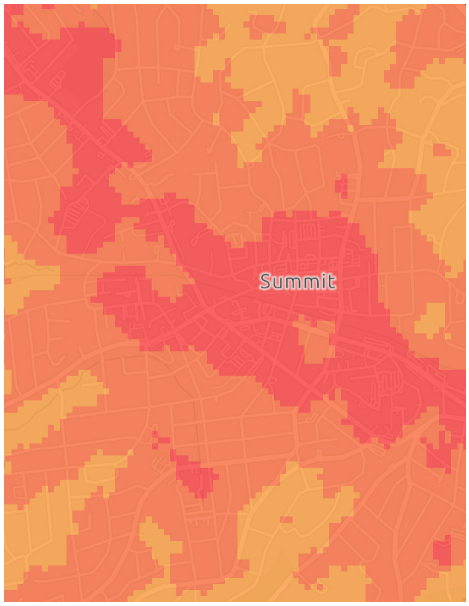
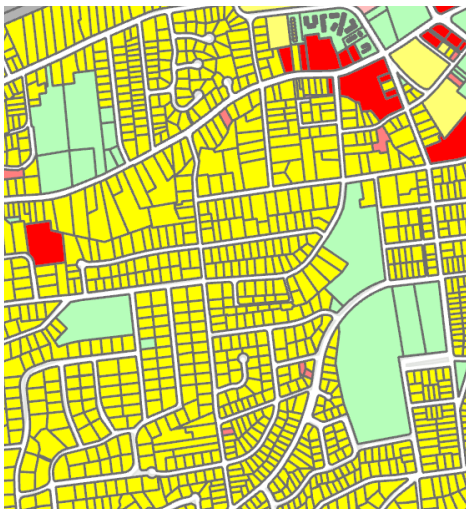
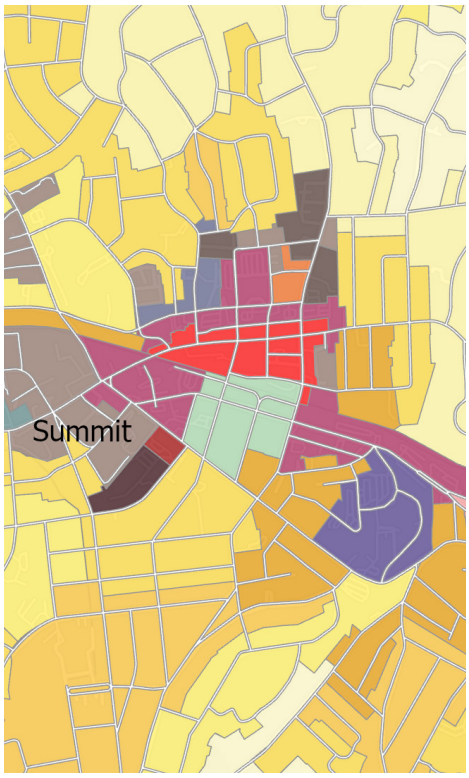






September 2026

Climate Change-Related Hazard Vulnerability Assessment

City of Summit

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 City of Summit 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 City 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 Municipal Land Use Law (MLUL) requires New Jersey 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 the City of Summit 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, and hurricanes (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).

Summit is in Union County, New Jersey. Situated between Interstate 78 and State Highway 24, Summit includes a mix of residential, commercial, light industrial, and public land uses. Spanning 6 square miles, the City of Summit is a diverse municipality located in the northwestern portion of Union County. It is served by Interstate 78 and State Highway 24 and has a vibrant Central Retail Business District (CRBD) surrounded by a densely populated residential area consisting of high and medium-density and multi-family housing. Additional details about Summit are included in Appendix A.

II. Methodology

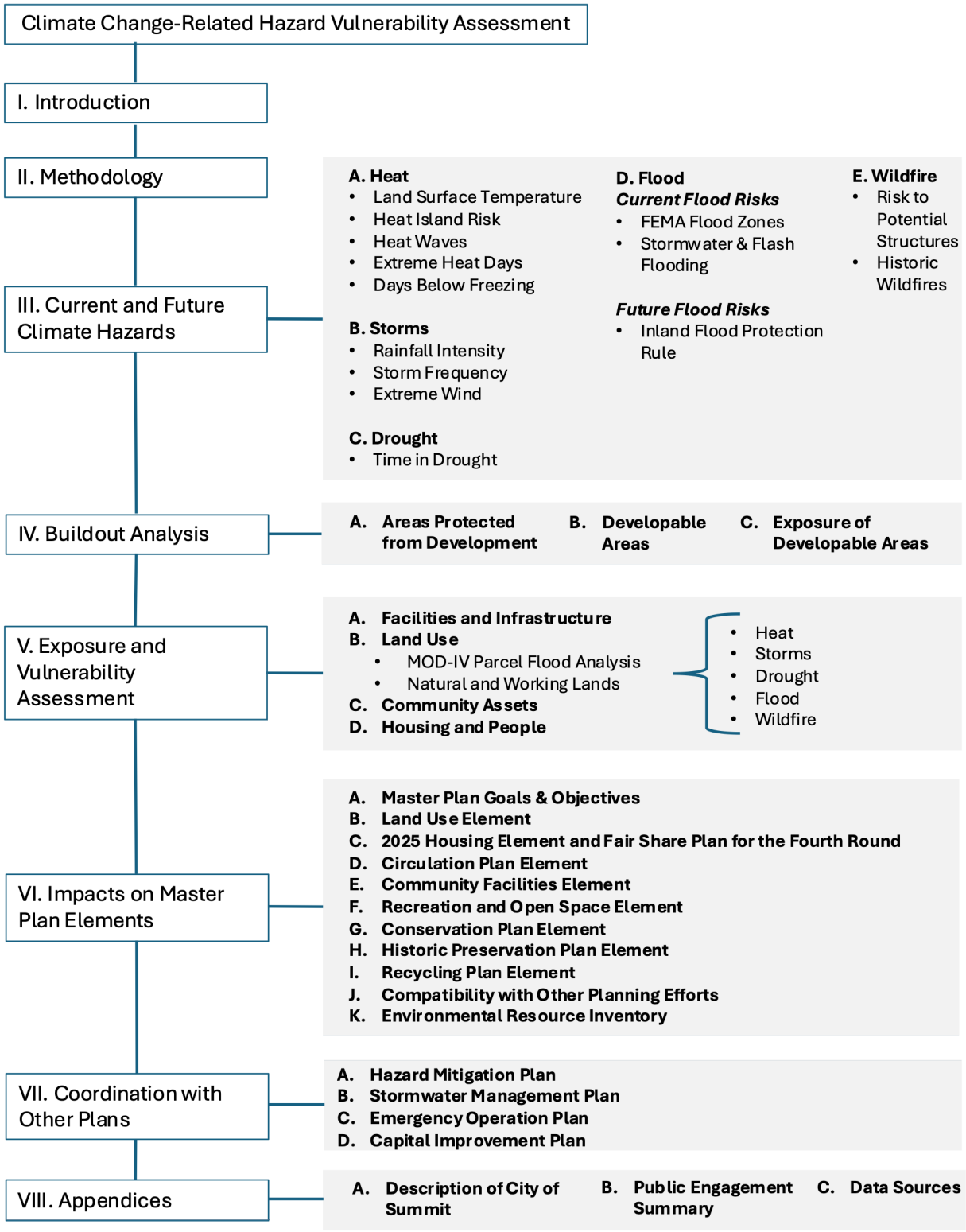
In accordance with the requirements of the MLUL, this assessment relies upon "the most recent natural hazard projections and best available science" provided by the NJDEP. This assessment was conducted in the summer and fall of 2025 and relies upon the best available data at that time. Publicly available datasets and data made available through various tools were utilized to analyze local climate change-related hazards and potential impacts to Summit 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. This rule is detailed in Section III.D.

The results of the web-based assessment were presented to Summit municipal staff and residents to obtain feedback and confirm results. These stakeholders also provided input on hazards for which 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. Summit 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 city from the hazards of heat, drought, flooding, extreme precipitation, wind, and wildfire. Most respondents indicated that flooding was their greatest concern for the city, followed by extreme precipitation, heat, and wind. 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 extreme precipitation, followed by heat and flooding, respectively.

