLUL, including the following components:

- Analysis of current and future threats to, and vulnerabilities of, the municipality associated with climate change-related natural hazards, including, but not limited to increased temperatures, drought, flooding, hurricanes, and sea-level rise (Section III);
- A build-out analysis of future residential, commercial, industrial, and other development in the municipality, and an assessment of the threats and vulnerabilities related to that development (Section IV);
- Identification of critical facilities, utilities, roadways, and other infrastructure that is necessary for evacuation purposes and for sustaining quality of life during a natural disaster, to be maintained at all times in an operational state (Section V);
- Analysis of the potential impact of natural hazards on relevant components and elements of the master plan (Section VI);
- A specific policy statement on the consistency, coordination, and integration of the climate-change related hazard vulnerability assessment with any existing or proposed natural hazard mitigation plan, floodplain management plan, comprehensive emergency management plan, emergency response plan, post-disaster recovery plan, or capital improvement plan (Section VII).

Situated along the tidal portion of the Delaware River in Salem County, Pennsville Township is the most populous of the county's 15 municipalities. The Township occupies a low-lying landscape along the southwestern edge of New Jersey, bounded to the west by the Delaware River and drained in part by the Salem River to its south. The township encompasses approximately 23 square miles of varied landscape, including tidal marshes, wetlands, and waterways to the east, fertile farmlands to the south and southwest, and established residential and commercial corridors in the northern and central portions of the community. Pennsville shares municipal borders with Carneys Point Township to the north, the City of Salem and Elsinboro Township to the south, Mannington Township to the east, and the Delaware River to the west.

This CCRHVA builds on a Coastal Vulnerability Assessment completed by Pennsville Township in coordination with Rutgers in 2023.[1] Additional details about Pennsville are included in Appendix A.

[1] Rutgers NJ Climate Change Resource Center. 2023. Pennsville Township Coastal Vulnerability Assessment.

II. Methodology

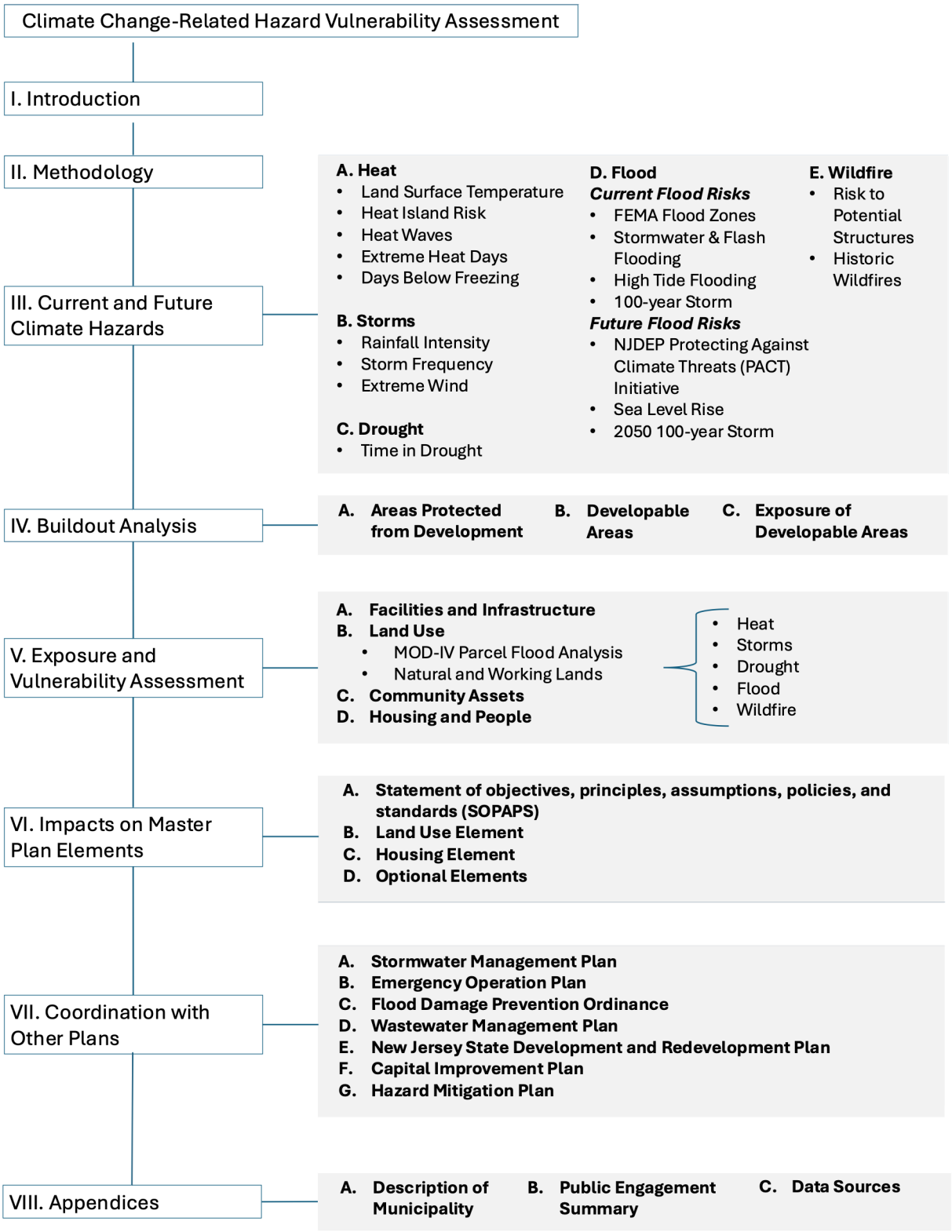
In accordance with the requirements of the MLUL, the following assessment relies upon "the most recent natural hazard projections and best available science" provided by the NJDEP. This assessment was conducted in the summer and fall of 2025. Publicly available datasets and data made available through various tools were utilized to analyze local climate change-related hazards and potential impacts to the Township at the three planning horizons below. The hazard projections align with a moderate greenhouse gas emissions scenario representing a future with a reduction in fossil fuel use consistent with today's global policies. It should be noted that the projected changes would be slightly greater under a higher greenhouse gas emissions scenario (i.e., representing a future with continued growth of fossil fuel use).

- Present day to assess current impacts and align with the shorter-term planning needs of the 10-year Master Plan Re-Examination Report (MPRR) cycle.
- Mid-century to assess future impacts and align with longer-term community planning needs and visioning.
- Late-century to assess long-term planning needs and align with the NJDEP Protecting Against Climate Threats (PACT) initiatives including the Inland Flood Protection rule and Resilient Environments and Landscapes (REAL) coastal flood rule. These rules are detailed in Section III.D.

The results of the hazard assessment were presented to Pennsville municipal staff and residents to obtain feedback and confirm results. These stakeholders also provided input on hazards for which authoritative web-based data was not available, including stormwater and flash flooding. Details on public engagement are included in Appendix B.

This document is organized into eight sections, depicted in Figure II-1. Each section addresses a required component as set forth by the MLUL.

Figure II-1. Pennsville CCRHVA document structure



III. Current and Future Climate Hazards

The New Jersey Municipal Land Use Law (MLUL) requires a CCRHVA to include an "analysis of current and future threats to, and vulnerabilities of, the municipality associated with climate change-related natural hazards, including, but not limited to increased temperatures, drought, flooding, hurricanes, and sea-level rise." This section addresses that requirement and includes analysis of the additional hazards of extreme precipitation, wind, and wildfire.

Local stakeholders were asked via an online survey to rank their level of personal concern for the Township from the hazards of heat, drought, flooding, extreme precipitation, wind, and wildfire. Most respondents indicated that flooding was their greatest concern for the Township, followed by wind, extreme precipitation, and heat. Drought and wildfire were of less concern. Local stakeholders were also asked to report how frequently they are personally affected by each hazard. Respondents indicated being most frequently affected by wind in the Township, followed by extreme precipitation and flooding. Less frequent impacts were reported from heat, drought, and wildfire (see Appendix B for details).

A. Heat

Average annual temperatures in New Jersey have risen by about 4 °F since 1900. By 2100, the annual average temperature is projected to increase an additional 3.7–6.2 °F.[2] Increased temperatures can have adverse impacts on public health, infrastructure, and plants (see Section V). Urbanized areas are disproportionately affected by heat due to higher population density, more impervious surfaces, and less natural landscapes. More than half of the local stakeholders who responded to the survey (52%) indicated being personally affected by heat in the Township "many times" or "a few times" each year (Appendix B).

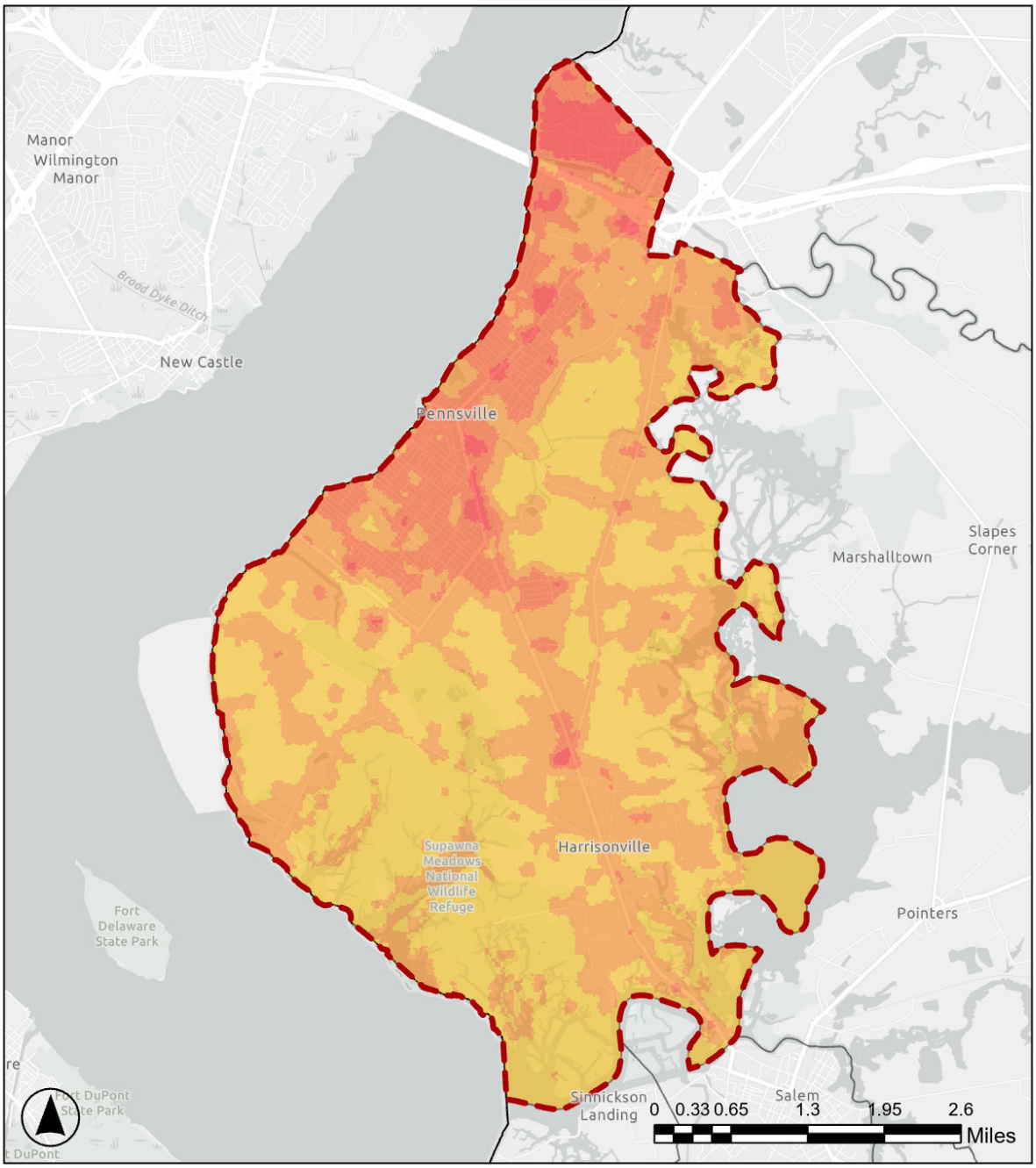
Land Surface Temperature

Map III-1 depicts the land surface temperature (temperature of the ground) in Pennsville in the summer of 2022. This data was collected by satellites at 100 square foot resolution. Impervious surfaces and structures such as buildings and roads absorb more solar radiation, increasing land surface temperature and emitting more heat than natural surfaces such as trees and water.

Land surface temperature is higher in Pennsville's developed areas. Residential neighborhoods and the North Broadway commercial corridor, located on the west side of the municipality along the Delaware River, reach surface temperatures ranging from 90 to over 110 °F. The industrial zone in the northern part of the municipality reaches temperatures exceeding 110 °F. Areas characterized by wetlands and agriculture are comparatively cooler, generally ranging between 80–90 °F.

[2] Davies, K., Shope, J., Broccoli, A., Gerbush, M., Kaplan, M., Robinson, D., Nikolopoulos, E., Araujo, D., Kopp, R., Herb, J. & Spector, A. 2025. State of the Climate: New Jersey 2024. Rutgers, The State University of New Jersey, New Brunswick, NJ. DOI: 10.7282/00000539.

Map III-1. Land surface temperature (°F) – Summer 2022



LEGEND

Land Surface Temperature

- Below 80
- 80 to 90
- 90 to 100
- 100 to 110
- Over 110

(Sources: NJDEP and NJ Public Health Adapt, Rutgers University)

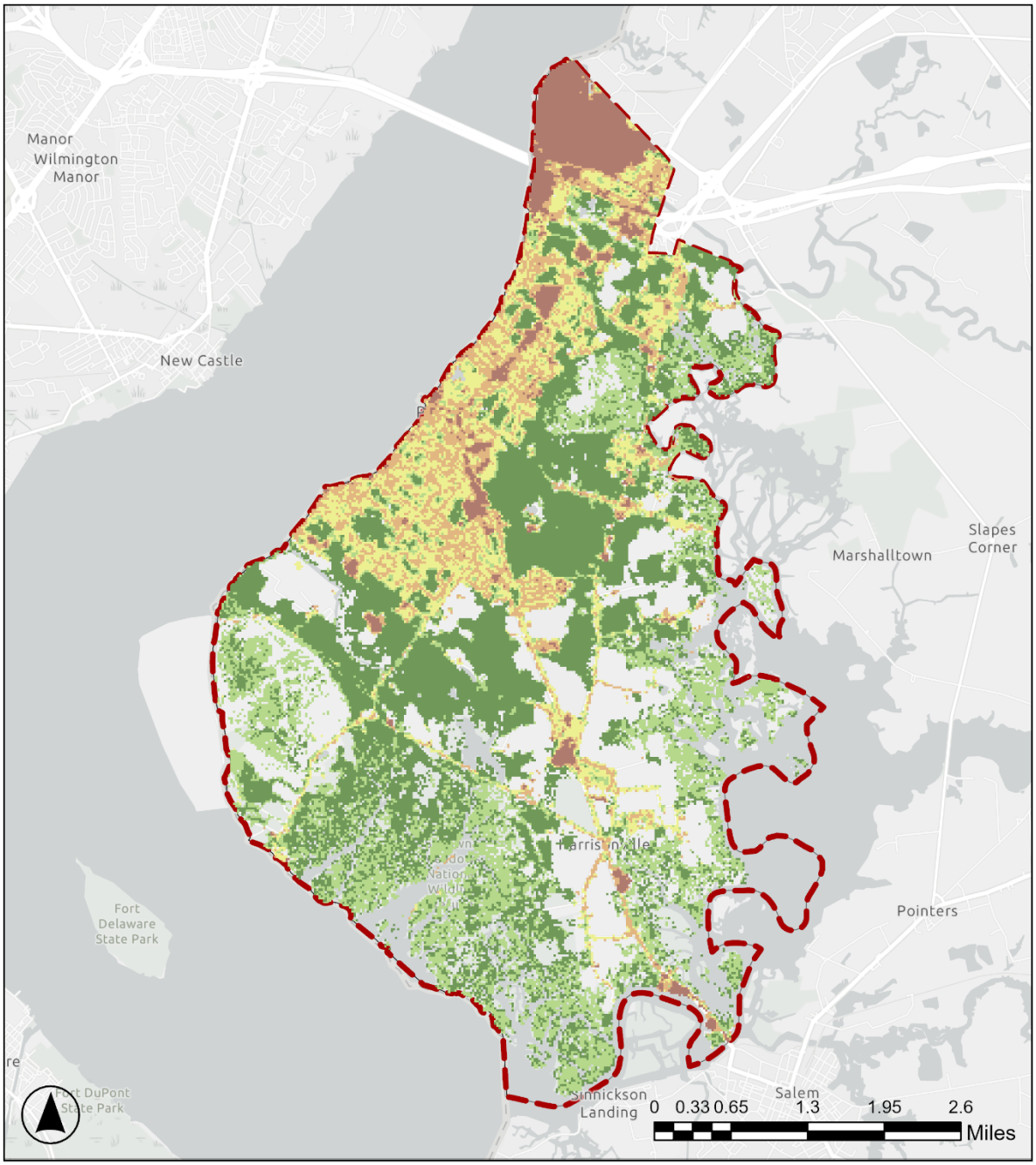
Heat Island Risk

While land surface temperature provides a granular depiction of potential heat impacts in the municipality, analysis of heat island risk offers a broader understanding of how heat can impact communities. A heat island is an area that is significantly warmer than the surrounding region. Areas with more impervious surface and minimal tree canopy are at risk of the heat island effect. Heat islands can increase daytime temperatures, reduce nighttime cooling, and contribute to greater concentrations of air-pollution.[3] Land use and zoning ordinances can mitigate heat island effects by setting standards for tree cover, vegetation, and impervious surface.

Map III-2 depicts the ratio between tree canopy cover and impervious surface in Pennsville. The analysis provides a ratio value from negative one (100% impervious cover) to positive one (100% canopy cover). This range of potential values is split evenly into five groups in the map below, ranging from "higher canopy cover" to "higher impervious cover." Heat island risk in Pennsville closely reflects land use patterns. The residential, commercial, and industrial areas on the west side of the municipality have higher ratios of impervious surface coverage and increased potential for heat island effects. Conversely, heat island risk is reduced by natural areas in the south and east parts of the municipality.

[3] U.S. Environmental Protection Agency. Heat island effect. https://19january2017snapshot.epa.gov/heat-islands_.html

Map III-2. Heat island risk



LEGEND

Ratio Between Canopy Cover and Impervious Surface

- Higher Tree Canopy Cover
- Moderately Higher Tree Canopy Cover
- Equivalent Impervious/Canopy Cover
- Moderately Higher Impervious Cover
- Higher Impervious Cover

(Sources: NJ Public Health Adapt)

Heat Waves

A heat wave is a period of unusually hot weather. Typically, heat waves are warmer than the historical averages for the area and much warmer than the temperatures before and after the heat wave event. Heat waves have a direct impact on human health, the local environment, and the economy (see Section V). Climate change is projected to drive longer and more frequent heat waves in New Jersey.[4]

Table III-1 provides a projection of change in future heat wave number and duration compared to a historical period of 1981–2010 at the county level. The threshold for a heat wave in Salem County is three days with average daily temperatures meeting or exceeding 82.3 °F. This threshold is the 95th percentile of 30 years (1981–2010) of daily average temperature during the warm season (May 1 to September 30). Average temperature is a synthesis of the daily maximum and minimum temperatures. Daily maximums emphasize the highest heat conditions a person may be exposed to, but daily minimums have been shown to be more important for heat stress and illness when elevated for an extended period.

Table III-1. Heat waves in Salem County

	Baseline 1981-2010	Moderate Emissions	
		Mid-century 2036-2065	Late-century 2070-2099
Average annual number of heat waves	1.2	4.8	6
Average days of heat wave duration	3.3	8.9	11.7
Maximum days of heat wave duration	8.6	19.9	24.5

(Source: NJ Public Health Adapt – Climate Conditions that Impact Health)

The data for Salem County indicates that the average number of heat waves annually may increase from about one annually to 5–6 per year by the end of the century. The average length of heat waves is projected to increase from about three days to 9–12 days by the end of the century. The typical maximum duration of heat waves may increase from approximately nine days to 20–25 days by the end of the century.

Extreme Heat Days

Table III-2 provides a projection of change in future extreme heat days compared to a historical period of 1981–2010 at the municipal level. July is historically the hottest month in New Jersey. Higher maximum temperatures exceed thresholds of comfort, increasing the occurrence of heat-related illnesses, energy demand, and harmful impacts on plants and animals.

[4] Davies, K., Shope, J., Broccoli, A., Gerbush, M., Kaplan, M., Robinson, D., Nikolopoulos, E., Araujo, D., Kopp, R., Herb, J. & Spector, A. 2025. State of the Climate: New Jersey 2024. Rutgers, The State University of New Jersey, New Brunswick, NJ. DOI: 10.7282/00000539.

Table III-2. Extreme heat days

	Baseline 1981-2010	Moderate Emissions		
		Change from Baseline		
		2030	2060	2090
Days greater than 95˚F	2	+ 6 to 8	+ 14	+ 18
Average daily high temp. in July (˚F)	85	+ 2	+ 4	+ 4 to 5

(Source: NJ Public Health Adapt – Climate Conditions that Impact Health)

Pennsville experienced an average of two days above 95 °F annually from 1981–2010. By 2030, this may increase by 6–8 days annually and 18 days annually by the end of the century. Pennsville experienced an average daily high temperature of 85 °F in July from 1981–2010. By 2030, the average daily high in July may increase by 2 °F and may increase by 4–5 °F by the end of the century.

Days Below Freezing

Table III-3 provides a projection of change in the future annual number of days below 32 °F compared to a historical period of 1981–2010 at the municipal level. Less very cold days mean less "code blue" situations, but potential impacts to agriculture, infrastructure, and disease vectors (e.g. mosquitoes and ticks).

Table III-3. Days below freezing

	Baseline 1981-2010	Moderate Emissions	
		Mid-century 2050-2070	Late-century 2080-2090
Average number of days below freezing	86	62	55

(Source: NJ Adapt Climate Snapshots – Forest Climate Risk Report)

Pennsville experienced an average of 86 days below 32 °F annually from 1981–2010. By the middle of the century, this may decrease to an average of 62 days below freezing each year. By the late century, the average number of days below freezing may decrease to 55 days annually.

B. Storms

Storms in New Jersey can bring heavy precipitation, flooding, and strong winds. Extreme weather events are those where conditions substantially exceed what is considered normal for a location. The NJCCRC's *State of the Climate: New Jersey 2024* reports that the frequency and intensity of extreme precipitation in New Jersey is expected to increase with climate change. The total annual rainfall within the state has increased by ~7% since the early 1900s, with the most intense events generating more rainfall compared to historical episodes. An increase in total annual rainfall of

approximately 3–13% may occur by the end of the century with moderate greenhouse gas emissions; additionally, extreme 24-hour rainfall is projected to increase by about 5–15%. Heavy rainfall can cause flooding and increase the likelihood of waterborne disease outbreaks. Heavy winds associated with storms can damage structures and vegetation, including impacts to the agricultural sector.

Wind and extreme precipitation ranked second and third, respectively, in local stakeholder concern as reported in survey responses, suggesting that storm-related hazards represent key community concerns (see Appendix B).

Rainfall Intensity

More intense rainfall means more rain within a given timespan, which can overwhelm stormwater infrastructure and cause flash flooding. Table III-4 provides a projection of change in rainfall over a 24-hour period for various annual storm probability events compared to a historical period of 1981–2010 at the municipal level. A storm with a lower percentage chance of occurring represents a greater intensity of rainfall (although it occurs less frequently).

Table III-4. Rainfall (in inches) over 24-hours by annual storm probability

	Baseline 1981-2010	Moderate Emissions	
		Mid-century 2036-2065	Late-century 2070-2099
50% chance storm	3.24	3.47	3.60
20% chance storm	4.13	4.46	4.59
10% chance storm	4.89	5.33	5.48
4% chance storm	6.01	6.50	6.74
2% chance storm	6.99	7.61	7.82
1% chance storm	8.05	8.70	8.94

(Source: NJ Adapt Local Planning Navigator – Extreme Precipitation)

The baseline amount of rainfall in a 24-hour period in Pennsville ranges from 3.24 inches (50% chance storm) to 8.05 inches (1% chance storm) for the period between 1981–2010. Throughout the century, this may increase by approximately one-quarter of an inch (50% chance storm in the mid-century) to nearly 1-inch (1% storm in the late-century).

Storm Frequency

More frequent rainfall means a given storm will occur more often in the future than it has historically. Table III-5 provides a projection of change in the frequency of the 10% chance (10-

year) and 1% chance (100-year) storms compared to a historical period[5] 1950-2000 at the municipal level.

Table III-5. Increase in annual probability for the 10% and 1% chance storm

	Historical 1950-2000	Moderate emissions	
		Mid-century 2020-2069	Late-century 2050-2099
10% chance storm	11.36%	15.07%	16.77%
1% chance storm	0.99%	1.59%	1.87%

(Source: Northeast Regional Climate Center, unpublished data)

The frequency of extreme rainfall events in Pennsville is projected to increase throughout the century. The probability of the 10% chance (10-year) storm may increase to a 15% chance annually by the mid-century and an approximately 17% chance by the late-century. The probability of the 1% chance (100-year) storm may increase to a 1.59% chance annually by the mid-century and a 1.87% chance by the late-century.

Extreme Wind

Extreme wind can be a standalone hazard but often occurs as a secondary effect of other severe weather events, such as thunderstorms, tropical cyclones, tornadoes, and hailstorms. Wind hazards in Pennsville were assessed using historic data on the occurrence of wind events and tornadoes.[6,7] Since 1950, four tornadoes ranging in magnitude from F0–F2[8] have been documented in Salem County, although none within Pennsville. Wind events have been recorded on 234 days in Salem Couty, with 14 events reported in Pennsville. These include events designated by NOAA as “High Wind” (speeds of 40 mph or greater lasting for one hour or longer, or winds of 58 mph or greater for any duration), “Strong Wind” (gusts between 39 to 57 mph), and “Thunderstorm Wind” (speeds equal to or greater than 40 mph in association with a thunderstorm). Due to its location along the Delaware River, Pennsville has heightened exposure to extreme wind relative to inland communities.

Most local stakeholders who responded to the survey (69%) indicated being personally affected by wind "many times" or "a few times" each year within the Township. Residents across the Township reported widespread wind damage, with common impacts including downed trees, lost roof shingles, siding damage, and repeated power outages (see Appendix B).

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[5] NOAA National Weather Service. Precipitation Frequency Data Server. 2025. Atlas 14 precipitation frequency estimates.

[6] Rutgers New Jersey Agricultural Experiment Station. 2025. Tornadoes in New Jersey: 1950 to Present.

[7] National Centers for Environmental Information, National Oceanic and Atmospheric Administration. 2025. Storm Events Database.

[8] National Weather Service, National Oceanic and Atmospheric Administration. 2025. The Fujita Scale.

C. Drought

The NJCCRC's *State of the Climate: New Jersey 2024* reports that New Jersey is projected to receive more of its rainfall from extreme precipitation events, with longer and drier periods between these events, resulting in more short-term drought conditions. Drought can have impacts across many sectors including public health, water supply management, agriculture, and the environment. Drought also increases the risk of wildfire (see Section III.E), especially in combination with high temperatures (Section III.A).[9]

Time in Drought

Table III-6 provides a projection of change in the percent of time spent in drought conditions annually for Salem County, compared to a historical period from 1981 to 2014. Droughts occur when evapotranspiration exceeds rainfall over a period that is considered abnormal for the region. Severe drought is when this imbalance becomes even more extreme due to heat or long periods without rainfall. These projections were developed based on modeled changes in precipitation and temperature, and do not account for variables such as soil moisture or reservoir levels.

[9] New Jersey Office of Emergency Management. 2024. State of New Jersey All-Hazards Mitigation Plan.

Table III-6. Annual* percent time in drought in Salem County

	Historical 1981-2014	Moderate emissions	
		Mid-century 2041-2070	Late-century 2071-2100
Drought	14.9%	+2.3%	+3.2%
Severe Drought	0%	+2.0%	+3.6%

(Source: Forthcoming dataset by Shope. J. Nikolopoulos, E., and Araujo DSD[10])
**In the northern hemisphere, the hydrological "water year" is the 12-month period from October to September.*

Historically, drought conditions have affected Salem County approximately 15% (1–2 months) of the year. Time spent in drought annually may increase by 2.3% by mid-century and by 3.2% by late-century. Salem County has not historically experienced severe drought conditions, but future severe droughts may occur 2% of the year by mid-century and 3.6% of the year by late-century.

D. Flood

Flooding damages property and infrastructure, disrupts services, and impacts health. Local stakeholders report frequent flood impacts in the Township, with 48% of survey respondents personally affected by flooding "many times" or "a few times" each year (Appendix B). Flooding in tidally influenced areas such as Pennsville is driven by three factors:

- Tidal flooding, caused by twice-daily high-tides (also known as "sunny day" or "nuisance" flooding);
- Storm events, bringing heavy precipitation and/or storm surge; and
- Sea-level rise, increasing the overall height of tidally influenced waterbodies, thus increasing the frequency and intensity of tidal and storm flooding.

Pennsville is subject to both coastal flooding and fluvial flooding (when intense rain events cause rivers and streams to overtop their banks). Although this analysis assesses coastal and fluvial flooding as separate risks in Pennsville, it is important to note that the compound effects can be especially hazardous. Further modeling beyond the scope of this analysis is needed to assess the compound impacts.

[10] Shope, J., Nikolopoulos, E., and Araujo, D.S.D. 2025. DRAFT New Jersey Projected Future Drought Dataset Technical Documentation.

This assessment identifies current and future flood risks in Pennsville based on the measures listed in Table III-7.

Table III-7. Measures of current and future flood risk

Current flood risk measures	Future flood risk measures
• FEMA flood zones • Stormwater and flash flooding • High tide flooding • Current storm scenario (100-year storm)	• NJDEP Protecting Against Climate Threats (PACT) initiative • Sea-level rise (SLR)–2050 and 2100 • Future storm scenario (100-year storm in 2050)

Maps for each of these flood measures are included in this section. Section V includes a simplified set of measures to allow map visualization of a range of potential flood extents that approximately correspond with current and future flood scenarios. Table III-8 lists the simplified list of flood measures included in Section V.

Table III-8. Flood measures and approximate corresponding flood scenarios*

Flood Measure	Approximate corresponding scenario(s)**
2 feet coastal inundation	• Current high tide flooding • 2050 sea-level rise permanent inundation
4 feet coastal inundation	• Current 100-year storm coastal flood • 2100 sea-level rise permanent inundation
FEMA 1% Annual Chance flood zone	• FEMA 1% Annual Chance flood zone
NJDEP Climate Adjusted Flood Elevation (CAFE)	• FEMA 0.2% Annual Chance flood zone in some areas • 2050 100-year storm coastal flood in some areas

**Each flood measure/scenario is defined in its applicable section below.*
***Scenarios approximately correspond with each flood measure in some, but not all, areas.*

Current Flood Risks

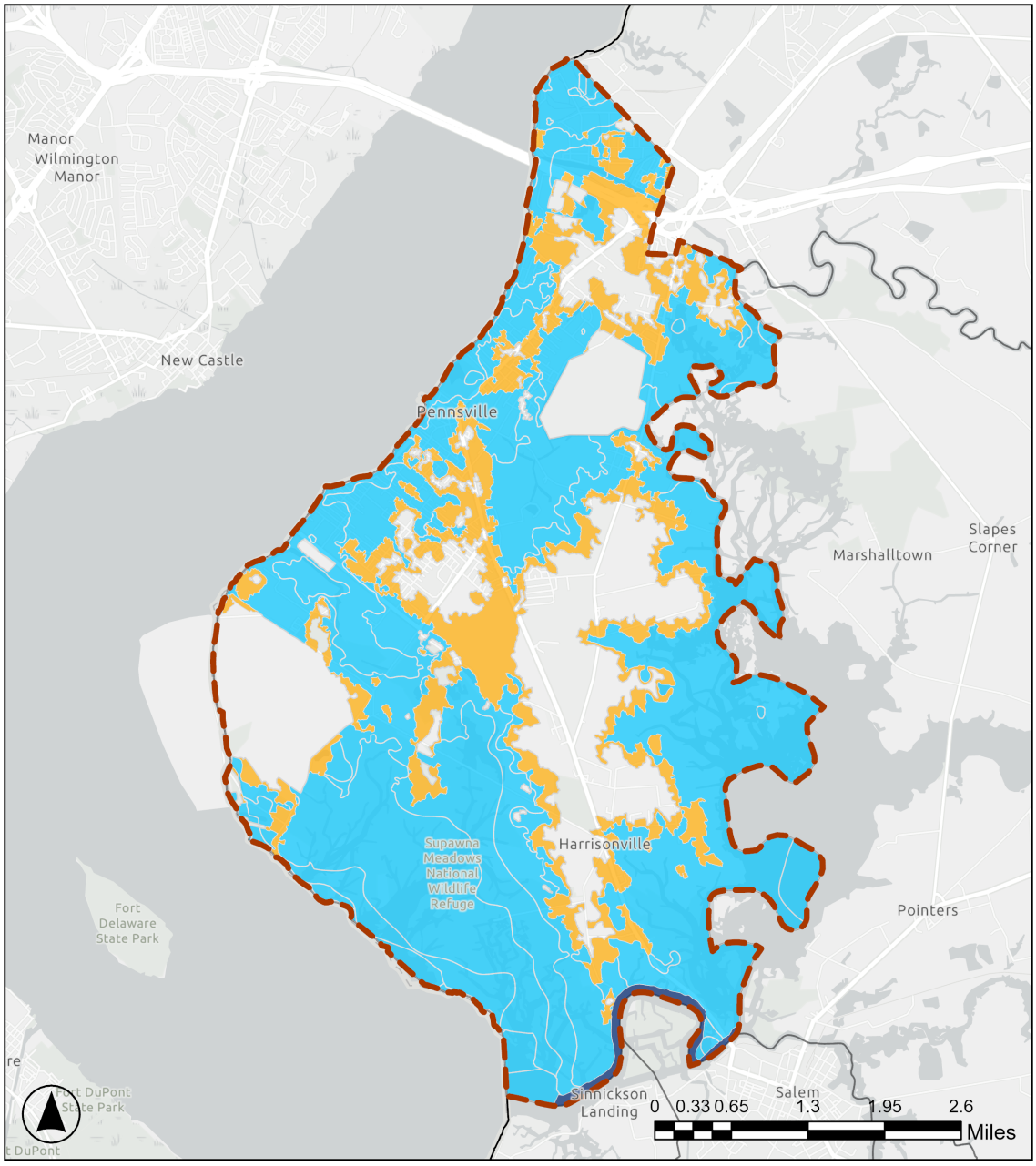
FEMA Flood Zones

The Federal Emergency Management Agency (FEMA) models flood hazards for much of the state. The 1% annual (100-year) flood, also known as the base flood, has a 1% chance of being equaled or

exceeded in any given year. The 0.2% annual (500-year) flood has a 0.2% chance of being equaled or exceeded in any given year. The regulatory floodway is a portion of the floodplain that, under FEMA regulations, must remain unobstructed to safely convey floodwaters and is an area where development is highly restricted.

Map III-3 depicts the FEMA flood zones in Pennsville. A substantial portion of Pennsville is within the FEMA 1% annual chance flood zone, including most of the municipality's residential, commercial, and industrial properties. The southern boundary of the municipality along the Salem River is designated as a regulatory floodway, in an area primarily characterized by wetlands.

Map III-3. FEMA flood zones



LEGEND

FEMA Flood Zones

- 1 Pct Annual Chance Flood
- 0.2 Pct Annual Chance Flood
- Regulatory Floodway
- Area of Minimal Flood Hazard

(Sources: FEMA and NJ Adapt)

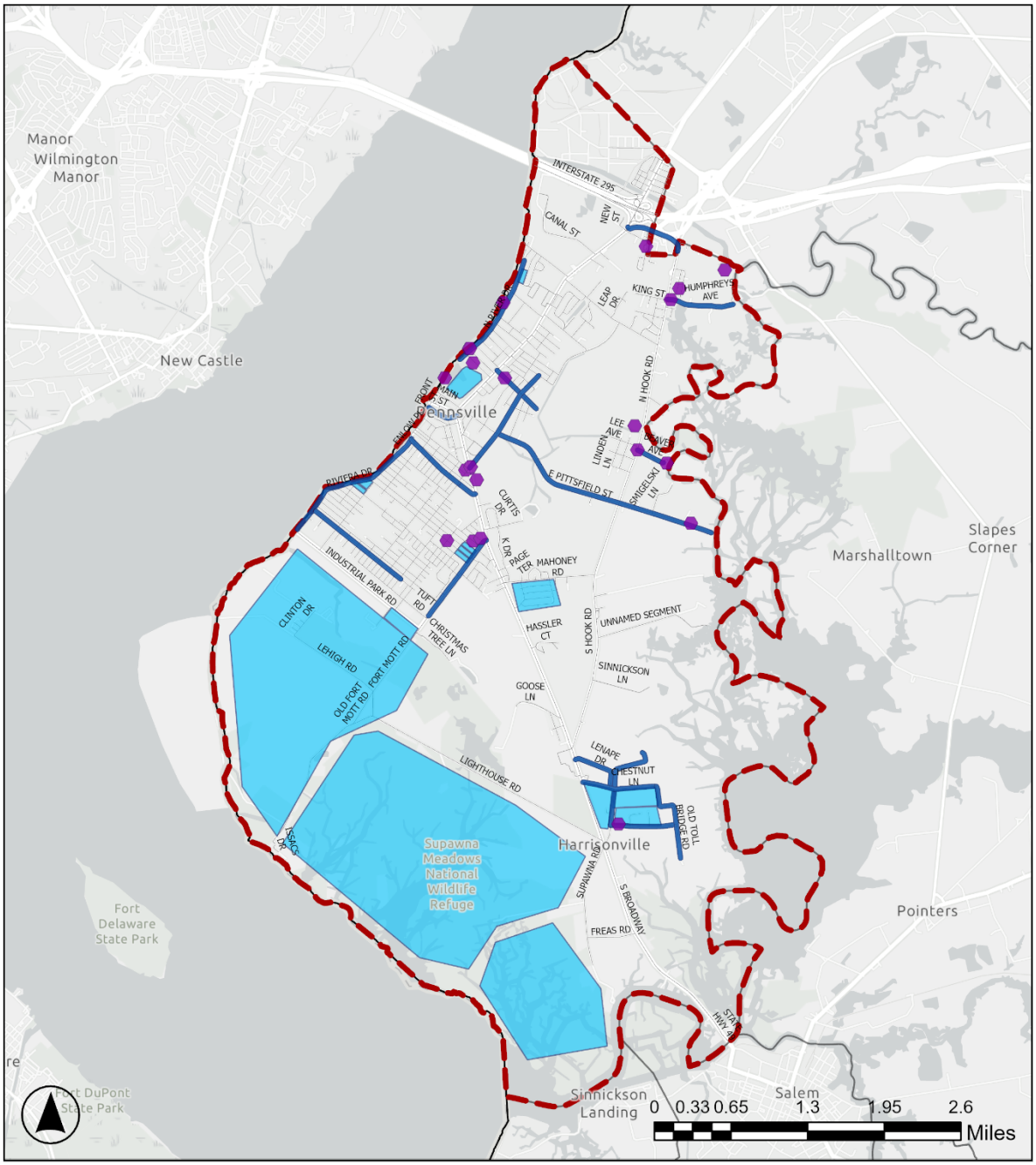
Stormwater and Flash Flooding

Flooding can occur during flash flood events when stormwater infrastructure is overwhelmed by extreme precipitation. Map III-4 depicts the observed locations of flooding during precipitation which were identified by community stakeholders through the public engagement process that included an in-person meeting and a public survey (see Appendix B).

Stormwater flood location points by stakeholders are scattered across the northern portion of the municipality, with a notable cluster along the waterfront and interior street network. These discrete locations reflect community-reported areas where localized drainage failures, ponding, or surface runoff have been observed. Three points were identified on South Broadway near the Pennsville Veterans of Foreign Wars (VFW). As Route 49 serves as the primary evacuation route for the region (Maps V-2 and V-3), flooding along this corridor can cause serious disruption to emergency egress and the safe evacuation of residents during storm events.

Road sections impacted by stormwater flooding are distributed along several corridors in the northern and central parts of the municipality, including Riviera Drive, Sanford Road, Fort Mott Road, and Dunn Lane. These road segments indicate recurring or potential disruptions to local transportation networks during storm events, potentially affecting emergency access and daily mobility for residents. Large contiguous areas impacted by stormwater flooding are concentrated predominantly in the central and southwestern portions of the municipality, with the most expansive zones located in the lower-lying interior areas near Harrisonville. These areas are likely associated with insufficient drainage infrastructure and low-gradient terrain, making them particularly vulnerable to prolonged inundation following significant precipitation events.

Map III-4. Stormwater and/or flash flooding locations



LEGEND

Stormwater flooding identified by stakeholders

- Stormwater Points

Road sections impacted by stormwater flooding

Areas impacted by stormwater flooding

High Tide Flooding

High tide flooding is caused by twice-daily high tides. High tide flooding can disrupt community life and essential services if roadways become impassable. High tide flooding occurs more frequently as sea-level rises. Table III-9 shows the increase in flooding days each decade since 1970 at Reedy Point, Delaware. Located across the Delaware River from Pennsville, this is the nearest tide gauge collecting flooding days data and is a good approximation of flood conditions in Pennsville.

Areas in Pennsville currently subject to high tide flooding are shown in Map III-5. The map depicts the extent of potential inundation at the National Oceanic and Atmospheric Administration's (NOAA) "minor" coastal flood threshold. Minor tidal flooding typically begins around 1.5–2 feet above the average high tide and is more likely to cause significant temporary interruptions rather than permanent destruction.[11] Pennsville's residential areas along the Delaware River, as well as portions of the industrial zone, experience tidal flooding. Additionally, most of the southern part of the municipality experiences tidal flooding, including wetlands along the Supawna Meadows National Wildlife Refuge, Salem River, and Kates Creek Meadow. These locations were confirmed by local stakeholders including municipal staff, residents, and community groups during the public engagement meeting (see Appendix B).

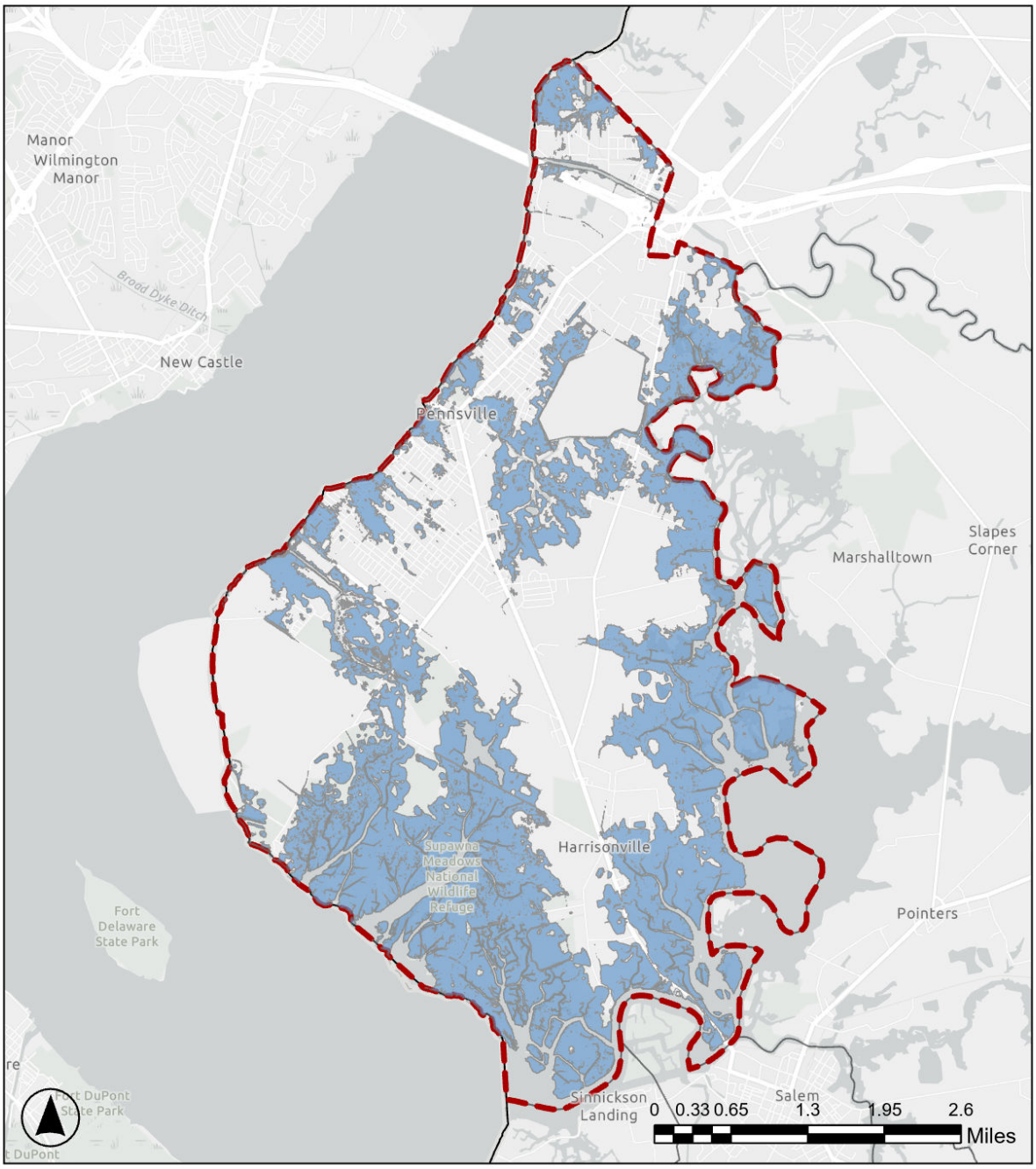
Table III-9. Historic flooding days at Reedy Point, Delaware

	1970-1979	1980-1989	1990-1999	2000-2009	2010-2019	2020-2024
Average flooding days per year	0.3	0.2	0.6	0.6	2.5	3.8

(Source: NOAA Sea Level Calculator – Changes in Flood Frequency)

[11] Sweet, W. V., Dusek, G., Obeysekera, J., Marra, J. J. National Oceanic and Atmospheric Administration. 2018. Patterns and Projections of High Tide Flooding Along the U.S. Coastline Using a Common Impact Threshold.