A. Heat

Average annual temperatures in New Jersey have risen by about 4°F since 1900. By 2100, the annual average temperature in New Jersey is projected to increase an additional 3.7-6.2°F.[1] 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 fewer natural landscapes. Nearly half of the stakeholders who responded to the survey (49%) indicated being personally affected by heat in Summit "many times" or "a few times" each year. Some respondents also believe that extreme heat strains electric grids.

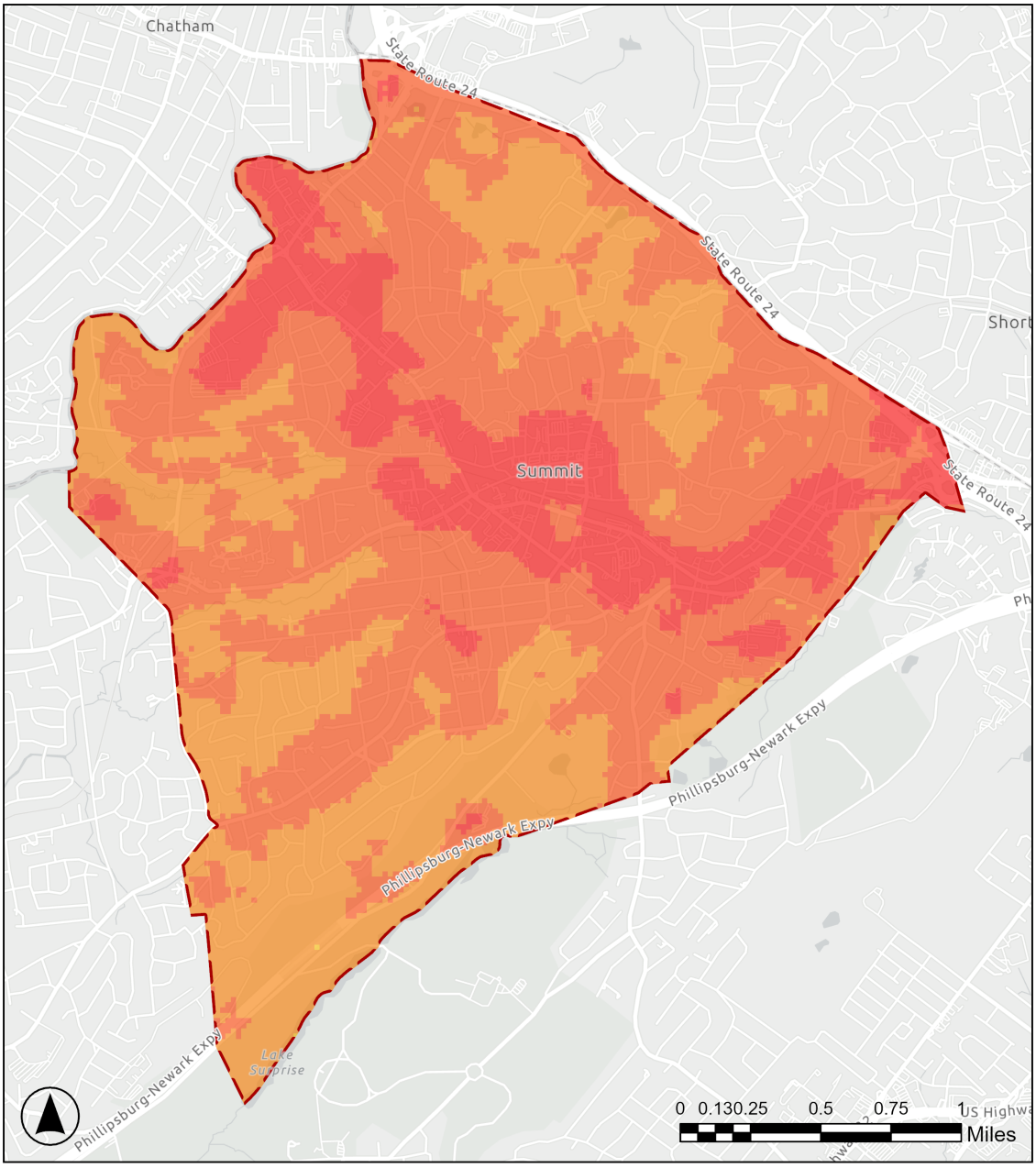
Land Surface Temperature

Map III-1 depicts the land surface temperature (temperature of the ground) in Summit in the summer of 2022. This data was collected by satellites at a 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.

The land surface temperature in Summit is generally high, ranging from 90°F to over 110°F. The highly developed areas of the city, especially in the downtown core and along the major transportation corridors, namely the Morris & Essex rail line and Morris Ave, experience higher temperatures averaging above 110°F. In contrast, the residential neighborhoods with their dense tree canopy situated to the north and south of the central commercial spine are comparatively cooler with temperatures ranging from 90°F to 110°F. The Woodland Park, Watchung Reservation, Briant Park, and the Union County Recreation Park along the southern border of the city help in mitigating the heat in the residential areas.

[1] 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, New Jersey. DOI: 10.7282/00000539.

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



LEGEND

Land Surface Temperature 2022

- Below 80°F
- 80° - 90°F
- 90° -100°F
- 100° - 110°F
- Over 110°F

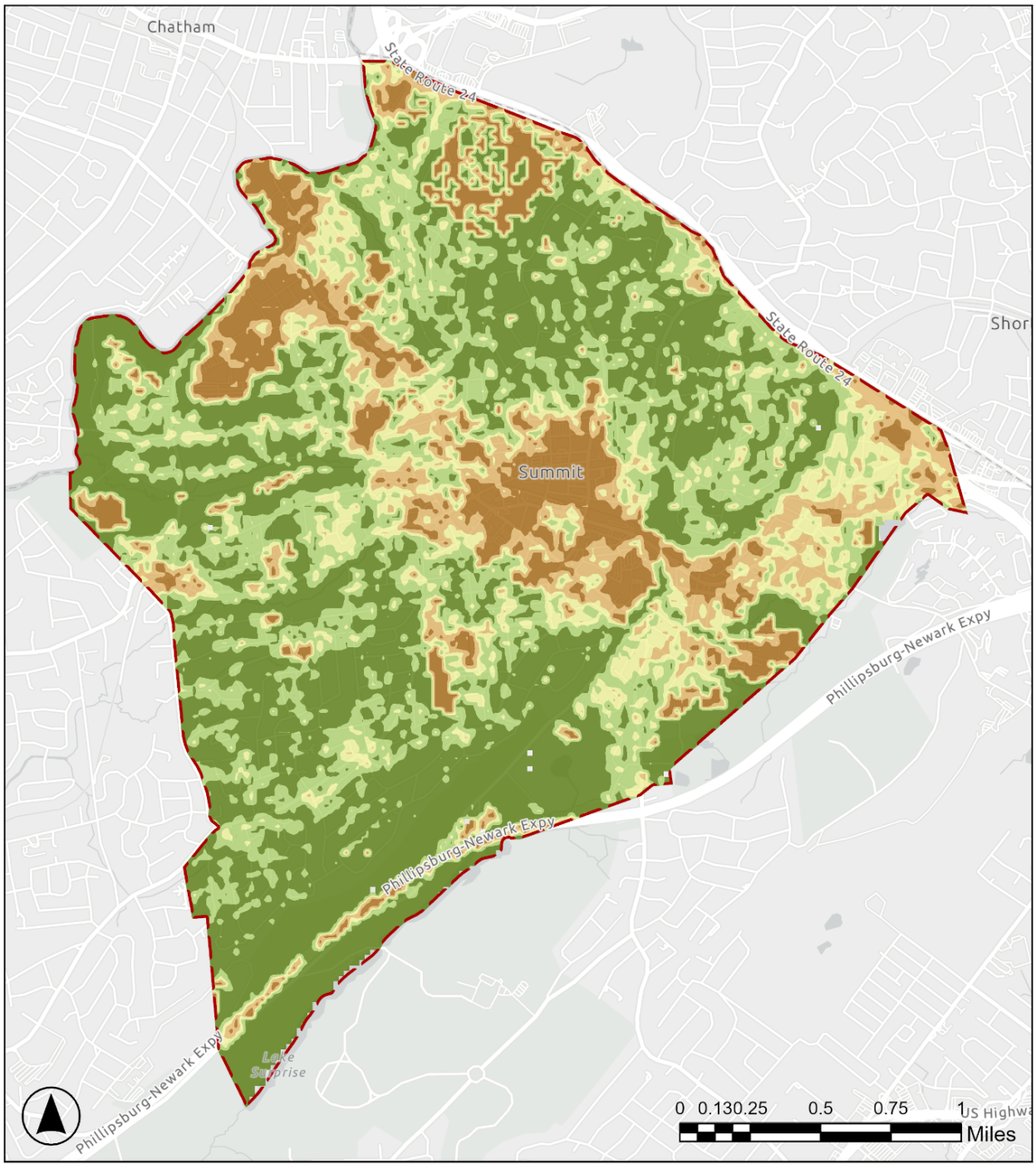
(Sources: NJDEP and New Jersey Climate Change Resource Center)