Map III-5. High tide flooding locations



LEGEND

High Tide Flooding

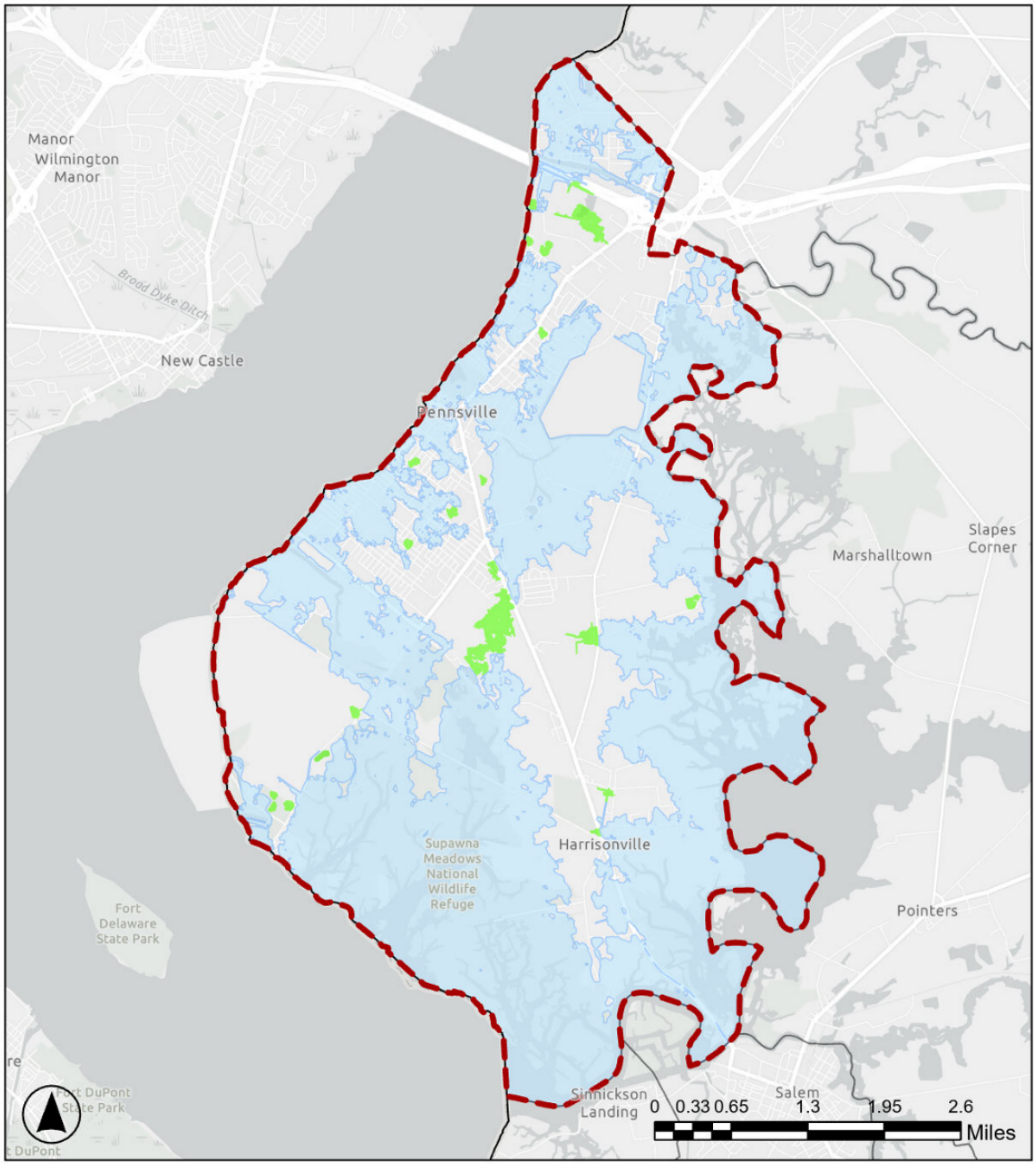
(Source: NOAA Sea-Level Rise Viewer)

100-Year Storm

The 100-year storm represents the coastal flood event that has a 1% chance of occurring annually according to modeling by the National Oceanic and Atmospheric Administration (NOAA). In Pennsville, today's 100-year storm event is anticipated to cause approximately four feet of coastal inundation. Coastal inundation is measured as feet above Mean Higher High Water (MHHW), a tidal datum representing the average height of the highest tide each day over a 19-year period. Map III-6 depicts areas in Pennsville that may be flooded during a 100-year storm event based on coastal storm flooding. It does not incorporate flooding due to rainfall, which may cause compounded impacts. The green "low-lying" areas on the map are below the elevation of the flood extent, and, as a result, have the potential to flood, but are hydrologically disconnected from the rest of the flooded area.

As depicted on the map, a 100-year storm event in Pennsville is expected to cause coastal inundation in residential areas along the Delaware River and sections of the industrial zone. Wetlands in the south and east parts of the municipality may be fully inundated. Under current models, agricultural lands and some residential areas along Route 49 are not likely to be affected by flooding under this scenario.

Map III-6. Potential inundation from 100-year storm



LEGEND

100 Year Storm (Current Risk without SLR)

4ft Coastal Inundation Extent

4ft Coastal Inundation Extent, Low Lying Areas

(Source: NJ Adapt)

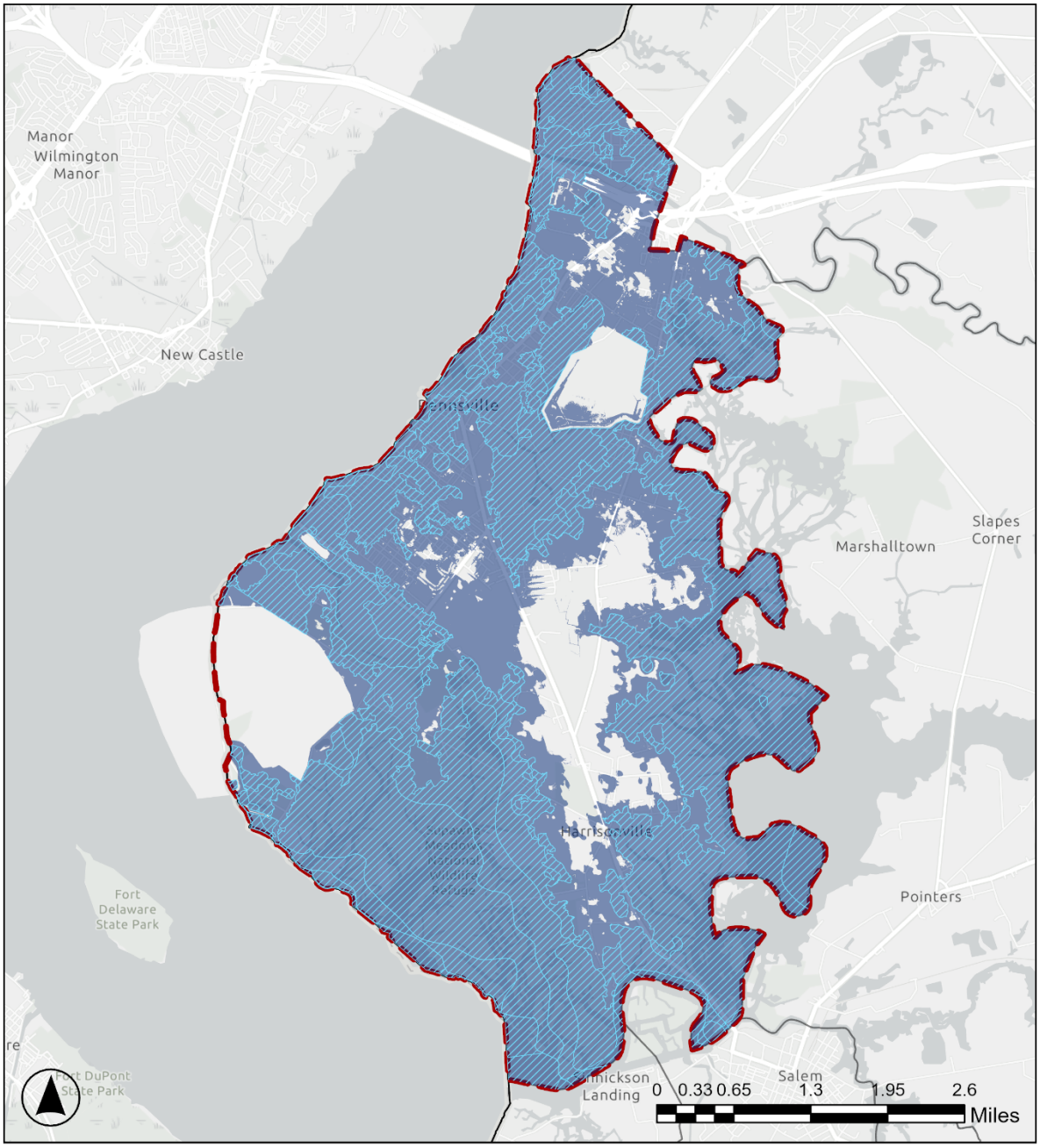
Future Flood Risks

NJDEP Protecting Against Climate Threats (PACT) Initiative

In 2020, NJDEP began a regulatory reform effort called Protecting Against Climate Threats (PACT) to make the state's natural and built environments more resilient to the impacts of climate change. Under this initiative, NJDEP passed two new rules to regulate development and redevelopment in areas of current and future flood risk in both fluvial and tidal areas. Adopted in July 2023, the Inland Flood Protection Rule established a new Design Flood Elevation (DFE) for specific types of new construction and redevelopment in inland/fluvial areas at risk of flooding. The new DFE is three feet above the elevation of the FEMA 1% Annual Chance Flood or, where NJDEP flood mapping is available, two feet above NJDEP's flood hazard area DFE if that is higher. Adopted in January 2026, the Resilient Environments and Landscapes (REAL) coastal flood rule adjusts Coastal Flood Hazard Areas to account for rising sea-level by establishing a new Climate Adjusted Flood Elevation (CAFE) equal to the FEMA 1% Annual Chance Flood's Base Flood Elevation plus four feet to account for projected sea-level rise by 2100. On June 1, 2026, the NJDEP paused the implementation of the REAL rules by one year to consider additional public comment. Most coastal municipalities have both tidal areas subject to CAFE and fluvial areas subject to the Inland Flood Protection Rule.

Map III-7 depicts the approximate extent of each rule in the Township. Most of the current and future flood risk areas appear to be subject to the coastal flood rule (i.e., CAFE), shown in dark blue. Some upriver areas appear to be subject to the Inland Flood Protection Rule, shown in light blue. This information can support local efforts to safeguard community facilities, infrastructure, and assets. However, it should be noted that the map is for planning purposes only and a site-specific survey is needed for flood impact analyses, permitting, or other legal or regulatory purposes.

Map III-7. Areas potentially subject to the NJ PACT regulatory reforms



LEGEND

FEMA 1pct Annual Chance Flood Zone

Approx. extent of REAL Climate Adjusted Flood Elevation

(Source: NJ Adapt)

Sea-Level Rise

The NJCCRC's *State of the Climate: New Jersey 2024* reports that sea-level has been increasing in New Jersey at a rate of 2.2 inches per decade since 1980 due to global sea-level rise and land subsidence. Global sea-level rise is caused primarily by the added water from melting land-based ice and the expansion of seawater as it warms. Land subsidence, or sinking, is caused primarily by "glacial isostatic adjustment" (the ongoing response of the earth's crust to the melting of the great ice sheets after the last ice age) and compaction of sediments due to natural processes and groundwater withdrawal.

Heightened sea levels present a greater likelihood of flooding during coastal storms or high tides and can salinate freshwater ecosystems, resulting in impacts to aquatic communities, fresh groundwater, and water quality.[12] Based on *New Jersey's Rising Seas and Changing Coastal Storms: Report of the 2025 Science and Technical Advisory Panel*, under an intermediate greenhouse gas emissions scenario (approximately consistent with current global policies) and excluding potential rapid ice sheet loss, sea-level is projected to increase 0.9 to 1.7 feet by 2050 and 2.2 to 3.8 feet by 2100. Including potential rapid ice-sheet loss processes could extend these ranges to 1.9 feet in 2050 and 4.5 feet in 2100.[13]

For planning purposes, statewide guidance recommends relying on estimates of two feet of sea-level rise by 2050 and four feet of sea-level rise by 2100. Map III-8 depicts the potential extent of this projected permanent inundation in Pennsville. Despite the gradual nature of sea-level rise, permanent inundation means that these areas may be impacted by each daily high tide by the end of the century.

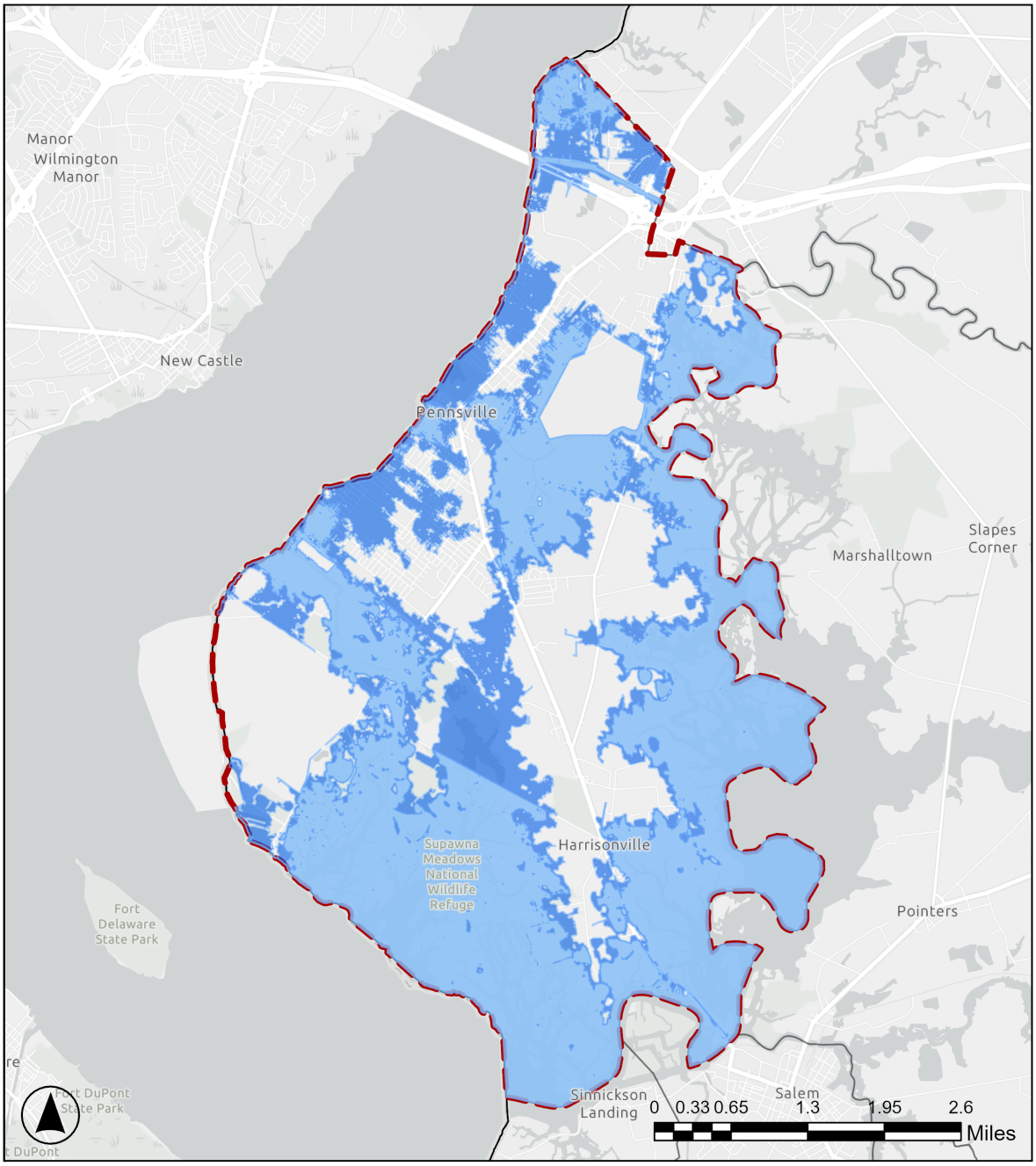
Under the 2050 scenario, with two feet of coastal inundation, some daily flooding is expected in the residential and commercial areas along the east portion of Broadway, as well as portions of the industrial sites in the north part of the municipality. Additionally, the wetlands in the south part of Pennsville are fully inundated, which could result in wetland loss and/or migration (see Section V.B.). Under the 2100 scenario, with four feet of coastal inundation, a greater number of residential and commercial areas, particularly along the Delaware River, may be flooded every day during high tide.

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[12] New Jersey Department of Environmental Protection. 2025. New Jersey Scientific Report on Climate Change. (Eds. B. Wiley, K. Raper, J. Bonventre, R. Hill, L.A. Lester, N.A. Procopio). Trenton, NJ. 275 pp.

[13] Kopp, R. E., A. Broccoli, G. Carleton, S. Dangendorf, R. DeConto, R. Frederiks, A.J. Garner, E. Grover Kopec, L. Haaf, B. Hamlington, N. Lin, J. Lorenzo-Trueba, J. Miller, D. Robinson, G. Vecchi, T. Wahl, J. Walker, J.M. Barr, J. Shope, D.K. Apoznanski, P. Kumar, L. Marxen, A. Spector, K. O'Neill, L. Auermuller, and M. Kaplan. New Jersey's Rising Seas and Changing Coastal Storms: Report of the 2025 Science and Technical Advisory Panel. Rutgers, The State University of New Jersey. Prepared for the New Jersey Department of Environmental Protection. Trenton, New Jersey.

Map III-8. Projected permanent inundation from future sea-level rise in 2050 and 2100



LEGEND

Projected Sea Level Rise 2050 — 2ft Coastal Inundation Extent

Projected Sea Level Rise 2100 — 4ft Coastal Inundation Extent

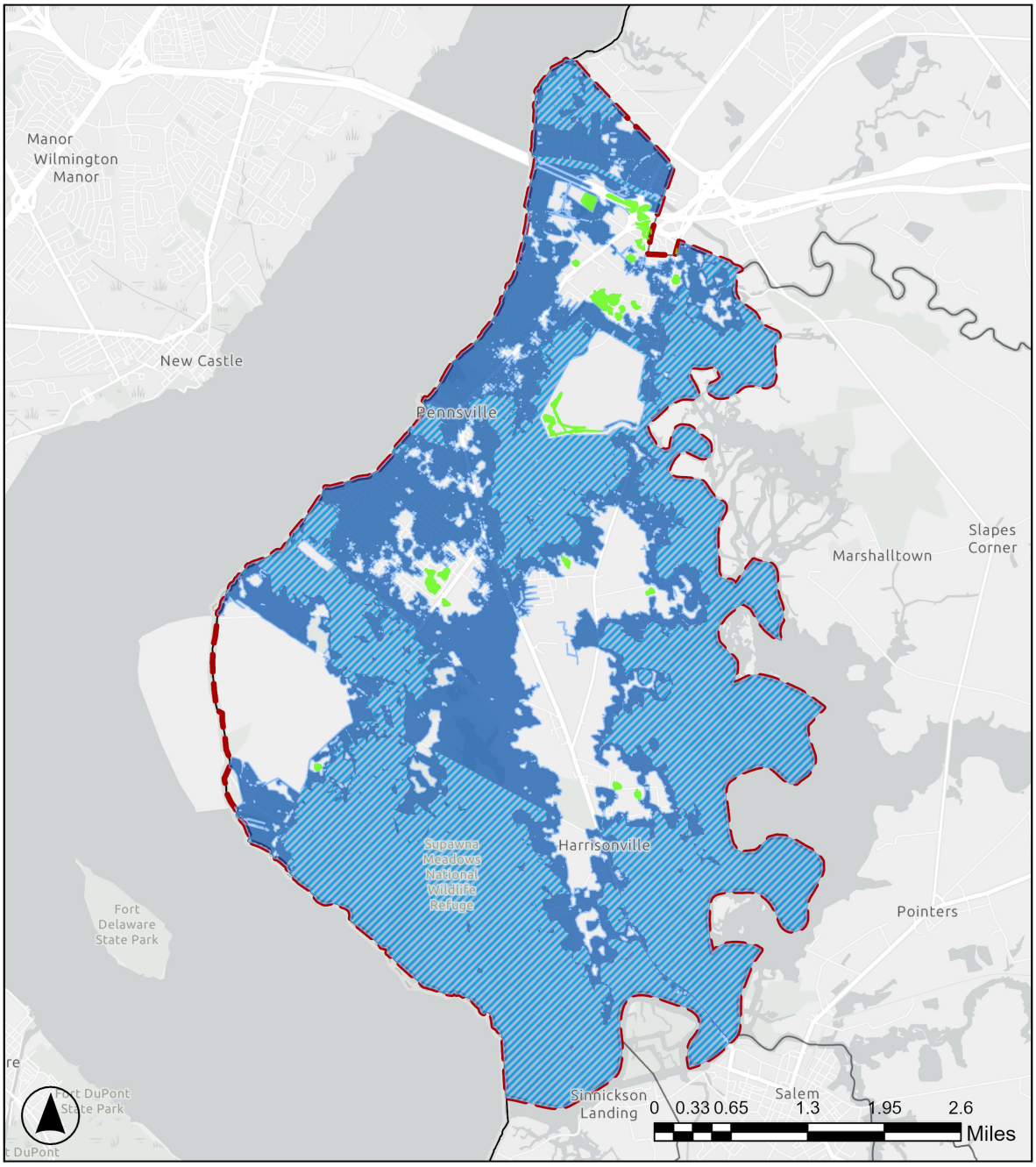
(Source: NJ Adapt)

2050 100-Year Storm

While sea-level rise causes permanent inundation, additional analysis of the 100-year storm compounded with sea-level rise helps to understand future temporary, extreme events. Map III-9 depicts the extent of potential inundation in Pennsville from a 100-year (1% chance) storm in 2050, including two feet of projected sea-level rise, resulting in approximately six feet of coastal inundation. The flood extent does not incorporate flooding due to rainfall, which may cause compounded impacts. The green "low-lying" areas on the map are below the elevation of the flood extent, and, as a result, have the potential to flood, but are hydrologically disconnected from the rest of the flooded area.

In 2050, projected inundation from a 100-year storm event would cause flood impacts across most of Pennsville's land area. Nearly all residential, commercial, and industrial areas would be completely inundated, with only some agricultural land along Route 49 and a small area in the northern section of the municipality would remain dry.

Map III-9. Potential inundation from coastal flooding from 100-year storm in 2050



LEGEND

100 Year Storm in 2050

6ft Coastal Inundation Extent

6ft Coastal Inundation Extent, Low Lying Areas

2ft Coastal Inundation Extent

(Source: NJ Adapt)

E. Wildfire

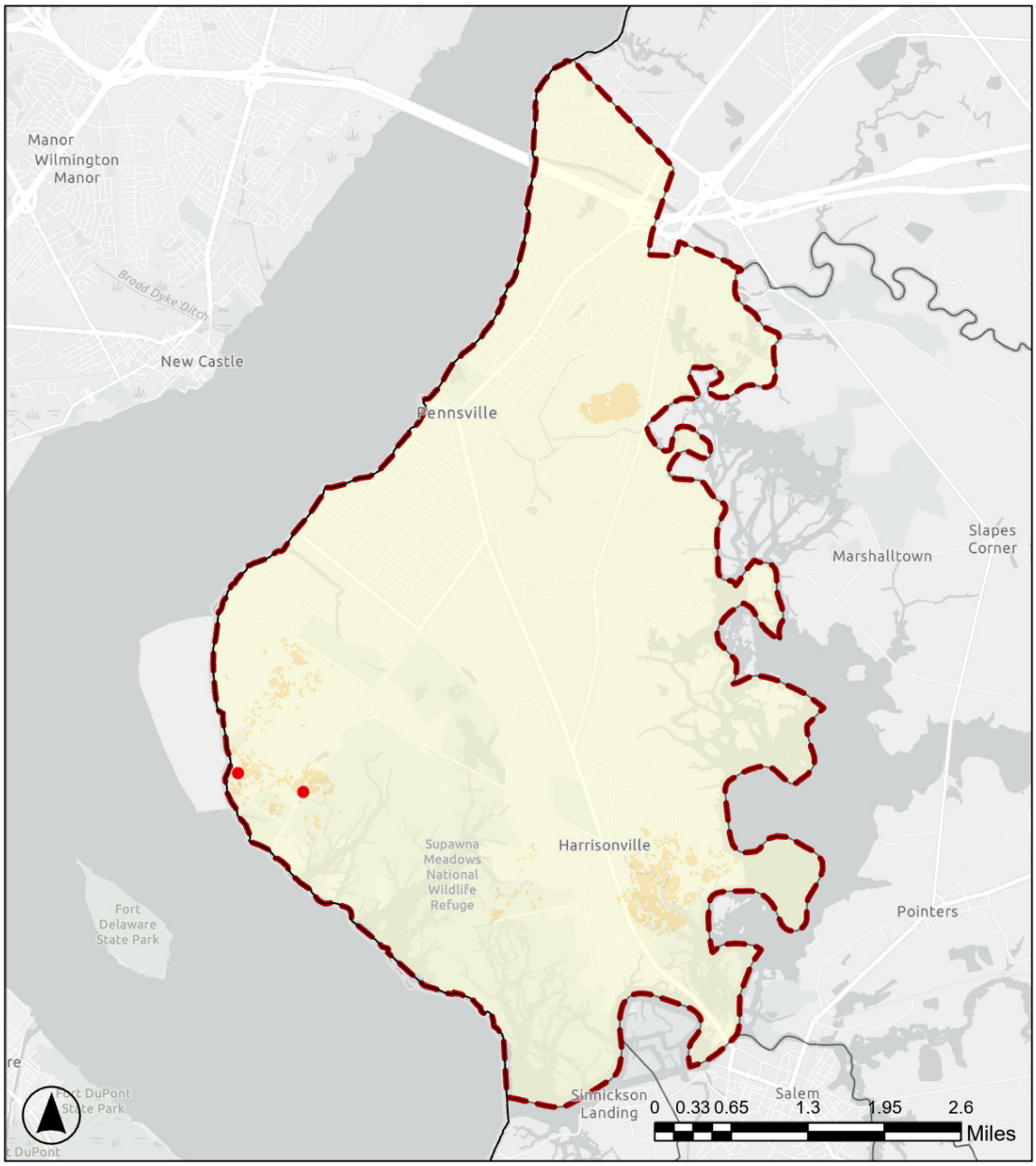
Wildfires are unplanned fires in natural areas including forests or grasslands. The NJCCRC's *State of the Climate: New Jersey 2024* reports that 798 wildfires burned 4,847 acres in New Jersey during the exceptionally dry 2024 fall season. Increasing temperatures are anticipated to cause greater evaporation and drier vegetation, exacerbating conditions contributing to wildfires. Beyond causing immediate damage to communities and infrastructure as well as severe economic impacts, wildfires also generate smoke filled with air pollutants that decrease air quality and pose serious risks to human health.

Wildfire hazards in Pennsville were assessed using historic wildfire data from the National Interagency Fire Center (NIFC)[14] and NOAA[15] and data on risk to potential structures from the NJ Wildfire Risk Assessment Portal.[16] The risk to potential structures dataset integrates modeled wildfire likelihood and intensity with generalized consequences to a structure on every pixel, allowing comparison of wildfire risk in locations with existing or future development.

Map III-10 depicts wildfire risk to potential structures and locations of historic wildfire incidents documented by the NFIC in Pennsville. Wildfire does not pose a significant risk to Pennsville or adjacent municipalities. Nearly all areas of the municipality are classified as low risk to potential structures, although four wildfire incidents were documented by NIFC and NOAA since 1950. In November 2001, unseasonably dry weather increased wildfire risks across the state. A fire burned four acres near Wingate Drive in Pennsville. A second fire burned more than 50 acres between Wingate Drive and Hook Road, causing voluntary evacuations of homes. In 2025, a human-caused incident was reported along Cemetery Road in February and another in the vicinity of Fort Mott Road was reported to have impacted 377 acres in March. Local stakeholders rank wildfire as having the lowest frequency of personal impact, consistent with its occasional and localized nature in the Township (Appendix B).

[14] National Interagency Fire Center. 2025. NIFC Open Data Site.
[15] National Centers for Environmental Information, National Oceanic and Atmospheric Administration. 2025. Storm Events Database.
[16] NJ Forest Fire Service. 2025. New Jersey Wildfire Risk Assessment Portal.

Map III-10. Wildfire risk to potential structures and select historic wildfires



LEGEND

Risk to Potential Structures

Low

High

NJ Wildland Fire Incident Locations

(Source: NJ Wildfire Risk Explorer and National Interagency Fire Center)

IV. Buildout Analysis

This section addresses the MLUL requirement that the CCRHVA include a "build out analysis of future residential, commercial, industrial, and other development in the municipality, and an assessment of the threats and vulnerabilities identified above related to that development." Certain areas within a municipality are not amenable to development, including wetlands, water bodies, and buffers around protected lands or species. This section identifies and analyzes the developable areas within the municipality with respect to the current zoning designations and exposure to current and future climate hazards. This analysis is a high-level planning exercise and should not be substituted for site-specific determinations of developability, which require field survey and professional engineering evaluation. This analysis differs from other methodologies of buildout analyses, such as those used in determining a municipality's realistic development potential to comply with affordable housing obligations.

The methodology used in this section includes the following steps:

1. Identifying the developable areas within Pennsville by determining and removing all areas that are protected from development;

2. Analyzing these areas with the current zoning districts and any areas identified by the municipality for redevelopment, then calculating the total potential development for these areas;

3. Analyzing the exposure of developable areas to heat and flooding. Flooding being the primary risk for Pennsville, this section details varying levels of exposure for potential lots and units, from areas that are expected to remain dry to those that may be completely inundated; and

4. Finally, identifying the developable areas and potential development least exposed to flooding.

A. Areas Protected from Development

Areas protected from development were identified based on two broad categories, detailed in Table IV-1 and represented in Map IV-1:

- Non-developable areas are the areas which are already developed with structures and infrastructure built on them (based on land use categories), water features, or wetlands.
- Constrained areas are those with development limitations due to environmental concerns (such as steep slopes, wetlands, critical habitats, etc.).

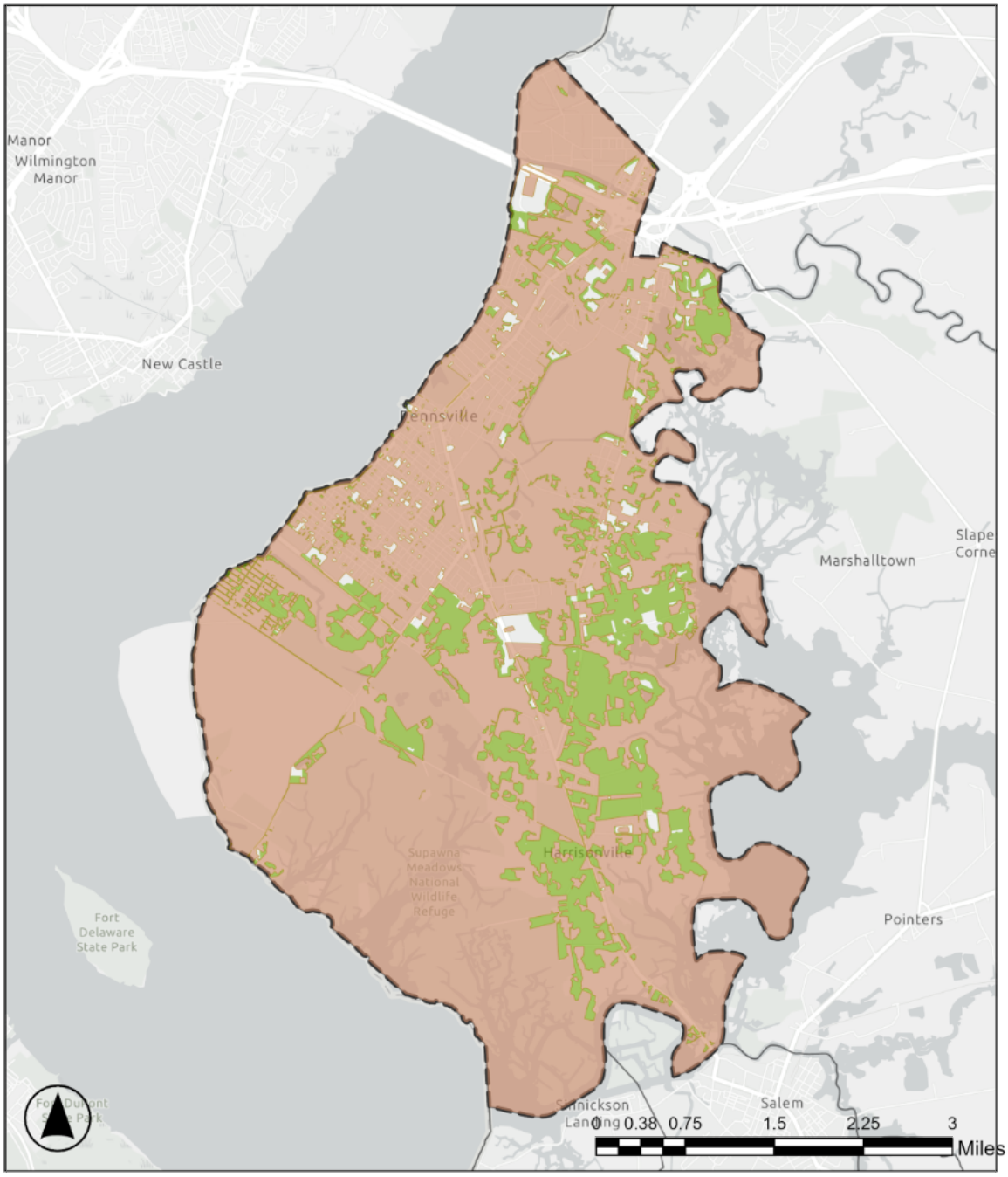
Table IV-1. Areas protected from development

Areas Protected from Development	Land Types	Datasets
Non-Developable Areas	Water, wetlands, transportation, barren land with extractive mining*, non-vacant urban land, publicly owned recreational lands, and open space/conserved land	• 2020 Land Use Land Cover Dataset • 2023 Parcel MOD-IV Composite • Protected Areas Database (PAD-US 4.1) • State, Local and Nonprofit Open Space of New Jersey • Preserved Farmland of New Jersey
Constrained Areas	• Riparian buffers for inland and coastal waters • Threatened and endangered species habitat • Regional Commissions, where applicable (Pinelands Management area, Highlands Preservation area, Hackensack Meadowlands District)	• Landscape Project v3.4 • Category One (C1) Waters of New Jersey • Preservation and Planning Area • Open Water Protection Area

Note: All land type categories and associated datasets identified in this table should be reviewed on a case-by-case basis to verify the nature, extent, and permanence of development restrictions.

** Barren land with extractive mining was included as a non-developable area due to the highly disruptive nature of these practices to the landscape. It is possible that future conditions after remediation of such sites may revert them to developable land and should be evaluated on a case-by-case basis.*

Map IV-1. Areas protected from development



B. Developable Areas

Developable areas were broadly identified through GIS-based mapping analysis to exclude the non-developable and constrained areas. The remaining developable areas consist primarily of undeveloped lands that are not subject to regulatory or environmental development restrictions. To further refine the developable areas, Pennsville's zoning ordinance was analyzed.

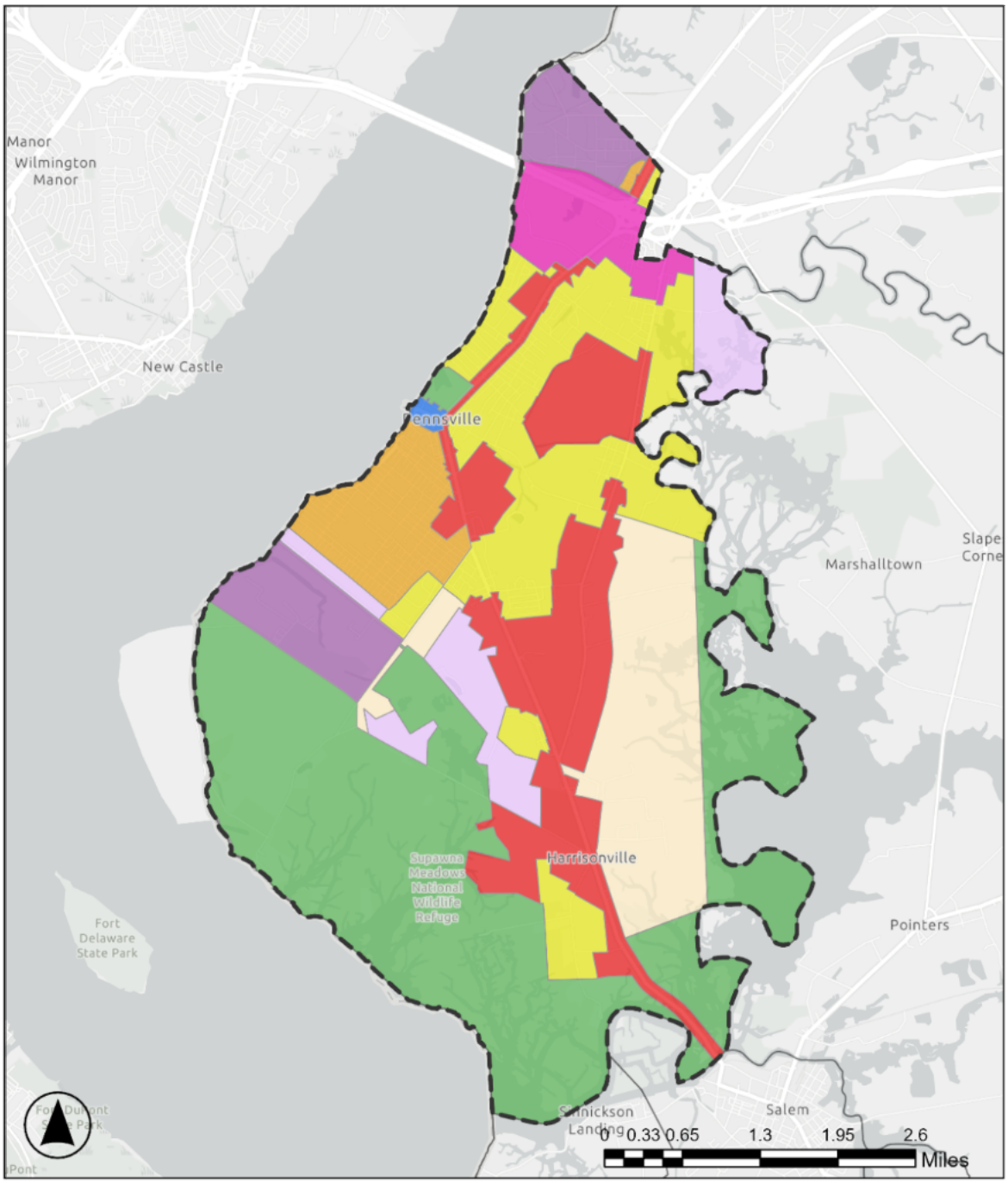
Zoning Analysis

Situated between the Delaware and Salem Rivers, Pennsville includes a mix of residential, commercial, and industrial land uses, with over half of its land area consisting of wetlands and agriculture (see Appendix A – Map A-2). Map IV-2 presents the zoning districts within the Township, which include: Business (BUS), Commercial (COM), Conservation (CON), Heavy Industrial (HI), Light Industrial (LI), Mixed Use (MU), and Residential (R-1, R-2, and R-3).

Conservation-designated lands constitute a significant portion of Pennsville's total land area, concentrated primarily along the eastern and southern boundaries including Supawna Meadows National Wildlife Refuge (see Section V.B. for further discussion of these lands). Residential development is distributed across three distinct zoning classifications and along with the commercial district forms the central section of the Township. The commercial zone runs along the major roads, namely Broadway and Hook Road.

Table IV-2 lists key developmental controls and minimum lot sizes permitted in each zoning district. The residential R-1 zone, which accommodates smaller-lot single-family development, is concentrated in the northern part of Pennsville. The residential R-3 zone, which requires the largest minimum lot size of 40,000 square feet, is located in the central-southern part and reflects a low-density development pattern.

Map IV-2. Zoning



Legend

Zoning Districts

- Business (BUS)
- Commercial (COM)
- Conservation (CON)
- Heavy Industrial (HI)
- Light Industrai (LI)
- Mixed Use (MU)
- Residential - R1
- Residentail - R2
- Residential - R3

Table IV-2. Pennsville zoning ordinance

Zoning District	Permitted Uses	Minimum Lot Size
CONS – Conservation	Open space, limited agri-use, passive recreation	a. Lot Area: 10 acres minimum b. Lot Frontage: 200 feet minimum c. Lot Width: 200 feet minimum
R-1 – Residential	Single-family dwellings	a. Lot Area: 10,000 square feet minimum b. Lot Frontage: 100 feet minimum c. Lot Width: 100 feet minimum d. Lot Depth: 85 feet minimum
R-2– Residential	Single-family dwellings	a. Lot Area: 15,000 square feet minimum b. Lot Frontage: 100 feet minimum c. Lot Width: 100 feet minimum d. Lot Depth: 85 feet minimum
R-3 – Residential	Single-family dwellings	a. Lot Area: 40,000 square feet minimum b. Lot Frontage: 200 feet minimum c. Lot Width: 200 feet minimum d. Lot Depth: 150 feet minimum
BUS – Business District	Commercial, retail, offices, some mixed use (if permitted)	a. Lot Area: 4,000 square feet minimum b. Lot Frontage: 30 feet minimum c. Lot Width: 30 feet minimum d. Lot Depth: 120 feet minimum
C – Commercial	Retail, offices, service establishments	a. Lot Area: 25,000 square feet minimum b. Lot Frontage: 100 feet minimum c. Lot Width: 100 feet minimum d. Lot Depth: 250 feet minimum
MU – Mixed Use	Residential above commercial, small-scale business	a. Lot Area: 2 acres minimum b. Lot Frontage: 200 feet minimum c. Lot Width: 200 feet minimum d. Lot Depth: 200 feet minimum
MU-2 – Inclusionary Mixed Use	Commercial + Residential with affordability component	No minimum listed

Continued on next page

TH, MF-1, MF-2, MF-3 – Townhouse/Multifamily	Higher-density residential, affordable housing (MF-3 = 100% affordable)	No minimum listed
LI – Light Industrial	Warehousing, light manufacturing, labs	a. Lot Area: 2 acres minimum b. Lot Frontage: 200 feet minimum c. Lot Width: 200 feet minimum d. Lot Depth: 200 feet minimum
HI – Heavy Industrial	Large-scale manufacturing, utility uses	a. Lot Area: 2 acres minimum b. Lot Frontage: 200 feet minimum c. Lot Width: 200 feet minimum d. Lot Depth: 200 feet minimum
General Rules (All Zones)	One principal building per lot (unless exception); all lots must front public road; no mixed commercial-residential uses unless allowed	

(Source: Pennsville Land Use Ordinances, Chapter 5 – Zoning)

Buildout Analysis

After broadly identifying the developable areas, the GIS-based zoning analysis resolved spatial discrepancies, including large land areas spanning multiple zoning districts and small, irregular parcels that did not conform to the minimum lot size requirements of the applicable zoning designation.

Map IV-3 illustrates the developable areas resulting from this analysis along with the zoning districts of Pennsville. The areas vary in shape and size and are not individual tax parcels but rather consolidated areas that are available for future development. Along with developable areas, the areas in need of redevelopment identified by Pennsville are also shown on this map which are primarily in the mixed use and heavy industrial zoning districts.

Table IV-3 shows the total available areas for development along with their development potential, calculated by applying an 80% gross-to-net conversion factor[17] to account for roads, stormwater infrastructure, and utility easements. After calculating the net area, the minimum lot size requirement was used to determine the number of potential lots. As the permitted use within residential zones in Pennsville (R1, R2 and R3) is single-family housing, the number of lots is

[17] Lathrop, R.G., and Myers, J. 2023. Buildout analysis for the Southern Barnegat Bay Watershed. Center for Remote Sensing and Spatial Analysis, Rutgers University.

equivalent to the number of potential units for development; these lots are labeled. For all other zoning districts, multiple units might be part of the future development. This analysis does not calculate the number of units and is limited to calculating the number of potential lots based on the zoning regulations. A total of 169 developable areas are identified across all zoning districts. Of these, 118 areas are located within the three residential zoning districts (R1, R2, R3), with a potential for 275 lots. The commercial zoning district (COM) contains 30 developable areas with a potential for 118 new lots. Assuming all developable areas are available to be developed to their full potential, the total buildout for Pennsville across the residential, commercial, business, light industrial, and mixed use zones is estimated at 437 potential lots.