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 than tree canopy are at risk of the heat island effect. Heat islands can increase daytime temperatures, reduce nighttime cooling, and cause more air pollution. 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 Summit. For each Census Block Group, 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 Summit closely reflects land use patterns. Summit’s downtown, main commercial corridors like Morris Ave, industrial areas in the northwest, and residential areas, particularly south of the Morris & Essex rail line, have moderately higher ratios of impervious surface coverage, increasing the potential for heat island effects. In contrast, the southwest part of the city, where residential neighborhoods have a significantly higher tree canopy cover, the risk of heat island effect is lower. The larger natural areas along the southern border of the city play an important role in offsetting the heat island risk.

Map III-2. Heat island risk



LEGEND

Tree Canopy Cover to Impervious Surface

- Higher Canopy Cover
- Moderately Higher Canopy Cover
- EquivalentCanopy/Impervious Cover
- Moderately Higher Impervious Cover
- Higher Impervious Cover

(Source: New Jersey Climate Change Resource Center)

Heat Waves

A heat wave is a period of unusually hot weather. Typically, heat waves are warmer than the area's historical averages 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.[2]

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 Union County is three days with temperatures meeting or exceeding 81.4°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 Union County

	Baseline 1981-2010	Moderate Emissions	
		Mid-century 2036-2065	Late-century 2070-2099
Average annual number of heat waves	1.1	4.1	5.2
Average days of heat wave duration	3.3	8.5	10.9
Maximum days of heat wave duration	7.2	16.8	20.2

(Source: New Jersey Public Health Adapt, Climate Conditions that Impact Health)

The data for Union County indicates that the average number of heat waves each year may increase from about one annually to 4-5 per year by the end of the century. The average length of heat waves is projected to increase from about three days to eight to eleven days by the end of the century. The typical maximum duration of heat waves may increase from around seven days to seventeen to twenty 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.

[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.

Table III-2. Extreme heat days

	Baseline 1981-2010	Moderate Emissions		
		Change from Baseline		
		2030	2060	2090
Days greater than 95˚F	2	+ 4	+ 10 to 12	+ 14
Average daily high temp. in July (˚F)	85	+ 2	+ 4	+ 4 to 5

(Source: New Jersey Public Health Adapt, Climate Conditions that Impact Health)

Summit experienced an average of two days above 95°F annually from 1981-2010. By 2030, this may increase by 4 days annually and by 14 days annually by the end of the century. Summit 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. Fewer very cold days mean fewer "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	116	107	101

(Source: New Jersey Adapt Climate Snapshots, Forest Climate Risk Report)

Summit experienced an average of 116 days below 32°F annually from 1981-2010. By the middle of the century, this may decrease to an average of 107 days below freezing each year. By the late century, the average number of days below freezing may decrease to 101 days annually.

B. Storms

Storms in New Jersey can bring heavy precipitation, flooding, and strong winds. Extreme 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 about 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 wind associated with storms can damage structures and vegetation, including impacts to agriculture. Extreme precipitation ranked second in local stakeholder concern as reported in survey responses, suggesting that storm-related hazards represent key community concerns.

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 percent chance of occurring represents a greater intensity of rainfall (although it occurs less frequently). See Map III-4 in the Flood section below for current stormwater flooding locations reported by local stakeholders.

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	3.43	3.67	3.77
20% chance storm	4.40	4.71	4.84
10% chance storm	5.23	5.65	5.75
4% chance storm	6.47	6.99	7.12
2% chance storm	7.55	8.23	8.38
1% chance storm	8.75	9.63	9.71

(Source: New Jersey Adapt Local Planning Navigator, Extreme Precipitation)

The baseline amount of rainfall in a 24-hour period in Summit ranges from 3.43 inches (50% chance storm) to 8.75 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 that a given storm will occur more frequently 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[3] of 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	11.46%	14.87%	16.00%
1% chance storm	0.99%	1.67%	1.79%

Source - Northeast Regional Climate Center, unpublished data.

The frequency of extreme rainfall events in Summit 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 16% chance by the late-century. The probability of the 1% chance (100-year) storm may increase to a 1.67% chance annually by the mid-century and a 1.79% 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 Summit were assessed using historic data on the occurrence of high wind events and tornadoes.[4,5] Since 1950, thirteen tornadoes ranging in magnitude from F0-F2[6] have been documented in Union County, although none within Summit. Wind events have been recorded on 13 days in Union County, with no events reported in Summit. However, being adjacent to two rivers and small waterbodies and given the heightened storm vulnerability of the state as a whole, Summit should expect potential exposure.

Most local stakeholders who responded to the survey (43%) indicated being personally affected by wind “many times” or “a few times” each year. Residents across the city reported widespread wind damage, including downed trees, infrastructural damage, and repeated power outages.

[3] NOAA National Weather Service. Precipitation Frequency Data Server. 2025. Atlas 14 precipitation frequency estimates.
[4] Rutgers New Jersey Agricultural Experiment Station. 2025. Tornadoes in New Jersey: 1950 to Present.
[5] NOAA National Centers for Environmental Information (NCEI). 2025. Storm Events Database.
[6] NOAA National Weather Service. 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).[7]

Time in Drought

Table III-6 provides a projection of change in the percent of time spent in drought conditions annually for Union County, compared to a historical period from 1981 to 2014. Droughts occur when evapotranspiration exceeds rainfall over a period 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.

[7] Office of Emergency Management. 2024. 2024 New Jersey State Hazard Mitigation Plan.

Table III-6. Annual* percent time in drought in Union County[8]

	Historical 1981-2014	Moderate emissions	
		Mid-century 2041-2070	Late-century 2071-2100
Drought	15.3%	+0.9%	+3.5%
Severe Drought	0%	+2.4%	+4.8%

(Source: Forthcoming dataset by Shope, J., Nikolopoulos, E., and Araujo, D.S.D.)

*In the northern hemisphere, the hydrological "water year" is the 12-month period from October-September.

Historically, drought conditions have affected Union County approximately 15% (1-2 months) of the year. Time spent in drought annually may increase by 0.9% by mid-century and by 3.5% by late-century. Union County has not historically experienced severe drought conditions, but future severe droughts may occur 2.4% of the year by mid-century and 4.8% 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 city, with 40% of survey respondents personally affected by flooding "many times" or "a few times" each year. Flooding in Summit is driven by three factors:

- Fluvial flooding, or riverine flooding, when intense rain events cause rivers and streams to overtop their banks;
- Pluvial flooding, when intense rain events lead to surface water accumulation; and
- Land cover type, which influences infiltration and runoff.

While this analysis primarily assesses fluvial flooding in Summit, it is important to note that flash flooding and other pluvial flooding can be especially hazardous. Further modeling beyond the scope of this analysis is needed to assess the compound impacts.

[8] 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 Summit based on the measures listed in Table III-7. Each of these flood measures is defined and mapped in this section.

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	• Inland Flood Protection Rule

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.

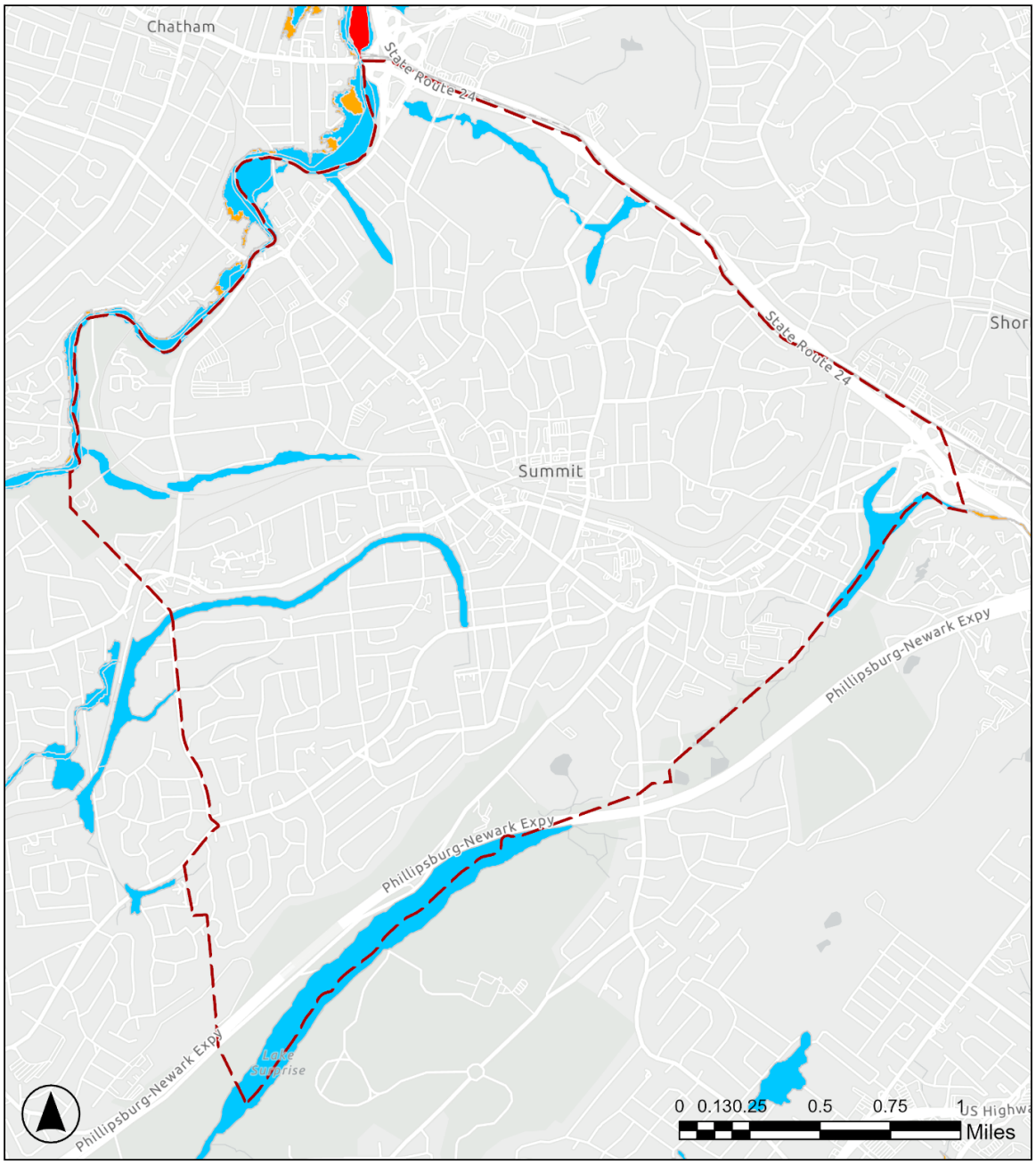
Current Flood Risks

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 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 Summit. Certain portions of Summit are within the FEMA 1% annual chance flood zone, particularly along the western edge of the city parallel to the Passaic River. The smaller streams along Springfield Avenue and Kent Place Boulevard also fall under the FEMA 1% annual chance flood zone. Most of the city's residential, commercial, and industrial properties are in areas of minimal flood hazard. The southeastern portion of the town, primarily characterized as forest land in the Watchung Reservation, has a 1% annual chance flood risk near Lake Surprise.

Map III-3. FEMA flood zones



LEGEND

FEMA Flood Zones

- 1 Pct Annual Chance Flood
- 0.2 Pct Annual Chance Flood
- Regulatory Floodway

(Sources: FEMA and New Jersey Climate Change Resource Center)

Stormwater and Flash Flooding

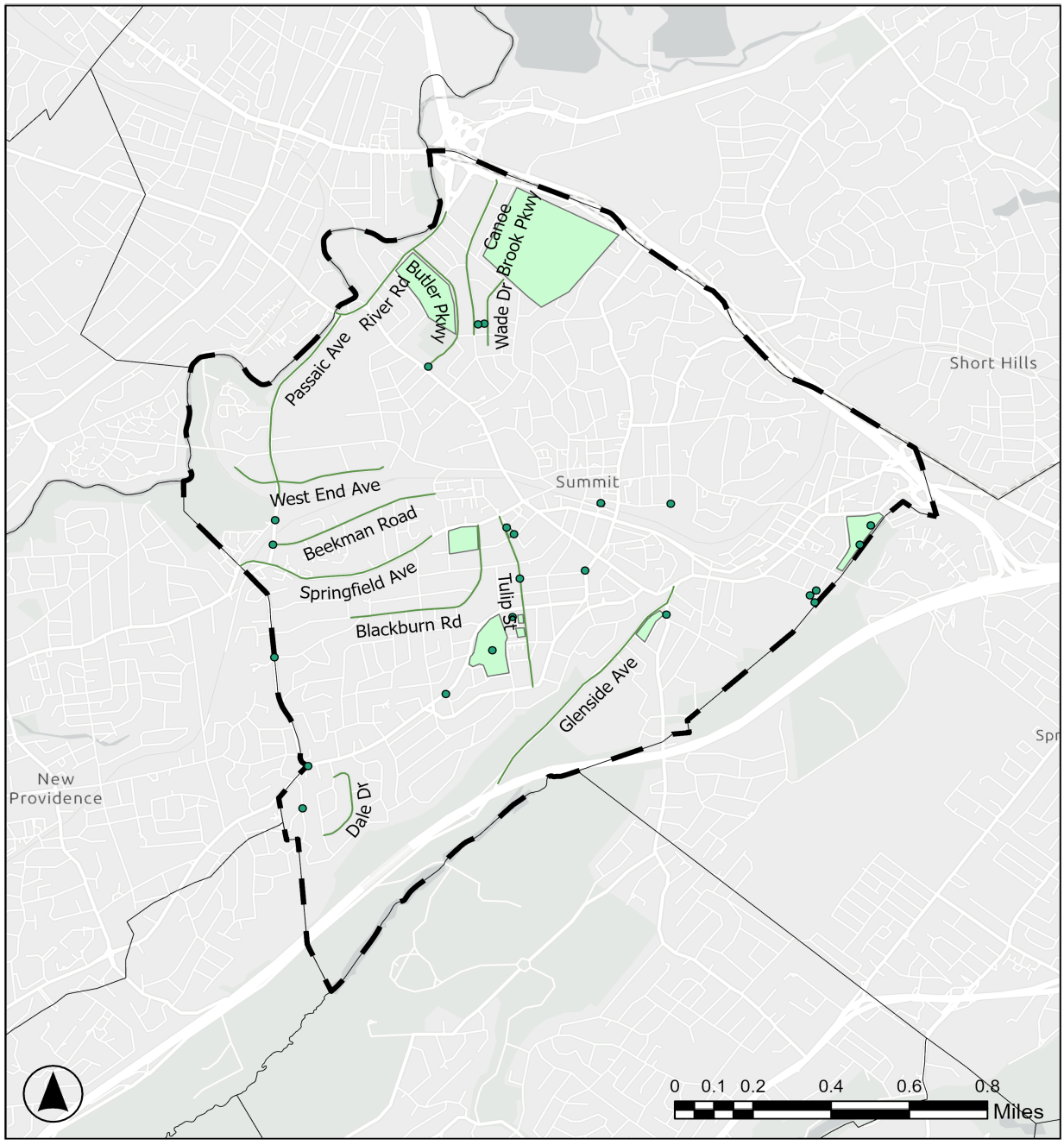
Flooding can occur during flash flood events when stormwater infrastructure is overwhelmed by extreme precipitation. Map III-4 depicts the observed locations of flooding during precipitation events, which were identified by community stakeholders through the public engagement process that included an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

Stormwater points identified by stakeholders are scattered across the municipality but concentrated particularly along the municipality's boundary and south of the Summit train station. These locations include roads such as Passaic Ave and Springfield Ave, and places such as Briant Park and Salt Brook. Flooding at these locations can affect mobility, transportation capabilities, and access to community spaces and places of worship.