Map IV-3. Developable areas and zoning districts in Pennsville

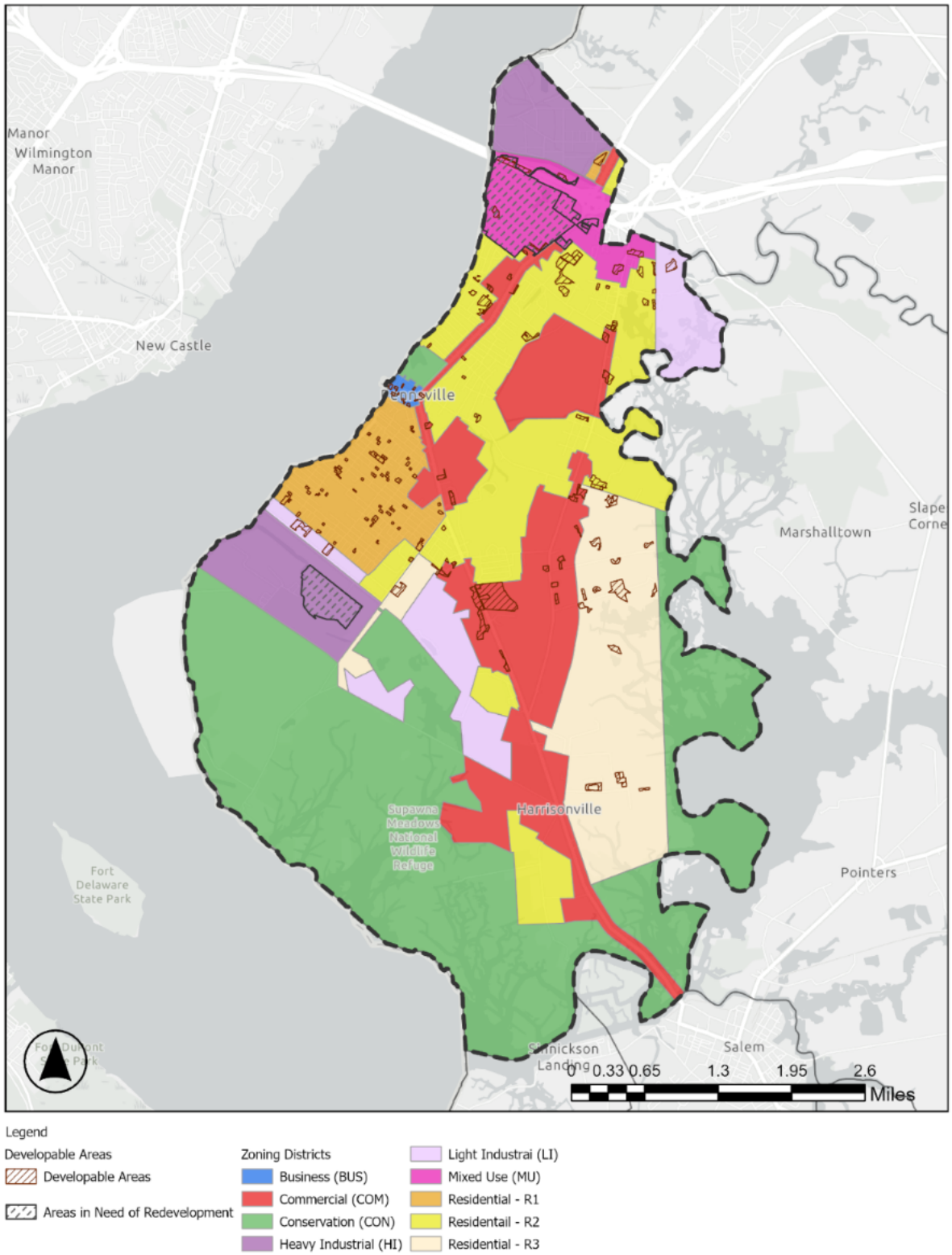


Table IV-3. Developable areas and development potential

Zoning District	Number of Developable Areas	Gross Developable Area (Sq. Ft.)	Net Developable Area (Sq. Ft.)	Minimum Lot Size (Sq. Ft.)	Potential Number of Lots
Business	10	147,493	117,994	4,000	29
Commercial	30	3,674,342	2,939,474	25,000	118
Light Industrial	3	608,279	486,623	87,120	6
Mixed Use	8	1,008,499	806,799	87,120	9
R1 – Residential	63	1,356,014	1,084,811	10,000	108
R2 - Residential	35	2,401,169	1,920,935	15,000	128
R3 - Residential	20	1,943,131	1,554,505	40,000	39
Total	169	11,138,927	8,911,142		437

Areas in need of Redevelopment

New Jersey's Local Redevelopment and Housing Law (LRHL) authorizes municipalities to designate underutilized or substandard properties as areas in need of redevelopment and to transform them into healthier, more vibrant, or economically productive spaces. The redevelopment process has its own regulatory requirements and approvals under the LRHL, and hence the development potential for these areas is not included within this buildout analysis.

Map IV-4 and IV-5 show the flood exposure of the four redevelopment areas, labeled as “Redev Areas 1 through 4.” Flood exposure is categorized as follows:

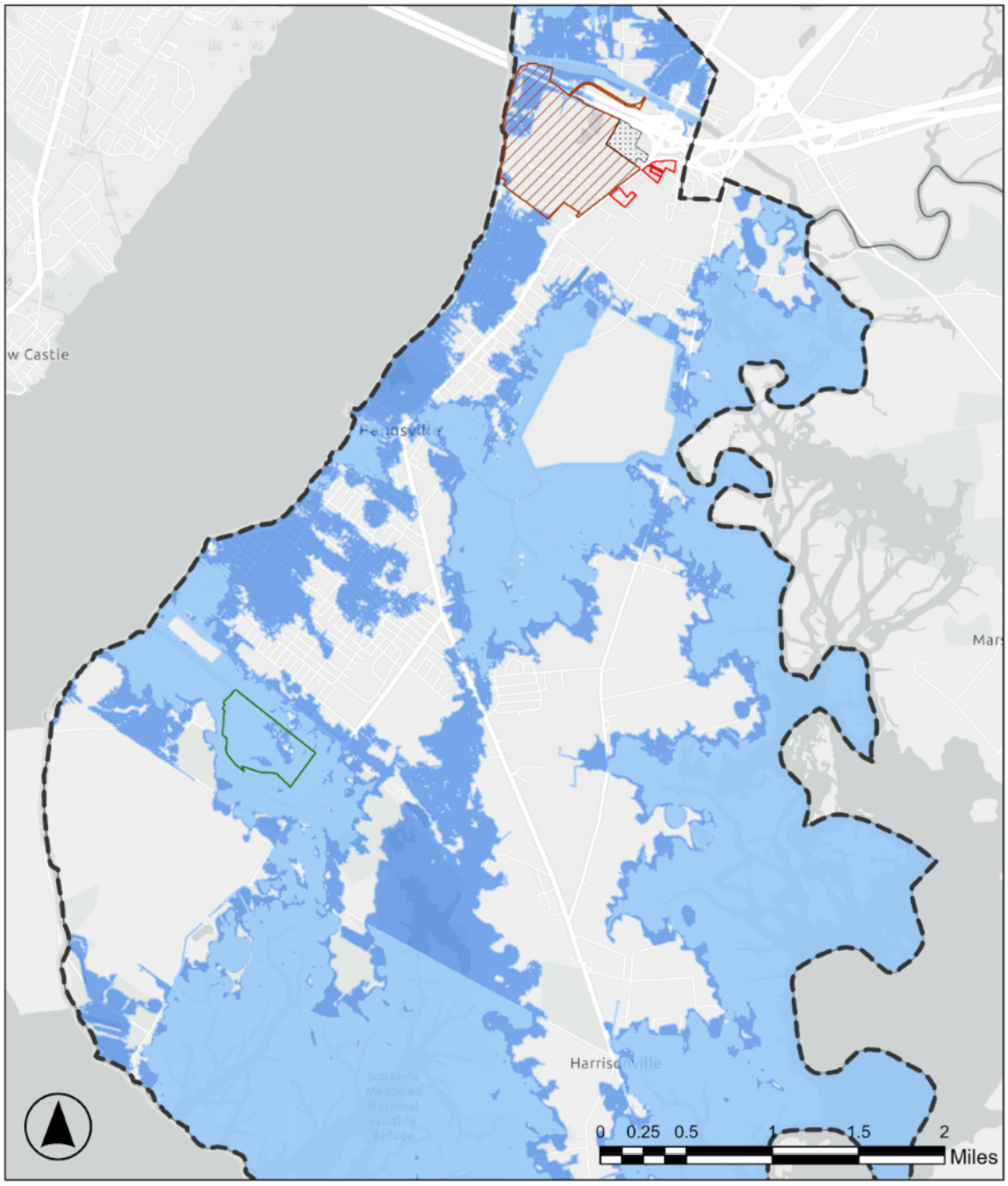
- Not inundated: 0% of the area is exposed to flooding
- Limited inundation: 1% to 50% of the area is exposed to flooding
- Considerable inundation: 51% to 99% of the area is exposed to flooding
- Completely inundated: 100% of the area exposed to flooding

Table IV-4 shows that Area 1 has some exposure. Areas 2 and 3 do not have any flood exposure at the 2 feet, 4 feet, as well as FEMA 1pct chance flood scenarios, but they are at considerable exposure within NJDEP Climate Adjusted Flood Elevation (CAFE). Area 4 is significantly inundated or at risk in all four scenarios. The purpose of this analysis is to highlight flooding challenges and support informed redevelopment decisions.

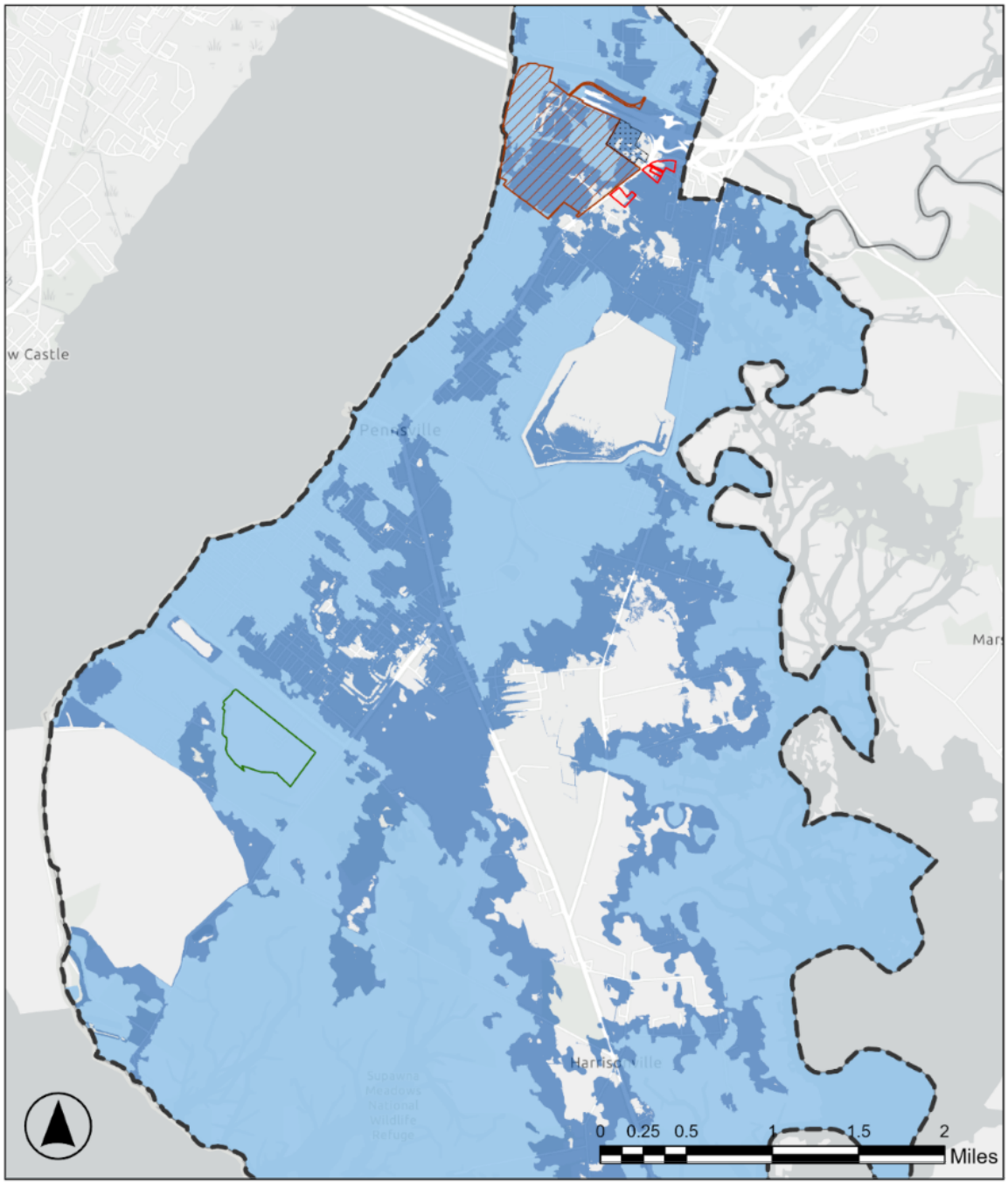
Table IV-4. Flood exposure of the areas in need of redevelopment

Area in need of redevelopment	Exposed at ...			
	2 feet coastal inundation	4 feet coastal inundation	FEMA 1% Annual Chance Flood	Approx. extent of CAFE
Redev Area 1	No	Limited	Considerable	Considerable
Redev Area 2	No	No	No	Considerable
Redev Area 3	No	No	No	Considerable
Redev Area 4	Considerable	Considerable	Completely at risk	Completely at risk

Map IV-4. Areas in need of redevelopment exposed at 2 feet and 4 feet coastal inundation



Map IV-5. Areas in need of redevelopment within FEMA flood zones

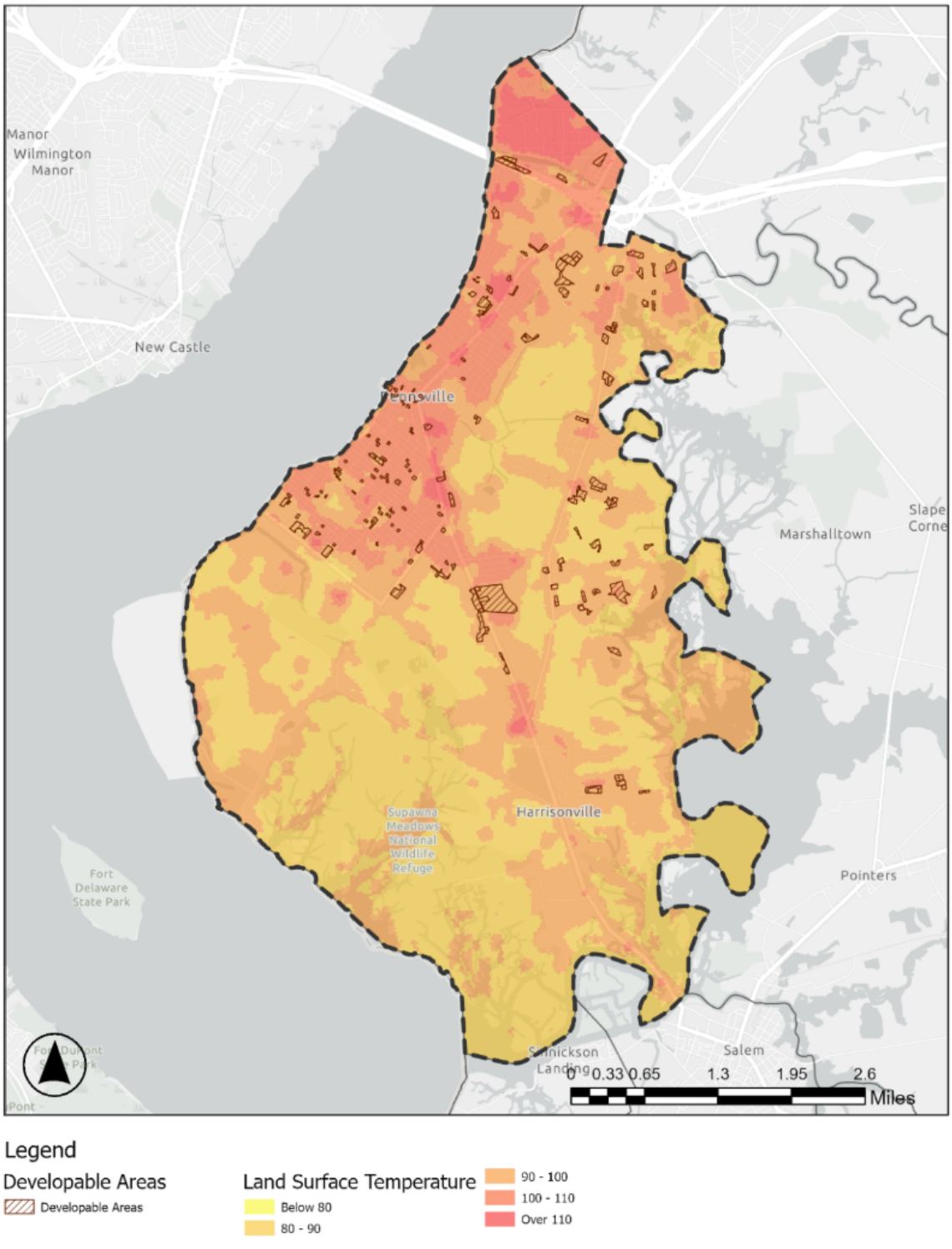


C. Exposure of Developable Areas

Identifying the climate hazard exposure of developable areas is the critical component of this built-out analysis to support decisions about where future development may face significant risk. This exposure analysis identifies how heat and flooding are projected to impact the development potential identified in Table IV-3.

Map IV-6shows the developable areas with respect to land surface temperature. As detailed in Section III.A, temperature projections indicate that Pennsville may experience increasing heat throughout the century. Since impervious cover, including buildings and streets, trap more heat, Pennsville shows a pattern of higher temperatures in residential, commercial and industrial zoning districts. Developable areas are scattered over these zones and may require consideration of heat mitigation strategies for new development.

Map IV-6. Developable areas and land surface temperature (°F)



Maps IV-7 through IV-10 depict the flood exposure of developable areas for each of the four flood measures listed in Table III-8 (two feet coastal inundation, four feet coastal inundation, FEMA 1% annual chance flood zone, and NJDEP Climate Adjusted Flood Elevation (CAFE)). Across all four flood scenarios, a clear pattern emerges in how developable areas are distributed among inundation categories. At 2 feet of coastal inundation most of the developable areas are not exposed to flooding; this outcome substantially changes for the 4 feet coastal inundation and FEMA 1% annual chance flood scenarios in which many areas towards the west of Pennsville are exposed to considerable or complete flood risk. Within the NJDEP Climate Adjusted Flood Elevation, only a few developable areas around S Broadway and S Hook Road have limited or no exposure to inundation.

Tables IV-5 through IV-8 present the areas impacted by each of these flood measures, respectively. For these flood exposure categories, the number of potential lots exposed is calculated using the 80% gross-to-net conversion factor and minimum lot sizes. At 2 feet of coastal inundation, 161 of 169 developable areas remain either not inundated or experience only limited inundation, with the remaining 8 areas facing considerable or complete inundation. As the flood scenario increases to 4 feet, the distribution shifts notably, with 91 of 169 developable areas falling into the considerable and completely inundated categories, the majority of which are in residential zones. The FEMA 1% annual chance flood scenario follows a similar pattern to the 4-foot scenario, with 54 of 169 of developable areas facing complete flood risk, especially in the Business, Commercial, R1, and R2 Residential zones. Within the NJDEP Climate Adjusted Flood Elevation only 20 of 169 developable areas remain either not exposed or experience only limited flood exposure, while 123 are completely at risk.

Table IV-5. Developable areas with development potential exposed at 2 feet coastal inundation

Zone ID	Total No. of Developable Areas	Not Inundated (0%)				Limited Inundation (1 - 50%)				Considerable Inundation (51 - 99%)				Completely Inundated (100%)			
		No. of Developable Areas	Gross Area (Sq Ft)	Net Area (Sq Ft)	Units/ Lots	No. of Developable Areas	Gross Area (Sq Ft)	Net Area (Sq Ft)	Units/Lots	No. of Developable Areas	Gross Area (Sq Ft)	Net Area (Sq Ft)	Units/Lots	No. of Developable Areas	Gross Area (Sq Ft)	Net Area (Sq Ft)	Units/Lots
Business	10	3	29,333	23,466	6	6	112,845	90,276	23	-	-	-	-	1	5,315	4,252	1
Commercial	30	30	3,674,342	2,939,474	118	-	-	-	-	-	-	-	-	-	-	-	-
Light Industrial	3	2	333,901	267,121	3	1	274,378	219,502	3	-	-	-	-	-	-	-	-
Mixed Use	8	6	714,591	571,673	7	2	293,908	235,126	3	-	-	-	-	-	-	-	-
R1 - Residential	63	57	1,181,627	945,302	95	3	54,802	43,842	4	-	-	-	-	3	119,585	95,668	10
R2 - Residential	35	27	1,965,341	1,572,273	105	4	164,811	131,849	9	1	66,120	52,896	4	3	204,897	163,918	11
R3 - Residential	20	16	1,633,263	1,306,610	33	4	309,868	247,894	6	-	-	-	-	-	-	-	-
Total	**169**	**141**	**9,532,398**	**7,625,918**	**365**	**20**	**1,210,612**	**968,490**	**47**	**1**	**66,120**	**52,896**	**4**	**7**	**329,797**	**263,838**	**22**

Table IV-6. Developable areas with development potential exposed at 4 feet coastal inundation

Zone ID	Total No. of Developable Areas	Not Inundated (0%)				Limited Inundation (1 - 50%)				Considerable Inundation (51 - 99%)				Completely Inundated (100%)			
		No. of Developable Areas	Gross Area (Sq Ft)	Net Area (Sq Ft)	Units/Lots	No. of Developable Areas	Gross Area (Sq Ft)	Net Area (Sq Ft)	Units/Lots	No. of Developable Areas	Gross Area (Sq Ft)	Net Area (Sq Ft)	Units/Lots	No. of Developable Areas	Gross Area (Sq Ft)	Net Area (Sq Ft)	Units/Lots
Business	10	-	-	-	-	-	-	-	-	2	27,684	22,147	6	8	119,809	95,847	24
Commercial	30	19	2,812,035	2,249,628	90	4	457,215	365,772	15	4	311,683	249,346	10	3	93,409	74,727	3
Light Industrial	3	1	151,472	121,178	1	1	182,429	145,943	2	1	274,378	219,502	3	-	-	-	-
Mixed Use	8	4	433,617	346,894	4	1	160,252	128,202	1	3	414,630	331,704	4	-	-	-	-
R1 - Residential	63	19	380,694	304,555	30	1	17,172	13,738	1	13	236,111	188,889	19	30	722,037	577,630	58
R2 - Residential	35	12	1,040,578	832,462	55	5	431,739	345,391	23	7	299,642	239,714	16	11	629,210	503,368	34
R3 - Residential	20	5	326,680	261,344	7	6	887,580	710,064	18	7	634,730	507,784	13	2	94,141	75,313	2
Total	**169**	**60**	**5,145,076**	**4,116,061**	**188**	**18**	**2,136,387**	**1,709,110**	**60**	**37**	**2,198,858**	**1,759,086**	**69**	**54**	**1,658,606**	**1,326,885**	**120**

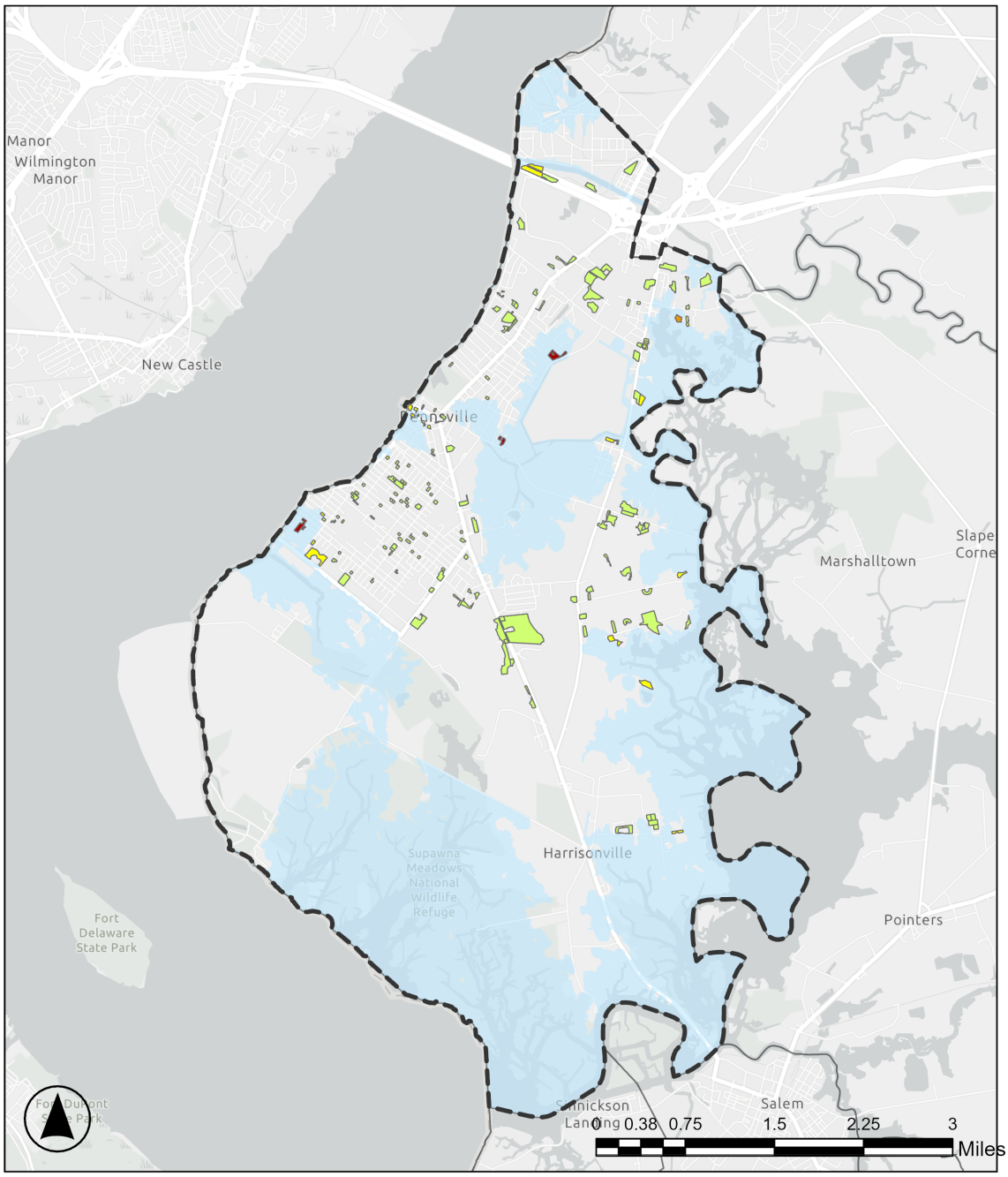
Table IV-7. Developable areas with development potential exposed within FEMA 1pct annual chance flood

Zone ID	Total No. of Developable Areas	Not Inundated (0%)				Limited Inundation (1 - 50%)				Considerable Inundation (51 - 99%)				Completely Inundated (100%)			
		No. of Developable Areas	Gross Area (sq Ft)	Net Area (Sq Ft)	Units/Lots	No. of Developable Areas	Gross Area (Sq Ft)	Net Area (Sq Ft)	Units/Lots	No. of Developable Areas	Gross Area (Sq Ft)	Net Area (Sq Ft)	Units/Lots	No. of Developable Areas	Gross Area (Sq Ft)	Net Area (Sq Ft)	Units/Lots
Business	10	-	-	-	-	-	-	-	-	1	7,803	6,242	2	9	139,690	111,752	284
Commercial	30	24	3,333,589	2,666,871	107	2	135,620	169,525	7	-	-	-	-	4	205,133	164,106	7
Light Industrial	3	1	182,429	145,943	2	1	151,472	189,340	2	1	274,378	219,502	3	-	-	-	-
Mixed Use	8	4	491,812	393,450	5	2	222,779	278,474	3	1	196,992	157,594	2	1	96,916	77,533	1
R1 – Residential	63	17	336,480	269,184	27	6	95,455	119,319	12	8	98,968	79,174	8	32	825,111	660,089	66
R2 – Residential	35	19	1,536,268	1,229,014	82	3	52,520	65,650	4	5	200,654	160,523	11	8	611,727	489,382	33
R3 – Residential	20	19	1,888,170	1,510,536	38	1	54,961	68,701	2	-	-	-	-	-	-	-	-
Total	**169**	**84**	**7,768,748**	**6,214,998**	**259**	**15**	**712,807**	**891,009**	**30**	**16**	**778,795**	**623,036**	**25**	**54**	**1,878,577**	**1,502,862**	**134**

Table IV-8. Developable areas with development potential exposed within approx. extent of CAFE

Zone ID	Total No. of Developable Areas	Not Inundated (0%)				Limited Inundation (1 - 50%)				Considerable Inundation (51 - 99%)				Completely Inundated (100%)			
		No. of Developable Areas	Gross Area (sq Ft)	Net Area (Sq Ft)	Units/Lots	No. of Developable Areas	Gross Area (Sq Ft)	Net Area (Sq Ft)	Units/Lots	No. of Developable Areas	Gross Area (Sq Ft)	Net Area (Sq Ft)	Units/Lots	No. of Developable Areas	Gross Area (Sq Ft)	Net Area (Sq Ft)	Units/Lots
Business	10	-	-	-	-	-	-			-	-	-		10	147,493	117,994	29
Commercial	30	9	394,479	315,583	13	3	2,003,919	1,603,135	64	4	442,133	353,706	14	14	833,811	667,049	27
Light Industrial	3	-	-	-	-	0	-	-	-	-	-	-	-	3	608,279	486,623	6
Mixed Use	8	-	-	-	-	1	92,830	74,264	1	-	-	-	-	7	915,669	732,535	8
R1 - Residential	63	-		-	-	2	92,843	74,274	7	5	96,268	77,014	8	56	1,166,903	933,522	93
R2 - Residential	35	-	-	-	-	1	28,565	22,852	2	9	887,812	710,250	47	25	1,484,792	1,187,834	79
R3 - Residential	20	2	174,849	139,879	3	2	542,813	434,250	11	8	588,132	470,506	12	8	637,337	509,870	13
Total	**169**	**11**	**569,328**	**455,462**	**16**	**9**	**2,760,970**	**2,208,776**	**85**	**26**	**2,014,345**	**1,611,476**	**81**	**123**	**5,794,284**	**4,635,427**	**255**

Map IV-7. Levels of flood exposure for developable areas with development potential at 2 feet coastal inundation



Legend

Coastal Inundation Extent

2ft Coastal Inundation Extent

Developable Areas - 2ft Coastal Inundation

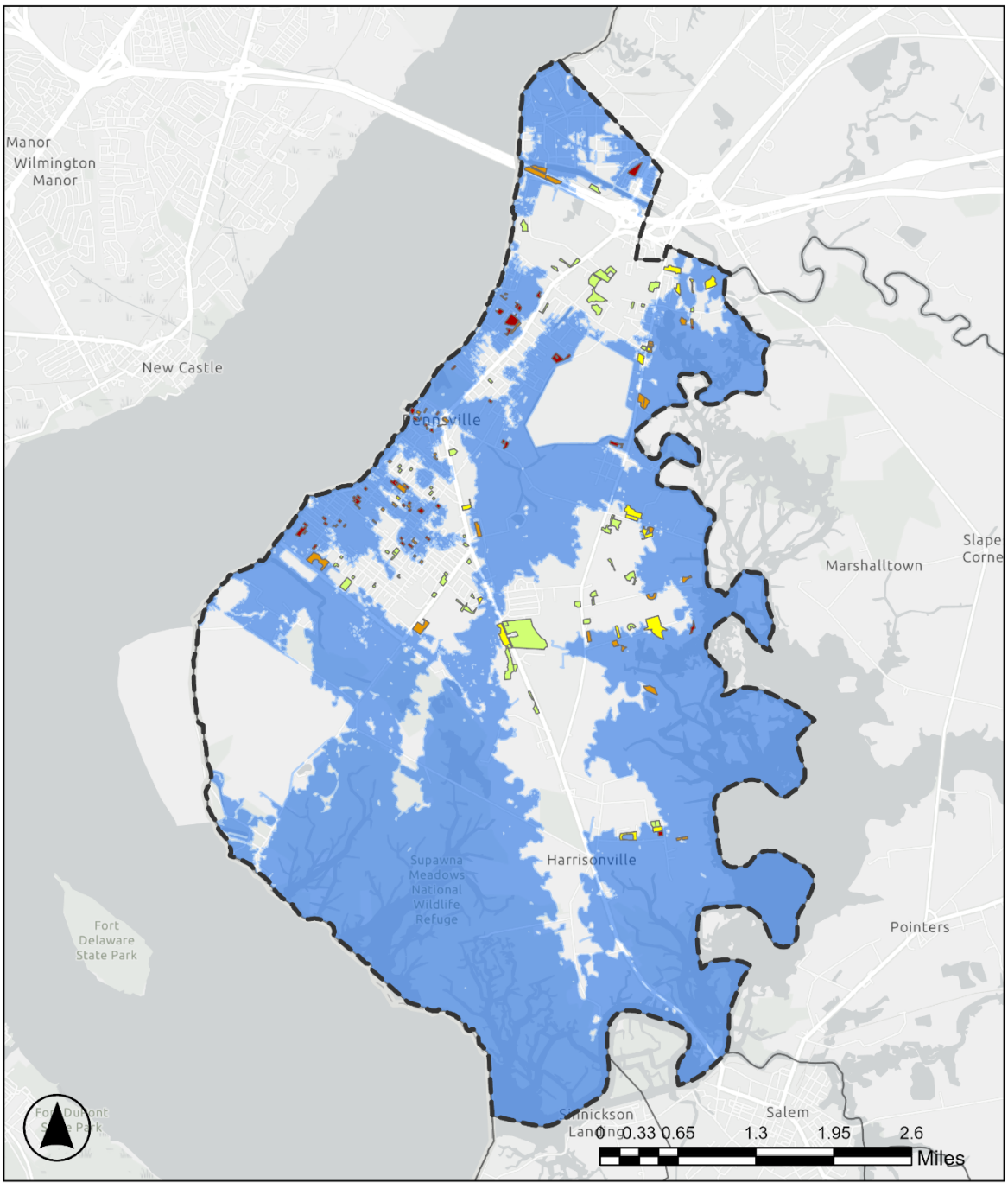
Not Inundated

Limited Inundation

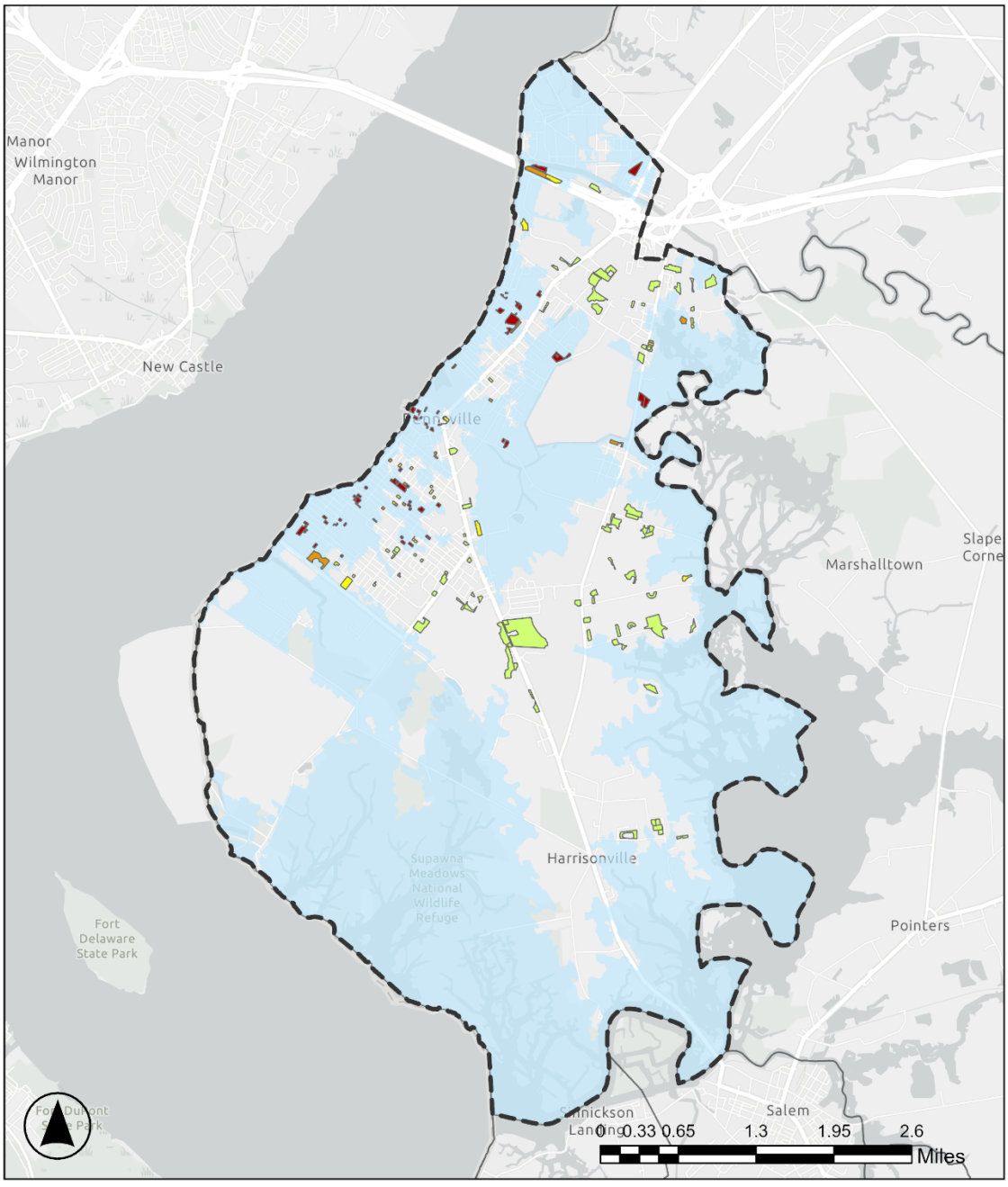
Considerable Inundation

Completely Inundated

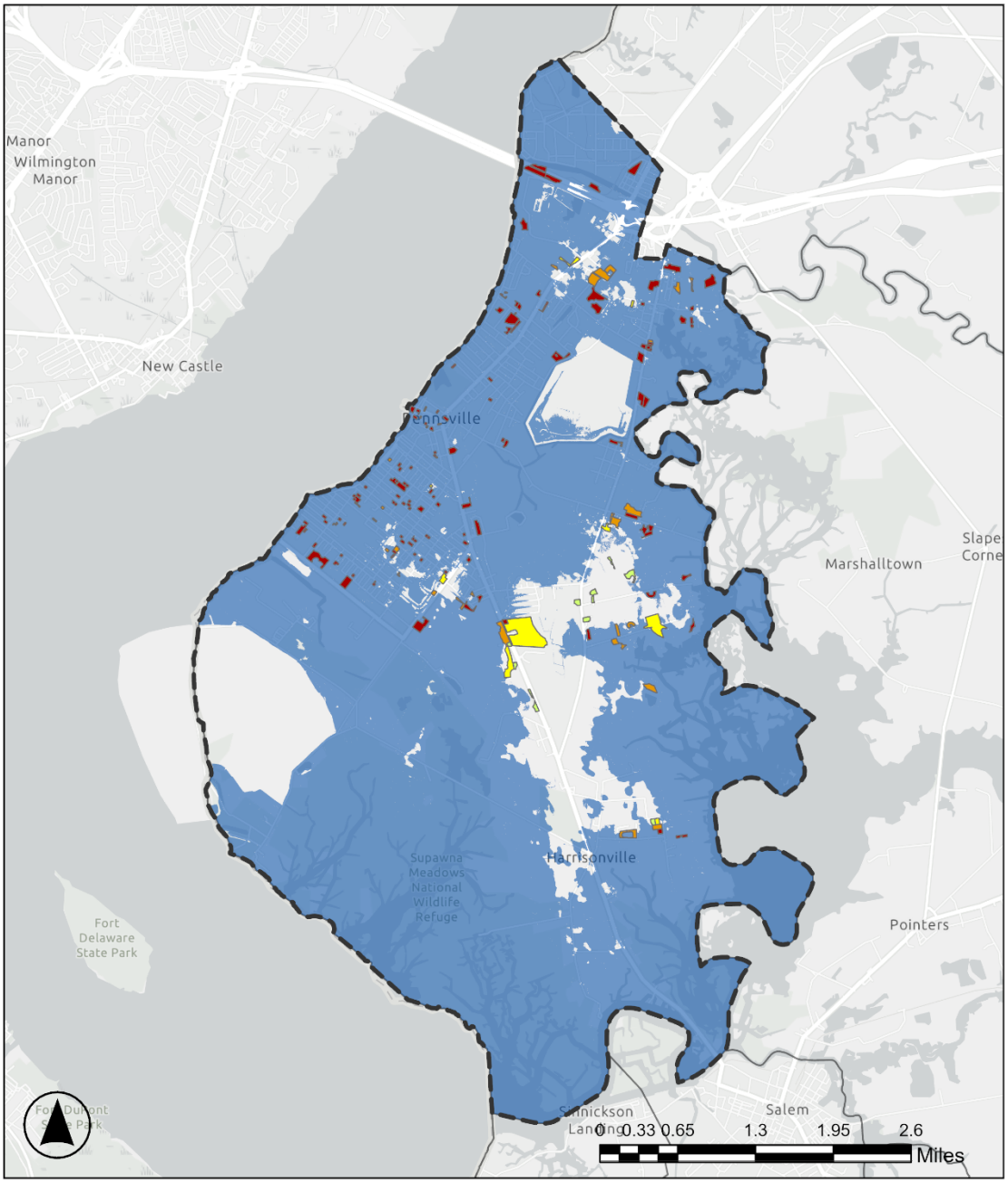
Map IV-8. Levels of flood exposure for developable areas with development potential at 4 feet coastal inundation



Map IV-9. Levels of flood exposure for developable areas with development potential within FEMA 1pct Annual Chance Flood



Map IV-10. Levels of flood exposure for developable areas with development potential within approx. extent of CAFE



Legend

Flood Scenario

Approx. extent of REAL CAFE

Developable Areas - Approx. extent of REAL CAFE

Not Inundated

Limited Inundation

Considerable Inundation

Completely Inundated

Areas with Least Flood Exposure

Focusing specifically on areas that are either not inundated or experience only limited inundation, the 2-foot scenario presents the least impact, with the majority of developable areas and their associated potential lots across all zones with no or limited exposure. At this flood level, the not inundated category alone accounts for 365 potential lots across all zones, with the largest shares within Commercial and R2 Residential zones. However, as the flood scenario increases to 4 feet, both the number of developable areas and the corresponding potential lots in these two safer categories decline noticeably, with the combined total falling to 248 lots. Under the FEMA 1% annual chance flood scenario, this pattern continues, with the not inundated and limited inundation categories together accounting for 289 potential lots, though the distribution shifts more heavily toward limited inundation than toward areas with no exposure. Within the NJDEP Climate Adjusted Flood Elevation CAFE scenario, the not inundated category has only 11 developable areas with 16 potential lots, and the limited inundation category retains only 85 potential lots across all zones, representing a major reduction from earlier scenarios.

The buildout analysis presented in this section establishes a planning-level baseline for understanding future development potential within Pennsville and its relationship to the climate-related hazards of heat and flooding. The analysis may help inform the evaluation of potential strategies, such as exploring rezoning opportunities in areas with lower flood exposure for mixed-use or identifying underutilized developed areas for redevelopment. Opportunities for risk-informed density transfer, the reallocation of development potential from areas of higher flood risk to areas of comparatively lower flood risk, may also be worth exploring as part of a broader resilience strategy. Additionally, proactive land-use policies, investment in coastal resilience infrastructure, and zoning approaches that balance development opportunities with long-term flood risk management could be considered as Pennsville looks toward its future growth.

V. Exposure and Vulnerability Assessment

New Jersey's MLUL requires a CCRHVA to identify "critical facilities, utilities, roadways, and other infrastructure that is necessary for evacuation purposes and for sustaining quality of life during a natural disaster, to be maintained at all times in an operational state." This section addresses and significantly expands upon that requirement, analyzing the climate hazard exposures of additional community facilities, assets, and population groups of importance to local planning. Where applicable, for consistency with Hazard Mitigation Planning, this section is categorized to facilitate alignment with FEMA Community Lifelines.

A. Facilities and Infrastructure

This sub-section addresses the MLUL's requirement for a CCRHVA to identify "critical facilities, utilities, roadways, and other infrastructure that is necessary for evacuation purposes and for sustaining quality of life during a natural disaster." It includes analysis of the following:

- **Critical facilities that are essential to maintain quality of life** – These include facilities related to education (e.g. schools and childcare centers), safety and security (e.g. law enforcement, fire stations, and emergency operation centers), health and medical care (e.g. hospitals, dialysis centers, VA medical facilities, and nursing homes), and commercial facilities that provide essential shopping and services (e.g. grocery stores, pharmacies, urgent care facilities, and banks).
- **Infrastructure and utilities necessary to maintain services** – These include facilities related to transportation and evacuation routes (e.g. roads, public transit, aircraft landing facilities, ferry terminals, gas stations, EV charging stations, and rail lines), energy (e.g. power plants), and water systems (e.g. wastewater treatment plants).
- **Hazardous facilities and known contaminated sites** – These are included in order to assess the potential for climate hazards to contribute to releases of hazardous materials.

These facilities, sites, and assets fall within the following FEMA Community Lifelines: Safety and Security; Health and Medical; Food, Water, Shelter; Transportation; Energy; Communications; Water Systems; Hazardous Materials. Climate risks to facilities and infrastructure are related to the asset's exposure to hazards and its ability to operate during or despite climate-related weather events. Risks also depend upon the ability of responders to provide services to the community from the asset and the ability of residents to access the services they provide.

Heat

As detailed in Section III.A, temperature projections indicate that Pennsville may experience increasing temperature and heat waves throughout the century. Increasing temperatures can have a variety of impacts on facilities and infrastructure as outlined below. Additionally, increasing temperatures will require greater health and medical services response. This may include planning for increased mobilization to and from health facilities and cooling centers. Additionally, schools have experienced operational challenges related to extreme heat. Older facilities often are not

equipped with central air conditioners and may not be safe during extreme heat events. Map V-1 shows the two designated cooling centers for heat emergencies within Pennsville. For large crowds, Pennsville Memorial High School is used, while the Municipal Building serves as a designated cooling center for smaller groups of residents.

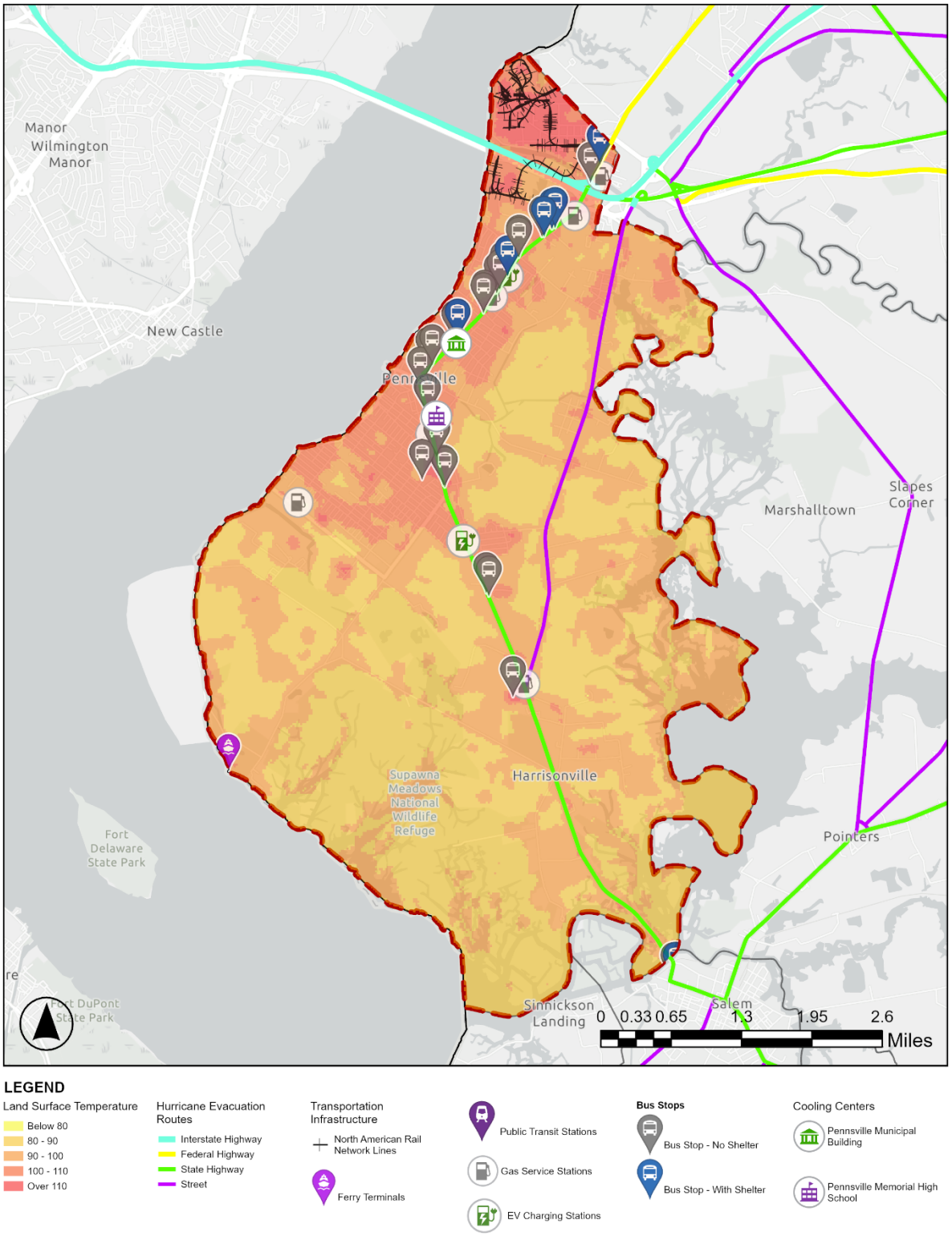
Potential impacts from heat on facilities and infrastructure include:

- **Energy systems** - Extreme heat can act as a stressor on New Jersey's energy systems due to increased demand for electricity for cooling and heating.[18] Heat can impact energy infrastructure, increasing the likelihood of mechanical issues or service disruption. The power plant operated by Atlantic City Electric near North Broadway has been demolished. Pennsville has two electric substations, one near Canal Street in the northern part of the township and one near South Broadway, both of which are within an area of elevated land surface temperature.
- **Communications infrastructure** - Communications infrastructure is critical to the daily functions of municipalities and is especially vital to emergency response and management. Communication infrastructure can be physical or cyber and is vital to the functionality of other infrastructure systems like utilities and transportation. Extreme heat can be a threat to telecommunications that are already high heat generators with temperature thresholds that may not be designed to endure extreme heat. Intense heat waves can cause overheating of machinery, increase fire risks, and lead to malfunctions in cooling systems. Failure or degradation of equipment catalyzes a slowdown of services across all other facilities and infrastructure. There are several communications towers in Pennsville. Most are concentrated towards the northern part of the township (above Rt 295) within an area of elevated land surface temperature.
- **Facilities storing or transporting hazardous materials** - Hazardous materials are also of concern during extreme heat events since nearly all chemicals are affected by heat. Extreme temperatures can impact the storage and transport of hazardous materials, especially if they are volatile.[19] Pennsville has three large industrial sites, Known Contaminated Sites, and one scrap metal facility. The two main industrial sites, namely Chemours Works (formerly DuPont) and Siegfried, hold several regulatory designations for potential hazardous materials storage and/or transport (see Map V-2). Transportation systems - Heat also impacts transportation. High temperatures can warp materials and reduce the reliability of air, land, and maritime systems. This impacts how goods and people move across all travel modes, including roads, railways, public transit, active transportation, water transport, and aviation infrastructure. Map V-1 depicts transportation assets in Pennsville that may be impacted by increasing temperatures. Key transportation infrastructure is located in areas of relatively high land surface temperatures. All of the municipality's NJ Transit bus stops are located along Broadway, where land surface temperatures can range from 90 to 110 °F. Only one bus

[18] Filión, N.A., Knutsen, M., and Phillips, S. New Jersey Department of Environmental Protection. 2025. New Jersey Extreme Heat Resilience Action Plan.
[19] New Jersey Office of Emergency Management. 2024. State of New Jersey All-Hazards Mitigation Plan.

stop along this route has a shelter. Additionally, rail lines servicing the Chemours Works facility in the northern part of the municipality experience land surface temperatures exceeding 110 °F. Risks posed by high temperatures include accelerated degradation of roads and railways, power system failures due to overheating, and public safety concerns for pedestrians and transit riders in areas with limited shade or tree canopy.

Map V-1. Land surface temperature (°F) with transportation infrastructure and cooling centers



Storms

As detailed in Section III.B, the frequency and intensity of extreme precipitation events are anticipated to increase throughout the century. Storm-driven extreme precipitation and wind affect the built environment across all sectors.

Extreme precipitation directly impacts stormwater management and water quality when overloaded water and sewage systems flood, with untreated water posing public health risks. For transportation, extreme precipitation events have been linked with increased risk of traffic accidents, road inaccessibility and/or closures, inability to use active transportation modes (e.g. biking and walking), pavement buckling, and material erosion on the base of bridges in water due to faster stream flow. Although not under municipal jurisdiction (see Map V-7), major bridges in Pennsville include the Delaware Memorial Bridge and bridge over the Salem Canal in the northern part of the Township and the Salem River Bridge in the southern part. Additionally, increased frequency of extreme precipitation leads to faster rates of degradation and can disrupt maintenance of energy and transportation infrastructure.

Historically, high winds in New Jersey have caused damage to power, communication, transportation, water, and other lifeline systems.[20] Extreme winds can cause structural damage to facilities, including the breakage or collapse of compromised components such as building materials like roofs, signage, or windows and outdoor components like fencing or cooling systems. Facilities and infrastructure are also vulnerable to indirect hazards such as falling trees and downed power lines. Transportation, utilities, and communication infrastructure are also vulnerable, as high winds can lead to disruptions in public transit service, create hazardous conditions for road users, interrupt emergency communications, and catalyze water and power outages. Roadways, railways, and bridges can be shut down due to structural compromise or blockage from trees and/or debris. Extreme winds can also contribute to the spread of wildfires and contaminant dispersal.

Drought

As detailed in Section III.C, Pennsville's time in drought each year is anticipated to increase throughout the century. Facilities and infrastructure that depend on water are most affected by drought. For example, energy production may be affected due to the need for cooling water, although no power plants are present in Pennsville. Drinking water and water treatment may also be impacted. Higher rates of groundwater pumping during drought conditions can impact water quality and exacerbate saltwater intrusion (the movement of saltwater into freshwater aquifers). Saltwater intrusion has been documented in the Potomac-Raritan-Magothy aquifer,[21] from which eight wells provide Pennsville's drinking water. Increased groundwater pumping during droughts may also increase the risk of land subsidence, particularly in sandy coastal soils, which can damage infrastructure such as sidewalks, roads, and rail lines.

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[20] New Jersey Office of Emergency Management. 2024. State of New Jersey All-Hazards Mitigation Plan.
[21] Domber, S., Barr K., Snook, I., Hoy, D., Carreno, B., Drabik, J., Walsh, S. NJDEP Division of Water Resources Management. 2024. 2024 New Jersey Water Supply Plan. 2024 New Jersey Water Supply Plan.

Flood

Transportation infrastructure is particularly vulnerable to flooding when roads and railways become impassible, disrupting daily life, emergency and healthcare services, and the food supply chain. Flooded energy and communications infrastructure can impact emergency response coordination and hinder oil, gas, and electricity production. For hazardous sites, flooding can mobilize pollutants and lead to acute and chronic health effects.[22] Potential public health impacts from mobilized pollutants include respiratory illnesses from mold exposure and infectious disease spread from microorganism contamination of clean water. The pollution impacts of flooding can continue after flood waters recede. Finally, flooding impacts in water systems can include damaged wells, contaminated aquifers and wells, and backed-up sewage systems that can overflow and discharge sewage into communities and water sources.

Maps V-2 and V-3 depict potential flood exposure of Pennsville's facilities and infrastructure (including critical facilities, transportation infrastructure, hazardous sites, and industrial parcels) for each of the four flood measures listed in Table III-8 (two feet coastal inundation, four feet coastal inundation, FEMA 1% annual chance flood zone, and approximate extent of NJDEP Climate Adjusted Flood Elevation). The analysis of hazardous sites included facilities present within the municipality regulated by any of the following programs:

- Toxic Catastrophe Prevention Act (TCPA)
- Discharge Prevention Containment and Countermeasure (DPCC)
- Known Contaminated Sites
- Community Right to Know
- Solid and Hazardous Waste Facilities
- Combined Sewer Overflow
- Scrap Metal Facilities

Within Pennsville, only the Fort Mott Ferry Terminal is affected under the two-foot flooding scenario. However, numerous facilities and critical infrastructure fall within the four-foot inundation area and the FEMA 1% annual chance flood zone. These include the Wastewater Treatment Plant, Central Park Elementary School on Oliver Avenue, and the Bright Start and Precious Time daycares on Main Street. These flooding scenarios also impact the gas station along Delaware Drive and several transit stops along North Broadway. State Highway NJ Route 49 (North and South Broadway), which runs through the entire township, serves as the designated evacuation route. Coastal flooding affects its southern sections as well as a small segment near Riverview Beach Park (Map V-4). Additionally, much of the route falls within the approximate extent of the CAFE scenario flooding. Some additional infrastructure including water tower, water wells and newly constructed Pennsville landfill community solar farm near Industrial Park Road were identified by local stakeholders (Maps V-2 and V-3) most of which are impacted by all four flooding scenarios. Table V-1 summarizes the number of each type of facility and infrastructure exposed at each flood measure.

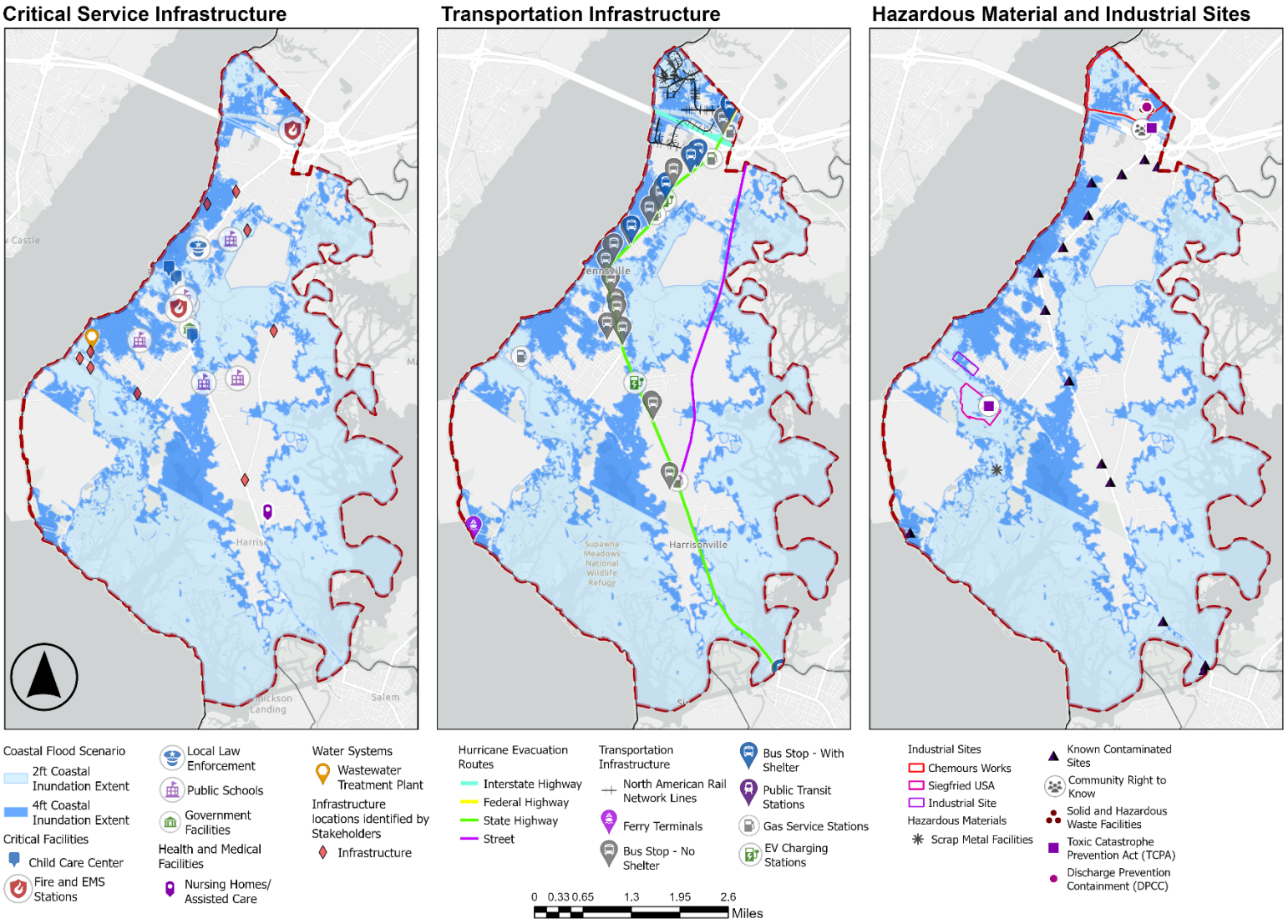
[22] New Jersey Office of Emergency Management. 2024. State of New Jersey All-Hazards Mitigation Plan.

A significant finding from this analysis is that all three industrial sites are affected by all four flood scenarios. The Chemours Works facility in the northern part of Pennsville produces materials used as coatings, oils, and greases. It is permitted under the following programs: Solid and Hazardous Waste Facility, Community Right-to-Know (CRTK), Toxic Catastrophe Prevention Act (TCPA), and the Discharge Prevention, Containment, and Countermeasure. These NJDEP regulatory programs cover facilities that manufacture, process, store, or use hazardous substances and, therefore, pose potential risks to public health and the environment in the event of accidental releases during flooding. The Siegfried facility on Industrial Park Road manufactures pharmaceutical chemicals and is permitted under the TCPA and CRTK programs. The third site is a multi-use warehouse with light industrial usage along Industrial Park Road. Table V-2 provides details on the exposure of these industrial parcels, which represent a total of 519 acres at risk with a net equalized value of approximately $122.3 million. The net equalized value includes the land and improvement value and is further explained in Section V.B.

To identify commercial facilities that provide essential shopping and services, Homeland Infrastructure Foundation-Level Data (HIFLD)[23] and USDA SNAP Retailers[24] datasets were reviewed. Although these facilities were not mapped because their locations frequently change, they include three banks, two grocery stores, and four pharmacies located along Broadway. All of these, with the exception of one pharmacy (Walmart), are within the approximate extent of the CAFE mapping developed by NJDEP. Additionally, one pharmacy (SAV-ON) and one grocery store (ACME) are within the FEMA 1% chance annual flood zone. The ACME is also exposed at four feet coastal inundation. These commercial facilities are important for post-storm continuity of services and are typically analyzed in the Hazard Mitigation Plan (HMP). See Section VII.G for discussion of the Salem County HMP and Pennsville Municipal Annex. From a land use perspective, Pennsville may consider overall impacts to commercial zoning, which is detailed in Section V.C.

[23] U.S. Department of Homeland Security. 2025. Homeland Infrastructure Foundation-Level Data (HIFLD).
[24] U.S. Department of Agriculture. 2026. Snap Retailer Location data.

Map V-2. Facilities and infrastructure exposed at 2 feet and 4 feet coastal inundation



Map V-3. Facilities and infrastructure within FEMA flood zones

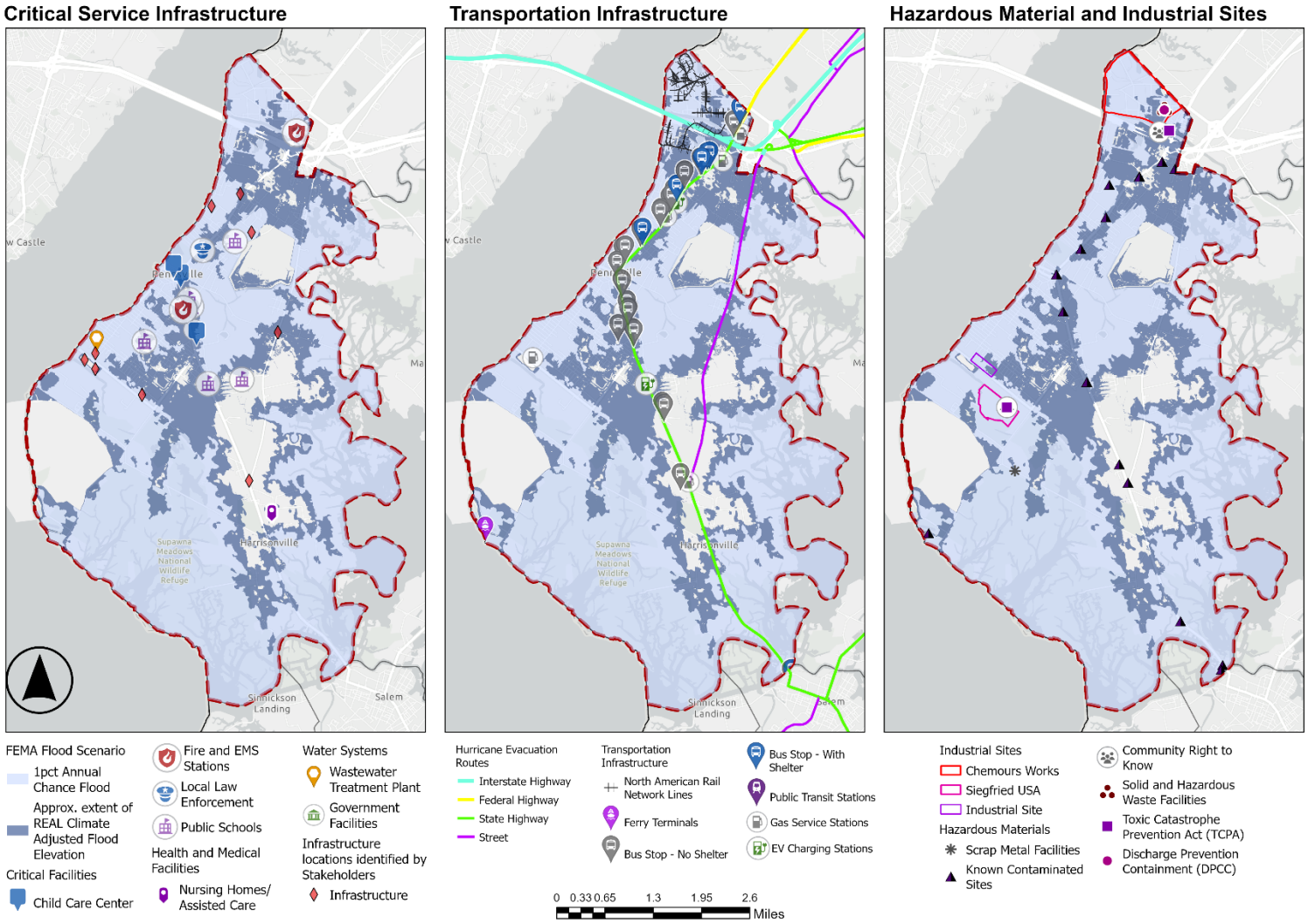


Table V-1. Flood exposure of facilties and infrastructure

	Total #	# Exposed in...			
		2 feet coastal inundation	4 feet coastal inundation	FEMA 1% Annual Chance Flood	Approx. extent of CAFE
Government					
Municipal facilities	1	0	0	0	1
Post offices	1	0	1	1	1
Safety and Security					
Child care centers	5	0	1	2	4
Fire stations	3	0	1	1	2
Local law enforcement	1	0	0	0	0
Public schools*	6	0	1	1	3
Health and Medical					
Nursing homes / Assisted care facilities	1	0	0	0	0
Water Systems					
Wastewater treatment plants	1	0	1	1	1
Transportation					
Ferry terminal	1	1	1	1	1
Public transit stations	32	0	2	2	21
Gas stations	6	0	1	1	4
EV charging stations	2	0	0	0	2
Hazardous sites					
Hazardous Sites	21	3	5	9	15

*Although public schools are included in this section as critical facilities, school property parcels (Public School Property-15A and Other School Property-15B) are analyzed with the other public property classes in the Section V.C).

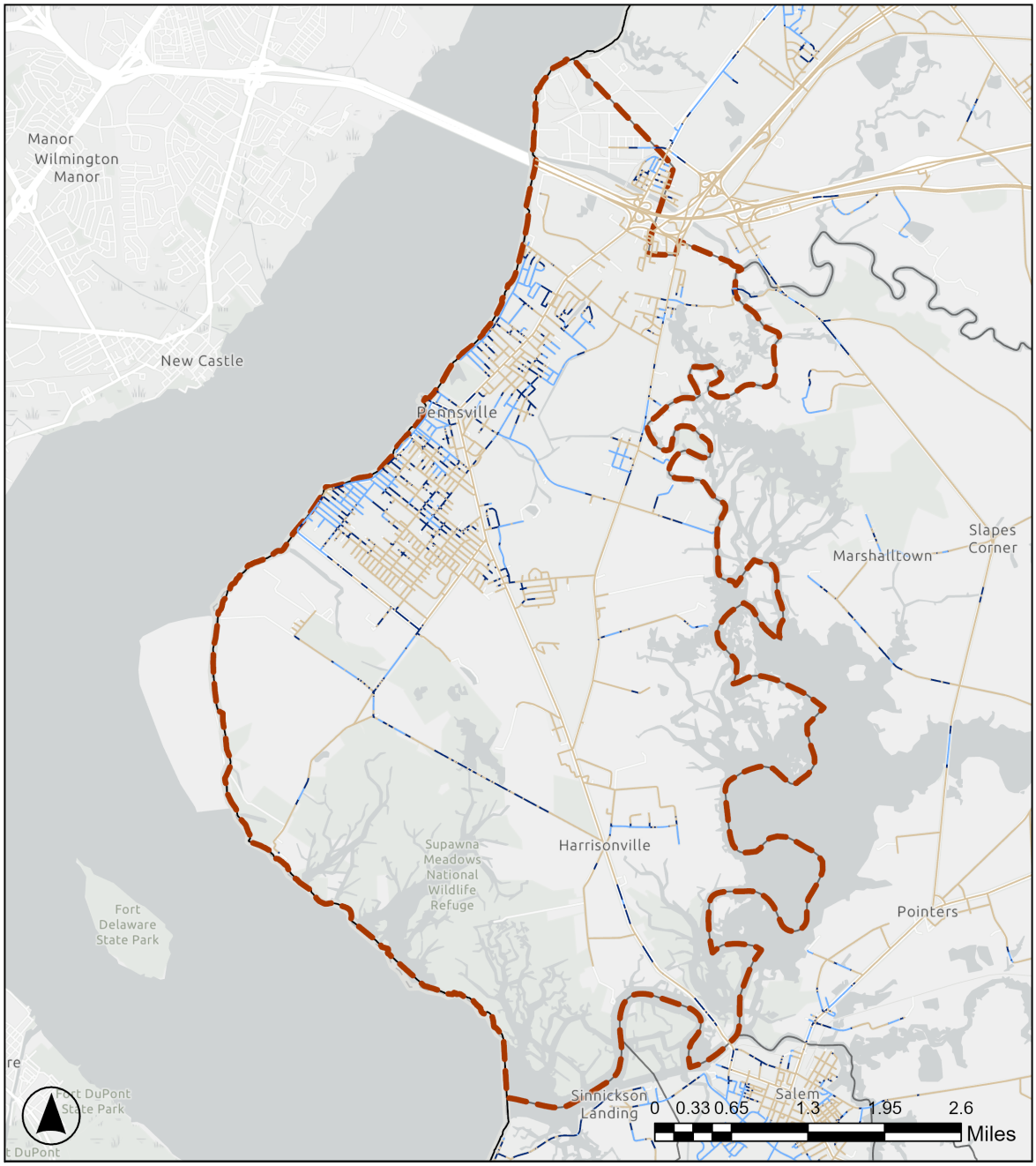
Table V-2. Flood exposure of industrial parcels

	Total # Parcels	Total Acres	Net Equalized Value ($)	Exposed in ...			
				2 feet coastal inundation	4 feet coastal inundation	FEMA 1% Annual Chance Flood	Approx. extent of CAFE
Chemours Works	1	388	99,651,220	Yes	Yes	Yes	Yes
Siegfried USA	1	103	20,156,826	Yes	Yes	Yes	Yes
Industrial Site	1	28	2,491,280	Yes	Yes	Yes	Yes

In addition to direct flood risk to facilities and infrastructure, it is important to understand potential impacts to access due to flood exposure of surrounding roads and/or evacuation routes. Map V-4 depicts roadways in Pennsville that are expected to be impacted by scenarios of two and four feet coastal inundation. The dark blue roads may flood at and beyond two feet coastal inundation. The light blue roads may be inundated at and beyond four feet coastal inundation. These roads are primarily in the residential area along the Delaware River, as well as some sections east of Broadway, presenting concerns for evacuations and/or emergency service access during flood events. Broadway itself appears to not be flooded at these water levels, with the exception of a small area adjacent to Riverview Beach Park. It should be noted that this roadway analysis accounts only for coastal (tidal) flooding and does not incorporate the compound effects of fluvial flooding or rainfall, which may cause more significant impacts.

Roadway jurisdictions are shown on Map V-5. The map distinguishes roads by color depending on jurisdiction of the Highway Authority, State, County, Municipal, Private, or other entities. This information can support planning of flood adaptation strategies for roadways by understanding which entity is responsible for road maintenance, improvement, funding, and regulation.

Map V-4. Potential roadway flooding at 2 feet and 4 feet coastal inundation

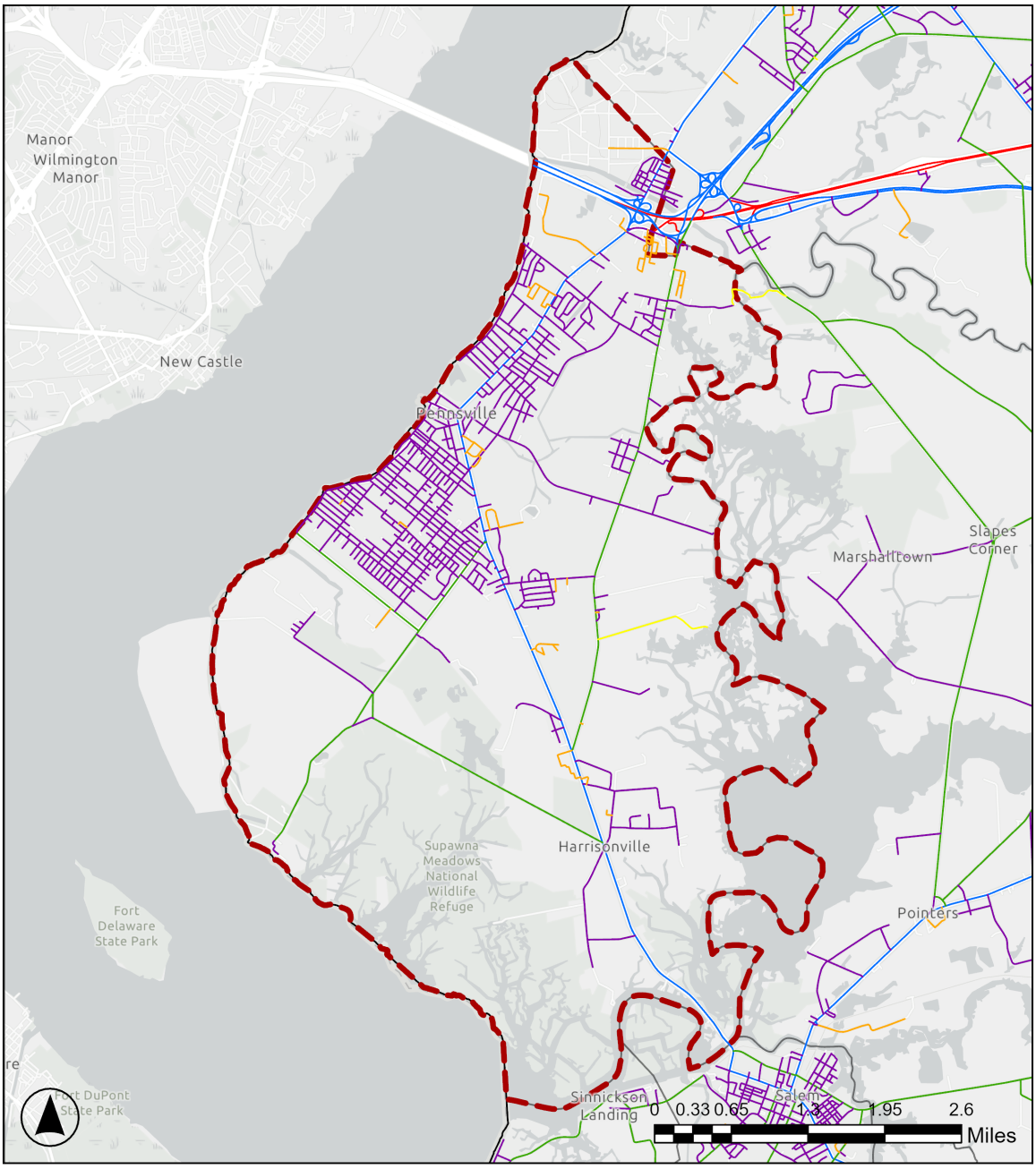


LEGEND

Coastal Inundation of Roadways

- Inundated at 2ft and above
- Inundated at 4ft and above
- Uninundated Roads

Map V-5. Roadway jurisdictions



LEGEND

Road Jurisdiction

- Highway Authority
- State
- County
- Municipal
- Private
- Other

Wildfire

While wildfire does not appear to pose a significant hazard to municipal facilities and/or infrastructure, there have been four documented wildfire events in Pennsville since 1950 (see Section III.E). Wildfires can pose significant disruption to transportation, communications, utilities, and hazardous sites. Wildfires can reach temperatures of 2,200 °F in extreme conditions,[25] which can melt nearby building materials and infrastructure assets without direct flame contact. Fires can directly damage or structurally compromise powerlines, telecommunications towers, water distribution systems, roads, bridges, and other transportation infrastructure through melting, warping, collapse, or deforming critical components of these systems. Direct fire impact on hazardous sites can release toxins into the air, water, and soil and can alter both hazardous substances and processing facilities. Wildfires can also overwhelm fire departments and other emergency services.

B. Land Use

MOD-IV Parcel Flood Analysis

The Parcels and MOD-IV Composite of NJ dataset provides basic information regarding property location, class, and tax value and taxation for each tax parcel in New Jersey.[26] This dataset was intersected with flood data to calculate the percentage of each parcel exposed under various flood scenarios. For the purposes of this assessment, a parcel is considered exposed if at least 50% of the land area is inundated or within the FEMA flood zone. Structures are likely to be impacted on most parcels at this threshold, although exceptions may include large parcels with limited development. Municipal equalized valuation ratios, from the NJ Division of Taxation's NJ 2023 Table of Equalized Valuations,[27] were applied to reflect assessment values that were closer to true market value. This information is useful when considering costs to repair, rebuild, or relocate after flood losses.

This assessment analyzed flood exposure for each property class for each of the four flood measures listed in Table III-8 (two feet coastal inundation, four feet coastal inundation, FEMA 1% annual chance flood zone, and approximate extent of NJDEP Climate Adjusted Flood Elevation). The results are included in each relevant sub-section: Industrial property is included in Section V.A – Facilities and Infrastructure; Farm property is included in Section V.B – Natural and Working Lands; Commercial, schools, and other public property is included in Section V.C – Community Assets; Residential and apartments property is included in Section V.D – Housing and People.

As an overview, this section includes an analysis of all parcels in Pennsville within the FEMA 1% Annual Chance flood zone, detailed in Table V-3 and depicted in Map V-6. Nearly half of Pennsville's 4,608 residential/apartment parcels are within the FEMA 1% annual chance flood zone, with a net equalized value of over $431 million at risk. The net equalized value is the sum of land value and improvement value, divided by municipal equalized valuation ratios to reflect assessment values that

[25] US Geological Survey. 2024. How Hot Are Wildfires?
[26] NJ Office of GIS. 2025. Parcel and MOD-IV Composite of New Jersey.
[27] https://www.nj.gov/treasury/taxation/pdf/lptval/2023/allcounties.pdf

are closer to true market value.[28] While improvement value captures the value of buildings and infrastructure most directly exposed to physical flood damage, the impact on land value is reflected directly in property taxes. Land values in flood-prone areas may decline independently of any improvements made to individual structures. Therefore, net value has been used in this assessment to reflect both fiscal and physical dimensions of flood risk. The significant exposure of residential areas presents current concerns for evacuation during storm events, as well as future risk of resident displacement as sea level rises (see Section V.D for further discussion).

Similar patterns of exposure exist across the other property classes. All three of Pennsville's industrial parcels are within the flood zone, with approximately 500 acres with a net equalized value of nearly $122.3 million at risk. Commercial parcels are the least-exposed property class, with about 25% (46 parcels, 89 acres) of 189 parcels exposed, with a net equalized value of over $24 million at risk.

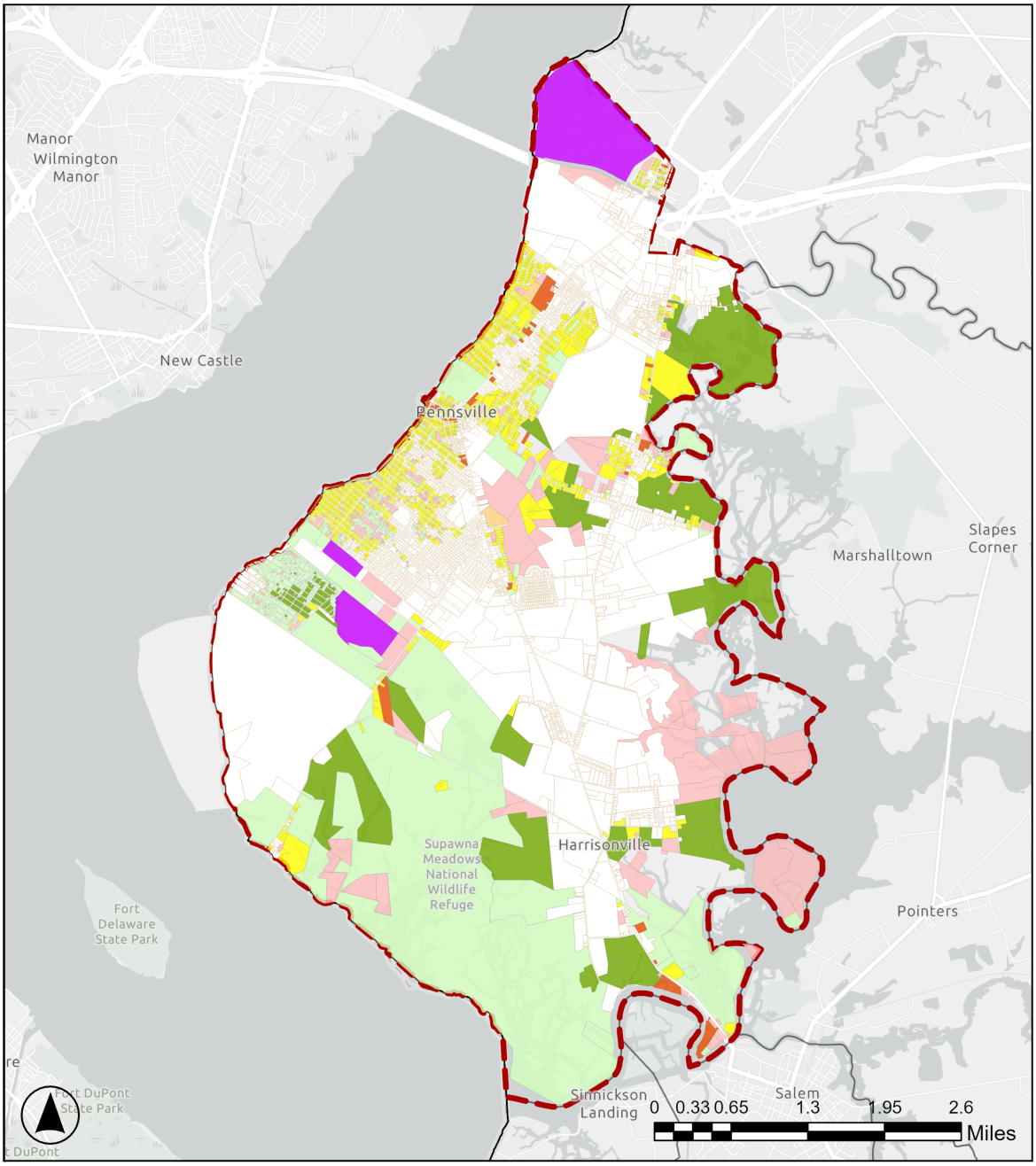
About 1500 acres of Pennsville's farm parcels are within the FEMA 1% Annual Chance flood zone. Of 162 total farm parcels, 160 are qualified 3B farms. The State's Farmland Tax Assessment program allows for reduced property taxes on land that is actively engaged in agricultural production and meets specific requirements regarding the amount of land and value of products sold. The Farm 3B parcels represent that land that qualifies for this program, and the Farm 3A parcels represent the other related land associated with the farm that does not qualify for the program, such as the farmhouse and other farm structures that are taxed at their normal rate. Farms must apply for this program annually, so the number of parcels and acres that qualify can vary year-to-year based on meeting the necessary requirements.

Table V-3. Property parcels within FEMA 1% annual chance flood zone

		Number / land area exposed in...		
		FEMA 1% Annual Chance Flood		
MOD IV Property Class	Total # parcels	# Parcels	Acres	Net Equalized Value ($)
Residential (2)	4,591	2,163 (47%)	929	413,059,844
Apartments (4C)	17	4 (23%)	24	18,041,978
Commercial (4A)	189	46 (24%)	89	25,008,844
Industrial (4B)	3	3 (100%)	518	122,299,327
Farm (3A and 3B)	162	90 (56%)	1,504	NA
Schools and other Public Property (15A through 15F)	586	417 (71%)	3,761	53,880,294
Vacant Land (1)	657	427 (65%)	1,323	11,449,762
Unclassified Land	353	203 (58%)	694	NA
Total	**6,558**	**3,353 (51%)**	**8,843**	**643,740,050**

[28] Marxen, L., A. Spector, J. DeLura, K. Reddy, and M. Kaplan. 2025. Current and Future Flood Exposure to New Jersey Properties and Associated Assessed Property Value at Risk. Rutgers University. https://doi.org/10.7282/00000502

Map V-6. Property parcels within FEMA 1% annual chance flood zone



LEGEND

Parcels inundated Above 50% - FEMA 1% Chance Annual Flood

- Residential
- Apartments
- Commercial
- Industrial
- Farm
- Schools and Other Public Property
- Vacant

Non-Inundated Parcels

Natural and Working Lands

Natural and working lands include wetlands, forests, agricultural land, and other open/green space. These lands benefit communities in many ways. They are especially important for addressing climate change for their capacity to absorb carbon from the atmosphere and mitigate the impacts of increasing temperatures.

Wetlands are the most extensive natural land cover category in Pennsville, followed by agricultural lands. Pennsville has approximately 3,400 acres of farm parcels (Appendix A, Table A-2) with wheat, corn and soybeans being the main crops grown within these farms.[29] Supawna Meadows National Wildlife Refuge, administered by the U.S. Fish and Wildlife Service, is situated within and adjacent to Pennsville Township along the Delaware River. It is a regionally recognized birding destination, drawing observers throughout the year but particularly during waterfowl migration in fall and winter. Together, these natural and working lands deliver critical ecosystem services, sustain significant biodiversity, and anchor the ecological character of the broader Delaware Bayshore region.

Protecting and restoring natural areas to reduce climate impacts was the top-ranked land use strategy among the local stakeholder survey respondents, reflecting strong community support for nature-based approaches to hazard mitigation (see Appendix B).

Heat

As detailed in Section III.A, temperature projections indicate that Pennsville may experience increasing heat throughout the century. Warmer temperatures may extend the length of the growing season and the types of crops that are viable in New Jersey. However, warmer winter temperatures can disrupt chilling time necessary for many perennial crops and allow more insects to overwinter, increasing growing season pest pressure. Extreme heat can damage crops before harvest or lead to early season development that can be damaged by later frosts. Warmer temperatures may also exacerbate drought conditions that can limit groundwater irrigation and stress rain-fed crops. The township's primary crops, wheat, corn, and soybeans, are each sensitive to heat during critical growth stages. Shifting temperature and precipitation patterns can alter the viability of current crop types over time, and farmers may need to adapt by adjusting planting schedules, crop selection, or irrigation practices.

In wetlands, extreme heat can disrupt ecosystems by contributing to habitat loss, changes in wildlife diversity and behavior, and degrading soil and water quality. In forests and green spaces, high temperatures can degrade soil health, increase the frequency and duration of wildfires, and accelerate the life cycles of insect pests, allowing them to mature and spread more rapidly.[30] Wetland-dependent and migratory species are similarly vulnerable, as rising temperatures alter the timing of plant phenology and insect emergence, creating mismatches between food availability

[29] National Crop Frequency data 2008-2025. USDA, National Agricultural Statistics Service

[30] New Jersey Office of Emergency Management. 2024. State of New Jersey All-Hazards Mitigation Plan.

and the arrival of migratory birds such as shorebirds and waterfowl that rely on Pennsville's marshes and the Delaware Bayshore corridor. When combined with extreme precipitation, heat can also increase the temperature of runoff entering waterways resulting in water quality issues.

Storms

The increasing frequency of extreme precipitation events (see Section III.B) may impact natural and working lands across urban and rural areas, contributing to heightened risks from pests, diseases, invasive species, and storm-related damage.[31] Heavy precipitation and associated runoff increases the rate of streambank erosion and destabilization, which may damage surrounding areas and impact water quality.[32]

Extreme precipitation can also negatively impact agriculture, including planting delays, root disease, and limited access to pastures for livestock.[33] Increased soil erosion and agricultural runoff may result in increased manure, fertilizer, and pesticides entering local waterways and contaminating surface and groundwater.[34] The adjacency of farm parcels to the Salem River and the wetlands toward the Delaware River creates conditions in which runoff carrying nutrients, sediments, and agrochemicals can reach sensitive aquatic and estuarine habitats.

High winds in New Jersey have historically caused significant agricultural losses and economic setbacks due to the impact of projectile debris (e.g. hail), damaging crops and killing livestock.[35] In forested areas and open spaces, extreme winds can cause tree failure, such as breakage or uprooting. This damage makes trees more susceptible to disease or pests, weakening overall forest health and making canopies less resistant to additional threats like wildfires.

Drought

As detailed in Section III.C, Pennsville's time in drought each year is anticipated to increase throughout the century. Droughts can affect wetlands, forests, agriculture, and other open/green space. Wetlands may become drier during prolonged droughts, potentially decreasing fisheries production and the quality of tourism and recreation opportunities (see Section V.C for details on recreation and tourism in Pennsville). In combination with heat, drought can drive changes and/or die-off to saltwater marsh

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[31] New Jersey Climate Change Alliance. 2022. Forest Resource Considerations for A New Jersey Natural and Working Lands Strategy.

[32] New Jersey Department of Environmental Protection. 2025. New Jersey Scientific Report on Climate Change. (Eds. B. Wiley, K. Raper, J. Bonventre, R. Hill, L.A. Lester, N.A. Procopio). Trenton, NJ. 275 pp.

[33] Hristov, A. N., Degaetano, A. T., Rotz, C. A., et al. 2018. Climate change effects on livestock in the Northeast US and strategies for adaptation. *Climatic Change*, 146, 33-45.

[34] U.S. Global Change Research Program. 2016. The impacts of climate change on human health in the United States: A scientific assessment. Pages 1–312 in A. Crimmins, J. Balbus, J. L. Gamble, C. B. Beard, J. E. Bell, D. Dodgen, R. J. Eisen, N. Fann, M. D. Hawkins, S. C. Herring, L. Jantarasami, D. M. Mills, S. Saha, M. C. Sarofim, J. Trtanj, and L. Ziska, editors. U.S. Global Change Research Program, Washington, DC.

[35] Lathrop, R. G., and A. A. Love. 2007. Vulnerability of New Jersey's coastal habitats to sea-level rise. Grant F. Walton CRSSA. Pages 1–17. Rutgers University, New Brunswick, NJ. https://doi.org/doi:10.7282/T3F18ZRZ

plant communities, especially when freshwater inputs decrease due to lack of rain.[36] Potential impacts of wetland loss in Pennsville are discussed in the next section (Flood).