Road sections impacted by stormwater flooding are also concentrated between the parks in the north and the southwestern area of the municipality. These roads include Glenside Ave, Blackburn Road, River Road, and Tulip Street. These road segments experience heavy runoff, resulting in recurring or potential disruptions to local transportation networks during storm events, including tree falls that can affect access and daily mobility for residents.

Large contiguous areas impacted by stormwater flooding are concentrated on the northern edge of the municipality, including Canoe Brook Country Club and Golf Club. These sites are also concentrated in the city center. Areas like Memorial Field, Tulip School, and Briant Park are inundated by recurring flooding that is consistent every year. 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 Points
- Road Sections Affected by Stormwater Flooding
- Areas Affected by Stormwater Flooding

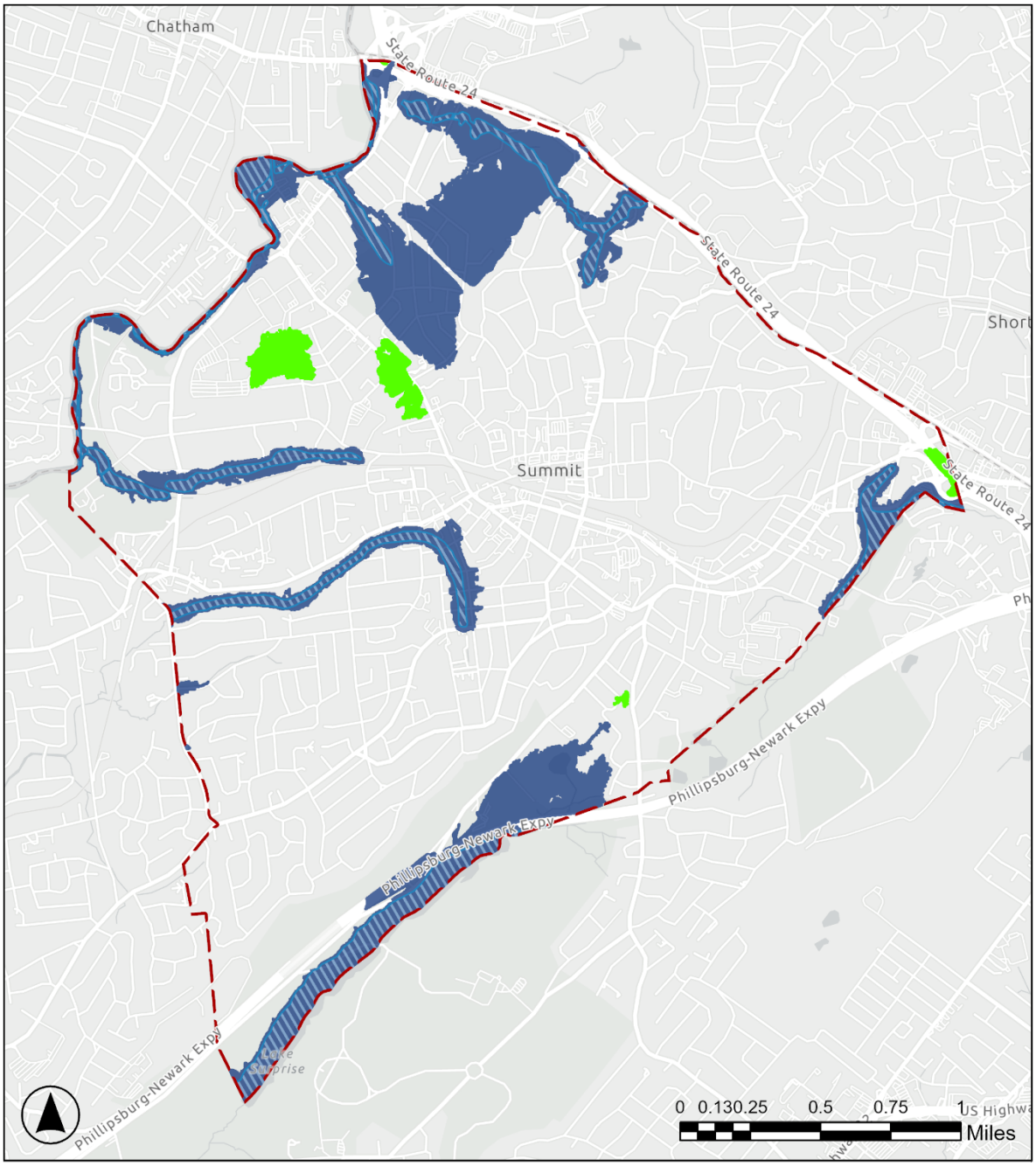
Note: Map is based on stakeholder survey and in-person feedback.

Future Flood Risks

Inland Flood Protection Rule

In July 2023, the NJDEP adopted the Inland Flood Protection Rule, establishing a new Design Flood Elevation (DFE) standard for specific types of new construction and redevelopment in inland/fluvial areas. 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. Map III-5 depicts areas in Summit that may be subject to the Inland Flood Protection Rule by estimating the extent of an additional three feet of flooding on top of the current FEMA 1% Annual Chance Flood. 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. The green "low-lying" areas are below the elevation of the expanded flood surface, and therefore have the potential to flood, but are hydrologically disconnected from the rest of the flood zone. This information can support local efforts to safeguard community facilities, infrastructure, and assets.

Map III-5. Areas potentially subject to the Inland Flood Protection Rule



LEGEND

- FEMA 1% annual chance flood zone
- Approximate extent of Inland Flood Protection rule
- Inland Design Flood Elevation Low-Lying Areas

E. Wildfire

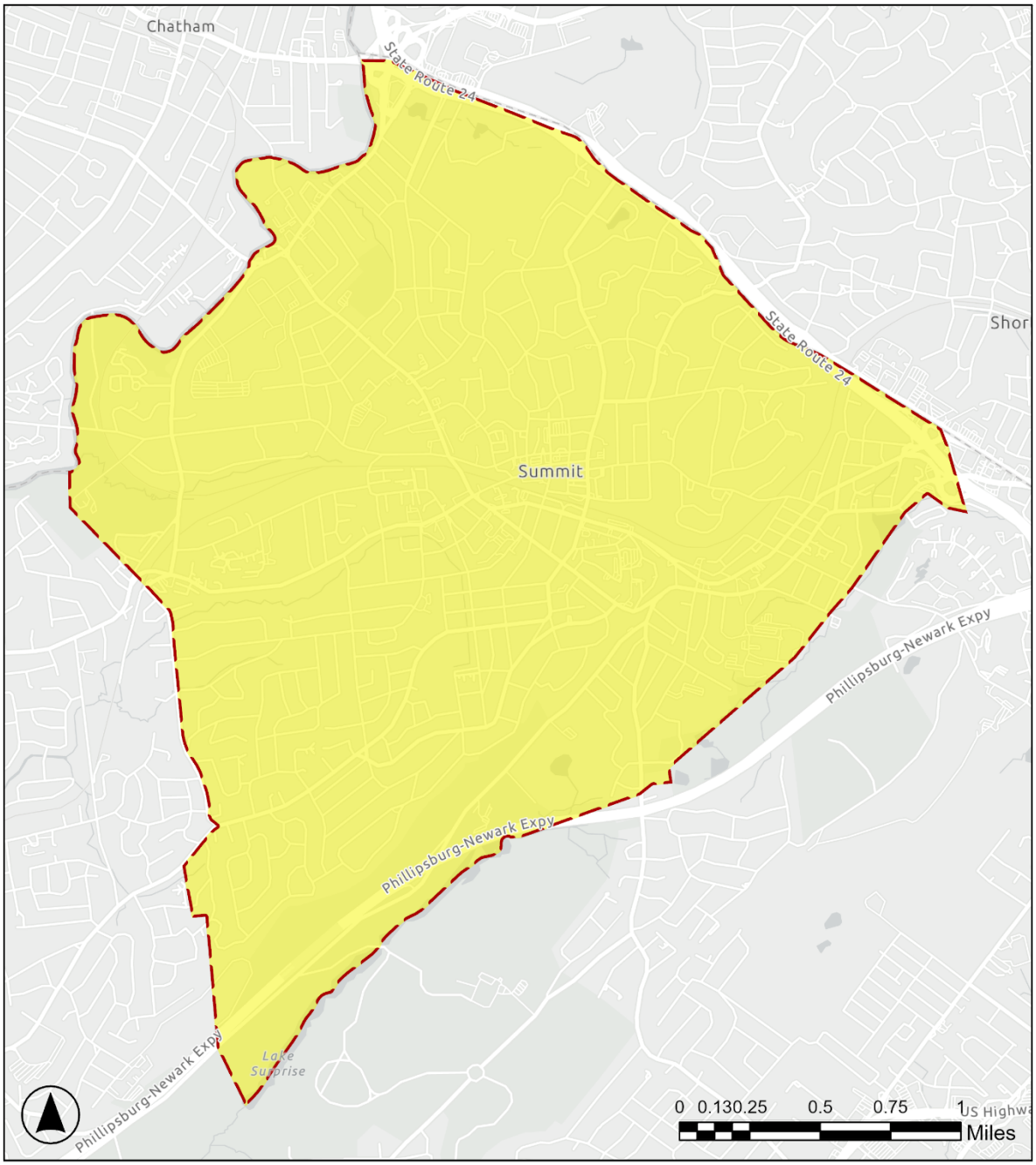
Wildfires are unplanned fires in natural areas including forests or grasslands. The NJCCRC's *State of the Climate: New Jersey 2024* reports that 798 wildfires burned 4,847 acres in New Jersey during the exceptionally dry 2024 fall season. Increasing temperatures are anticipated to cause greater evaporation and drier vegetation, exacerbating conditions contributing to wildfires. Wildfire smoke contains air pollutants that decrease air quality and pose risks to human health.

Wildfire hazards in Summit were assessed using historic wildfire data from the National Interagency Fire Center (NIFC)[9] and NOAA[10] and data on risk to potential structures from the New Jersey Wildfire Risk Assessment Portal.[11] 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-6 depicts wildfire risk to potential structures and locations of historic wildfire incidents documented by the NIFC in Summit. Wildfires do not pose a significant risk to Summit or adjacent municipalities. All areas of the municipality are classified as low risk to potential structures, and no wildfire incidents have been documented by NIFC and NOAA since 1950. Local stakeholders rank wildfire as having the lowest frequency of personal impact, consistent with its occasional and localized nature in the city.

[9] National Interagency Fire Center. 2025. NIFC Open Data Site.
[10] National Oceanic Atmospheric Administration. National Centers for Environmental Information. 2025.
[11] NJ Forest Fire Service. 2025. New Jersey Wildfire Risk Assessment Portal.

Map III-6. Wildfire risk to potential structures and select historic wildfires



LEGEND

Risk to Potential Structures

Low

High

(Source: New Jersey 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 threats and vulnerabilities identified above related to that development." Certain areas within a municipality are not fit for development, including wetlands, water bodies, and certain buffers around water bodies or protected 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 applications of buildout analysis, 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 developable areas within Summit 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. Summit experiences high land surface temperatures in the historic downtown and surrounding residential areas. This section details varying levels of exposure for potential lots and units, and

4. Finally, identifying developable areas and potential development that are 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: Already developed lands (based on land use categories), water features, or wetlands.

- Constrained areas: Those with development limitations due to environmental concerns.

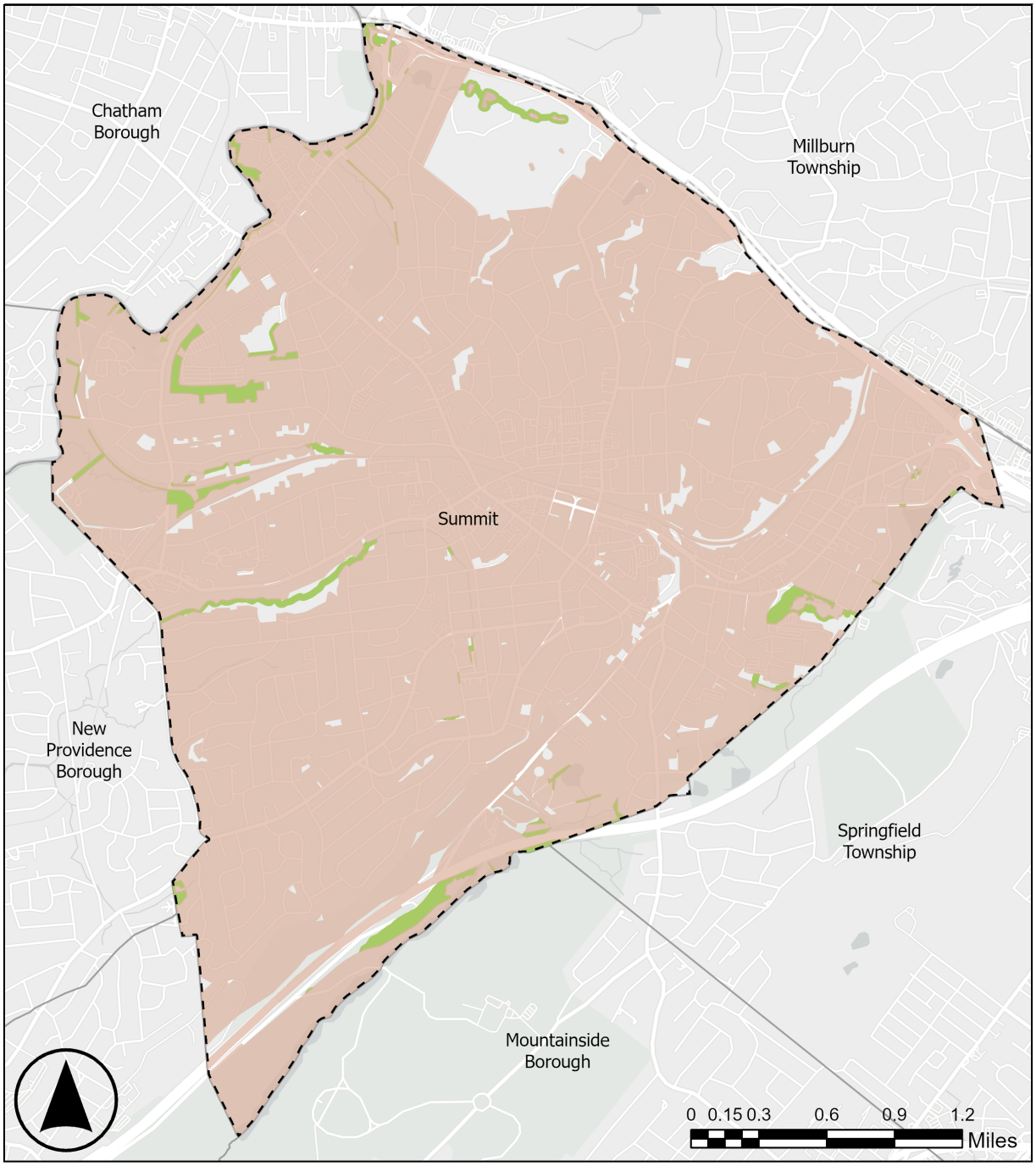
Table IV-1. Areas protected from development

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 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, Summit's zoning ordinance was analyzed.