Agricultural drought occurs when there is not enough water available for a particular crop to grow at a particular time due to soil moisture deficiencies, lack of groundwater, and precipitation. The United States Department of Agriculture (USDA) issued six agricultural-related drought declarations in Salem County between 2012 and 2023.[37] Agricultural drought may result in a reduction in crop yields, economic loss, livestock stress, an increased demand for irrigation, and soil degradation. Although Pennsville contains significant agricultural land, drought was rated as a low priority hazard in its Municipal Annex to the Hazard Mitigation Plan (see Section VII.G).

Drought may also compound risks from other climate hazards. For example, drought may exacerbate saltwater intrusion due to increased groundwater pumping and decreased freshwater input via precipitation (see next section (Flood) for a detailed discussion of saltwater intrusion on natural and working lands). Additionally, drought in combination with high temperatures can increase the risk of wildfires, due to an increase in evaporation, dry soil conditions, and large-scale loss of trees and vegetation.

Flood

Natural and working lands help absorb excess rainwater and buffer storm surge, thereby reducing flooding in surrounding areas. However, flooding can also damage vegetation, negatively affecting ecosystem health and the agricultural industry. Map V-7 depicts flood risk to natural and working lands in Pennsville for each of the four flood measures listed in Table III-8 (two feet coastal inundation, four feet coastal inundation, FEMA 1% annual chance flood zone, and approximate extent of NJDEP Climate Adjusted Flood Elevation). Additional details on exposure of farm parcels are included in Table V-4. Although some large areas of agricultural land along South Broadway are not exposed at the included flood scenarios, there is significant overall risk to farm parcels. Forty-two percent of Pennsville's approximately 160 farm parcels are exposed at two feet of coastal inundation and 62% are exposed at four feet. Similarly, 56% are within the FEMA 1% chance annual flood zone, rising to 86% within the approximate extent of NJDEP Climate Adjusted Flood Elevation.

In coastal areas, tidal marshes are expected to migrate landward or "retreat" as sea level rises due to inundation and saltwater intrusion. In the Delaware River and its tributaries, the saltwater front (location where salt and freshwater meet in a waterbody) may be pushed further upriver.[38] Areas of current tidal marsh could convert to mud flats or open water and existing adjacent areas of dry land could be converted to new wetlands over time. In the Delaware Estuary, inundation could result in the loss of up to 92% of brackish marshes, 32% of tidal swamps, and 6% of tidal freshwater marshes

[36] New Jersey Department of Environmental Protection. 2025. New Jersey Scientific Report on Climate Change. (Eds. B. Wiley, K. Raper, J. Bonventre, R. Hill, L.A. Lester, N.A. Procopio). Trenton, NJ. 275 pp.
[37] New Jersey Office of Emergency Management. 2024. State of New Jersey All-Hazards Mitigation Plan.
[38] Delaware River Basin Commission, 2022. *Sea level rise and associated effects in the Delaware Estuary Coastal Zone*. pp. 1-82.

by 2100.[39] Additionally, much of Pennsville's forested land is adjacent to tidal marsh and could be impacted if increasing inundation and salinity causes tree die-off (i.e. "ghost forests").

Map V-8 depicts a time progression from current day to 2050 (two feet of sea-level rise), to 2100 (four feet of sea-level rise) of potential marsh retreat in Pennsville. It indicates areas of potential ecosystem conversion between freshwater shrub wetland (tidal or non-tidal, characterized by shrubs and small trees), freshwater emergent wetland (tidal or non-tidal, characterized by small plants like grasses and mosses), saltwater marsh (tidal, dominated by salt-tolerant grasses), unconsolidated shore (frequently inundated areas of silt, sand, or gravel with minimal vegetation), and water (open water). Large portions of land area in both the southwestern part of Pennsville and along the eastern border currently consist of saltwater marsh and are subject to marsh retreat. Most of Pennsville's agricultural land is in or adjacent to these areas and may be impacted as soils become wetter and saltier. The gradual loss of working farmland to salinization and inundation within Pennsville represents not only an economic concern but a long-term transformation of the township's rural landscape and the open space character. Additionally, much of Pennsville's existing wetland areas within the Supawna Meadows NWR and along the Salem River could degrade to unconsolidated shore by 2100. Loss and/or degradation of these wetland areas wetlands could decrease their ability to buffer flood waters, increasing flood risks to adjacent developed areas.

Table V-4. Flood exposure of farm parcels*

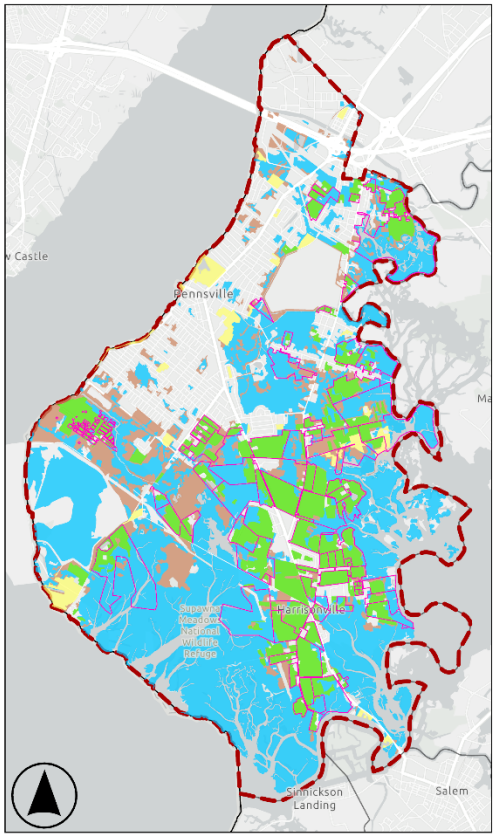
	Number / land area exposed in…							
	2 feet coastal inundation		4 feet coastal inundation		FEMA 1% Annual Chance Flood		Approx. extent of CAFE	
MOD IV Property Class	# Parcels	Acres	# Parcels	Acres	# Parcels	Acres	# Parcels	Acres
Farm 3A Total parcels = 2	0	0	0	0	0	0	2 (100%)	5
Farm 3B Total parcels = 160	67 (42%)	1,610	99 (62%)	2,067	90 (56%)	1,504	138 (86%)	2,902

*Farm 3B parcels are in agricultural production and qualify for the State's Farmland Tax Assessment program. Farm 3A parcels are other lands associated with the farm that do not qualify for the program (farmhouse, other farm structures, etc.).

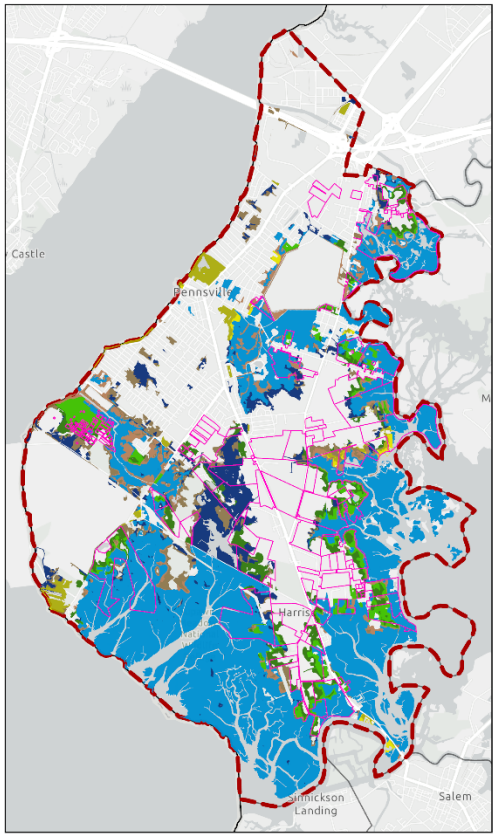
[39] Lathrop, R. G., and A. A. Love. 2007. Vulnerability of New Jersey's coastal habitats to sea-level rise. Grant F. Walton CRSSA. Pages 1–17. Rutgers University, New Brunswick, NJ. https://doi.org/doi:10.7282/T3F18ZRZ

Map V-7. Flood exposure of natural and working lands

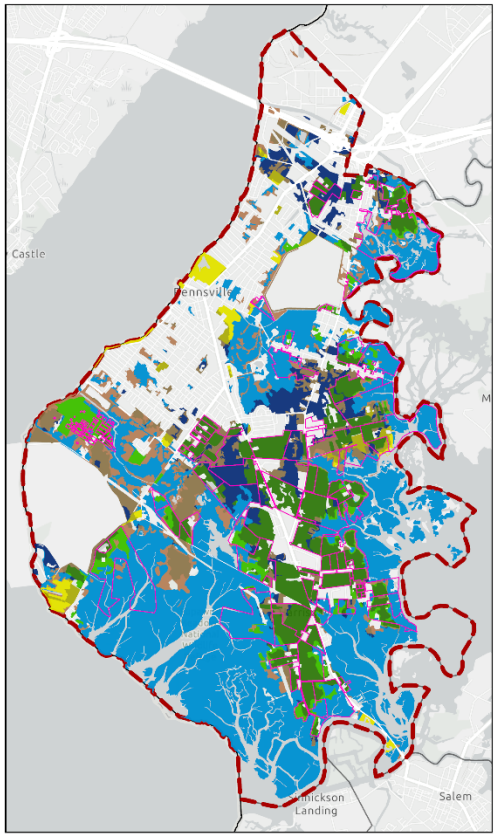
All Natural and Working Lands



Coastal Flooding 2ft and 4ft



FEMA 1% Chance and Approx. extent of CAFE



Parcels
- Farm Parcels

Land Use: 2020
- Recreational
- Agricultural
- Forestland
- Wetlands

Impacted at 2ft
- Recreational
- Agricultural
- Forestland
- Wetlands

Impacted at 4ft
- Recreational
- Agricultural
- Forestland
- Wetlands

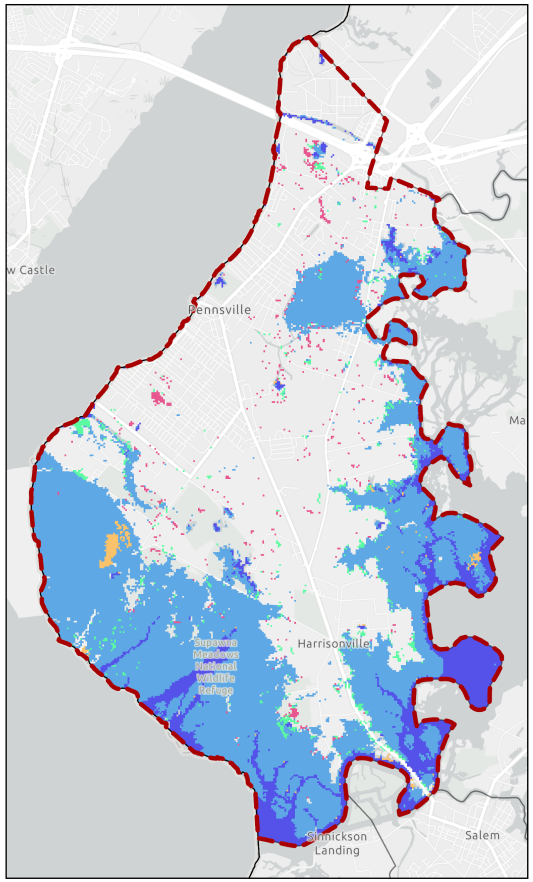
Impacted by FEMA1pct
- Recreational
- Agricultural
- Forestland
- Wetlands

Impacted by Climate Adjusted Flood Elevation
- Recreational
- Agricultural
- Forestland
- Wetlands

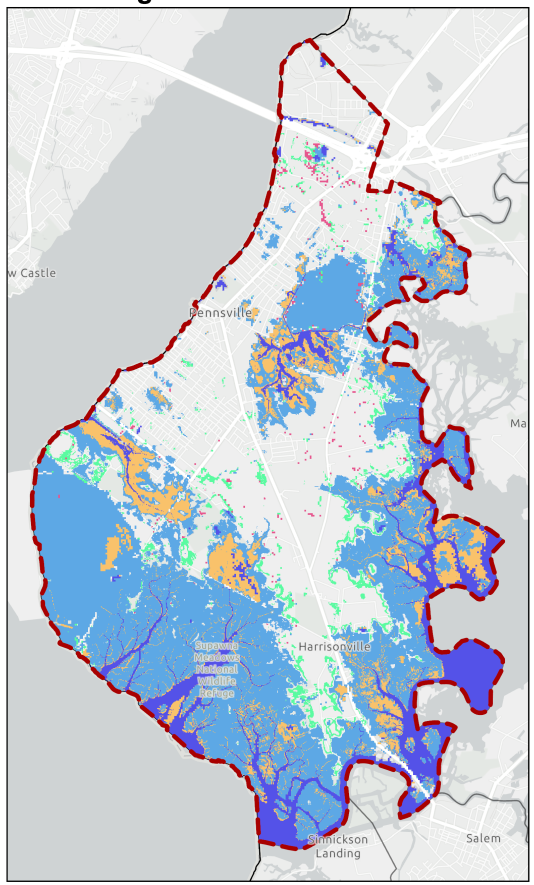
0 0.38 0.75 1.5 2.25 3
Miles

Map V-8. Marsh retreat

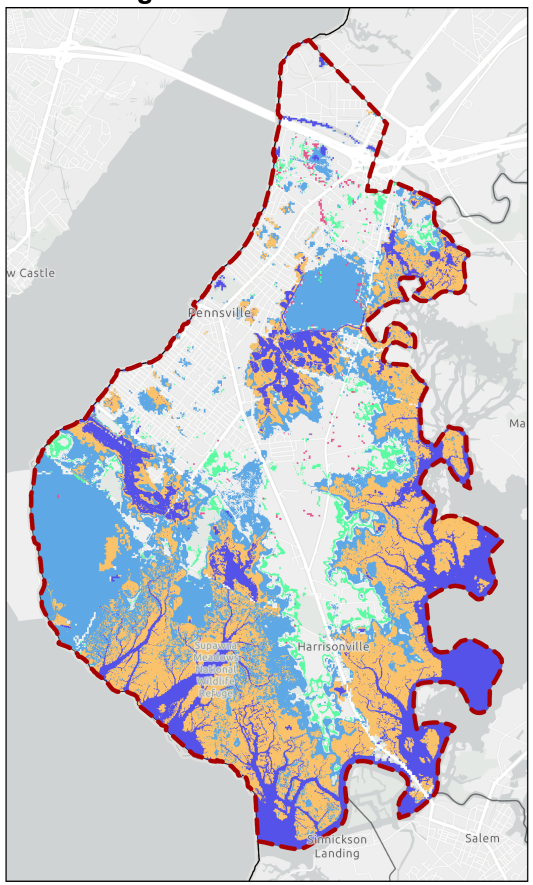
Current Marsh Extent



Marsh Migration - 2 ft



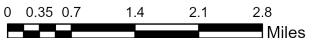
Marsh Migration - 4 ft



LEGEND

- Freshwater Shrub Wetland
- Freshwater Emergent Wetland
- Saltwater Marsh
- Unconsolidated Shore
- Water





(Source: NOAA Sea-level rise Viewer – Marsh Migration)

Wildfire

Although wildfire risk in Pennsville is relatively low, there have been four documented wildfire events since 1950 (see Section III.E). Statewide, wildfires account for the damage or destruction of about 7,000 acres of forests each year, releasing pollutants such as carbon monoxide, volatile organic compounds, carbon dioxide, hydrocarbons, nitrogen oxides, and fine particulate matter. Wildfires destroy vegetation, threaten biodiversity, and damage habitat for threatened and endangered species. Conversely, many plant species have adapted to fire, and some are dependent on it for reproduction. The Wingate Drive area has experienced recurrent fires, illustrating that localized wildfire risk as a concern for Pennsville's natural lands, particularly during periods of prolonged dry weather when *Phragmites*-dominated marsh edges and transitional wetland vegetation become highly combustible.

In addition to the hazard of direct contact with fire, wildfires can cause prolonged secondary hazards to the lands they impact, including the weakening of soils, stripping of vegetation to absorb runoff, and the baking of soils with high clay content, creating impervious conditions that can increase the chance of flooding.

C. Community Assets

There are other assets in a community that may not be "critical" as defined by a CCRHVA. Assets with local value may be places that:

- Represent community identity;
- Are important to quality of life;
- Have significance for cultural reasons; and/or
- Provide community recreation.

Local planning can benefit from understanding impacts to these assets that shape everyday life in the community. Climate hazards may pose immediate and/or direct risks based on the exposure of the asset itself, as well as indirect and/or long-term risks associated with potential loss of the value provided to the community. Community assets in Pennsville were identified through publicly available datasets and input from municipal staff, residents, and other local stakeholders. Public datasets included locations of: (a) libraries, (b) art venues, (c) entertainment and sporting venues, (d) public access points to tidal waterways, and (e) historic properties. Community assets identified by local stakeholders were categorized as follows (see Appendix B for a complete list of places identified in each of these categories):

- **Civic & Community** - Organizations focused on community needs such as social connections, advocacy, including senior centers, youth centers, etc. Salem County FOP Lodge 6, Pennsville Senior Center, and Pennsville Veterans of Foreign Wars (VFW) were among of the assets identified by local stakeholders.
- **Businesses** - Shops, restaurants, and other commercial entities providing community services. ACME, Wawa, gas stations and few other shops were identified as important businesses by local stakeholders.

- **Cultural** - Museums, galleries, theaters, churches, and other spiritual centers, etc. Pennsville Historic Society, and St. George's Episcopal Church were few of the cultural assets identified by the local stakeholders.
- **Recreation** - Playgrounds, parks, trails, ball fields, etc. Riverview Beach Park, Pennsville Little League, Pennsville Sports Complex, Pennsville Soccer Field, and Salem Boat Club were important assets identified by local stakeholders.

Although essential commercial services (e.g. groceries, banks, hardware stores, etc.) may also be considered community assets, these facilities are included in Section V.A because of their importance to recovery after natural disasters. In this section, overall exposure analysis of commercial property parcels is included to support consideration of risks to commercially zoned areas.

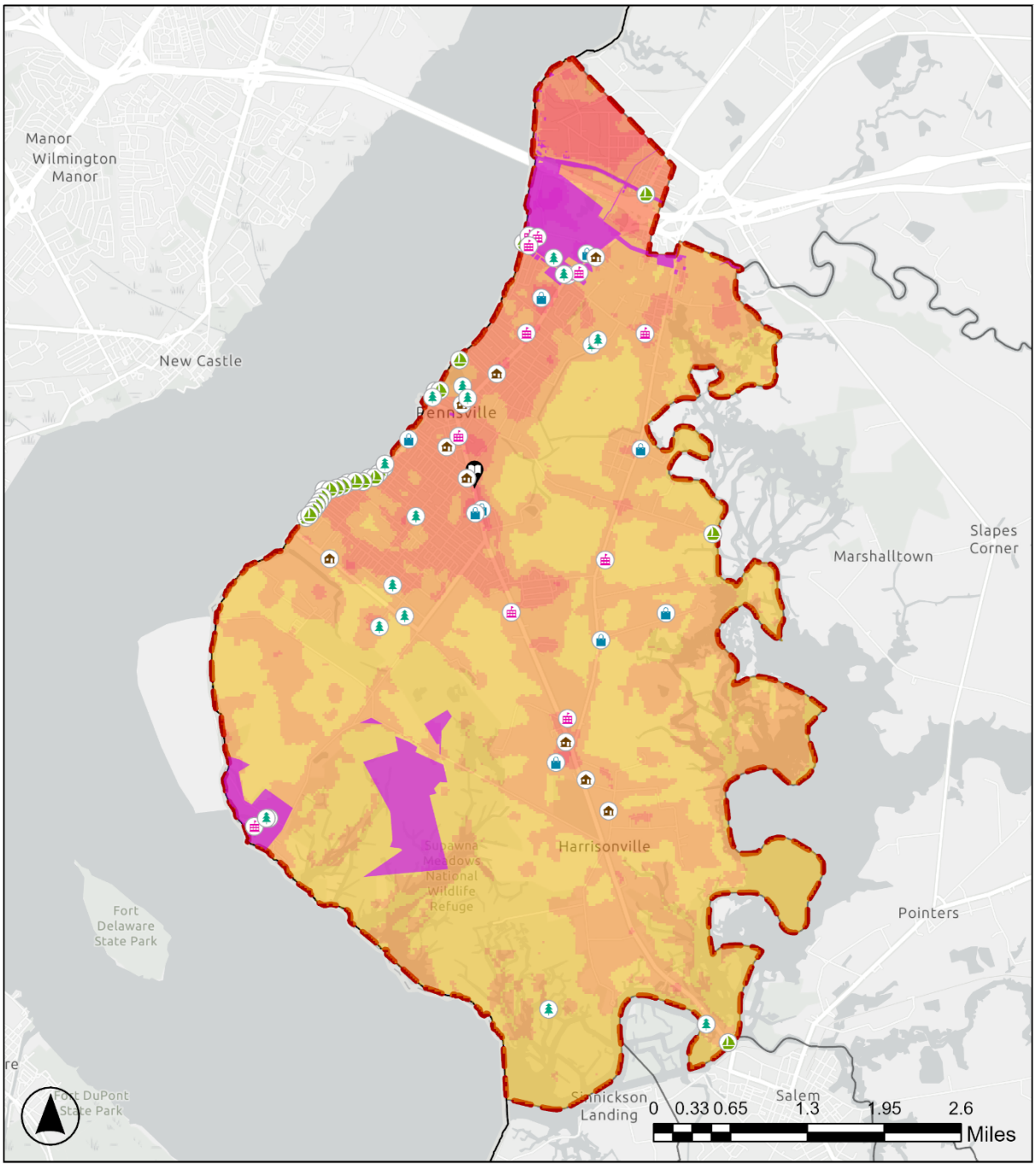
Heat

As detailed in Section III.A, temperature projections indicate that Pennsville may experience increasing heat throughout the century. Increasing temperatures limit a community's ability to access and use various indoor and outdoor community assets, thus impacting social well-being and public health. On the other hand, places of gathering such as parks, libraries, and community centers can provide heat relief. Parks and green spaces can provide heat relief, but these outdoor assets can become unsafe without available shaded areas, trees, and water. Indoor facilities with air conditioning such as libraries, local shops, community centers, and event venues can also serve as cooling spaces. Yet, these locations risk facing increased demand that can exceed their capacity. Ensuring such facilities are properly equipped, accessible, and resilient to extreme temperatures is essential for protecting public health and maintaining social and community well-being.[40]

Map V-9 depicts land surface temperature in summer 2022 in relation to Pennsville's community asset. The library, and various historic properties, in the northern portion of the municipality, and some points of public access to tidal waterways are in areas that experience higher temperatures. Community assets identified by stakeholders, including businesses, civic and community organizations, cultural sites, and recreational facilities, are distributed primarily across the northern and central portions of the Township, where heat exposure is also greatest.

[40] Filión, N.A., Knutsen, M., and Phillips, S. New Jersey Department of Environmental Protection. 2025. New Jersey Extreme Heat Resilience Action Plan.

Map V-9. Land surface temperature (°F) and community assets



LEGEND

Land Surface Temperature

- Below 80
- 80 - 90
- 90 - 100
- 100 - 110
- Over 110

Community Assets

- Library
- Public Access to Tidalways
- Historic Properties

Community Assets identified by Stakeholders

- Business
- Civic & Community
- Cultural
- Recreation

Storms

As detailed in Section III.B, the frequency and intensity of extreme precipitation events are anticipated to increase throughout the century. Extreme precipitation impacts community assets and economic well-being. Extreme precipitation can limit access to outdoor recreation when parks and other outdoor spaces flood and the impacts can last for extended periods. Additionally, extreme precipitation can drive biodiversity loss, impacting recreational fishing and hunting.[41] Pennsville's location along the Delaware River and the presence of Supawna Meadows National Wildlife Refuge make fishing and hunting particularly important recreational activities for residents and visitors alike. The refuge supports an authorized deer hunting program targeting white-tailed deer, as well as waterfowl hunting opportunities for species such as Mallard, American Black Duck, and Canada Goose.

Drought

As detailed in Section III.C, Pennsville's time in drought each year is anticipated to increase throughout the century. Community assets can have varying water supply demands, which can place stress on water infrastructure, the local economy, quality of life, and natural resources during droughts. Water-based recreational activities (e.g. boating, kayaking, water skiing, fishing, etc.) often depend on specific water levels. These activities can be restricted when water levels drop, negatively impacting local tourism and quality of life.[42] Water-based recreational activities are particularly relevant to Pennsville given its extensive Delaware riverfront.

Agricultural droughts hinder the irrigation of farms, limiting the availability of fresh produce for farmers' markets. Reduced water supply has also been linked with lower water quality, impacting recreation and water-based jobs. Drought watches may trigger mandatory water conservation measures.[43]

Flood

Flood risk to community assets include short-term, temporary impacts from coastal storm events, as well as the potential for long-term losses associated with permanent inundation from sea-level rise (see Section III.D). Maps V-10 and V-11 depict potential flood exposure of community assets in Pennsville for each of the four flood measures listed in Table III-8 (two feet coastal inundation, four feet coastal inundation, FEMA 1% annual chance flood zone, and approximate extent of NJDEP Climate Adjusted Flood Elevation). Table V-5 summarizes the number of each type of asset exposed at each flood measure. Maps V-12 and V-13 depict the community asset parcels exposed by each flood measure for the following property classes: Commercial, Schools, Public Properties, Church and Charitable, and Other Exempt Properties. Tables V-6 and V-7 provide details on the number of parcels, land area, and value of property exposed.

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[41] New Jersey Department of Environmental Protection. 2023. Outside, Together! A statewide comprehensive outdoor recreation plan for New Jersey.

[42] National Integrated Drought Information System, National Oceanic and Atmospheric Administration. 2025. By Sector: Recreation & Tourism.

[43] Domber, S., Barr K., Snook, I., Hoy, D., Carreno, B., Drabik, J., Walsh, S. NJDEP Division of Water Resources Management. 2024. 2024 New Jersey Water Supply Plan

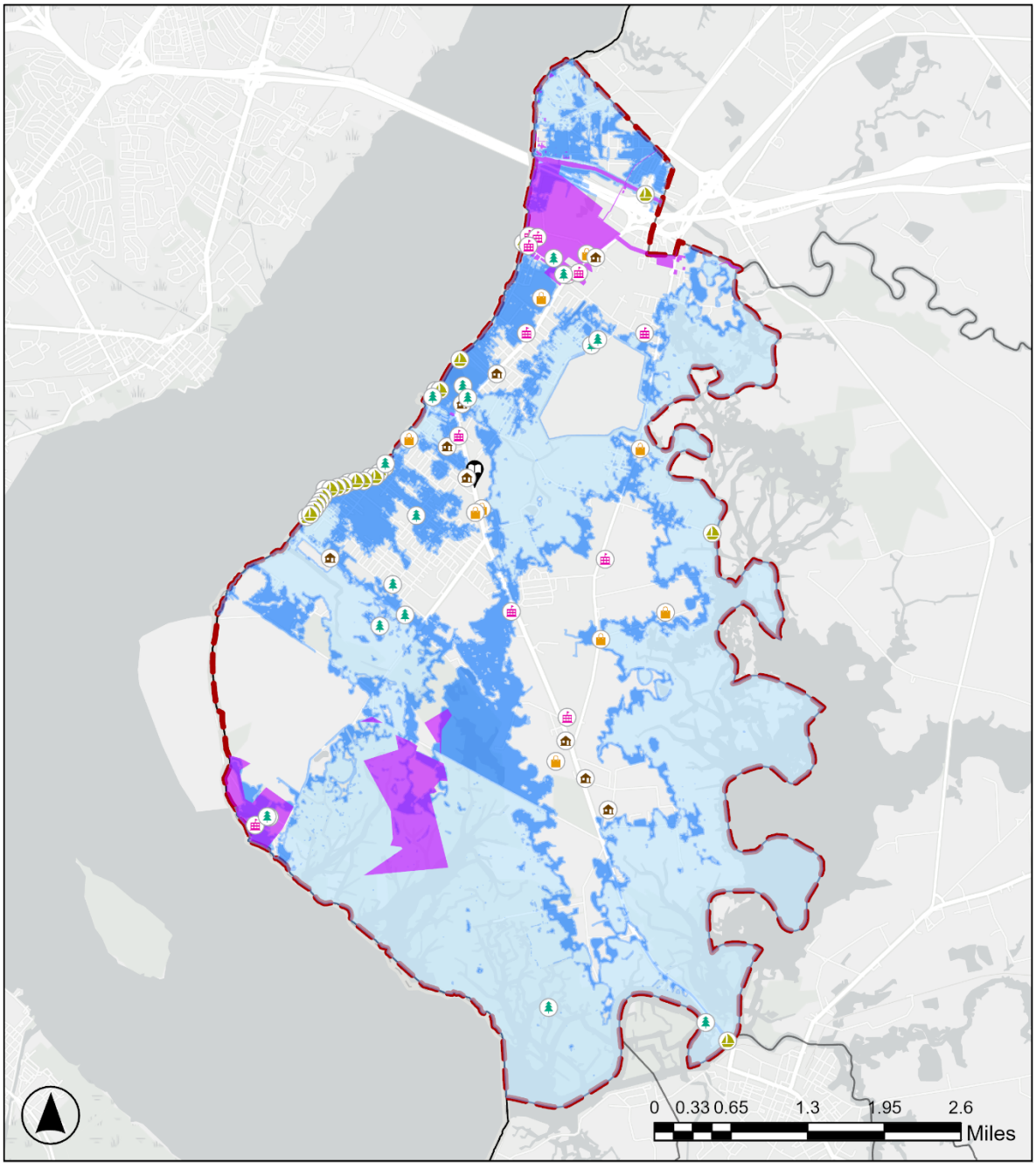
Pennsville's most flood-vulnerable community assets are its public access points to tidal waterways. All 24 points are within the FEMA 1% annual chance flood zone. Additionally, several Historic Districts and individual historic properties, located in the north and southwest parts of the municipality, are at risk of current and future flood impacts. Fort Mott State Park along the Delaware river is an important historic and cultural asset for Pennsville and is impacted by all the four flooding scenarios. The public library is not exposed to flooding at the scenarios included in the assessment. Among the community assets identified by the local stakeholders, mostly recreational areas, including Supawna Meadows, Salem Boat Club, and Pennsville Boat Ramp, are impacted by two feet of coastal inundation. Four feet of coastal flooding and FEMA 1% annual chance flood have a similar impact and additional cultural assets including Pennsville Historic Society and churches are impacted. Most of the cultural, recreational, as well as civic and community assets are within the approximate extent of the NJDEP's climate-adjusted flood extent. The most prominent among these are Riverview Beach Park, Pennsville Animal Shelter, Pennsville VFW, Pennsville Sports Complex, and Pennsville Little League. Although businesses were also identified by stakeholders, due to the transient nature of commercial establishments, a detailed analysis of flooding impacts to commercial parcels is presented in Maps V-12 and V-13.

Table V-5. Flood exposure of community assets

	Total #	# Exposed in...			
		2 feet coastal inundation	4 feet coastal inundation	FEMA 1% Annual Chance Flood	Approx. extent of CAFE
Libraries	1	0	0	0	0
Public Access Points to Tidal Waterways	24	7	21	24	24
Business*	9	1	3	3	7
Civic & Community*	9	1	2	2	5
Cultural*	13	0	3	3	9
Recreation*	15	3	9	9	13

*Community assets identified by stakeholders

Map V-10. Community assets exposed at 2 feet and 4 feet coastal inundation



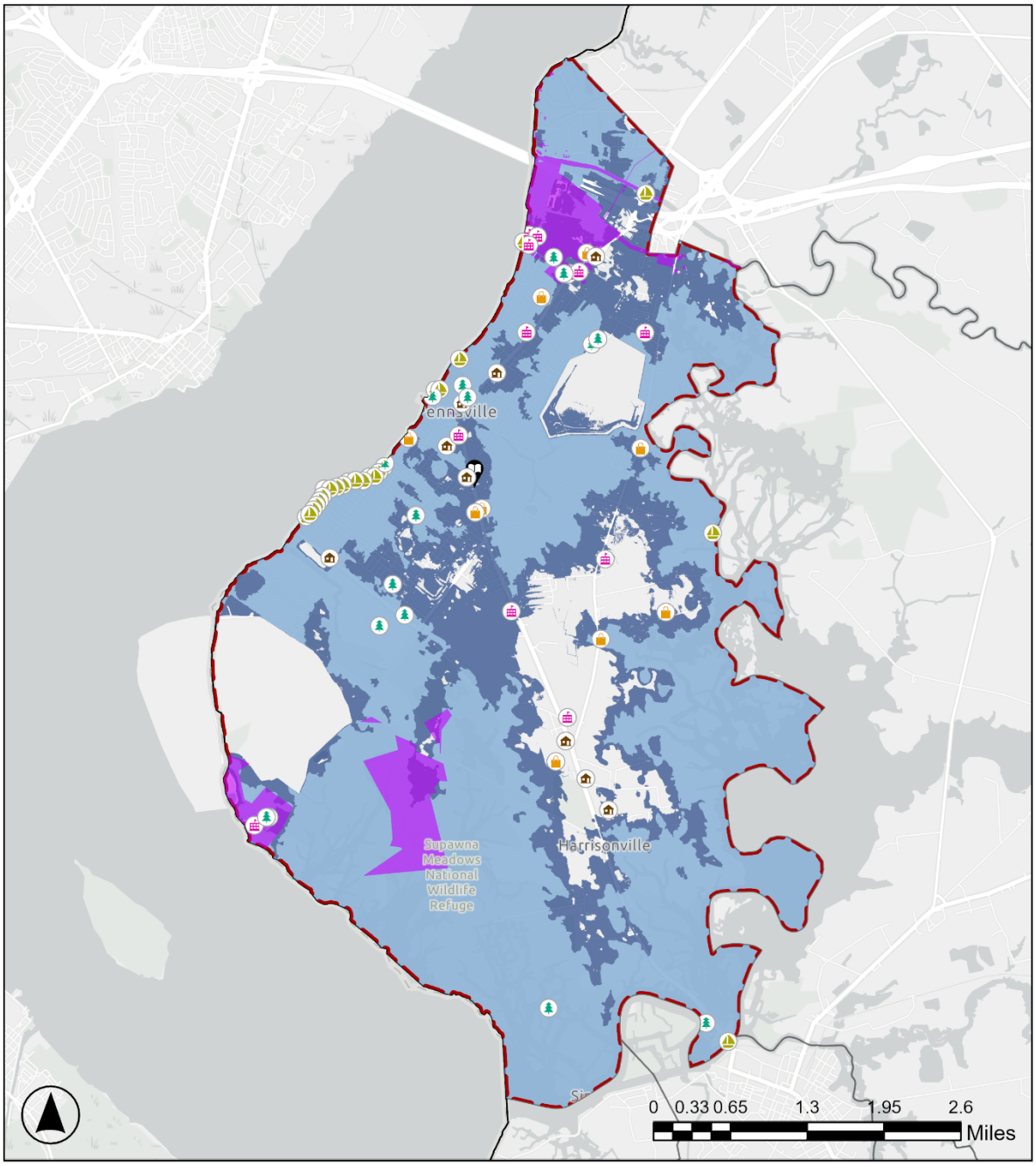
LEGEND

Flood Scenario
- 2ft Coastal Inundation Extent
- 4ft Coastal Inundation Extent

Community Assets
- Library
- Public Access to Tidalways
- Historic Properties

Community Assets identified by Stakeholders
- Business
- Civic & Community
- Cultural
- Recreation

Map V-11. Community assets within FEMA flood zones



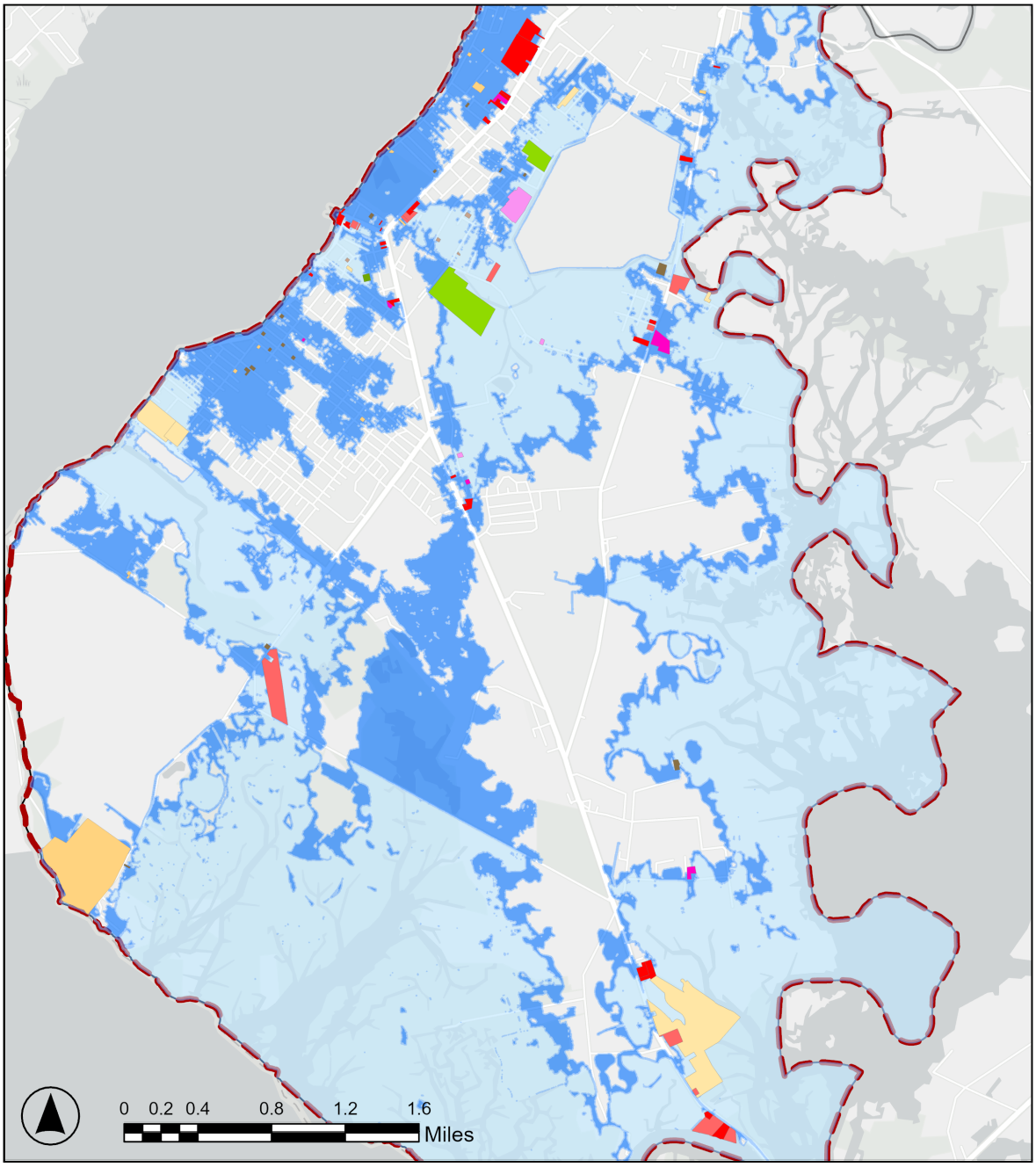
LEGEND

FEMA Flood Zones
- 1Pct Annual Chance Flood
- Approx. extent of Climate Adjusted Flood Elevation

Community Assets
- Library
- Public Access to Tidalways
- Historic Properties

Community Assets identified by Stakeholders
- Business
- Civic & Community
- Cultural
- Recreation

Map V-12. Community asset parcels exposed at 2 feet and 4 feet coastal inundation



LEGEND

- 2ft Coastal Inundation Extent
- 4ft Coastal Inundation Extent

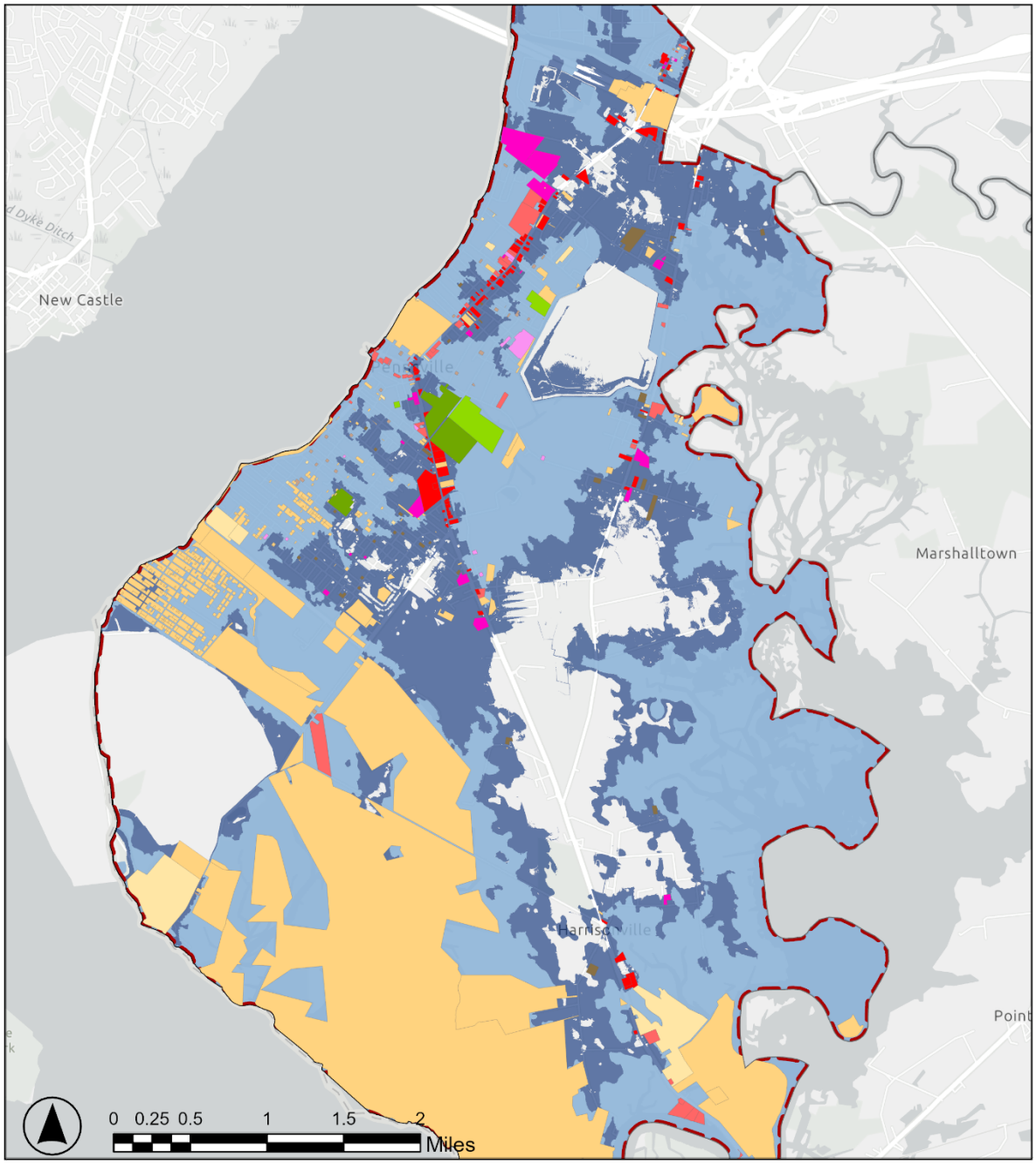
Impacted at 2ft

- Commercial
- Schools
- Public Properties
- Church and Charitable
- Other Exempt Properties

Impacted at 4ft

- Commercial
- Schools
- Public Properties
- Church and Charitable
- Other Exempt Properties

Map V-13. Community asset parcels within FEMA flood zones



LEGEND

FEMA Flood Zones

- 1Pct Annual Chance Flood
- Approx. extent of Climate Adjusted Flood Elevation

Impacted by FEMA1pct Chance Flood

- Commercial
- Schools
- Public Properties
- Church and Charitable
- Other Exempt Properties

Impacted by approx. extent of Climate Adjusted Flood Elevation

- Commercial
- Schools
- Public Properties
- Church and Charitable
- Other Exempt Properties

Table V-6. Flood exposure of community asset parcels at 2 feet and 4 feet coastal inundation

		Number / land area exposed in...					
		2 feet coastal inundation			4 feet coastal inundation		
MOD IV Property Class	Total # parcels	# Parcels	Acres	Net Equalized Value ($)	# Parcels	Acres	Net Equalized Value ($)
Commercial (4A)	189	13 (7%)	45	4,437,469	44 (23%)	90	20,345,914
Schools (15A and 15B)	8	2 (25%)	46	4,855,007	3 (37%)	47	5,186,721
Public Properties (15C)	458	6 (1%)	110	1,984,803	20 (4%)	203	19,169,905
Church and Charitable (15D)	43	3 (7%)	12	2,180,369	11 (25%)	22	6,856,378
Other Exempt (15E and 15F)	77	4 (5%)	1	808,794	23 (30%)	8	4,394,993
Total	**775**	**28 (4%)**	**214**	**14,266,442**	**101 (13%)**	**370**	**55,953,911**

Note: Class 15 properties with no improvement value were excluded from the count of exposed parcels.

Table V-7. Flood exposure of community asset parcels within FEMA flood zones

		Number / land area exposed in...					
		FEMA 1% Annual Chance Flood			Approx. extent of CAFE		
MOD IV Property Class	Total # parcels	# Parcels	Acres	Net Equalized Value ($)	# Parcels	Acres	Net Equalized Value ($)
Commercial (4A)	189	46 (24%)	89	25,008,844	155 (82%)	192	83,944,818
Schools (15A and 15B)	8	3 (37%)	47	5,186,721	7 (87%)	114	44,035,127
Public Properties (15C)	458	20 (4%)	203	19,169,905	440 (96%)	3865	51,001,370
Church and Charitable (15D)	43	12 (28%)	16	7,915,546	39 (91%)	96	32,691,455
Other Exempt (15E and 15F)	77	28 (36%)	7	5,423,767	64 (83%)	38	13,977,329
Total	**775**	**109 (14%)**	**363**	**62,704,783**	**705 (91%)**	**4305**	**225,650,100**

Note: Class 15 properties with no improvement value were excluded from the count of exposed parcels.

Wildfire

Although wildfire risk in Pennsville is relatively low, there have been four documented wildfire events since 1950 (see Section III.E). Community assets most at risk during wildfires are those located within the Wildland Urban Interface where the built environment intermingles with undeveloped land, such as forests and grasslands.[44] Wildfire can disrupt the food supply chain due to impacts on roads used to transport agricultural products.[45] Although wildfires within Pennsville are occasional and localized, they have led to traffic jams and home evacuations within the township in recent past. Wildfires can also severely impact local air quality, making it undesirable to visit parks and other community assets even after a wildfire has been extinguished.[46] This can particularly affect individuals with respiratory conditions (see Section V.D).

[44] U.S. Fire Administration. 2022. What is the WUI?

[45] New Jersey Office of Emergency Management. 2024. State of New Jersey All-Hazards Mitigation Plan.

[46] Mattson, A. 2025. As wildfires increase, NJ considers public-health impact. *NJ Spotlight News*.

D. Housing and People

Climate hazards can exacerbate existing housing issues such as escalating housing costs, displacement of lower-income people, and aging infrastructure. Although everyone who lives in New Jersey is vulnerable to climate change, some population groups are more vulnerable than others. Assessing the disproportionate impacts faced by these populations is necessary to assess the impacts of climate change on a community as a whole. Table V-8 provides data[47] on Pennsville's vulnerable population groups.

Table V-8. Vulnerable populations in Pennsville

	Population Estimate	Population Percent
Low-income*	3,739	29%
No health insurance	616	5%
Aged 65 and older	2,493	20%
Aged 17 and younger	2,786	22%
Disabled	2,014	16%
Minority	1,904	15%
American Indian or Alaska Native	0	0%
Asian	44	0.3%
Black or African American	392	3%
Native Hawaiian or Pacific Islander	0	0%
Some other race	150	1%
Two or more races	472	4%
Hispanic	846	7%
Living in group quarters	0	0%
	Household Estimate	Household Percent
Limited English proficiency households	63	1%
No vehicle households	208	4%
Mobile home housing units	216	4%
Multi-unit housing units	208	4%

*Below twice the poverty threshold as determined by the US Census Bureau.

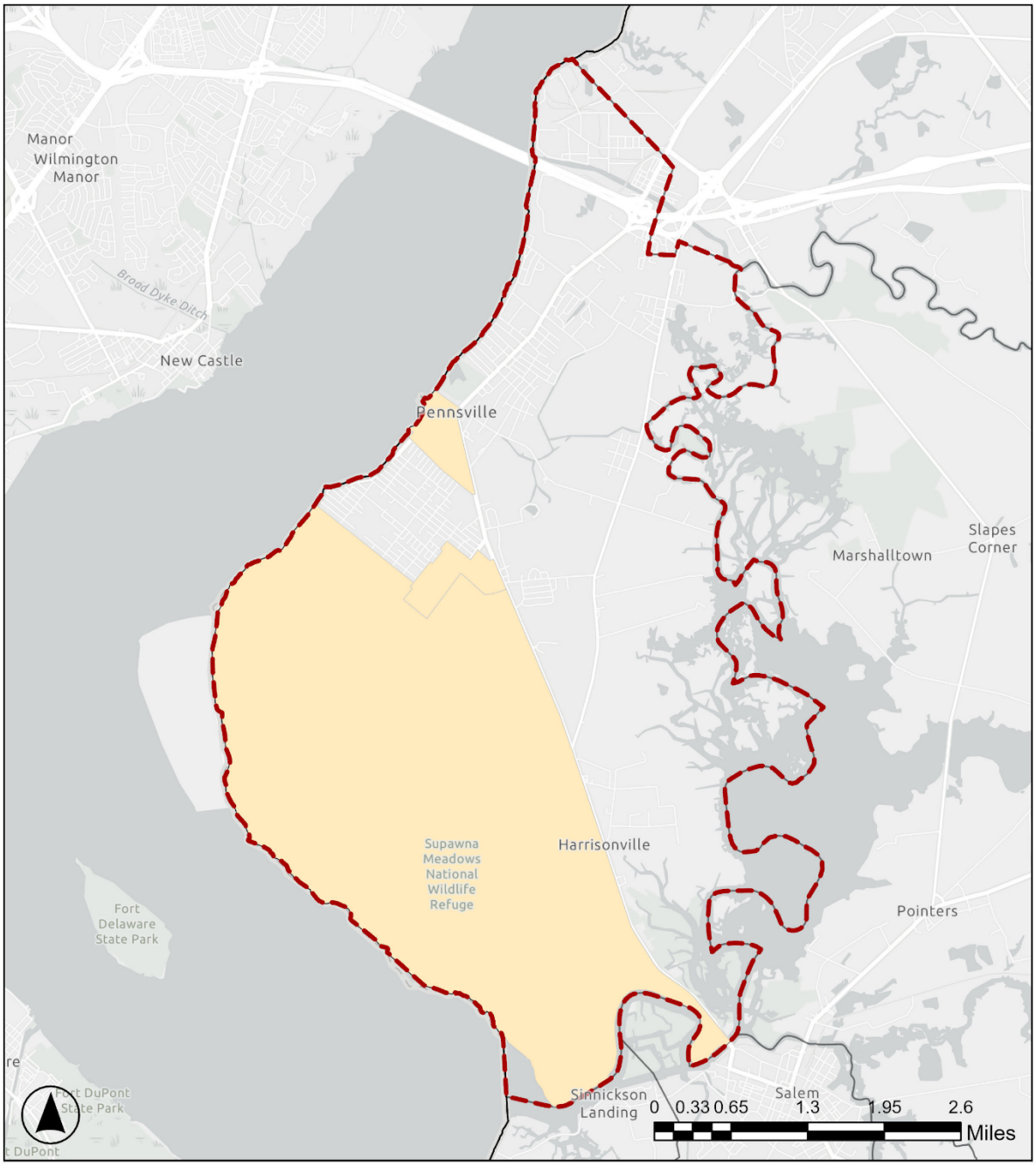
[47] U.S. Census Bureau. 2024. American Community Survey Five Year Estimates.

Additionally, the New Jersey Environmental Justice Law (N.J. Stat. Ann. 13:1D-157) defines Overburdened Communities (OBC) as census block groups with:

- At least 35 percent low-income households (at or below twice the poverty threshold as determined by the United States Census Bureau); or
- At least 40 percent of the residents identify as minority or as members of a State recognized tribal community; or
- At least 40 percent of the households have limited English proficiency (without an adult that speaks English "very well" according to the United States Census Bureau).

The OBC designation facilitates mapping of these vulnerable populations within each municipality statewide. As depicted on Map V-14, three of Pennsville's census block groups located on the west and south parts of the municipality are defined as OBC due to the percentage of low-income households. Within these census blocks, there are 1,254 residents in low-income households and 298 identifying as minorities.

Map V-14. Overburdened communities



LEGEND

Overburdened Communities under the New Jersey Environmental Justice Law

Low Income

Heat

As detailed in Section III.A, temperature projections indicate that Pennsville may experience increasing heat throughout the century. Hot days, in combination with poor housing conditions and lack of climate control can have significant impacts on health. Lack of air conditioning and crowded living spaces can cause heightened anxiety, disrupt sleep patterns, and stress cardiovascular systems.[48] Housing with insufficient building insulation located in areas of high surface temperature or potential heat islands may expose residents to temperatures that can exceed outside temperatures. In New Jersey, heat-related hospital admissions during the warm season (May to September) increased approximately 156% between 2004 and 2013.[49] Children, elderly people, and those with pre-existing conditions are especially at risk. In Pennsville, 42% of the population is either over 65 years old (20%) or under 17 years old (22%).

Additionally, the combination of high heat with high humidity increases risk to outdoor occupational groups for heat-related illnesses like heat stroke.[50] Occupational groups that are particularly vulnerable because of the amount of time spent outside include workers in construction, agriculture, forestry, and natural resource management. 24% of Pennsville's employed labor force is employed in agriculture, construction, and transportation and warehousing sectors[51] which makes them vulnerable to heat-related health risks during extreme heat events. High temperatures also increase the concentration of ground-level ozone in the air. This is particularly harmful for individuals with chronic respiratory conditions.[52]

To better understand potential heat stress challenges to residents, Map V-15 depicts housing parcels relative to land surface temperature. Most of Pennsville's housing is located in higher-temperature areas, partly because impervious surface (i.e. buildings, roofs, sidewalks, parking lots, streets, etc.) trap heat. Map V-16 depicts heat island risk relative to the census block groups designated as OBCs. The more northern block group is located in an area of higher impervious surface and greater heat island risk. The two more southern block groups include large areas of wetlands and, as a result, do not reflect high heat island risk at the scale of this analysis. The township has two designated cooling centers (Map V-1) for heat emergencies. For large crowds, Pennsville Memorial High School is used, while the Municipal Building serves as a designated cooling center for smaller groups of residents.

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[48] Filión, N.A., Knutsen, M., and Phillips, S. New Jersey Department of Environmental Protection. 2025. New Jersey Extreme Heat Resilience Action Plan.

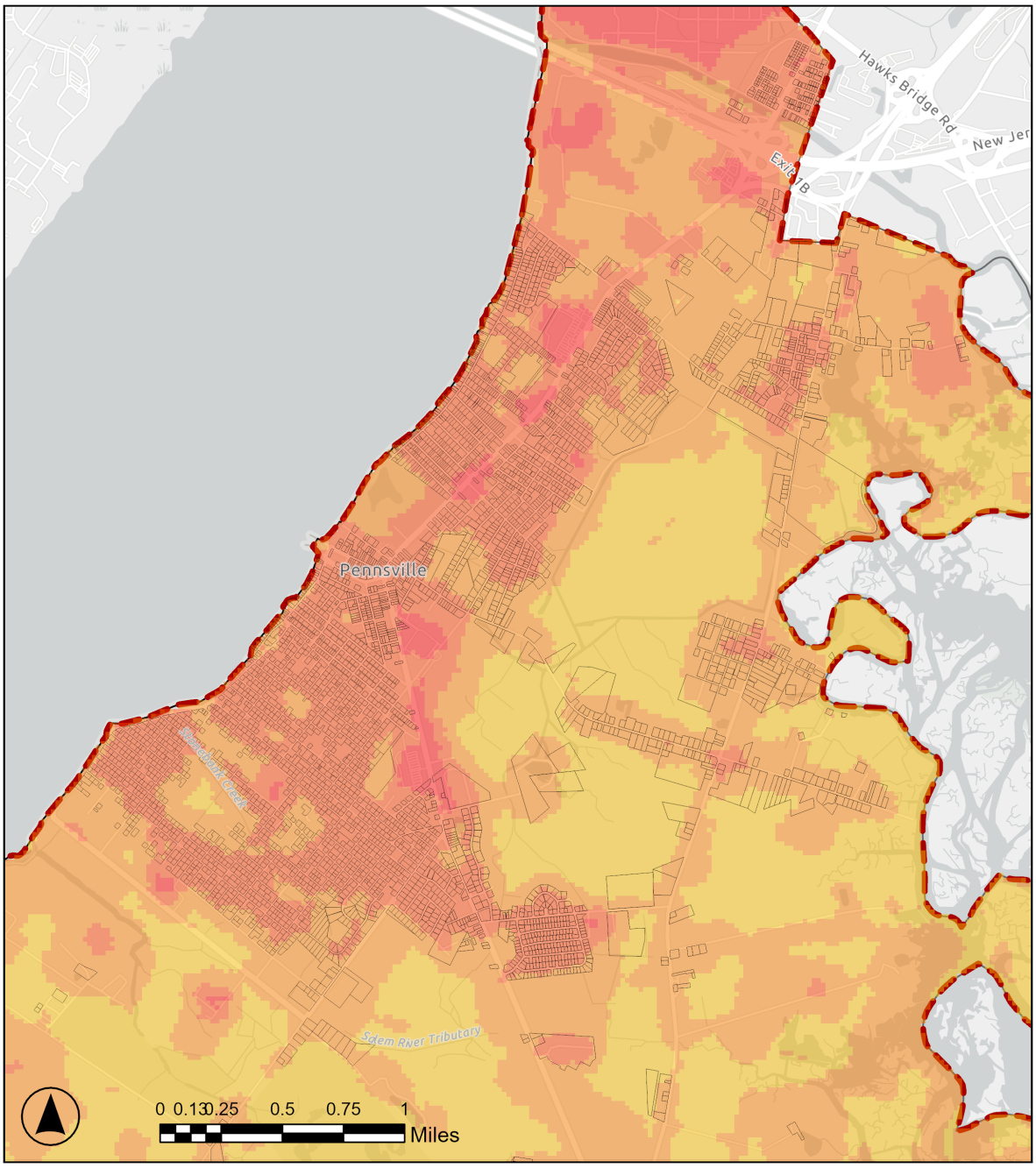
[49] Moran, D., J. Whytlaw, J. Herb, M. Kaplan, J. Madrigano, and P. Kinney. 2017. New Jersey Climate and Health Profile Report. New Jersey Climate Adaptation Alliance. New Brunswick, NJ: Rutgers University.

[50] New Jersey Department of Environmental Protection. 2022. Climate Change Impacts on Human Health & Communities: Addendum to the 2020 New Jersey Scientific Report on Climate Change. Version 1.0. (Eds. J.A. Bonventre, L.A. Lester). Trenton, NJ. 54 pp.

[51] Township of Pennsville. 2025. Housing element and fair share plan: Fourth round plan.

[52] Center for Disease Control. 2022. Heat and chronic conditions.

Map V-15. Land surface temperature (°F) and housing



LEGEND

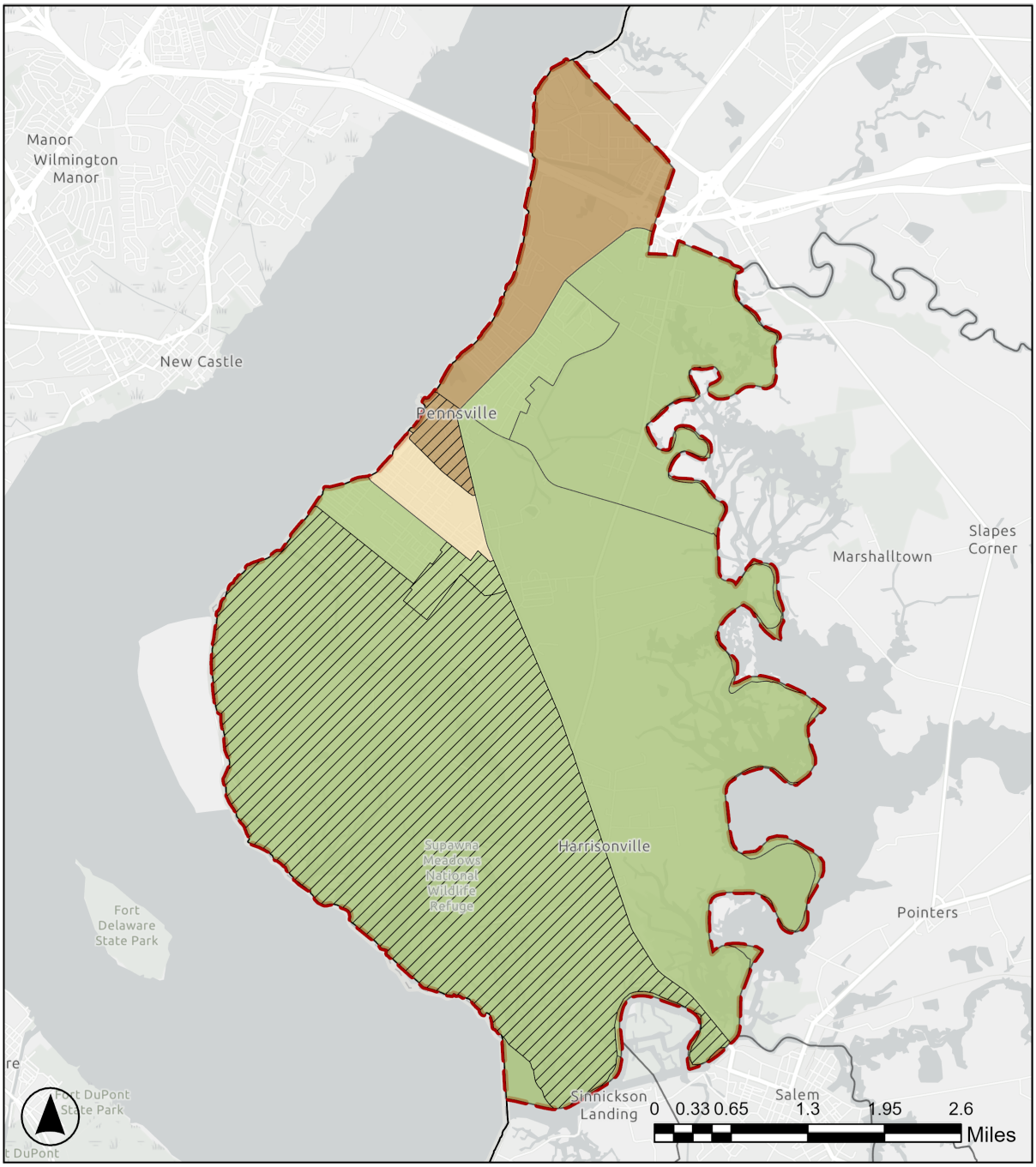
Land Surface Temperature

- Below 80
- 80 - 90
- 90 - 100
- 100 - 110
- Over 110

Pennsville Parcels

- Residential and Apartments

Map V-16. Heat island risk to Overburdened Communities



LEGEND

Ratio Between Canopy Cover and Impervious Surfaces

- Higher Canopy Cover
- Moderately higher Canopy Cover
- Equivalent Canopy/Impervious Cover
- Moderately Higher Impervious Cover
- Higher Impervious Cover

Overburdened Community Criteria

- Low Income

Storms

As detailed in Section III.B, the frequency and intensity of extreme events are anticipated to increase throughout the century. The public health impacts of storms are well documented in New Jersey. For example, extreme rainfall during the warm season has been connected to increases in hospitalizations for gastrointestinal illness.[53] In the aftermath of Superstorm Sandy, adults exposed to mold in their homes were more likely to be diagnosed with asthma and more likely to report mental health distress. Children living in homes that experienced even minor damage were at higher risk for psychological and emotional issues.[54] According to data from the US Census Bureau, approximately 6% of Pennsville's population does not have health insurance and may be at particular risk of health impacts.

Tropical storms and hurricanes may damage residential buildings, including impacts from tree debris and the loosening of windows or roof shingles. Mobile homes are especially susceptible to damage or loss. There are 216 mobile homes in Pennsville (representing 4% of the total housing units), including but not limited to one community in the FEMA flood zone in the northeast part of the Township. Financially burdened households are also at particular risk as their response to extreme weather is constrained by limited resources. These constraints may prevent evacuation, the purchase of backup energy systems, access to emergency services, and/or insurance uptake. Review of summary data on the National Flood Insurance Program in Pennsville indicates that there are 16 Repetitive Loss properties and one Severe Repetitive Loss property with a total of 54 claims paid on these structures since 1978.[55]

Power outages pose additional risks to vulnerable populations, including the elderly and medically frail, who are more susceptible to temperature exposure in homes and facilities without air conditioning or heat. The loss of power can have serious health implications for New Jersey residents, where approximately 15.8% of homes rely on electricity for heating and cooling. Beyond residential settings, individuals in medical facilities may face life-threatening situations if critical equipment fails due to storm-induced outages. Vulnerable populations, like the elderly, especially in coastal communities, are considered the most vulnerable due to the direct exposure to high-impact storms, limited adaptive capacity, and need for additional time or assistance during evacuations.[56] Kent Avenue Senior Living apartments in the northern part of Pennsville and Lindsay Place on the Supawna Road house the most vulnerable residents of the township.

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[53] Gleason, J. & Fagliano, J. 2017. Effect of drinking water source on associations between gastrointestinal illness and heavy rainfall in New Jersey. https://doi.org/10.1371/journal.pone.0173794.

[54] Abramson, D., Alst, D., Merdjanoff, A., Piltch-Loeb, R., Beedasy, J., Findley, P., Peek, L., Mordy, M., Moroso, S., Ocasio, K., Park, Y.S, Sury, J., Tobin, J. 2015. Sandy Child and Family Health Study PERSON Report.

[55] Federal Emergency Management Agency. 2026. Open FEMA Dataset: NFIP Multiple Loss Properties - v1.

[56] New Jersey Office of Emergency Management. 2024. State of New Jersey All-Hazards Mitigation Plan.

Drought

Pennsville's time in drought each year is anticipated to increase throughout the century (see Section III.C). Drought can exacerbate climate-related effects on social systems. Due to the limited availability of reservoirs to back up the groundwater supply, municipalities in southern New Jersey are potentially more vulnerable to longer periods of drought.[57] While the built environment, including housing, is not directly damaged by drought, a home's dependence on the public water supply can influence its livability during drought periods. During periods of heightened demand on public water systems, increasing operational costs may be passed down to the consumer. Increasing water supply rates may restrict water access for financially constrained households. In rural communities, droughts are felt more acutely due to the reliance on private wells, their susceptibility to drying up, and the costly nature of maintaining them. Limitations to financial and technical resources further exacerbate a community's vulnerability to drought-related hazards.[58]

Flood

New Jersey has the largest number of affordable-housing units exposed to sea-level rise among all coastal states, with 1,640 affordable housing units subject to coastal flooding at least once a year.[59] Flooding impacts vulnerable populations by exacerbating existing underlying inequities. In addition to impacts to property, flooding causes physical and mental health impacts. The most direct health impact from flooding is drowning and trauma. Other health impacts from flooding can be the result of increased risk of exposure to contaminants such as bacteria, mold, parasites and chemical pollutants that can cause gastrointestinal, respiratory, and other conditions. Costly repairs and displacement resulting from flood damages can create financial burdens that disproportionately impact low- to moderate-income families.[60]

Maps V-17 and V-18 depict the potential flood exposure of housing parcels in Pennsville for each of the four flood measures listed in Table III-8 (two feet coastal inundation, four feet coastal inundation, FEMA 1% annual chance flood zone, and approximate extent of NJDEP Climate Adjusted Flood Elevation). Tables V-9 and V-10 provide details on the number of parcels, land area, and value of property exposed.

Pennsville has approximately 4,600 residential parcels and about half of these are exposed under current potential flood scenarios. Specifically, 441 are impacted at two feet of coastal inundation, 1,963 are impacted at four feet of coastal inundation, and 2,167 are within the FEMA 1% annual chance flood zone. The proportion of housing parcels at risk is projected to increase throughout the century, with 4,104 parcels potentially subject to the CAFE scenario. (See section VI.C.

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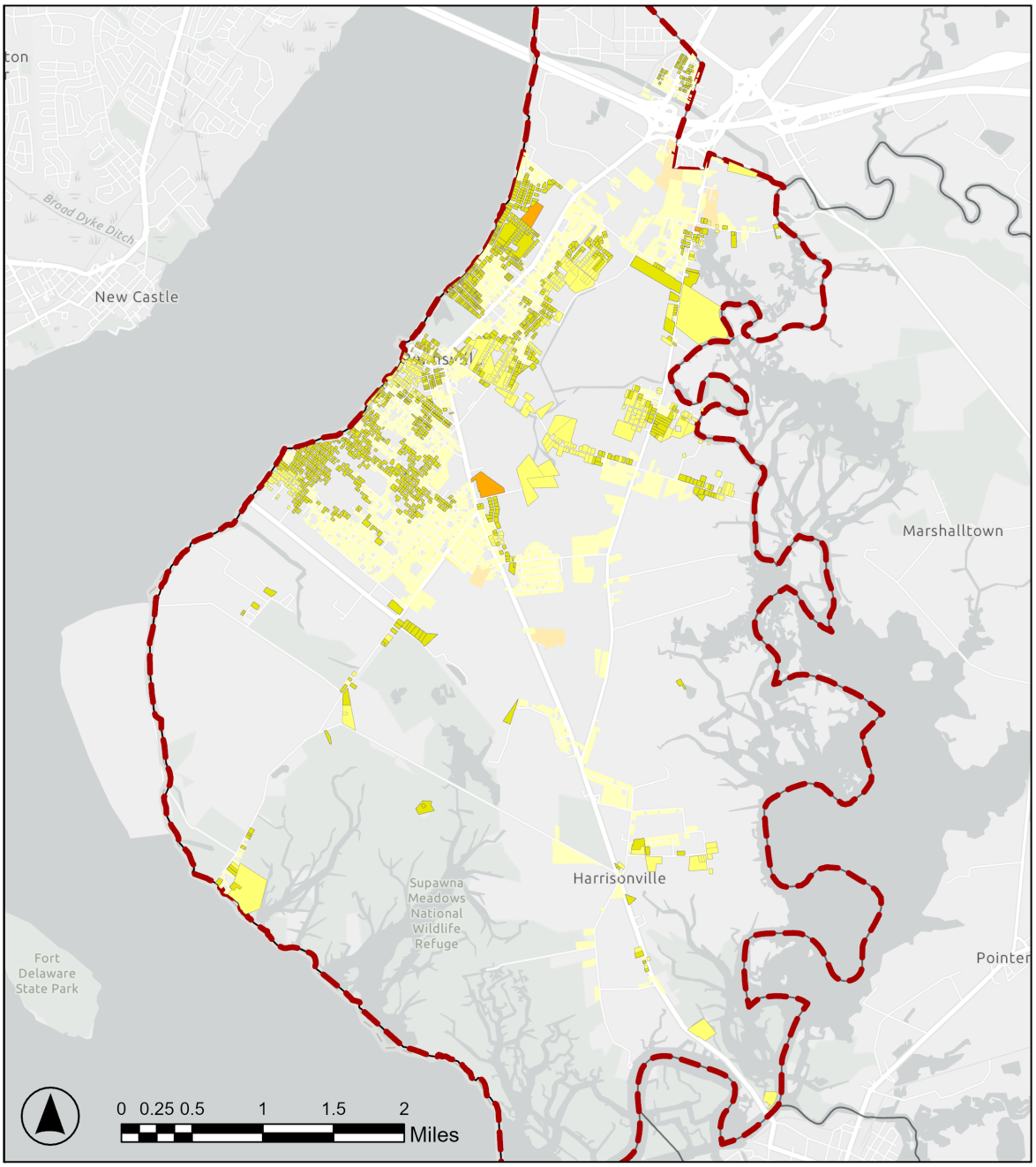
[57] New Jersey Department of Environmental Protection. 2025. New Jersey Scientific Report on Climate Change. (Eds. B. Wiley, K. Raper, J. Bonventre, R. Hill, L.A. Lester, N.A. Procopio). Trenton, NJ. 275 pp.

[58] Domber, S., Barr K., Snook, I., Hoy, D., Carreno, B., Drabik, J., Walsh, S. NJDEP Division of Water Resources Management. 2024. 2024 New Jersey Water Supply Plan.

[59] Buchanan, Maya K. et al. 2020. Sea level rise and coastal flooding threaten affordable housing. Environmental Research Letters, Volume 15.

[60] Interagency Council on Climate Resilience. 2025. New Jersey Statewide Flood Resilience Initiatives.

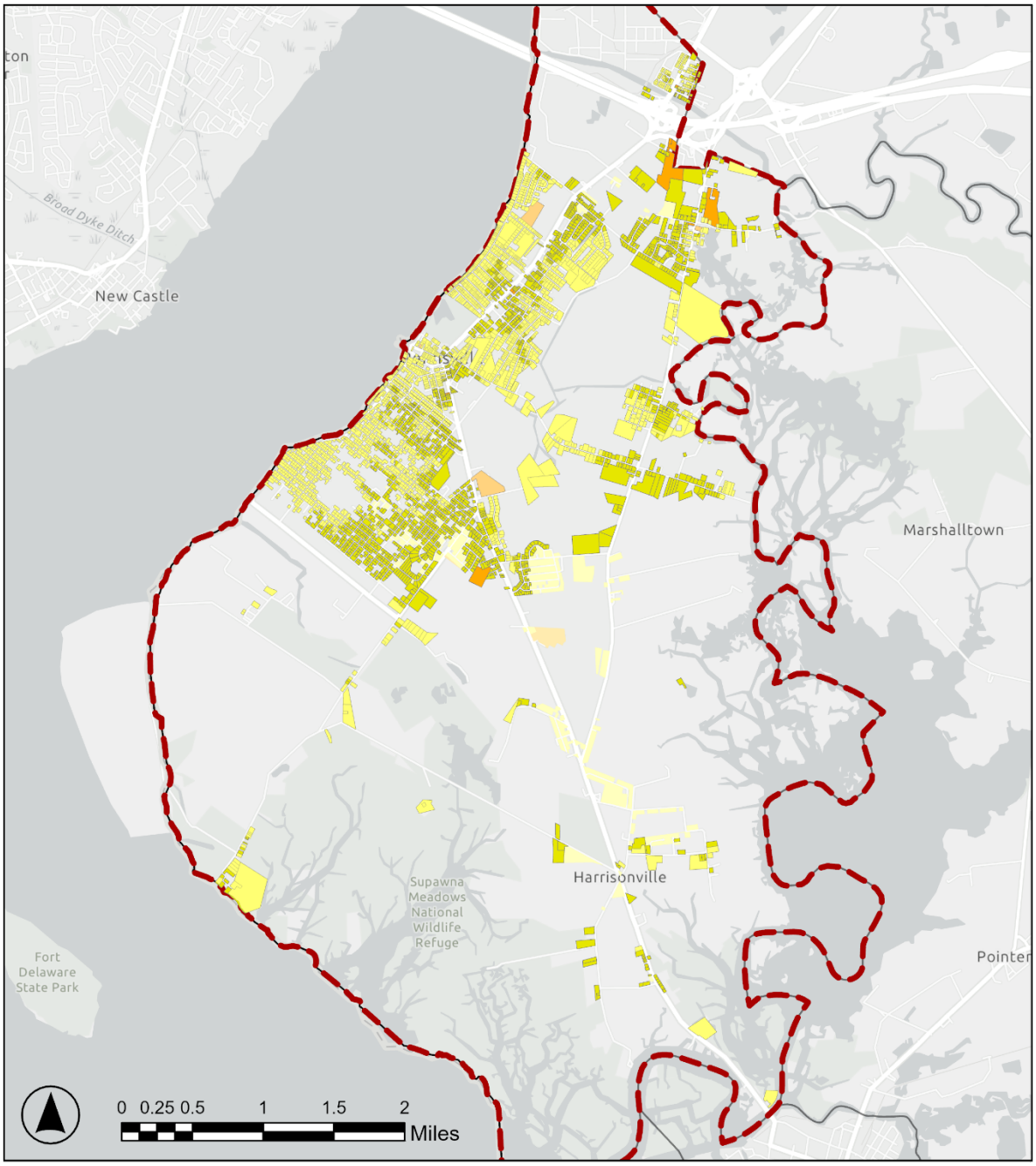
Map V-17. Housing parcels exposed at 2 feet and 4 feet coastal inundation



LEGEND

Parcels Not Flooded	Parcels Impacted by 2ft Inundation Extent	Parcels Impacted by 4ft Inundation Extent
Residential	Residential	Residential
Apartments	Apartments	Apartments

Map V-18. Housing parcels within FEMA Flood Zones



LEGEND

Parcels Not Flooded	Parcels impacted by FEMA1pct	Parcels impacted by Climate Adjusted Flood Elevation
Residential	Residential	Residential
Apartments	Apartments	Apartments

Table V-9. Flood exposure of housing parcels at 2 feet and 4 feet coastal inundation

		Number / land area exposed in...					
		2 feet coastal inundation			4 feet coastal inundation		
MOD IV Property Class	Total # parcels	# Parcels	Acres	Net Equalized Value ($)	# Parcels	Acres	Net Equalized Value ($)
Residential (2)	4,591	441 (10%)	431	87,383,657	1,959 (43%)	945	373,782,480
Apartment (4C)	17	0	0	0	4 (24%)	24	18,041,978
Total	**4,608**	**441 (9%)**	**431**	**87,383,657**	**1,963 (43%)**	**970**	**391,824,458**

Table V-10. Flood exposure of housing parcels within FEMA Flood Zones

		Number / land area exposed in...					
		FEMA 1% Annual Chance Flood			Approx. extent of CAFE		
MOD IV Property Class	Total # parcels	# Parcels	Acres	Net Equalized Value ($)	# Parcels	Acres	Net Equalized Value ($)
Residential (2)	4,591	2,163 (47%)	929	413,059,844	4,089 (89%)	1,721	777,917,717
Apartment (4C)	17	4 (24%)	24	18,041,978	15 (88%)	65	29,034,504
Total	**4,608**	**2,167 (47%)**	**953**	**431,101,822**	**4,104 (89%)**	**1,786**	**806,952,221**

Maps V-19 and V-20 depict potential flood exposure of OBC in Pennsville for each of the flood measures. Table V-11 summarizes the number of people exposed within Pennsville's OBC census blocks for each flood measure.

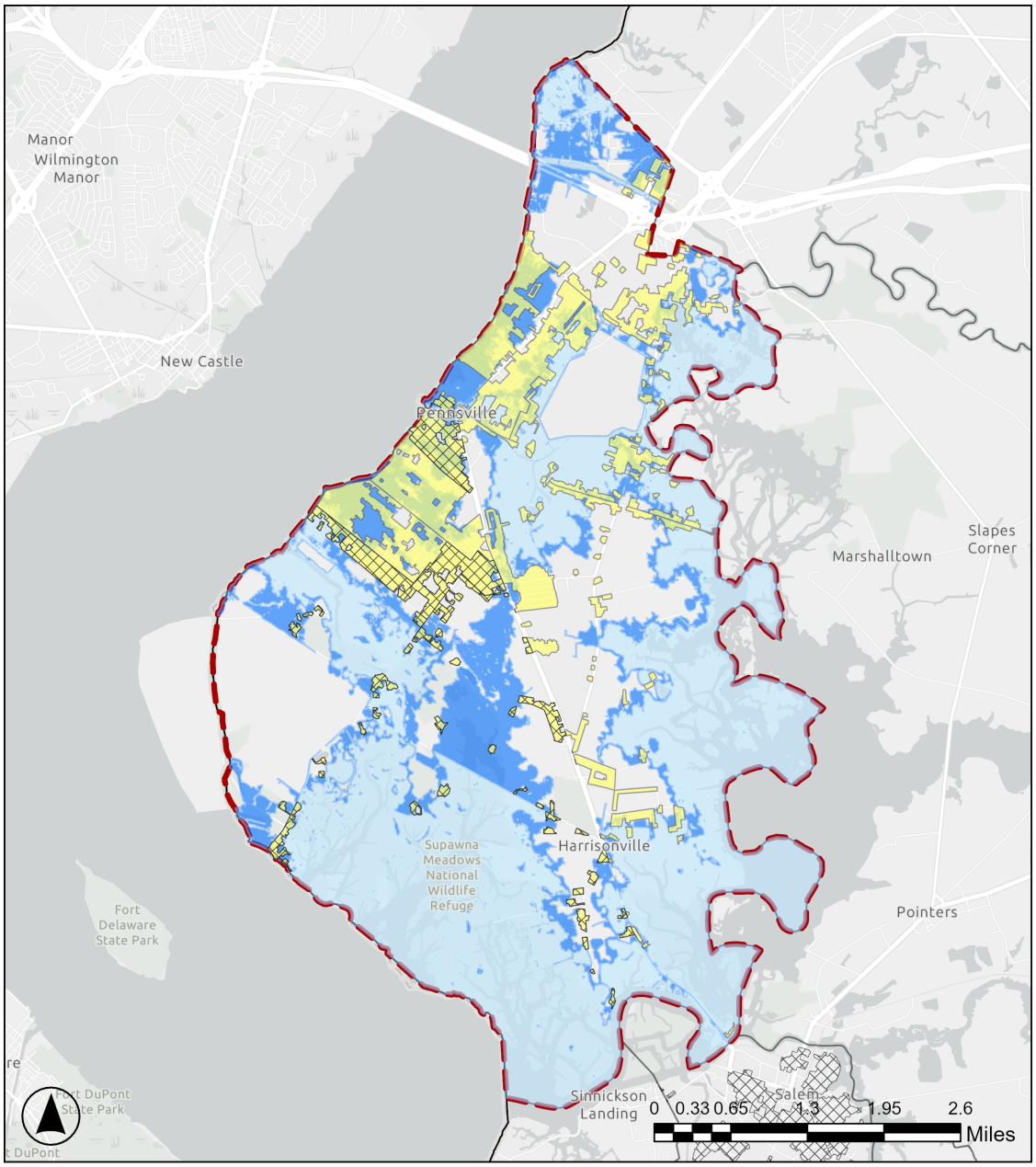
A portion of Pennsville's low-income population is exposed at two feet of coastal inundation (132 people), 4 feet coastal inundation (385 people), and within the FEMA 1% annual chance flood zone (427 people). These people may currently be impacted by high tide flooding events and are also at risk from the 100-year storm. A greater number of the low-income population resides within the approximate extent of the NJDEP Climate Adjusted Flood Elevation (1,072 people), indicating the need for planning to address future flood risks to these people. A small portion of Pennsville's minority population also resides within these flood risk areas.

Table V-11. Flood exposure of Overburdened Communities

	Total # in OBC census blocks	Estimated number of people exposed in...			
		2 feet coastal inundation	4 feet coastal inundation	FEMA 1% Annual Chance Flood	Approx. extent of CAFE
Low-income*	1,254	132	385	427	1072
Minority	298	40	111	121	263
Limited English proficiency households	0	0	0	0	0

**At or below twice the poverty threshold as determined by the United States Census Bureau*

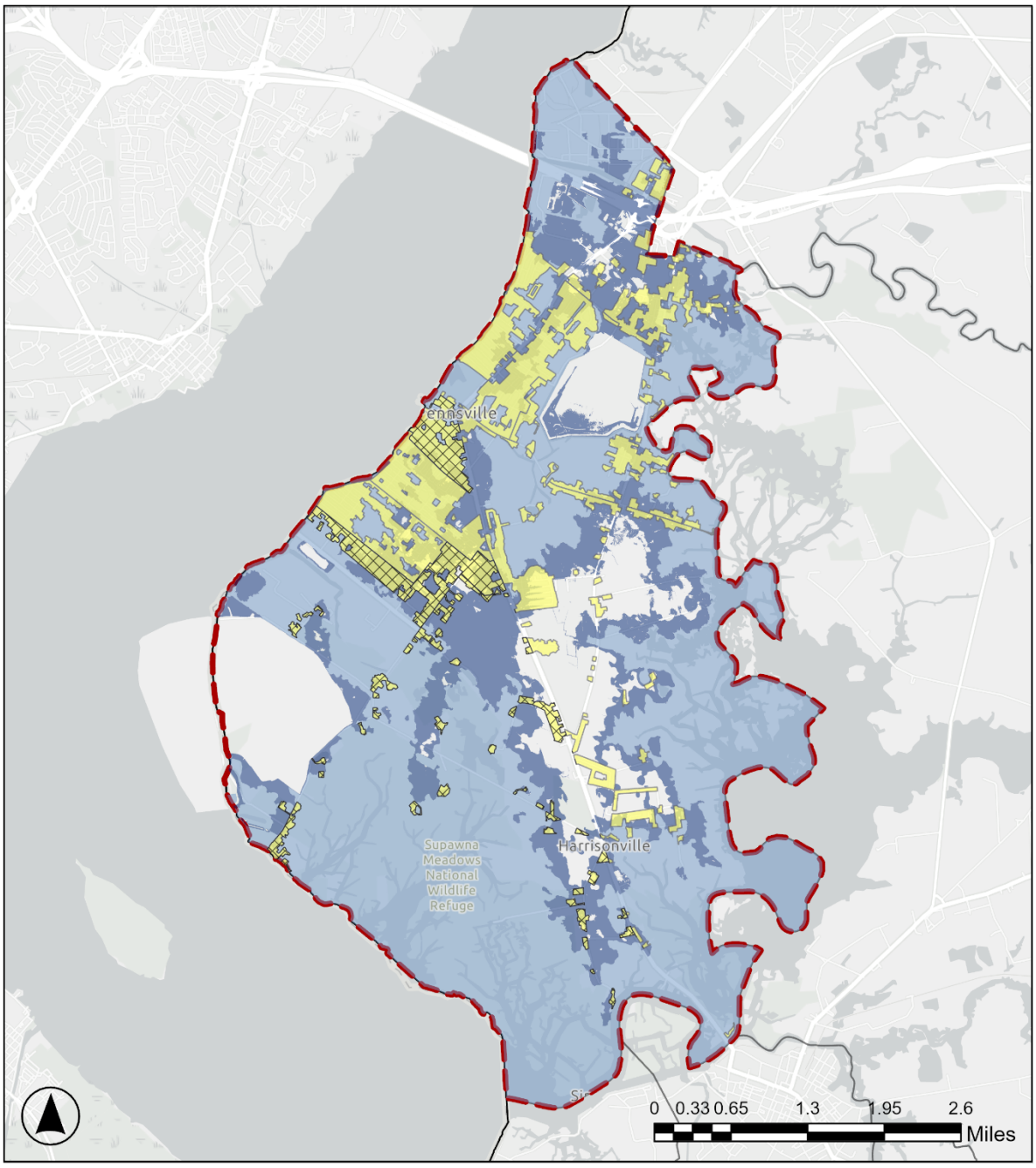
Map V-19. Overburdened Communities exposed at 2 feet and 4 feet coastal inundation



LEGEND

- 2ft Coastal Inundation Extent
- 4ft Coastal Inundation Extent
- Residential Areas
- Residential Areas in Overburdened Communities

Map V-20. Overburdened Communities within FEMA flood zones



LEGEND

- 1Pct Annual Chance Flood
- Approx. extent of Climate Adjusted Flood Elevation
- Residential Areas
- Residential Areas in Overburdened Communities

Wildfire

Although wildfire risk in Pennsville is relatively low, there have been four documented wildfire events since 1950 (see Section III.E). Housing most at risk during wildfires is located in areas where the built environment mixes with natural land. Wildfires can cause shifts in the housing market as fires destroy homes and displace residents. Municipalities may struggle to bounce back and provide sufficient housing stock after wildfires, causing a plateau or declining population in communities with large or recurring events.[61]

[61] New Jersey Office of Emergency Management. 2024. State of New Jersey All-Hazards Mitigation Plan.

VI. Impacts on the Master Plan

The NJ MLUL requires a CCRHVA to analyze "the potential impact of natural hazards on relevant components and elements of the master plan." Pennsville's Master Plan was completed in 2002, and the re-examination was completed in 2015. While the 2025 re-examination report was referenced for this analysis, the Township is currently undertaking a new re-examination for which this CCRHVA can offer important contributions. The reviewed documents include the following plan elements:

Mandatory elements:

- Statement of objectives, principles, assumptions, policies, and standards (SOPAPS)
- Land Use
- Housing

Optional elements:

- Circulation and Transportation
- Community Facilities
- Economic Development
- Historic Preservation
- Recreation
- Environmental Protection

A. Statement of objectives, principles, assumptions, policies, and standards (SOPAPS)

As outlined in its Master Plan, Pennsville is a township in Salem County, Southern New Jersey, characterized by a rich agrarian history and the challenges of a declining industrial economy. The township is largely covered by agriculture use and wetlands. The 2002 Master Plan describes that water and wetlands make up 57% of Pennsville, and approximately one-third of Salem County shoreline are in Pennsville. Pennsville has the opportunity to continue its efforts to promote seasonal tourism as part of a resilient economic development strategy by focusing on the Delaware River and wetland areas as recreation spaces. Currently, Pennsville's top goal in its economic strategy is to encourage light industry by rezoning the Industrial Road area and Hook Road area to Mixed Use/ Commercial/Office, as well as rezoning the area along Main Street for a Central Business District.

Previously, Pennsville's planning efforts included:

- 2002 – Master Plan
- 2008 – Master Plan Reexamination Report
- 2009 – Housing Element and Fair Share Plan
- 2015 – Master Plan Reexamination Report
- 2017 – Third Round Housing Element and Fair Share Plan
- 2025 – Fourth Round Housing Element and Fair Share Plan
- 2025 – Draft Master Plan Reexamination Report

As stated in the 2002 Master Plan, Pennsville aims to preserve its rural character. By adhering to the State's Development and Redevelopment Plan and Smart Growth Policy, Pennsville has made a good effort to cluster its neighborhoods to preserve open space. This approach aligns with the Master Plan goals of focusing development to areas with existing infrastructure, including sanitary sewer and water supply. This creates a distinction between the townships' fertile farmlands in the south and southwestern areas, and the urbanized area clustered along the western shoreline. This distinction is consistent with Salem County's Master Plan to rezone the eastern and southern border of Pennsville for conservation, since it is subject to the regulations pursuant to the New Jersey Coastal Area Facility Review Act (CAFRA).

The 2025 Draft Reexamination report contains notes from the 2008 Reexamination regarding progress made from the 2002 Master Plan. Notable changes from the 2002 Master Plan include: the creation of a central business district, a mixed use district, and a redevelopment district. The land use ordinance was also amended to add a conservation district.

Although the Township's expressed goal is to maintain its rural character, the Township of Pennsville is one of the five municipalities designated as "Salem County's Western Economic Growth and Development Corridors." Historically, Pennsville was home to one of the most prominent industrial companies of its era, the DuPont Chambers Works. Recognizing the economic and environmental challenges associated with Pennsville's decline in industrial use, the NJ Department of Community Affairs provided the township with a Smart Growth Planning Grant which was intended to develop a Smart Growth Regional Plan which was to serve as a regional multi-sector approach to land use, economic development, community facilities, infrastructure, and conservation planning consistent with the State Development and Redevelopment Plan, the County Growth Management Plan, and long-term planning of other municipalities in the Planned Growth Corridor. The completed plan will serve as a submission to the State Planning Commission for regional plan endorsement. Given Pennsville's ongoing comprehensive planning efforts in collaboration with the county and other municipalities, the township may benefit from pursuing Plan Endorsement from the State Planning Commission which may offer the township technical assistance, and priority status for state capital investments and state grants and loans.