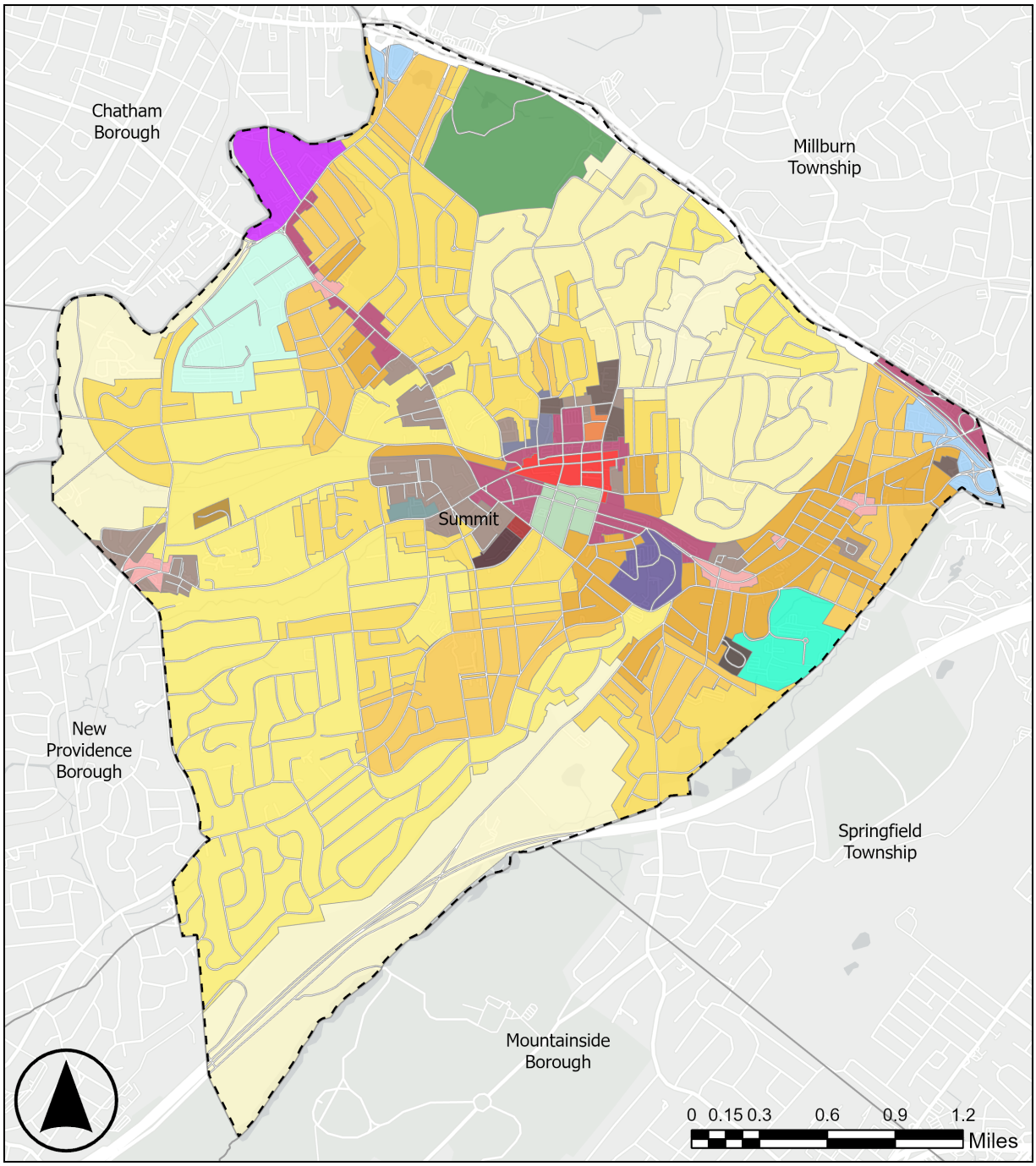
Zoning Analysis

Situated within the Raritan Valley and Rahway Valley regions in the northern-central part of Union County, Summit is a commuter city with suburban character consisting of a historic downtown with tree-lined residential neighborhoods. Map IV-2 presents the zoning districts within Summit which includes Residential (R-43 through R-5), Multifamily (MF), Business (B), Office/Research (ORC), Industrial (LI), Institutional (PI), Public Lands (PL), and Golf course (G).

Summit's zoning follows a radial pattern. Commercial zones (CRBD, B, and B-1) are concentrated in the city's historic downtown along Morris Ave and Springfield Ave. These zones are surrounded by higher-density multi-family residential (MF, MFT) and townhouses (TH-1 and TH-2). A vast majority of districts are dedicated to residential use (R-43 through R-5) and are spread from the town center to the city's boundaries. Research/Office (ORC, ORC-1, RO60, PROD, and PROD-2) and Neighborhood Business (NB) are transitional zones and act as a buffer between commercial and residential neighborhoods.

Table IV-2 lists key developmental controls and minimum lot sizes permitted based on the city's zoning ordinance. Residential development is distributed across 11 zoning districts and covers most of the city. They permit single-family homes, two-family homes, affordable housing, and multi-family housing under clearly defined minimum lot sizes ranging from 5,000 sq. ft. to 43,000 sq. ft. and up to 6 acres for townhouses. Town center zones (CRBD, B, NB) permit pedestrian-oriented mixed uses, with commercial and retail services such as restaurants, government services, financial and advisory services, and food markets. These zones are based on floor-area ratio controls and urban form standards. Research/Office zones permit the conversion of smaller-lot buildings for offices located around the city center to large-tract planned campuses (research and private facilities like Bristol Myers Squibb, NAKI Therapeutics Inc., Atlantic Health Critical Care, BMS Construction LLC, Kenvue Brands LLC) in the northeastern and northwestern peripheries of the city. Institutional and public lands (Summit Free Public Library, Central Presbyterian Church, Atlantic Health Overlook Medical Center, schools and parks) have moderate lot sizes with allowances to accommodate civic functions. Industrial zones (LI) on the northwestern edge of the city permit manufacturing and warehousing of small and lightweight items.

Map IV-2. Zoning



LEGEND

Zoning Districts

- Single Family Residential: R-43
- Single Family Residential: R-25
- Single Family Residential: R-15
- Single Family Residential: R-10
- Single Family Residential: R-6
- Single Family Residential: R-5
- Affordable Housing: RAH-1
- Gateway - 1: GW-1
- Multi-Family Residential: MF
- Multi-Family Tower Residential: MFT
- Town House - 1: TH-1
- Town House - 2L TH-2
- Neighborhood Business: NB
- Business: B
- Business 1: B-1
- Central Retail Business District: CRBD
- Office Residential Character: ORC
- Office Residential Character - 1: ORC-1
- Research Office: RO60
- Planned Research Office Development: PROD
- Planned Research Office Development - 2: PROD-2
- Light Industrial: LI
- Professional-Institutional: PI
- Public Land: PL
- Golf: G

Table IV-2. Summit zoning ordinance

Zone	Description	Permitted Uses	Notable Restrictions/ Exclusions	Min Lot Size
R-43	Single Family Residential	Single-family dwellings	Very low-density zoning; large lot requirement	43,000 sq.ft.
R-25	Single Family Residential	Single-family dwellings	Low-density residential; large setbacks required	25,000 sq.ft.
R-15	Single Family Residential	Single-family dwellings	Moderate lot size; controlled density	15,000 sq.ft.
R-10	Single Family Residential	Single-family dwellings	Smaller lot sizes permitted	10,000 sq.ft.
R-6	Single Family Residential	Single-family dwellings	Increased density allowed; smaller setbacks	6,000 sq.ft.
R-5	Single Family Residential	Single-family dwellings; two family (conditional)	Higher coverage allowed; compact lots	5,000 sq.ft.
RAH-1	Affordable Housing	Affordable housing; residential uses	Higher density permitted for affordable housing	7,000 sq.ft.
GW-1	Gateway - 1	-	-	Not Listed
MF	Multi-Family Residential	Multifamily residential	Density limited to ~12 units/acre	2 acres
MFT	Multi-Family Tower Residential	Multifamily; assisted living	Density up to ~20 units/acre (higher with bonuses)	2 acres
TH-1	Town House - 1	Townhouses	Density up to ~8 units/acre; tract-based development	5 acres
TH-2	Town House - 2	Townhouses	Lower density (~4 units/acre)	6 acres
NB	Neighborhood Business	Local retail, Services	Small-scale commercial	Not Listed
B	Business	Retail, Office, Commercial	Higher coverage allowed; urban form	Not Listed