In addition to economic and environmental objectives, Pennsville aims to provide affordable housing consistent with its New Jersey Fair Share housing obligations and to encourage preservation, rehabilitation, and adaptive reuse of its historic buildings. Specifically, in the 2025 Draft Reexamination objectives, Pennsville adopted a housing objective to have single-family medium-density housing. Moving forward, limiting multiple-family residential development to areas with existing adequate utilities and community facilities would ensure consistency with the township's Master Plan objectives.

Climate Hazard Connections

Section III. Current and Future Climate Hazards, identifies climate change-related threats to Pennsville Township, including flooding, heat, storms, drought, and wildfire. Pennsville is subject to coastal and fluvial flooding, with most of the township affected by 4ft coastal inundation by 2025 and FEMA 1% Annual Chance flood.

The 2002 Master Plan does not include specific mention of mitigation plans for identified climate change hazards. The draft 2025 Reexamination Plan stated the need to incorporate the New Jersey Department of Environmental Protection's 2024 Resilient Environments and Landscapes (REAL) Rule in the township's objectives, principles, assumptions, policies, and standards in the Master Plan's section. By integrating the master plan with the latest amendment to the flood hazard control act, the township can acknowledge the effects of climate change on the general welfare and move toward climate-informed planning. This includes reconsidering land-use, redevelopment, and infrastructure decisions with awareness of environmental vulnerability and its associated risks. Another point made in the 2025 Reexamination Plan is to comply with the 2008 MLUL Amendment and prepare a "Green Building and Environmental Sustainability Element." Currently, neither element has been fully articulated in the 2025 Reexamination Plan. The CCRHVA may serve as a vital foundation for bridging the gap between township planning and climate change analysis, advancing climate resilience, and enabling further re-examination of the master plan.

In coastal areas, a general threat related to climate change and sea-level rise is the inland migration of tidal marshes. Pennsville's eastern border and southwest part is currently home to its tidal marshes. This means Pennsville's coastal land borders might shift inland over time, if there is no conservation mitigation to this regard. The CCRHVA assessment shows the marsh retreat through Map V-8. Additionally, the sea-level rise projection in Pennsville for 2050 and 2100 is shown in map III-8. Projection of the nearest 2050 shows a 2ft inundation extent while the 2100 shows 4ft inundation extent. Most areas are not exposed to sea-level rise hazards with the exception of some areas alongside the North Broadway, South Broadway, South Hook Road, and at the westernmost point of New Jersey (beside Fort Mott)

With the support of local leaders, the township has made strong efforts to address flood hazard mitigation. Pennsville participates in FEMA's Community Rating System (CRS), which helps reduce flood insurance costs for residents of the respective township. The FEMA CRS program assesses a municipality's efforts to provide mitigating infrastructure/capital improvements. Currently, Pennsville is at level 8 on a scale of 1-10 with 1 being the highest score that a local government can achieve.

Cooler winds from the shore and river contribute to Pennsville's low overall risk of wildfires. While wildfire is not a significant risk for Pennsville, there have been 4 documented wildfire incidents since 1950. Map III-10 visualizes the wildfire risk locations in Pennsville.

Potential Resilience Considerations

- As part of its participation in the five municipalities' Smart Growth Planning Grant, Pennsville could benefit from advancing a Redevelopment Plan for the DuPont Chambers Works. Outcomes of both these efforts could help position to pursue Plan Endorsement from the State Planning Commission which offers the potential for positioning Pennsville for funding opportunities to advance its resilience priorities.
- Pennsville could also benefit from continuing its efforts to seek grants for recreation infrastructure maintenance which would deliver local economic benefits related to riverfront recreation while enhancing riverfront adaptation to flood hazards. Pennsville could consider incorporating a "Green Building and Environmental Sustainability Element" in the future Master Plan reexamination, as recommended by the 2008 MLUL Amendment and the 2025 Draft Reexam; such an element could serve to element sustainability design plans that foster adaptation to climate change such as greater adoption of nature-based infrastructure strategies.
- Pennsville could consider incorporating a "Farmland Preservation Element" in the future reexamination as Pennsville agriculture land use type covers 12.38% of the township as stated in the 2002 Master Plan. Such an element could be structured to outline priorities for maintenance of the township's rich agricultural history in ways that adapt to changing climate conditions.
- The Address marsh migration risk due to sea-level rise (CCRHVA Map V-8) and its influence on Pennsville eastern border and southwest part shifting borders (inland migration) over time and consider conservation mitigation to this regard.
- By documenting its ongoing climate change resilience and hazard mitigation efforts, Pennsville could strive to increase its rating via the Community Rating System to deliver financial benefits to residents pursuant to the National Flood Insurance Program.
- The status of the NJDEP's Resilient Environments and Landscapes (REAL) Rule is rapidly changing; Pennsville would be well-served by continuing to be informed about the evolution of this regulatory initiative and its implications for the township.

B. Land Use Element

The land-use in the Township of Pennsville primarily contains farm-qualified and public uses, which collectively account for 58% of the town's land area. Pennsville continues to emphasize residential development that preserves the rural character of the community. The most common type of residential zoning in the community is R-2 zoning (Map IV-2). According to the 2002 Master Plan, wetlands comprise 57% of the township's area. Currently, the Land Use section of the plan does not address climate hazards such as flooding.

Climate Hazard Connections

Flooding

In Pennsville, there are 99 parcels of lands that are actively devoted to agricultural or horticultural use that are impacted at 4 feet of inundation (Table V-4), many of which are located in southern Pennsville near wetlands zoned as conservation land. An additional 138 parcels fall within the Climate Adjusted Flood Elevation (CAFE) area, and these appear to be concentrated near southwest Pennsville.

Three significant industrial sites in Pennsville (Chemours Works, formerly DuPont; Siegfried, and the warehouse at 88 Industrial Park Road) are affected by all four flood scenarios in Section III (Map III-8, Map III-7), which would impact 529 acres of industrial area for the town. This analysis does not include the most recent warehouse development and solar farm in the Township, which were not included in the original mapping prepared for this CCRHVA. Chemours Works is permitted and regulated by the following programs: as a Solid and Hazardous Waste Facility, a Community Right-to-Know (CRTK), Toxic Catastrophe Prevention Act (TCPA), and the Discharge Prevention, Containment and Countermeasure Program (DPCC). The Siegfried site is also classified under TCPA and CRTK. Based on the classifications, potential flooding could increase the risk of accidental release from these facilities and related public health threats.

By 2050, large sections of land use in eastern Pennsville including significant R3 and commercially zoned areas would be permanently inundated. In addition, nearly half of Pennsville's 4,608 residential/apartment parcels are within the FEMA 1% Annual Chance Flood Zone (Tables V-3 and V-10).

One concern for the municipality is an increase in impervious surfaces. Specifically, there is a long strip of land in northwest Pennsville that is noted as having a high ratio of impervious surface to canopy cover and, additionally, there has also been an increase in warehouse development within Salem County and nearby neighborhoods, which significantly increases impervious surface and stormwater runoff. Considering opportunities to reduce impervious cover and increase reliance on nature-based infrastructure could be a viable topic for the township's upcoming Master Plan reexamination.

Another distinct land-use concern in Pennsville centers on two expansive areas containing historic dredge spoils deposited by the U.S. Army Corps of Engineers (USACE) during historic dredging operations along the Delaware River and its connected water features. The western disposal area is currently zoned for conservation, while the northern site is zoned for commercial use. Because these properties are owned by the federal government and managed by the USACE, Pennsville lacks direct jurisdictional control or management authority over the land. Due to their elevated topography, neither site appears to face immediate inundation risks under standard flood scenarios. Nonetheless, both sites warrant formal assessment within local flood vulnerability modeling. Because the precise chemical composition of these historic materials remains unverified according to local Pennsville officials, major sediment displacement during an extreme weather event could introduce contaminants or heavy siltation into municipal stormwater infrastructure, posing potential risks to public health and the local environment.

Drought

Pennsville is projected to experience increasing durations of drought by mid-century, which may pose challenges to corn and soybean farmers. Salem County's Farmland Preservation Plan strongly encourages water reduction strategies for farmers, but water use has continued to increase, and 29% of water withdrawals are for agricultural use based on 2018 data. Drought would likely have a low impact on residential development as Pennsville has already reduced land development based on the available water supply.

Wildfire

Overall, wildfire does not appear to pose a significant risk to Pennsville based on the CCRHVA. However, additional monitoring of sections of phragmites where previous wildfires have occurred may be warranted and Pennsville may benefit from evaluating state and county funding opportunities for such monitoring.

Heat

Temperatures in the northern industrial section of Pennsville exceeded 110°F which may pose higher heat risks for industrial workers as this section of the municipality also has a higher heat island risk. The increased heat level in industrial areas may also pose concerns for nearby wetlands that should be monitored. According to NJ Public Health Adapt,[62] southern Pennsville has a Heat Vulnerability index of 3 and northern Pennsville has a Heat Vulnerability index of 4 (1 indicates the lowest vulnerability category, and 5 indicates the highest vulnerability). Census Tracts in northern Pennsville also contain slightly higher rates of asthma at approximately 10%, meaning that extreme heat days would pose a higher risk for those communities.

Potential Resilience Considerations

- Continue Pennsville's ongoing efforts to coordinate with Salem County and the NJDEP Blue Acres Program to encourage home buyouts. The content of the CCRHVA may provide Pennsville with valuable information and data to engage local residents to better communicate their potential risks in order to encourage consideration of strategic buy out efforts. Use the upcoming Master Plan reexamination process as an opportunity to facilitate broader community envisioning efforts to consider how high-risk residential property could be converted to public waterfront. This community envisioning could potentially be used to gather support for a broader partnership with Blue Acres, and the Hazard Mitigation Division of the state Office of Emergency Management.
- Strengthen local ordinances to ensure that new or substantially modified commercial development includes state-of-the-art stormwater controls that are equipped to manage increased levels of stormwater runoff.

[62] Rutgers University. NJ Public Health Adapt.

- Explore funding opportunities to expand use of nature-based infrastructure, such as bioswales and permeable surfaces, as part of the planned bike trail to support community recreation, ecotourism and flood retention.
- Use the upcoming Master Plan reexamination as an opportunity to promote and/or require greater use of nature-based infrastructure, such as increased tree canopy, throughout the township, including as a buffer in the north industrial region, to reduce urban heat island.
- Collaborate with state agencies including the New Jersey Forest Fire Service to increase controlled burns on phragmites patches to reduce wildfire risk.
- As part of the upcoming Master Plan reexamination, consider zoning changes designed to minimize the expansion of industrial development into high-risk flood areas.
- Coordinate with NJDEP to assess the extent to which CCRHVA flood hazard assessments are adequately reflected in industrial environmental regulatory permits such as stormwater pollution prevention plans.
- Provide density bonuses for developers that implement green building strategies to prepare for future Smart Homes applications.

C. Housing Element

2025 Housing Element and Fair Share Plan (Fourth Round)

Adopted in June 2025, the Fourth Round Housing Element and Fair Share Plan (HEFSP) outlines how Pennsville plans to meet its affordable housing requirements. The Township has already fully met its Prior Round Prospective Need of 228 units. Looking ahead to the 2025-2035 cycle, the plan identifies a Present Need (essentially a rehabilitation demand) of 69 units and a new Prospective Need of 46 units. To reach these numbers, the Township is leaning heavily on eight designated inclusionary zoning sites. Another important detail highlighted in the plan is the age of Pennsville's housing. The median home was built in 1963, and nearly 70% (68.2%) of all occupied homes are more than half a century old.

Climate Hazard Connections

While the HEFSP dictates where new affordable housing will be sited, the township may want to consider overlaying the flood hazard mapping prepared for this CCRHVA with HEFSP inclusionary housing areas to assess potential hazards, vulnerabilities of forthcoming development of affordable housing units. Creating an overlay mapping for the eight inclusionary zones against standardized risk models for flooding, heat, and wildfire could provide the township with valuable information to ensure that design standards for new units incorporate state-of-the-art resilience practices.

Flooding

Out of Pennsville's roughly 4,600 residential parcels, about half face some level of risk under the current models:

- **441** parcels are impacted at 2 feet of coastal inundation.
- **1,963** parcels are impacted at 4 feet of coastal inundation.
- **2,167** parcels fall within the FEMA 1% annual chance flood zone.
- **4,104** parcels fall within the Climate Adjusted Flood Elevation (CAFE).

Heat

Extreme heat is a growing concern, deeply tied to the age of Pennsville's housing. With the median home built in the early 1960s, older houses often lack modern insulation and energy-efficient cooling. For the 1,254 low-income residents living within the Township's three Overburdened Community (OBC) tracts, summer heat waves pose serious health and financial strain due to high energy costs.

Wildfire and Drought

Drought conditions directly impact long-term housing growth. Pennsville operates under a DEP Water Allocation permit, meaning water supply constraints are a genuine hurdle for new, dense development. Additionally, if any of the planned inclusionary sites sit near wetland edges, they could face localized wildfire risks from the dry, invasive phragmites that grow densely in those margins, a risk that spikes significantly during dry spells.

Potential Resilience Considerations

To better align the HEFSP with broader climate resilience targets, the Township could consider the following actions:

- For the eight established inclusionary sites and the 69 units targeted for rehabilitation, implement site-level design standards that mitigate risks identified in the Draft Hazard Assessment. This ensures that while the sites themselves are fixed, the structures built upon them are designed to handle elevated flood or heat risks.
- As the Township looks toward the current affordable housing obligations, conduct comprehensive climate vulnerability screening on all prospective sites. This proactive approach will help steer future development toward lower-risk areas, avoiding flood zones and hazardous wetland buffers entirely during the initial site selection process.

Optional Elements in the Master Plan

The Township of Pennsville Master Plan does not include any stand-alone additional elements as depicted in N.J.S.A. 40:55D-28. However, potential elements are referenced in sections throughout the Master Plan, including the Introduction, Goals and Objectives, Land Use, and Housing Sections. The mentioned elements are included because they closely relate to Pennsville's climate change hazards and can provide specific guidance on Pennsville planning opportunities and restrictions. Our report gives support to formally including these elements in the Master Plan Reexamination.

D. Circulation and Transportation

In the Township of Pennsville 2002 Master Plan, there are descriptions of transportation infrastructure within the municipality. As transportation is critical during logistics during emergencies, evacuations, and general resilience, it has been added to this document for consideration.

There are two main transportation methods within Pennsville: automobile and bicycle. There are no passenger rail services within the municipality, however the rail infrastructure still exists. As of the 2002 Master Plan, there were three bus routes provided by NJ Transit within Pennsville: Route 402, Route 423, and Route 468, all of which largely follow roadways outside of the jurisdiction of the Township.

Climate Hazard Connections

Flooding and Storms

In current conditions, it is impossible to travel from the northernmost part of Pennsville to the southernmost part of Pennsville without entering a flood hazard area. In consideration of climate change-related sea-level rise of 4 feet, which is the projected sea-level rise by year 2100, there will be portions of North and South Broadway Street (State Highway 49) and portions of North and South Hook Road (County Route 551) that will be permanently inundated, eliminating the core functionality of these roads and severing the circulation within the township. Additionally, East and West Pittsfield Street, the municipal road that acts as a primary connector between these two State and County roads, will be completely and permanently underwater.

Similarly, the bike route along the Delaware River that circumferences a good portion of the township will also be inundated for the majority of its length. A few small sections along Industrial Park Road are above water. There is a section of the township planned for future development and expansion near the intersection Clinton Drive and Lehigh Road and northeast of the second Army Corps of Engineering Delaware River spoils pile that will be permanently underwater in most locations, and within the 1% flood hazard area for the rest by year 2100 under current climate change models. This shift may have significant impacts on township planning and emergency response. Furthermore, anticipated sea-level rise and flooding have the potential to render all current public transit mechanisms impossible.

Heat, Drought, and Wildfire

For transportation infrastructure, the other hazards have minimal impact and interplay, but it is noted that the roadways and non-motorized paths within Pennsville are critical in connecting to other elements of the Master Plan and will likely be integrated into other sections of this report. For instance, Heat, Drought, and Wildfire have a marginal nexus as roadways contribute to heat island effect and this will continue to worsen as average global temperatures continue to rise, but roadways also serve as manufactured firebreaks to slow the spread of wildfires, both of which are connected to land use and environmental resources contained within Pennsville.

Potential Resilience Considerations

- Develop a Capital Improvement Plan that proactively invests in raising critical roadways to maintain safe circulation and long-term accessibility, based on the current and future flood impacts and aligned with the natural lifecycle of road infrastructure. Clearly, given the jurisdiction of the state and county over key roadways, collaboration with other government agencies is critical.
- Complete the bicycle path along the Delaware River - consider future improvements to raise the elevation of the bike path in conjunction with NJDEP approvals to create a natural levee, use nature-based infrastructure to maximize flood retention, and provide additional protection from flooding.
- Continue to encourage ongoing discussions with Salem City and Salem County to explore elevation or other strategies to address the current elevation of the bridge into Salem City which sits below the anticipated inundation area per the latest revisions to the Flood Hazard Area guidelines (NJ PACT REAL).
- Consider additional street trees where appropriate and feasible to protect from heat island effect.

E. Community Facilities

The Township's 2002 Master Plan provides a list of planning goals associated with Community Facilities. The main focus is to continue maintenance and level of service from each facility with added attention to the Americans with Disabilities Act (ADA). The report also attempted to scope out additional locations for future facilities, such as a youth center. The Master Plan does not currently include a comprehensive list of community facilities. For the purposes of this report, a small selection of relevant assets, such as the library and public access to waterways were added for review, as well as select vehicular infrastructure. In its upcoming Master Plan Reexamination, the township may want to expand its planning goals beyond a commitment to ADA to highlight the criticality of ensuring that fire departments, police stations, and the emergency management office are able to remain in operation at all times, including during climate-related events

Climate Hazard Connections

Section V.C provides a detailed overview of community assets related to climate hazards. While public data sources identified a limited number of assets, the public engagement process (Appendix B) empowered residents to highlight the facilities that are most meaningful to them and that shape the community's identity.

Potential Resilience Considerations

Pennsville could consider the development of a comprehensive list of critical infrastructure, as well as include a proper Community Facilities Plan Element with connections to a future Capital Improvement Plan.

All critical infrastructure should be assessed for flood and heat impacts, with appropriate mitigation strategies applied, including potential relocation outside of future inundation zones in accordance with state regulations, waterproofing measures, or other resilience improvements to reduce anticipated climate-related risks.

F. Economic Development

Economic Development is a critical part of any municipality, helping build, design, and plan for new ratables to help lighten the communal tax burden of residents and account for logical traffic and utility usage within the township. Despite this, many municipalities, including Pennsville, do not have a clearly defined Economic Development Plan pursuant to N.J.S.A. 40:55D-28. There is, however, a series of goals and objectives outlined in the 2002 Master Plan explicitly pertaining to Economic Development. In summary, those goals direct future efforts to locate retail and commercial uses along highways to alleviate parking strain and congestion on local roadways. There are areas along Broadway that are suggested for redevelopment, and the historic areas along Main Street were encouraged to develop in a more pedestrian manner such as sidewalk cafes and retail shops. Specialized commercial facilities such as offices and clinics should be in close proximity to public transit where possible.

Climate Hazard Connections

For Economic Development, many of the upcoming conditions for year 2100 are going to have significant impacts and will deter normal market forces. The following is a hazard-by-hazard breakdown.

Flooding and Storms

As discussed, sea-level rise and increasingly intense storm events present significant long-term challenges for Pennsville's business community and economic outlook. A substantial portion of Pennsville's land is designated for agricultural use; however, much of this area faces considerable flood risk over time, either through permanent inundation or increased vulnerability during storm events. Without proactive adaptation measures, the agricultural sector may face significant pressure by year 2100 under current projections. Similarly, portions of the warehousing facility to the south of the Delaware Bridge may also be affected. While the implications for existing businesses are notable (Section V.C), the outlook for future economic growth will require careful planning and strategic investment. New commercial development near the floodplain is subject to additional regulatory requirements that may present challenges, particularly for smaller businesses. A proactive economic development strategy that accounts for these realities will be essential to sustaining and growing Pennsville's economic vitality through the planning horizon.

Heat and Drought

Industry and agriculture have a prominent presence within Pennsville. Heat and drought can have an adverse impact on the ecosystem, especially in areas that will now be inundated with water and may have the existing salt marshes migrate inwards towards higher ground.

Other

Much of economic development is contingent on zoning, which has a similar nexus to circulation and land use planning. Therefore, many of the comments associated with this section are addressed elsewhere in this report.

Potential Resilience Considerations

- Develop a standalone Economic Development Plan which reflects the hazards assessment contained in this CCRHVA; collaborate with neighboring municipalities and Salem County to collectively pursue shared regional opportunities and proactively plan for the impacts of climate change at the regional level.
- Coordinate with local businesses to educate them on climate-related risks facing the township and to encourage their engagement in generating economically feasible solutions that not only benefit the businesses but that also contribute to overall community resilience.
- Seek opportunities to engage with County and State agencies promoting agricultural development to explore new technologies or adaptive reuse of older agricultural technologies that may prove opportunistic to areas with higher sea-level rise, such as floating farmlands.

G. Historic Preservation

The Township's 2002 Master Plan includes consideration of historic sites in the Goals and Objectives section. The plan emphasizes the importance of protecting historic structures to bolster community pride and encourage economic development through a focus on the town's culture. The Master Plan goal is to encourage preservation, rehabilitation, and adaptive reuse of historic buildings and structures as well as adequate maintenance of sites. Climate change-related hazards are not currently addressed in the 2002 Master Plan or subsequent 2015 and 2025 Master Plan reexaminations. The Township's historic district and individual properties located in the north and southwest are at risk of current and future flood impact, except the public library.

Climate Hazard Connections

Flooding

Flooding poses the greatest risk to historical preservation in Pennsville. The National Register of Historic Places lists the Fort Mott and Finn's Point National Cemetery Historic District and Finn's Point Rear Range Light Historic Property. Both of these historic sites are located in southwestern part of Pennsville and are subject to flooding under the four flood scenarios: 2 feet coastal inundation, 4 feet coastal inundation, FEMA 1% Annual Chance flood zone, and NJDEP Climate Adjusted Flood Elevation (CAFE). The NJDEP lists 12 properties in Pennsville on their Known Historic Properties List. Flooding to any of these historic properties could cause irreversible damage including:

- Hydrostatic pressure on foundations and basements
- Erosion
- Damage to interior and exterior materials
    - Saturation of insulation
    - Wood rot
    - Damage to metals, finishes
    - Masonry or concrete deterioration

Flood damage will require rehabilitation or rebuilding congruent with preservation standards and flood adaptations to minimize future flood damage in flood zone areas.

Heat

The historic sites analyzed in Section V have generally low heat risk. The sites in the north experience higher land surface temperatures. The temperature projections included in this CCRHVA indicate that Pennsville will experience more extreme heat over the coming century. Given the age of residential and commercial structures throughout the township, many buildings may lack the cooling systems required to maintain safe indoor activities during heatwaves.

Potential Resilience Considerations

- Create an inventory of historic assets to determine assets at greatest risk. Seek funding opportunities, such as the New Jersey Historic Trust, to support rehabilitation and repair of historic structures in ways that ensure their ability to sustain higher temperatures. These efforts would benefit from engagement with the public and property owners. Prioritize applications for designation of non-designated at-risk historic structures on state and national historic registers when eligible to increase opportunities for funding support when available.
- As part of the upcoming Master Plan Reexamination, consider adoption of adaptation standards for especially at-risk historic structures that are in the flood zones that balance flood protection with preservation. This could include raising structures or installing floodproofing materials where the structure will not be substantially altered. Consistent with the National Parks Service *Guidelines on Flood Adaptation for Rehabilitating Historic Buildings*.
- Prioritize creating drainage and implementing green infrastructure (such as constructed wetlands) around the building to prevent or reduce flood damage in high-risk areas. As part of the upcoming Master Plan Reexamination, consider adoption of a historic preservation ordinance to protect sites, oversee rehabilitation and integrate climate hazards assessment into overall preservation efforts.

H. Recreation

The Township's 2002 Master Plan includes recreation in the Goals and Objectives and lists important recreation areas and activities in Pennsville. The Master Plan encourages recreational activities related to the town's coastal environment such as fishing, boating, ferry, crabbing, biking and nature walks. The recreation plan does not address any climate hazards directly. The township is currently focused on creating a bike path connection to the ferry. The Master Plan also encourages maintaining and expanding recreational facilities and creating linkages between existing parks and open spaces.

Climate Hazard Connections

Flooding

The Master Plan reexamination can utilize the recreation plan to invest in acquiring open spaces and protecting the town's parks and refuges. This can be important to addressing climate hazards such as flooding and heat. Pennsville has important recreational spaces such as Fort Mott State Park, Riverview Park, Killcohook National Wildlife Refuge, and Supawna Meadows National Wildlife Refuge. All of these parks are subject to flooding under the four flood scenarios: 2 feet coastal inundation, 4 feet coastal inundation, FEMA 1% Annual Chance flood zone, and NJDEP climate adjusted flood elevation (CAFE). These areas are mostly made up of coastal wetlands which are sensitive resources and important in mitigating climate change effects. The continued protection and procurement of open spaces for recreation will prevent further development in flood areas and provide continued ecological services.

Flooding in these recreation areas can result in erosion and destruction of wetland ecosystems. The threat of increased stormwater runoff from intense rainfall can discharge pollutants into these environmentally sensitive areas. Destruction or degradation of Pennsville's coastal parks, wildlife refuges, and other protected areas will likely decrease the recreational activities that were provided there.

Wildfire and Drought

Some of these areas have growth of dry weed or Phragmites that are vulnerable to wildfires during drought. Increased drought may cause concern for human-caused wildfires, the main cause for wildfire incidents in Pennsville.

Potential Resilience Considerations

- Given jurisdictional management of most of these sites by state and federal agencies, Pennsville's most likely opportunity is to share the outcomes of the CCRHVA with managing agencies to promote collaborative protection efforts. Collaborative efforts could include:
    - Converting paved parking areas of parks and protected space to permeable materials allowing easier drainage of stormwater.
    - Restoring dunes and wetlands for flood protection and natural barriers.

    - Replenishing beaches to allow for more recreation opportunities and creation of engineered tidal flood barriers.
- Create an inventory of recreation areas and water-dependent uses such as boat ramps and inform planning and decision-making of these uses with outcomes of this CCRHVA.
- Review local ordinances to identify opportunities to strengthen provisions for requiring or encouraging nature-based infrastructure in flood prone areas to promote flood retention. Discourage development that increases impervious surface coverage and seek pervious alternatives where possible in parking lots, bike trials, and park infrastructure and equipment.

I. Environmental Protection

The Townships' 2002 Master Plan mentions Environmental Protection in the Goals and Objectives. The Plan explains that 57% of the township's land area is wetlands which causes environmental constraints. The Plan also includes a brief description of some Pennsville's natural resources including endangered species, wetlands, soils, and Potomac-Raritan-Magothy (PRM) Aquifer. It also identifies areas that lay above the 10 ft contour line would be less likely to flood and appropriate for development.

The Draft 2025 re-examination of the Master Plan suggests amendments of the zoning map to include conservation areas for protection of wetlands, stream corridors, wellhead protection and aquifer recharge stations. The re-examination also calls for development ordinances that require buffers to protect groundwater. The overall goal of the Environment element in the Pennsville master plan is to protect environmentally sensitive areas from degradation. The main ordinance that supports this element is the town's Stormwater Management Plan.

Climate Hazard Connections

Flooding

Pennsville is a coastal town with wetlands covering 57% of their land and a significant portion of the township is designated as PA-5 (Environmentally Sensitive Planning Area) in the State Development and Redevelopment Plan. The environmentally sensitive land is crucial to mitigating flooding. Domestic and industrial water is supplied by the Potomac-Raritan-Magothy Aquifer and there are concerns about salt-water intrusion and capacity to supply projected water demands and flooding can increase this risk. The large presence of agriculture may further the flood risks in Pennsville. An increase in stormwater runoff on farmland may increase pollutant runoff into nearby waterways.

Wildfire

Pennsville has large areas of phragmites growth near wetlands. This is most likely an invasive type of phragmites which can cause ecological problems that out competes native wetland vegetation. This invasive phragmites poses fire hazards in Pennsville because of dense monoculture growths of the dry stalky plant.

Potential Resilience Considerations

- Update natural resource inventory.
- Use zoning to establish conservation overlay zones to protect floodplains and wetlands and to enhance community flood resilience.
- As part of the upcoming Master Plan Reexamination, the township could consider establishment of a "Green Buildings and Environmental Sustainability Element" that could serve as an overarching plan for strategies designed to protect environmentally sensitive natural resources while enhancing efforts to address climate change-related hazards. Opportunities to include in such an element could include: identification of priority lands for conservation, establishment of standards and guidance for expansion of nature-based solutions in development and redevelopment, exploring funding to support community gardens, pursuing funding to remove invasive phragmites and restore native wetland vegetation.

VII. Coordination with Other Plans

The NJ MLUL requires a CCRHVA to include a "policy statement on the consistency, coordination, and integration of the climate change-related hazard vulnerability assessment with any existing or proposed natural hazard mitigation plan, floodplain management plan, comprehensive emergency management plan, emergency response plan, post-disaster recovery plan, or capital improvement plan." This section addresses and expands upon that requirement by analyzing how the hazard exposures identified in Sections III, IV, and V may impact Pennsville's following plans:

- Township of Pennsville Stormwater Management Plan
- Township of Pennsville Stormwater Pollution Prevention Plan
- Flood Damage Prevention Ordinance [A-24-2014]
- Emergency Operations Plan
- New Jersey State Development and Redevelopment Plan
- Capital Improvement Plan
- Hazard Mitigation Plan

These plans were reviewed and analyzed to identify connections with the current and future climate hazards and exposures identified in this CCRHVA. For each plan, this section includes a summary of relevant findings and potential considerations for Pennsville to improve resilience to climate-related hazards.

A. Township of Pennsville Stormwater Management Plan

The Township's Stormwater Management Plan was adopted in 2021 and the Stormwater Pollution Prevention Plan (SPPP) was adopted in 2025. The townships' SPPP and associated ordinances are in compliance with NJDEP's stormwater regulations as set forth in N.J.A.C. 7:8. Pennsville holds a Tier A MS4 Stormwater Permit and is in compliance with current permit requirements. The Township's stormwater management ordinances are the same as NJDEP's model ordinances and include the following:

- Ordinance A-17-2019- Stormwater Regulations
    - Article 1 Sec. 24.1- Pet Waste
    - Article 2 Sec. 24.2- Improper Disposal of Waste Ordinance
    - Article 3- Wildlife Feeding
    - Article 4- Refuse Containers / Dumpsters
    - Article 5- Illicit Connection
    - Article 6- Yard Waste Collection Program
    - Article 7- Containerized Yard Waste
    - Article 8- Litter Control

- Ordinance A-21-2023- Privately-Owned Salt Storage
- Ordinance A-15-2019- Stormwater Runoff
- Ordinance A-16-2019- Private Storm Drain Inlet Retrofitting
- Ordinance A-14-2024- Tree Removal and Replacement Regulations

Climate Hazard Connections

The Township's Stormwater Regulations do not reference climate change hazards or flooding mitigation. However, the Stormwater Management Plan, SPPP, and township stormwater ordinances consistent with NJDEP permit requirements incorporate best management strategies that also help with flooding mitigation. Some pump station improvements were made by Pennsville Sewer Authority in 2024 to replace sewer main breaks.

Flooding and Storms

Flooding is a major concern for the Township's stormwater management efforts. The increased intensity of rain events will put more pressure on stormwater systems. An additional factor for this risk in Pennsville is the presence of beavers, which interfere with stormwater drainage. The conditions under NJDEP Climate Adjusted Flood Elevation (CAFE) will impact most current stormwater systems. Additionally, in the event of storms, current facilities may be overloaded with the predicted intensity of rainfall.

Potential Resilience Considerations

- Monitor state regulations to ensure that the township's stormwater regulations stay updated and reflect climate change-related hazards outlined in this CCRHVA. Similarly, continue to update the Township's stormwater management plan pursuant to relevant laws and regulations.
- Seek funding opportunities to upgrade the township's stormwater management system to address flooding near road infrastructure, homes, and businesses and require site improvements such as: underground retention basins, detention ponds, upgraded sewer network pipes, and additional stormwater inlets.
- Ensure that any capital improvements in the township (infrastructure, roads, public facilities, stormwater systems, etc.) incorporate nature-based infrastructure requirements including rain gardens, bioswales, wetlands, increased tree canopy. Similarly, use the upcoming Master Plan reexamination to consider integration of nature based standards for new and substantially improved developments and redevelopment. Prepare and submit to the NJDEP the Watershed Inventory Report, with a summary and electronic map current with MS4 Permit Requirements for 2026. Consider how to best reflect the climate related hazards from this CCRHVA in the Watershed Inventory Report.
- Comply with MS4 Permit Requirements for 2026 and 2027.

B. Emergency Operations Plan

An Emergency Operations Plan (EOP) is a guideline for government and emergency workers when dealing with natural and manmade disasters. EOP's main objective is to minimize loss of life and property which can be done by ensuring good coordination across all levels of government in the event of an emergency. An EOP generally includes 4 phases of emergency management, which are 1) mitigation, 2) preparedness, 3) response, and 4) recovery.

The Office of Emergency Management (OEM) establishes EOP and the Emergency Management Coordinator (EMC) serves as a liaison among municipal departments and external agencies. In addition, OEM routinely conducts drill exercises to test county or municipal emergency response capabilities.

The EOP content contains basic plans and annexes. The basic plan includes key sections such as situation overview, operations and control, responsibilities, continuity of government, administration and logistics, and plan development and maintenance. The annexes detail emergency management, including alert, warning, communication, evacuation, fire and rescue, law enforcement, public health, sheltering, public works, and social services. The EOP recognizes a range of hazards. Those hazards includes earthquake, landslide, tsunami, flood, hurricane, storm, human epidemic, animal epidemic, plant epidemic, rural fire, urban fire, levee or dam failure, aircraft wreck, train wreck, shipwreck, multi-vehicle wreck, building collapse, power failure, gas failure, water supply failure, chemical spill, nuclear spill, oil spill, air pollution, water pollution, civil disturbance, and nuclear war.

The EOP also outlines the township's response in the event of a declared state of emergency. In New Jersey, the Governor, the County, and Local EMC can declare a state of emergency during significant weather events and natural disasters (N.J.S.A. App.A:9-37). When a state of emergency is declared, the news will be shared through traditional media outlets such as television, radio, newspapers, the internet, and the emergency alert system. Generally, it may result in a travel ban, evacuation, and the limitation of certain citizen actions.

Climate Hazard Connections

The hazards that are applicable in Pennsville EOP and are connected with climate change are 1) flood, 2) hurricane, 3) storm, 4) rural fire, 5) urban fire, 6) power failure, 7) gas failure, 8) water supply failure, 9) chemical spill, 10) nuclear spill, 11) oil spill, 12) air pollution, and 13) water pollution. Based on the hazard analysis outlined in this CCRHVA, high-risk hazards in Pennsville township include: storms, chemical spills, and air pollution. Additionally, though the EOP document includes a comprehensive inventory of hazards with specific response protocols based on each category, it does not incorporate impacts of sea-level rise as a climate hazard in its identification.

The peninsula-like characteristic of the township makes its location vulnerable to flooding and storm-related hazards. Due to its proximity to the Delaware River, the CCRHVA recognizes flooding as the main hazard in Pennsville. In the CCRHVA, flooding measures are mapped out in four scenarios: 1) 2 feet coastal inundation, 2) 4 feet coastal inundation, 3) FEMA 1% Annual Chance flood zone, and 4) NJDEP Climate Adjusted Flood Elevation (CAFE). The risk of flooding is divided

into current and future flood risk (Maps III-3 through III-9). As part of implementing the EOP, Pennsville's Office of Emergency Management conducts outreach events where they encourage residents to use disaster supply kits; these events may provide an opportunity to also educate the public about the content of the CCRHVA.

Potential Resilience Considerations

- Consider how to best incorporate climate-related scenarios, such as coastal flooding, storm surge, extreme weather events and heatwaves, into ongoing emergency response exercises.
- Use the publication of the CCHRVA as a mechanism to enhance public awareness and preparedness of climate change-related risks and hazards.

C. Flood Damage Prevention Ordinance

Pennsville's Flood Damage Prevention Ordinance restricts development in Special Flood Hazard areas based on FEMA's FIRM maps and FIS reports. Within the Special Flood Hazard areas, development permits are required and construction standards are increased to lower the risk of flooding damage and improve safety. Non-residential buildings within Flood Hazard areas must be elevated or floodproofed and residential buildings must be elevated to Base Flood Elevation (BFE) +2 feet. It should be noted that this requirement is lower than BFE + 4 feet required under the NJDEP Climate Adjusted Flood Elevation regulations. This plan also describes how construction code standards from the Uniform Construction Code must be implemented for Flood Hazard Reduction.

Climate Hazard Connections

The current construction code guidelines described in the ordinance may need to be reviewed to ensure that they comply with the NJDEP Climate Adjusted Flood Elevation regulations and to determine their appropriateness with current flood projections. The construction standards for new and substantially improved development likely make it more expensive for low-income homeowners living within the FEMA 1% Annual Chance Floodplain to renovate and sell their homes.

Potential Resilience Considerations

- Monitor the provision of variances described in the building code standards for flooding to ensure that they are appropriate for higher flood risks in the municipality.
- Update the Flood Hazard Prevention Ordinance to ensure compliance with the most recent NJDEP regulations.
- Continue to engage with the Federal Emergency Management Agency and the Hazard Mitigation Division of the New Jersey Office of Emergency Management to maximize opportunities for funding to support hazard mitigation actions.
- As part of the upcoming Master Plan Reexamination consider including a gradual increase in the required minimum home elevations in areas identified as high risk in this CCRHVA.

D. Salem County Wastewater Management Plan

Pennsville is part of Salem County's Wastewater Management Plan, which governs the capacity and treatment techniques of sewage within the service area. The Pennsville Township Chapter was prepared prior to the County document in May 2016. The Deepwater neighborhood of Pennsville sends its sewage to Carney's Point to the north, whereas the rest of Pennsville Township flows to a Wastewater Treatment Plan overseen by the Pennsville Sewerage Authority via gravity and the various 16 pump or lift stations.

As per the latest Wastewater Management Plan, Pennsville has an updated sewer service area that is located such that the treatment plant does not exceed its maximum capacity of 1.875 mega-gallons per day (mgd). This limitation curbs the ability for Pennsville to develop further, as the municipality has largely met its maximum capacity for the treatment of sewage.

Climate Hazard Connections

The primary hazard facing the wastewater treatment system is flooding. Because pump stations are located in low-elevation areas, they are exceptionally susceptible to rising sea levels and increased flood risks. This vulnerability manifests either when an inundation risk zone fully engulfs a pump station, or when routine flooding over compromised manholes introduces inflow into an already at-capacity treatment facility.

Consequently, a critical topic for deliberation in the upcoming Master Plan Reexamination is how to accommodate relocated residences within the Township should more property owners opt for residential buyouts. However, because the sewer service area is currently operating at maximum capacity, permitting new housing projects is strictly limited—even when those projects are intended to relocate Pennsville residents out of high-risk flood and sea-level rise zones.

Potential Resilience Considerations

- Pennsville would benefit from developing a Capital Improvement Plan that reflects the hazards assessment in this CCRHVA to ensure that future investments reflect predicted climate conditions.
- Account for anticipated future housing loss and hopeful relocation of such housing within an updated waste management and minimization plans (WMMP) with the intent of balancing limited treatment capacity.
- Explore funding opportunities, such as through the New Jersey Water Bank, to relocate or elevate the most impacted sewer pump stations.

E. New Jersey State Development and Redevelopment Plan

The New Jersey State Development and Redevelopment Plan serves as a statewide framework to ensure coordinated, integrated planning across all levels of government. To achieve its "2050 Vision," the Plan prioritizes effective statewide coordination by identifying ten core focus categories: Economic Development, Housing, Infrastructure, Revitalization and Recentering,

Climate Change, Natural and Water Resources, Pollution and Environmental Clean-Up, Historic and Scenic Resources, Equity, and Sound and Integrated Planning. Through this 2050 framework, New Jersey envisions a prosperous future that expands opportunity for all, striving to be the premier state to live, work, raise a family, and age in place. The core strategy for realizing this goal centers on proactively addressing the urgent, intersecting challenges of climate change, environmental justice, and technological advancement.

Climate Hazard Connections

Climate change is one of the group categories in New Jersey's prosperous 2050 vision. According to the New Jersey State Development and Redevelopment Plan, climate change is an important issue because it is directly linked to public health, economic stability, and community resilience. The plan's goal is to address both the causes of climate change and its effects through a multi-pronged strategy toward reducing the State's GHG emissions.

New Jersey has three priority actions to address the adverse impacts of global climate change: Decarbonization, Hazard Mitigation (Flooding, Extreme Heat, Wildfires, and Other Adverse Impacts of Climate Change), and Protection of coastal areas and riverine corridors.

Integration of land and transportation planning is the focus of New Jersey's decarbonization strategy to reduce greenhouse gas emissions. This strategy emphasizes encouraging dense, mixed-use communities and active transportation (walking and biking) as well as low-emission transportation (public transit and electric vehicles). The plan also emphasizes wetland, forest, and farmland restoration as a carbon sequestration approach. Map V-1 visualizes the heat effect through land surface temperature in Pennsville while also supplementing the transportation infrastructure.

The plan's hazard mitigation strategy prioritizes reducing urban heat islands through green infrastructure. This includes implementing permeable or cool pavements, which the EPA notes can maintain temperatures to cooler than traditional asphalt. While green infrastructure leverages natural materials to manage both heat and stormwater runoff, the strategy also incorporates structural and property-level solutions. These include elevating homes, purchasing properties in flood-prone areas, and improving regional and watershed-level stormwater planning to mitigate flood risks and enhance water quality.

In alignment with the State Development and Redevelopment Plan, Pennsville has been proactive in supporting the utilization of state buyout initiatives like the Blue Acres program. Maps V-17 and V-18 delineate the housing parcels impacted by various flooding scenarios and should be leveraged to identify areas of repetitive loss. Actively pursuing Blue Acres buyouts will enable Pennsville to permanently eliminate the risk to life and property within established hazard zones, while simultaneously converting these vulnerable floodplains into protected open space. While buy out strategies can potentially contribute to a reduction of the tax base and concerns about community identity, their implementation would help to increase Pennsville's Community Rating System (CRS) level which would allow the community to benefit from additional flood insurance premium reductions.

Lastly, the Coastal Areas and Riverine Corridors goals of the State Development and Redevelopment Plan focus on restoring natural habitats to reduce flooding and increase ecosystem resilience, and promoting well-managed coastal and riverine communities. The plan also encourages municipalities to participate in the FEMA Community Rating System (CRS) and to coordinate smart growth management programs by implementing DEP floodplain regulations and incorporating emergency response planning and mitigation strategies.

The state plan reinforces the importance of a Climate Change-Related Hazard Vulnerability Assessment (CCRHVA) as a tool to inform a municipality's ongoing planning of its exposure and resilience to climate change. Acknowledging and addressing climate change impacts creates opportunities to protect communities, improve air quality, reduce the impacts of storm events and flooding, manage sea-level rise, prevent wildfires, and safeguard the health and wellbeing of people, wildlife, and habitats.

Potential Resilience Considerations

- Use the upcoming Master Plan reexamination to integrate aspects of the CCRHVA into local planning to create greater coordination between the township's land use planning and hazard mitigation efforts Continue participating in the FEMA Community Rating System (CRS), which Pennsville currently ranks at level 8, while also striving to increase the community's CRS score and community preparedness.

F. Capital Improvement Plan

The 2025 Pennsville Capital Improvement Plan (CIP) is a proposal for 6-year capital program expenditures from 2025 to 2030. The plan is to inform township residents of the anticipated capital improvements and ensure their effectiveness until the final adoption of capital ordinances.

Climate Hazard Connections

The current 2025 Pennsville Capital Improvement Plan offers important opportunities to integrate the hazards assessment outlined in this CCRHVA with long term infrastructure investments. The current plan does not explicitly classify projects as climate adaptation initiatives; rather, it classifies them as several specific programs with an indirect relationship to climate resilience by improving and maintaining infrastructure. Proposed efforts in the plan that have climate hazard connections include:

1. Heron Avenue Granular Activated Carbon (GAC) Treatment, important under flooding to reduce contamination risk and improve water quality.
2. Well maintenance, including provisioning a generator for wells and replacing wells. These are important to maintain the water supply during extreme events.
3. Various Roadway Improvements are important for accessibility in the event of an emergency.

Potential Resilience Considerations

- The township would benefit from using the hazard assessment in this CCRHVA to inform design and implementation of current initiatives outlined in the CIP to ensure their implementation promotes community resilience. In doing so, the township has the opportunity to increase its ranking under the Community Rating System. The township would benefit from incorporating Pennsville's tailored CCRHVA recommendations in its future CIP to mitigate and adapt to the current and future climate-change hazard projections.

G. Hazard Mitigation Plan

Pennsville Hazard Mitigation Plan (HMP)

The Pennsville Hazard Mitigation Plan (HMP) evaluates nine natural hazards, ultimately ranking riverine and tidal flooding as the Township's most pressing threats due to its location along the Delaware River floodplain. The plan organizes its mitigation efforts across four categories: prevention, property protection, structural projects, and emergency services. Key initiatives include stormwater system upgrades, voluntary buyouts for repetitive-loss properties in Special Flood Hazard Areas (SFHAs), and continued participation in the National Flood Insurance Program (NFIP). However, the HMP's internal capability assessment highlights a critical constraint: a lack of specialized technical capacity required to manage these complex projects, meaning Pennsville depends heavily on county, state, and consultant support for actual implementation.

Climate Hazard Connections

Flooding

The Exposure and Vulnerability Assessment (Section V) reinforces the HMP's prioritization of flood and storm risks but provides the localized, quantitative data the HMP lacks. While the HMP broadly identifies vulnerabilities like the aging Delaware River levee and legacy infrastructure, the assessment grounds these concerns in four precise scenarios: 2-foot and 4-foot coastal inundation, the FEMA 1% annual chance flood, and NJDEP Climate Adjusted Flood Elevation (CAFE). Additionally, compound flooding impacts from storms (Map III-4) may block stormwater outfalls during heavy rainfall, directly validating the HMP's call for urgent drainage upgrades.

Heat

The HMP identifies extreme heat as its third-highest priority. The Draft Hazard Assessment brings this risk into sharper focus by pointing out that urban heat islands disproportionately affect the Township's developed areas, placing a heavy burden on socially vulnerable populations.

Wildfire and Drought

Ranked as Priority 4 and Priority 6, respectively, in the HMP, wildfire and drought present an interconnected local threat in Pennsville: invasive phragmites. The assessment highlights that these dense, stalky plants crowd out native wetland vegetation. During prolonged drought periods, they turn into highly flammable tinderboxes, creating a serious localized brush fire risk for properties that border the wetlands.

Potential Resilience Considerations

- Linking HMP mitigation goals directly to the Capital Improvement Plan (CIP) to systematically secure and track funding for high-dollar projects like levee maintenance and drainage retrofits.
- Building internal capacity by prioritizing hazard planning training for municipal staff through FEMA's Emergency Management Institute, NJOEM, or the New Jersey State League of Municipalities.
- Expanding mitigation actions to formally address extreme heat, such as identifying accessible cooling centers or boosting the tree canopy in densely developed, heat-prone zones.
- Coordinating with environmental agencies on a targeted action plan to manage and remove invasive phragmites, reducing the wildfire fuel load near residential buffers.
- Reviewing the local Flood Damage Prevention Ordinance (FDPO) alongside standard NFIP compliance checks to ensure the Township is keeping pace with the latest NJDEP Inland Flood Protection Rules.

2025 Salem County Multi-Jurisdictional Hazard Mitigation Plan (Regional Strategies)

While Pennsville now maintains its own local HMP, the *2025 Salem County Multi-Jurisdictional Hazard Mitigation Plan* still provides essential regional context. Hazards like coastal storms, heat waves, and droughts ignore municipal boundaries, making county-level coordination a practical necessity. Reviewing the County HMP highlights a few key regional strategies the Township can tap into:

- **Regional Transportation and Evacuation Corridors:** County and state agencies own many of the primary roads running through Pennsville. Since the County HMP prioritizes keeping these evacuation routes dry, Pennsville might benefit from promoting joint projects with the county, like road elevations and drainage fixes, where tidal flooding repeatedly cuts off access.
- **Public Health and Heat Wave Response:** Extreme heat is a regional public health issue. Pennsville can coordinate with the Salem County Health Department and regional emergency management to ensure unified communication regarding cooling center hours and health advisories during prolonged heat waves.
- **Water Supply and Drought Management:** Because drought impacts agricultural areas and municipal water supplies across the entire region, aligning Pennsville's water conservation efforts with county-wide drought management strategies ensures a more stable, equitable water supply during dry spells.

- **Shared Technical and Data Resources:** Salem County OEM's mitigation program offers technical assistance and manages centralized data for critical facilities. Pennsville can adopt a formal policy to leverage these county GIS resources and risk assessments, taking some of the technical pressure off its municipal staff.
- **Watershed-Scale Stormwater Management:** The County HMP stresses that stormwater management requires a watershed-level approach. As Pennsville plans its local drainage upgrades, coordinating with the county's broader efforts along the Delaware and Salem Rivers will help ensure local fixes don't just push water issues onto neighboring areas.

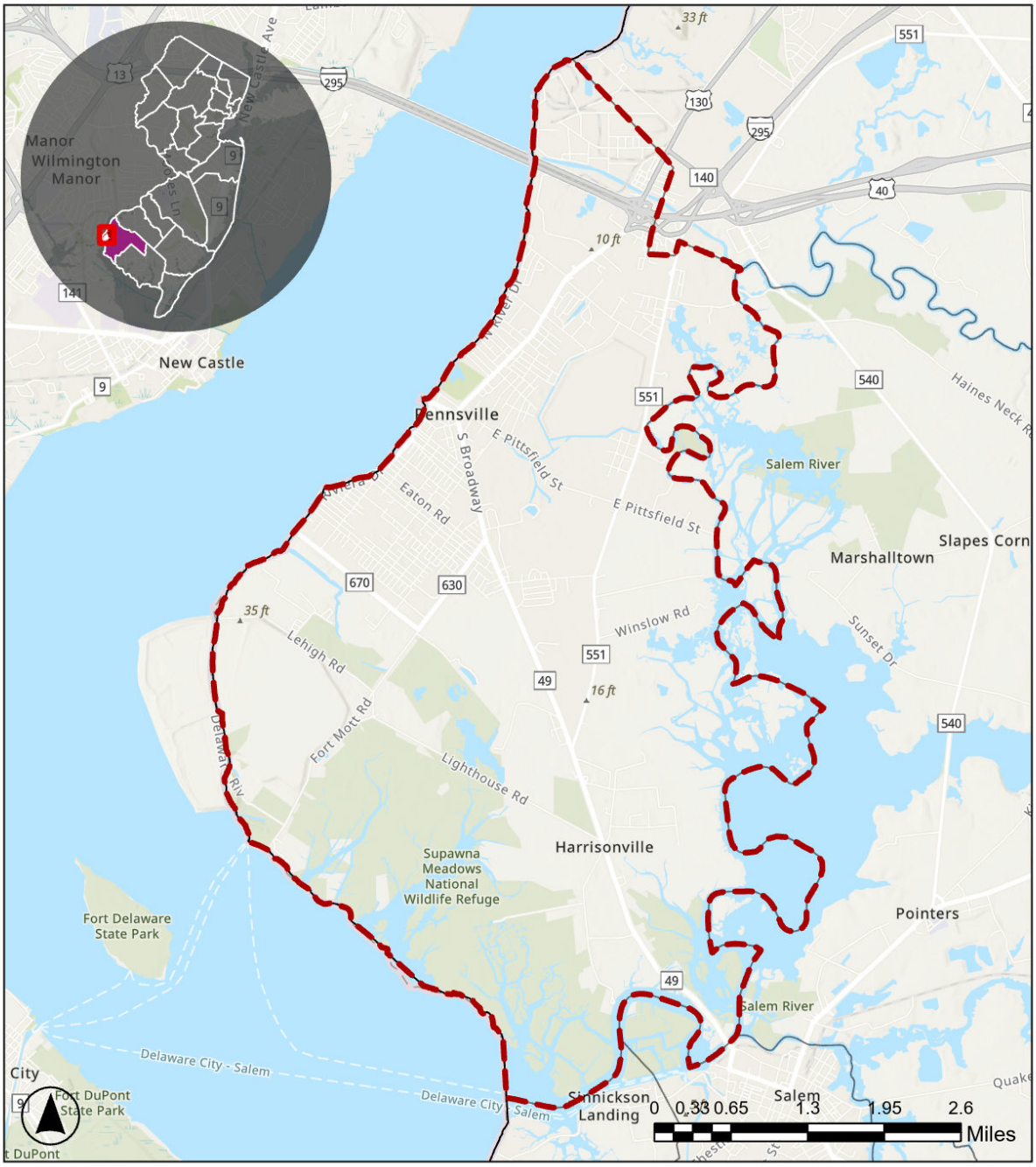
VIII. Appendices

Appendix A: Description of Pennsville Township

Pennsville Township (henceforth, "Pennsville") is located in Salem County, New Jersey. It is bordered to the west by the Delaware River and to the southeast by Kates Creek Meadow and Mannington Meadow. Surrounding municipalities include Carneys Point Township to the north, Mannington Township to the east, Salem City to the southeast, and Elsinboro Township to the south. Pennsville spans 24.58 square miles and is the westernmost town in New Jersey. Map A-1 depicts Pennsville's location.

Pennsville's location along the Delaware River historically made it a prime location for farming, fishing, and tourism. In the mid-1880s, it was a hub for ferries traveling to and from Philadelphia, with two riverfront resorts and an adjoining beachfront park attracting thousands of visitors. Industrialization began in 1916 with the establishment of DuPont Dye Works, followed by the construction of the Deepwater Generating Station in 1929. In the 1950s, the completion of the Delaware Memorial Bridge linked Pennsville (and the state of New Jersey) to Delaware for the first time. Today, Pennsville reflects its history of industrial, recreational, and residential uses.

Map A-1. Pennsville Township



LEGEND

- NJ
- Municipal Boundaries
- Pennsville

Demographics

According to the 2023 American Community Survey,[63] Pennsville's residential population is 12,238. The population density is approximately 517 people per square mile. Table A-1 includes detailed demographic information for Pennsville.

Table A-1. Demographic data for Pennsville Township, Salem County, New Jersey

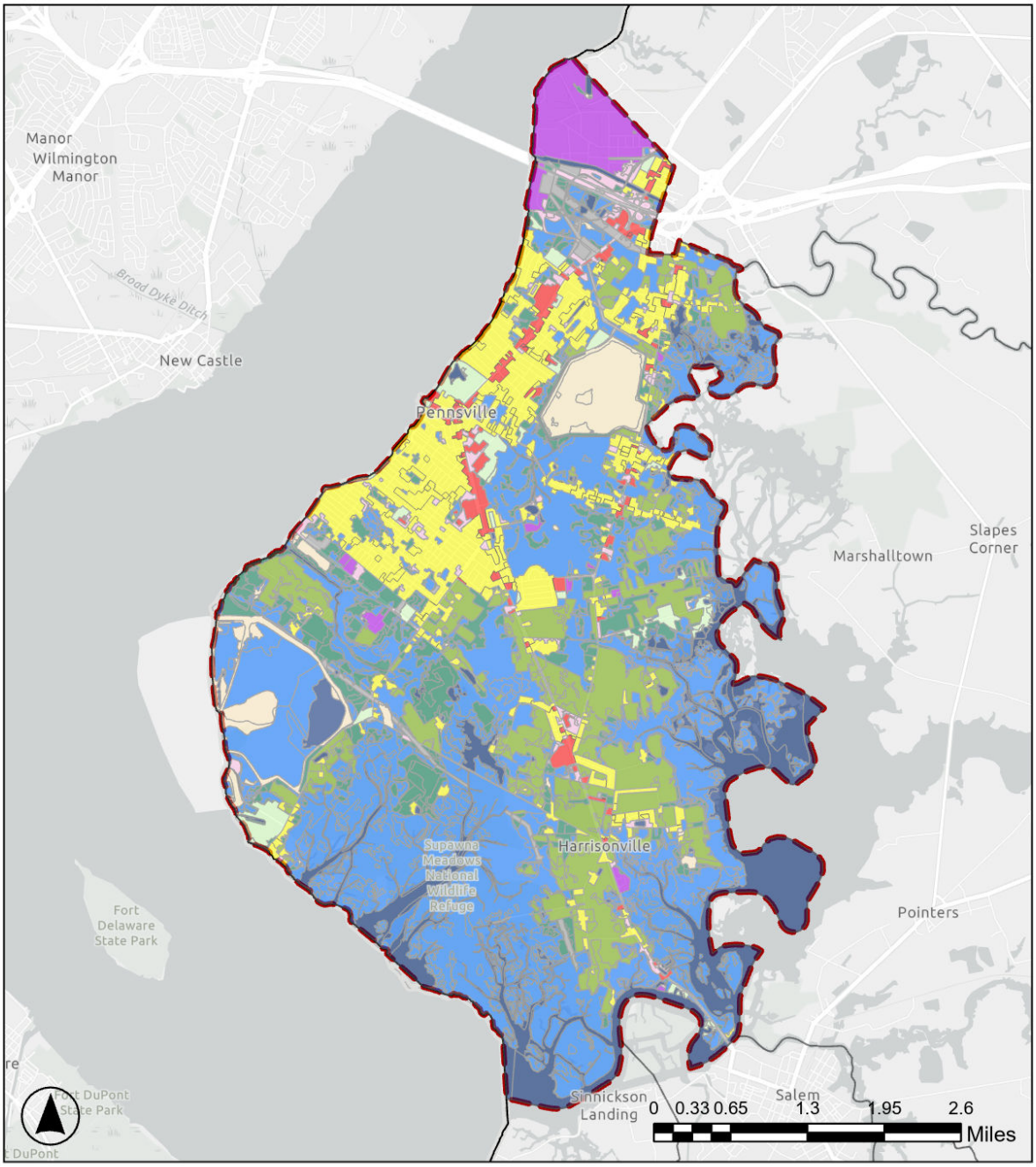
	New Jersey	County	Township
Total population	9,267,014	64,973	12,238
Population density	1,260 people/mile^2	174 people/mile^2	517 people/mile^2
Population change (2020 to 2023)	+381,596	+2,219	+204
Median age	40.1	41.9	42.2
Population below 18	2,031,322	14,221	2,558
Population above 65	1,599,816	12,294	2,567
Median Household Income	$101,050	$78,412	$74,219
Persons in poverty	889,287	8,131	1,559

Land Uses

Pennsville is a semi-rural township, with over half of its land area consisting of wetlands and agriculture. Residential use is concentrated along the Delaware River and commercial uses along North Broadway. Industrial uses, including the former DuPont site (now Chemours Works) and the former Deepwater Generating Station are within the most northern part of Pennsville. Map A-2 depicts Pennsville's land use-land cover. Table A-2 and Map A-3 detail property parcels and classes.

[63] U.S. Census Bureau. 2023. American Community Survey Five Year Estimates.

Map A-2. Land Use-Land Cover (2020)



LEGEND

Land Use: 2020

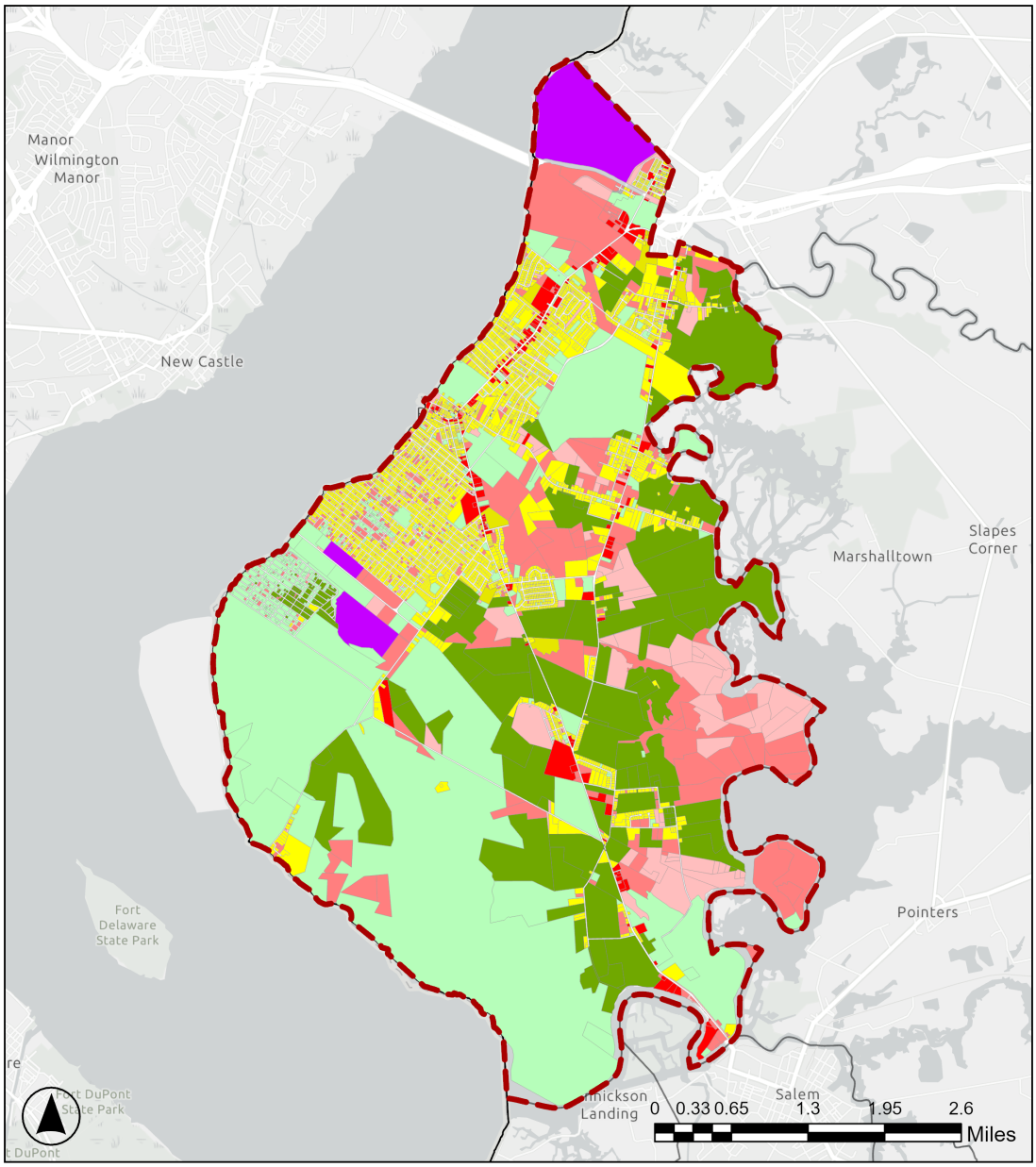
- Residential
- Commercial
- Industrail and Commercial
- Industrial
- Mixed or Other Urban
- Transportation, Communication and Utilities
- Recreational
- Agricultural
- Forestland
- Water
- Wetlands
- Barren Lands

Table A-2: Pennsville parcels by property class

Property class	Number of parcels	Area in acres
Residential (2)	4,591	1,930
Apartments (4C)	17	83
Commercial (4A)	189	290
Industrial (4B)	3	518
Education (15A and 15B)	8	124
Public Property (15C)	458	5,177
Church and Charitable (15D)	43	120
Cemeteries (15E)	3	59
Farmlands (3A and 3B)	162	3,413
Transportation (5A and 5B)	2	1
Other Exempt (15F)	74	44
Vacant Land (1)	657	2,006
Unclassified Land	353	972
Total	**6,560**	**14,738**

(Source: Parcels and MOD-IV Composite of NJ)

Map A-3. Pennsville Township parcels and property classes



LEGEND

Parcels
- Residential
- Apartments
- Commercial
- Industrial
- Farm
- Schools and Other Public Property
- Railroad Property
- Vacant
- No Value

(Source: Parcels and MOD IV Composite of NJ)

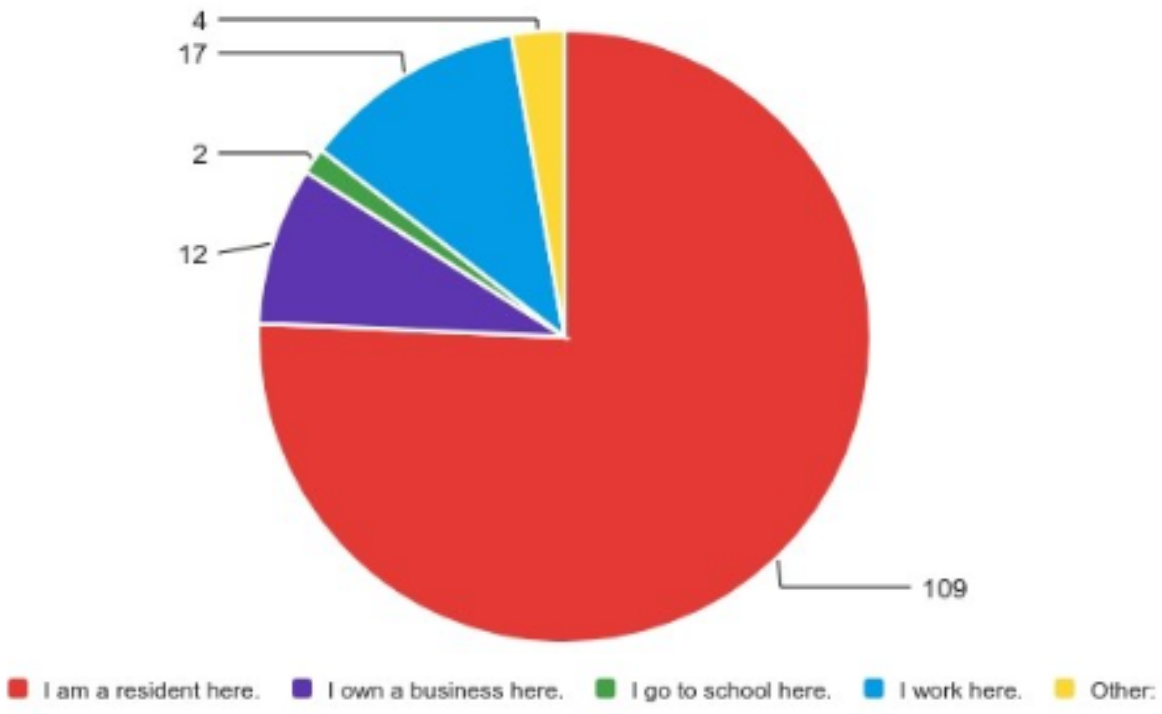
Appendix B: Public Engagement Summary

The Township advertised the CCRHVA public engagement opportunities by email and Facebook starting on February 2, 2026. The in-person meeting was held on April 9, 2026, following the scheduled Rotary club meeting. Approximately 85 local stakeholders attended, including residents, members of the Township committee, and community partners. The meeting included a brief presentation by Rutgers to explain the overall CCRHVA project (process, goals, etc.) and an overview of hazard assessment findings, followed by participants visiting "stations" with large printed maps to share locations and experiences with flooding (high tide and/or stormwater), community assets, other climate hazards (heat, wind, drought, wildfire), and any other questions or concerns. The online survey was designed to replicate the opportunities for input provided at the in-person meeting. To this end, respondents were asked to mark digital maps and provide details about the locations of climate hazards and community assets. The survey was open for four weeks from March 25 to April 21, 2026, and had 117 responses. Input from the in-person meeting and the survey was used to refine the hazard analyses and maps in Sections III and V.

Survey Results

Q1 – How would you describe your relation to Pennsville Township? Select all that apply. – Selected Choice

117 responses



Q1_5 Other: - Text

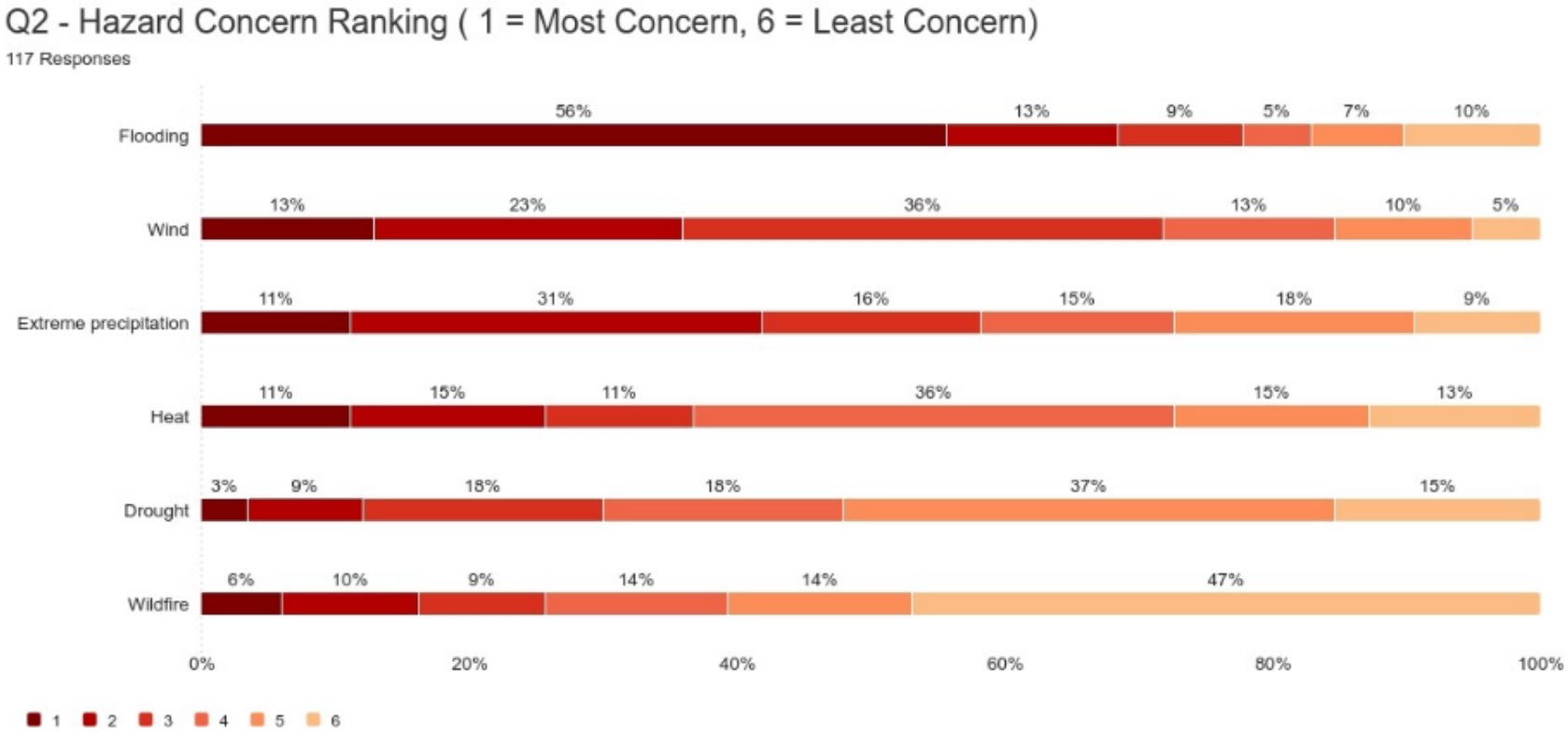
Other: - Text
I own a rental which I grew up in.

Q2 - Rank each hazard according to your level of personal concern for Pennsville Township, with 1 being the most concern and 6 being the least concern.

Note: Lower average rank indicates greater level of personal concern.

Rank	Hazard	Average Rank
1	Flooding	2.26
2	Wind	3.00
3	Extreme Precipitation	3.26
4	Heat	3.67
5	Drought	4.22
6	Wildfire	4.60

Continued on next page


Q2 - Hazard Concern Ranking (1 = Most Concern, 6 = Least Concern)
117 Responses
Flooding
56%
13%
9%
5%
7%
10%
Wind
13%
23%
36%
13%
10%
5%
Extreme precipitation
11%
31%
16%
15%
18%
9%
Heat
11%
15%
11%
36%
15%
13%
Drought
3%
9%
18%
18%
37%
15%
Wildfire
6%
10%
9%
14%
14%
47%
0%
20%
40%
60%
80%
100%
1
2
3
4
5
6

Q3 – How frequently are you personally affected by these hazards in Pennsville Township?

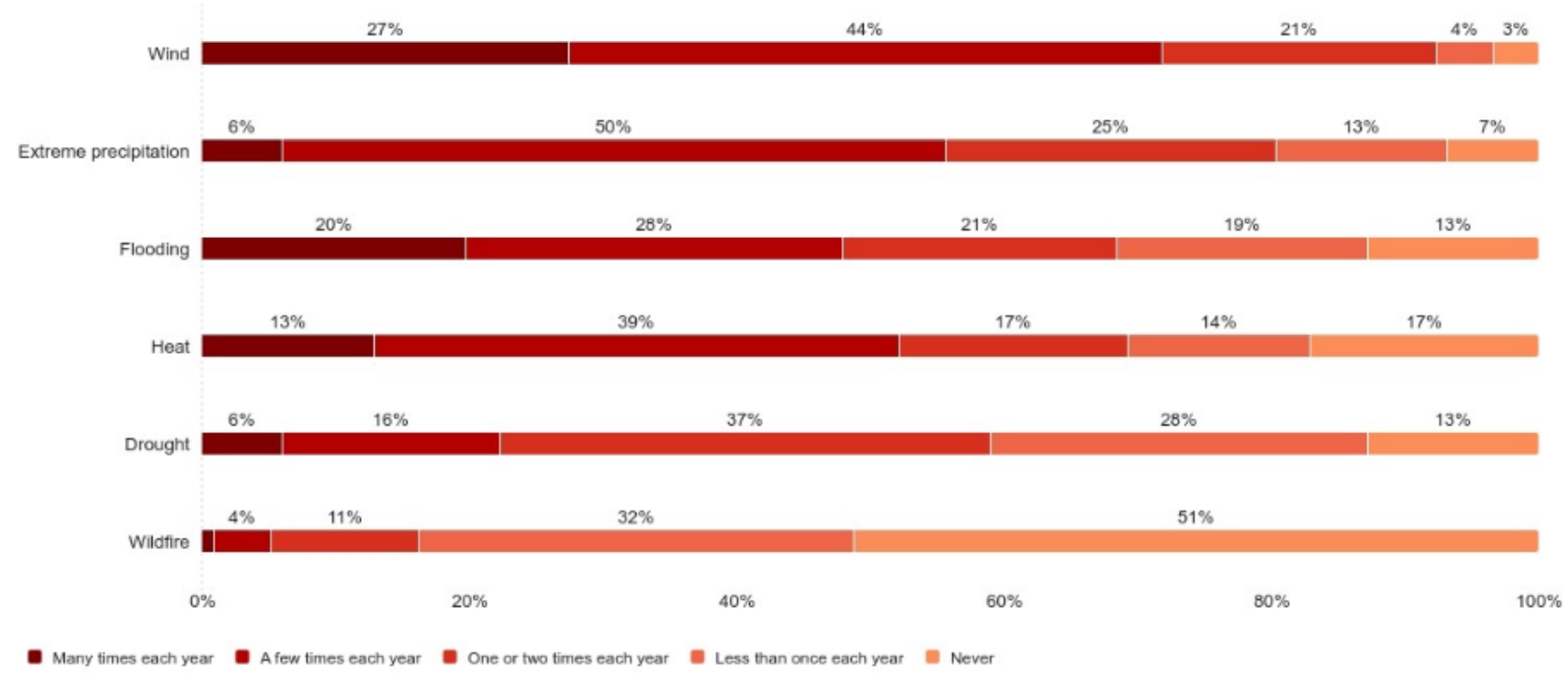
Note: Higher average indicates more frequently impacted. (Scale: Many times each year=5, A few times each year=4, 1 or 2 times each year=3, Less than once each year=2, Never=1).

Rank	Hazard	Average
1	Wind	3.88
2	Extreme precipitation	3.35
3	Flooding	3.23
4	Heat	3.17
5	Drought	2.74
6	Wildfire	1.71

Continued on next page

Q3 - How frequently are you personally affected by these hazards in Pennsville Township

117 Responses



Q4 - Please share details below about up to three important places in Pennsville Township. The CCRHVA will recommend ways to protect the places most important to the community.

(Examples include recreational facilities, entertainment venues, museums, shops, places of worship, etc. We have already identified government facilities like schools and fire stations, so there is no need to share those.)

Please include:

- Place name
- Address or description of location
- Why it's important

Note: Responses to Q4 were categorized and added to the community assets maps in Section V.C.

East Point Lighthouse
Riverview Beach Park
Animal Shelter
Shopping centers
Penn Beach
Acme Shopping Center
Fort Mott / Finns Point
Local shopping centers
Recreation Department
Supawna Meadows
The Shipyard (60 Main St)
Chestnut Lane
Gas stations
Wawa (S Broadway)
Penn Beach Neighborhood
Riviera Rd
Riviera Drive
Municipal Building
N River Drive
Hook Road

Continued on next page

Chestnut Road
Broadway entry (north access point)
Pennsville Midget Football
Boat Ramp and River Walk
Pennsville Historical Society
Atlantic City Electric Substation (N Broadway)
PV Soccer Fields (Wingate)
Pump stations
Local churches
PV Little League (Churchtown Rd)
Ashcraft Funeral Home
Finns Point Cemetery
Engine House Restaurant
Historical Society (general)
St. George's Episcopal Church
Hidden Creek Farms
Fire station
Waterfront
DuPont Deepwater
Wingate Dr
Jersey Fitness
141 Michigan Rd
Residential – E Pittsfield St
Pennsville Memorial High School
Penn Beach waterfront
Finn's Point National Cemetery
PV High School (N Broadway)
Residential – Beaver Ave
Police Station
Small pond (Plow Point Rd)
Delaware River waterfront
Community Hardware (N Broadway)

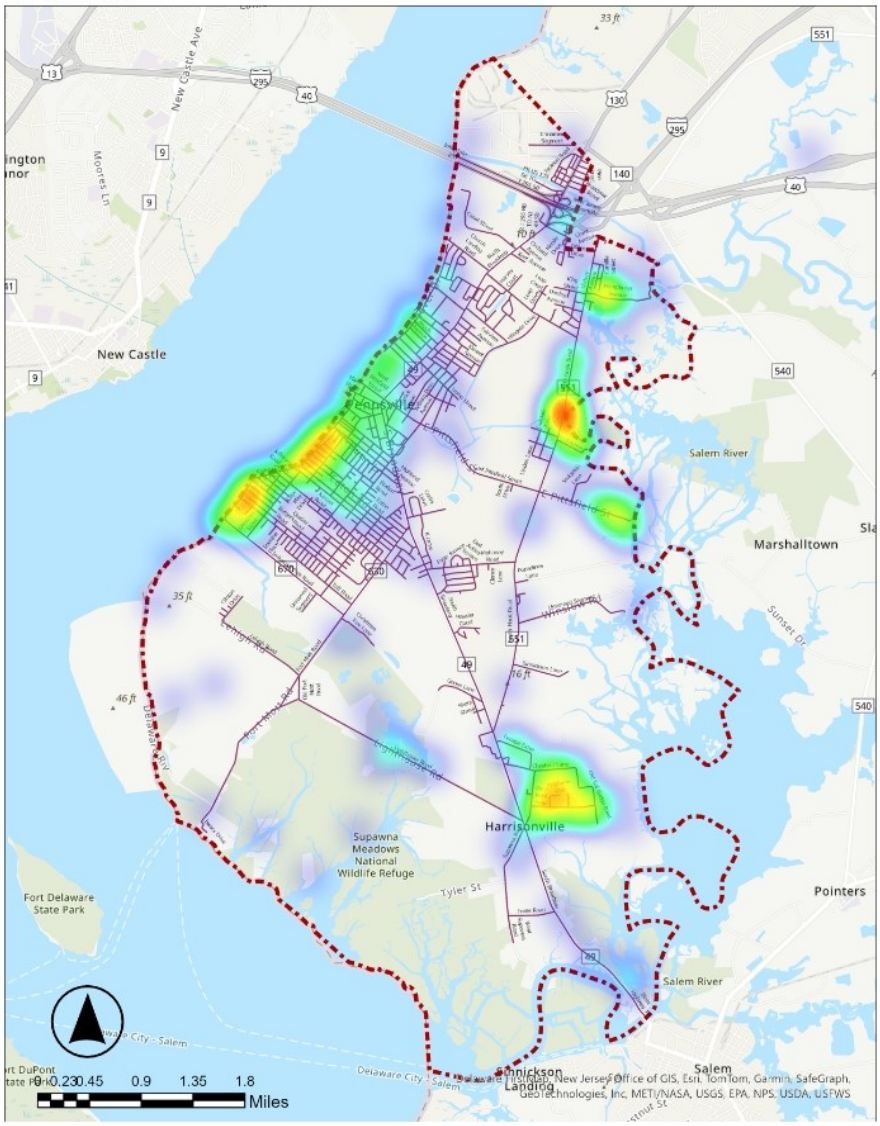
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Township Administration (N Broadway)
Undeveloped farmland (Plow Point Acres)
Riverfront (Delaware River)
Sunoco fuel station
Old Toll Bridge Road
Southern Pennsville flooding area
Utility substation owned by Exelon - Behind little league field 373 N-Broadway 230 line
Hunting preserve - Mallard hunting's
Public works facility near bulkhead
Sewage treatment facility
Solar farm
Water tower + treatment plant
Elder facility
Water wells
Lindsey place
Pennsville towers

Q5 - Click on the map below to add locations where you have observed flooding in Pennsville Township.

Note: The heat map colors represent the concentration of points added to the map in a location with highest concentration=yellow/red, medium-high=green, medium-low=light blue, lowest=purple.

Q5 - HEAT MAP



LEGEND

Concentration of flooding locations

Low----------Medium----------High

Q6 - Please share details about each location you added to the map, including:

- **Names of flooded roads, intersections, and/or neighborhoods,**
- **How often it floods**
- **Causes of flooding (high tide, rain, storm surge)**
- **Damage or effects**

Note: Responses to Q6 were used to refine the flood map(s) in Section III. Stormwater flooding locations were added to Map V-X.

Q7-Q10 - If you have experienced any of the climate hazards below [heat, wind, drought, wildfire] in Pennsville Township, please share details about the event(s) including:

- **Approximate location, if applicable**
- **Year (and month/season, if known) of event(s)**
- **Observed impacts**

Heat
Normal heat of summer
Summer months
General heat waves, nothing specific
August
Entire Township
Summer heat is higher every year.
Entire area of Pennsville
I've seen the crops in the field behind my property get partially damaged at least 2 of the 6 years that I've lived here on East Supawna Rd.
Summers can be hot
Last summer – hot
Summer heat waves
* Location: Township-wide. * Year/Season: June 2025 (late spring/early summer). * Observed Impacts: A prolonged and intense heat wave prompted local officials to issue mandatory water restrictions. Residents were asked to refrain from non-essential water use, such as washing cars or watering lawns, to manage the strain on the water supply. * Long-term Trend: Average summer temperatures in New Jersey have risen by 3.5°F since 1900,

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leading to more frequent and intense "heat island" effects in developed areas.
drought during summer months impacts water pressure and growing season
Summer heat seems to have increased
Summers - elderly parents with no air conditioners
Each year the area has experienced a heat wave.
Away from river
Our summers have become hotter and come sooner and last longer in my opinion.

Wind
Straight line winds causing power outages all throughout town
Throughout the year
Strong storms in the winter and summer, nothing specific
Supawna road
Our house and parks. Fallen trees, erosion
Entire Township
Wind is a constant threat. It's so strong at times you can hear the house take the hit. We have cleared a lot of trees to help minimize the risk, but some storms are getting so strong I'm not sure how we don't have more damage around town
Entire area of Pennsville
East Supawna Rd. I lost 2 beautiful pine trees in 2021 and 2026 due to high winds. I also had a portion of my roof damaged in the 1st event that resulted in an insurance claim
High winds near river
Cracker Barrel sign
Windgate, Fort Mott
A few weeks ago- trees fallen over
Winds during storms
* Location: Area-wide, particularly impacting coastal and utility infrastructure. * Year/Season: * March 2026: Recent severe storms brought gusts exceeding 70 mph across the region, resulting in thousands of power outages. * July 1995: One of the most severe recorded wind events in Pennsville featured estimated gusts of 66 mph during a severe thunderstorm. * Observed Impacts: High wind events in this area frequently result in downed trees and power lines, leading to localized power losses and potential damage to homes. Pennsville is identified

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as having a "major wind risk" due to its vulnerability to hurricanes and tropical storms.
Every strong storm, we have had roof damage
141 Michigan Rd.
The wind has knocked almost every tree over in my yard over the last 15yrs I've lived here on Union St. August of 2024 was the last one.
The wind off the Delaware River is at times extreme
Storms have become noticeably more severe the last several years including high wind gusts and straight-line shear winds. Approximately 3 years ago, almost every home on Meghan's Way had extensive roof damage and tree loss due to high winds. Several homes on neighboring Mathews Lane, Supawna and Chestnut were also damaged.
2 years ago, lost shingles on roof
I live in an area surrounded by open fields and marshes. There isn't much buffer to the wind. I've had to replace roof shingles and flash following heavy winds. Most of my neighbors have experienced the same thing.
Trees falling in woods between Dolbow and Locust/Fenwick Ave
Extremely high winds living on the river in wintertime and with storms and residual hurricanes we experienced. Have to remove patio furniture in summer storms not required for people living inland; water sprays 20+ feet; blow high tide water into the yard, laying water around the trees and grass. High winds broke an old peach tree in half about two years ago
Living on the river wind is always an issue with trees, tree branches, roof shingles, keeping the wind from penetrating doors and windows.
Almost daily 8 plow point rd.
All along the river front
Meghan's Way: I had to remove a $5000 awning I had installed because of high winds that started occurring about 4 years ago
Year round. Matthews Ln. Trees knocked down; shingles and siding ripped off.

Drought
Normal in summer
Summer months but not often
Have not experienced a real drought
All over time, 1-2 times per year water restrictions
Plants, wildlife
Farms

Continued on next page

We get into droughts. I worry about the wells in town. Pumps seem to go down a few times a year.
Farmland
I've seen the crops in the back of my property completely winter due to the heat and drought in both 2023 and 2025
Every summer there is limited water usage.
Hot dry summers happen
The entire town and state from time to time
Summertime droughts due to high temperatures and lack of rain.
Pond behind our house is very low
We've been told to limit water usage a few times during the summer when it doesn't rain.
Summers between approximately 2019-2023 were very dry with intense sun in Pennsville and the tristate area. My lawn was "fried" even when I ran an in-ground irrigation system for over an hour daily from 2am to 3am (or longer). I had two evergreens die. The pond between Meghans Way and Mathews Ln was significantly down. There have been occasions when the pond is low that algae blooms occur, and mosquitoes also become more of a problem.
various summers we have been on water restrictions
Each summer we experience periods of drought. We've occasionally had water restrictions placed on our residents.
Wingate road brush fire
Summer. Matthews ln. Dead grass and plants. Water conservation.
Yearly occurrence seems to be. At times it will be very wet and the next thing you know we've had no rain for weeks and have water restrictions.

Wildfire
Carelessness of people not following burn bands during droughts
There was a wildfire a year or two ago near the Supawna wildlife refuge, but I was not affected.
People lighting fires on fort Mott and Wingate from droughts
Fort Mott & hook road dikes
Not a huge concern, but it became one when we had a fire at Fort Mott. It would be hard to control if it hit right.
Fort mott& hook road area dike
There was a wildfire between Fort Mott and West Supawna Road 2 years ago

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Area around Fort Mott and the Dyke
Windgate, Fort Mott
Caused by dry conditions
* Location: Vicinity of Fort Mott State Park and Fort Mott Road. * Year/Season: March 2025 (early spring). * Observed Impacts: * Scale: A "suspicious" wildfire burned at least 50 acres near Fort Mott Road. * Community Threat: The fire reached 85% containment after threatening 12 homes, leading several residents to voluntarily evacuate. * Visibility: Thick clouds of black smoke were visible for miles, and local fire officials noted it was one of the largest fires seen in the township in a long time.
2025- Fort Mott
Both dyke areas in town are a constant threat for wildfire
The Dike between Hook Road and Wingate Drive.
Occasionally there have been marsh fires that have caused heavy smoke in the area. This has caused me respiratory issues. I have asthma.
Smoke from nearby jurisdictions
Surrounding areas. Yearly
Fort Mott Area, unsure of dates. Wingate area, unsure of dates
Ft Mott and hook rd. dikes
Smoke at the home when Wingate drives it fort Mott catches fire.

Q11 - Below are examples of strategies related to land use and zoning that can help reduce the impacts of climate hazards. Rank their importance for your municipality, with 1 being most important and 5 being least important.

Note: Lower average ran = higher priority.

Rank	Strategy	Average Rank
1	Protect and restore natural areas to reduce climate impacts	1.67
2	Direct the location of new development to less-vulnerable areas	1.95
3	Update building standards to increase climate resilience	3.49
4	Require more trees and landscaping to reduce heat	3.81
5	Encourage compact, walkable neighborhoods with access to public transit	4.09

Appendix C: Data Sources

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Section III Detailed Data Sources

Tables

Table III-1. Heat waves - https://njhealthadapt.rutgers.edu/, Public Health Report, Table 1

Table III-2. Extreme heat days - https://njhealthadapt.rutgers.edu/, Public Health Report, Table 2

Table III-3. Days below freezing - https://njhealthadapt.rutgers.edu/, Forest Climate Risk Report

Table III-4. Rainfall (in inches) over 24-hours by annual storm probability - https://njhealthadapt.rutgers.edu/, Public Health Report, Table 3

Table III-5. Increase in annual probability for the 10% and 1% chance storm - Northeast Regional Climate Center, unpublished data

Table III-6. Annual percent time in drought - Shope, J., Nikolopoulos, E., and Araujo, D.S.D. 2025. DRAFT New Jersey Projected Future Drought Dataset Technical Documentation, unpublished data

Table III-9. Historic flooding days - https://coast.noaa.gov/sealevelcalculator/#, Changes in Flood Frequency

Maps

Map III-1. Land surface temperature – Summer 2022 – https://rutgers.maps.arcgis.com/apps/mapviewer/index.html?webmap=4d8f6d249e394357827fecd5312fc861

Map III-2. Heat island risk - https://rutgers.maps.arcgis.com/home/item.html?id=fc1878a4cb3f432da15a030d63896076#overview

Map III-3. FEMA flood zones - https://rutgers.maps.arcgis.com/apps/mapviewer/index.html?webmap=cba402bdd0334334b6c2f2568d7e5443

Map III-5. High tide flooding locations - Rutgers University (2026). *NOAA Minor High Tide Flooding for New Jersey (Rutgers Modified)*. https://rutgers.maps.arcgis.com/home/item.html?id=dadbb5799a0a45cba87c87e9649e82b3#overview

Map III-6. Potential inundation from 100-year storm - https://njfloodmapper.org/, Total Water Levels Tool, Accessed May 2025

Map III-7. Areas potentially subject to the NJ PACT regulatory reforms – https://services1.arcgis.com/ze0XBzU1FXj94DJq/arcgis/rest/services/NJ_FEMA_FP3_4_9_2024/FeatureServer, https://gisdata-njdep.opendata.arcgis.com/datasets/njdep::tidal-climate-adjusted-flood-elevation-cafe-slr-4ft-for-new-jersey/about

Map III-8. Projected permanent inundation from future sea-level rise in 2050 and 2100 - https://njfloodmapper.org/, Total Water Levels Tool, Accessed May 2025

Map III-9. Potential inundation from coastal flooding from 100-year storm in 2050 - https://njfloodmapper.org/, Total Water Levels Tool, Accessed May 2025

Map III-10. Wildfire risk to potential structures and select historic wildfires - NJ Wildfire Risk Explorer and Wildland Fire Incident Locations | National Interagency Fire Center

Map V-16. Heat island risk to Overburdened Communities - https://rutgers.maps.arcgis.com/apps/mapviewer/index.html?webmap=9f8adca918b0467bbcf74f5c06918e22