Continued on next page

B-1	Business - 1	Business / Office	Large lot requirement; lower coverage	85,000 sq.ft.
CRBD	Central Retail Business District	Central Retail Business District	High FAR (225-300%); mixed-use core	Not Listed
ORC	Office Residential Character	Office / Research / Commercial	Moderate setbacks and coverage	8,000 sq.ft.
ORC-1	Office Residential Character - 1	Office / Commercial	Lower coverage than ORC	10,000 sq.ft.
RO60	Research Office	Office / Residential mix	Medium density	60,000 sq.ft.
PROD	Planned Research Office Development	Planned development	Special standards apply	Not Listed
PROD-2	Planned Research Office Development - 2	Planned development	Large tract required	15 acres
LI	Light Industrial	Industrial uses	Extremely low coverage (3%)	124 acres
PI	Professional Institutional	Institutional / Public uses	Moderate coverage and height	15,000 sq.ft.
PL	Public Land	Public uses, Civic functions	Higher coverage allowed	15,000 sq.ft.
G	Golf	Golf	-	Not Listed

(Source: City of Summit, NJ, Code 2025-12-16, Municipal Code, Chapter 35 Development Regulations, Part II Zoning, Article XIII Zoning Regulations)

Buildout Analysis

After broadly identifying developable areas, GIS-based zoning analysis resolved spatial discrepancies. Large parcels spanning multiple zoning districts were split by the district to ensure compliance with its zoning regulations. Irregular parcels that did not conform to the minimum lot size requirements of the applicable zoning designation were thoroughly reviewed before removing them from the analysis. In addition, parcels with limited or no roadway access, within private lots, and on land designated as green space were removed from the analysis. Minimum lot size criteria for each zoning district were used to determine how many potential lots could be developed within Summit.

Map IV-3 illustrates the developable areas resulting from the analysis along with the zoning districts of Summit. The areas vary in shape and size and may not be individual tax parcels. There are 39 developable areas highlighted in black outlines concentrated in downtown and eastern regions of Summit. Along with developable areas, the areas in need of redevelopment are also shown on this map; the area is located within the Public Lands (PL) zoning district in downtown Summit.

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[12] 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 the R-43 to R-5 zones in Summit is single-family housing, the number of lots is equivalent to the number of potential units for development. A total of 39 developable areas are identified across seven zoning districts, with a gross developable area of 896,546 square feet and a net developable area of 717,237 square feet, yielding a potential of 75 additional lots. The largest share of this capacity is distributed within the single-family residential zoning districts, with R-5 offering 15 developable areas and a potential of 34 new lots, R-10 offering 5 developable areas and a potential of 18 new lots, and R-6 offering 5 developable areas and a potential of 15 new lots. While most districts have strict minimum lot size requirements, there is no information about the minimum lot size requirements for Business and Neighborhood Business districts. Development in the districts that do not have the minimum lot size specified within the zoning ordinance would have to be calculated on a case-by-case basis.

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

Map IV-3. Developable areas with designated zoning districts in Summit

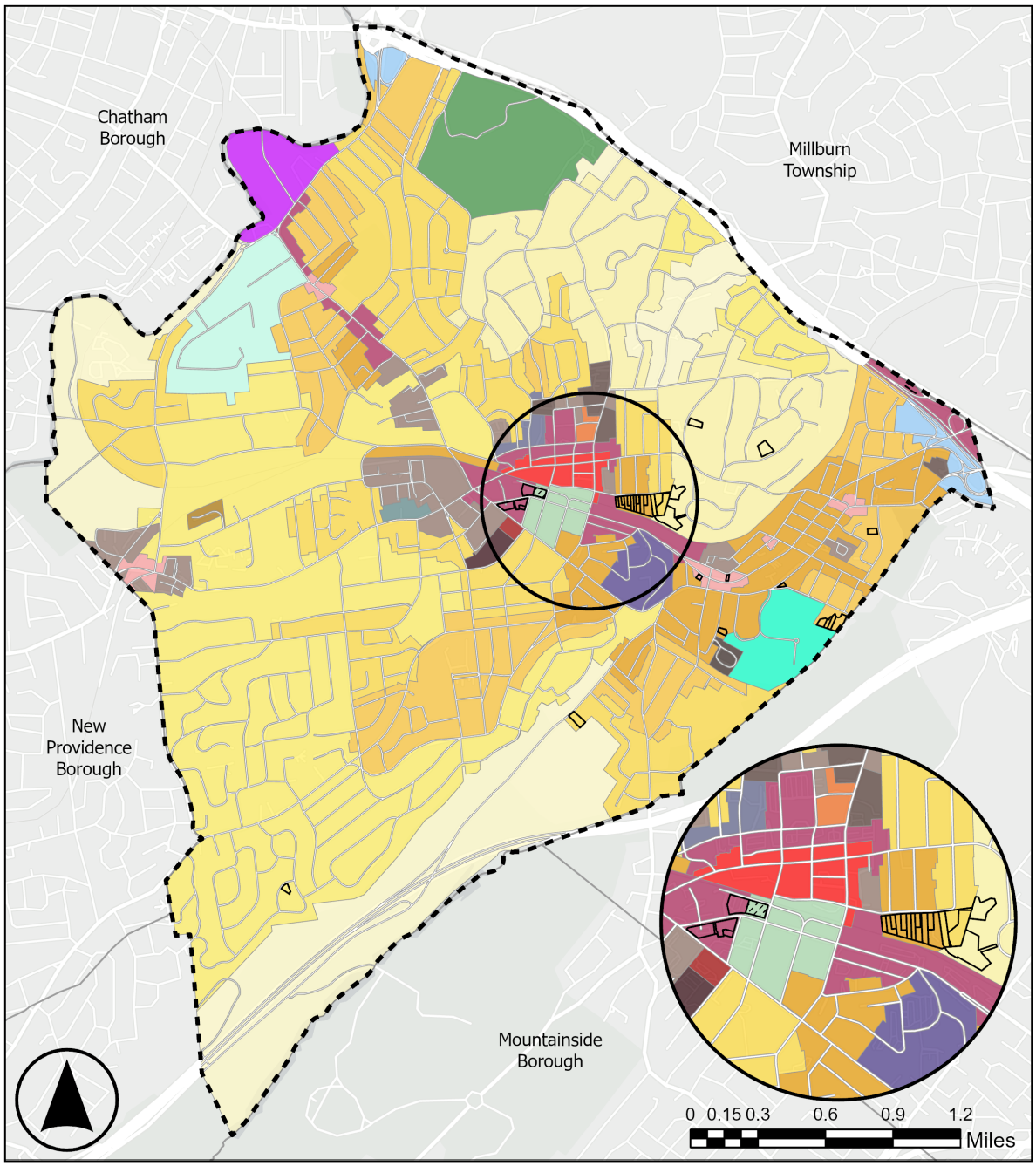


Table IV-3. Developable areas and development potential

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	7	107,497	85,998	Not Listed	-
Neighborhood Business	2	11,458	9,167	Not Listed	-
Single Family Residential: R-10	5	226,024	180,820	10,000	18
Single Family Residential: R-15	1	15,898	12,718	15,000	1
Single Family Residential: R-25	4	213,428	170,742	25,000	7
Single Family Residential: R-5	15	214,186	171,349	5,000	34
Single Family Residential: R-6	5	108,054	86,443	6,000	15
Total	**39**	**896,546**	**717,237**		**75**

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 shows the areas in need of redevelopment in Summit and the approximate extent of NJDEP Inland Flood Protection Rule (FEMA 1% chance plus 3ft). The area in need of redevelopment is in downtown Summit, at the corner of Maple St. and Broad St., near the transit station. The site is currently used by the United States Postal Service (USPS) and falls within the Public Lands (PL) zoning district in the city's downtown.

This area is not exposed to any of the flooding scenarios and provides Summit with an opportunity and greater control to shape future development with respect to land uses, and zoning controls such as permitted and prohibited uses, lot coverage, parking requirements, streetscape, etc.

Map IV-4. Areas in need of redevelopment within FEMA flood zones



LEGEND

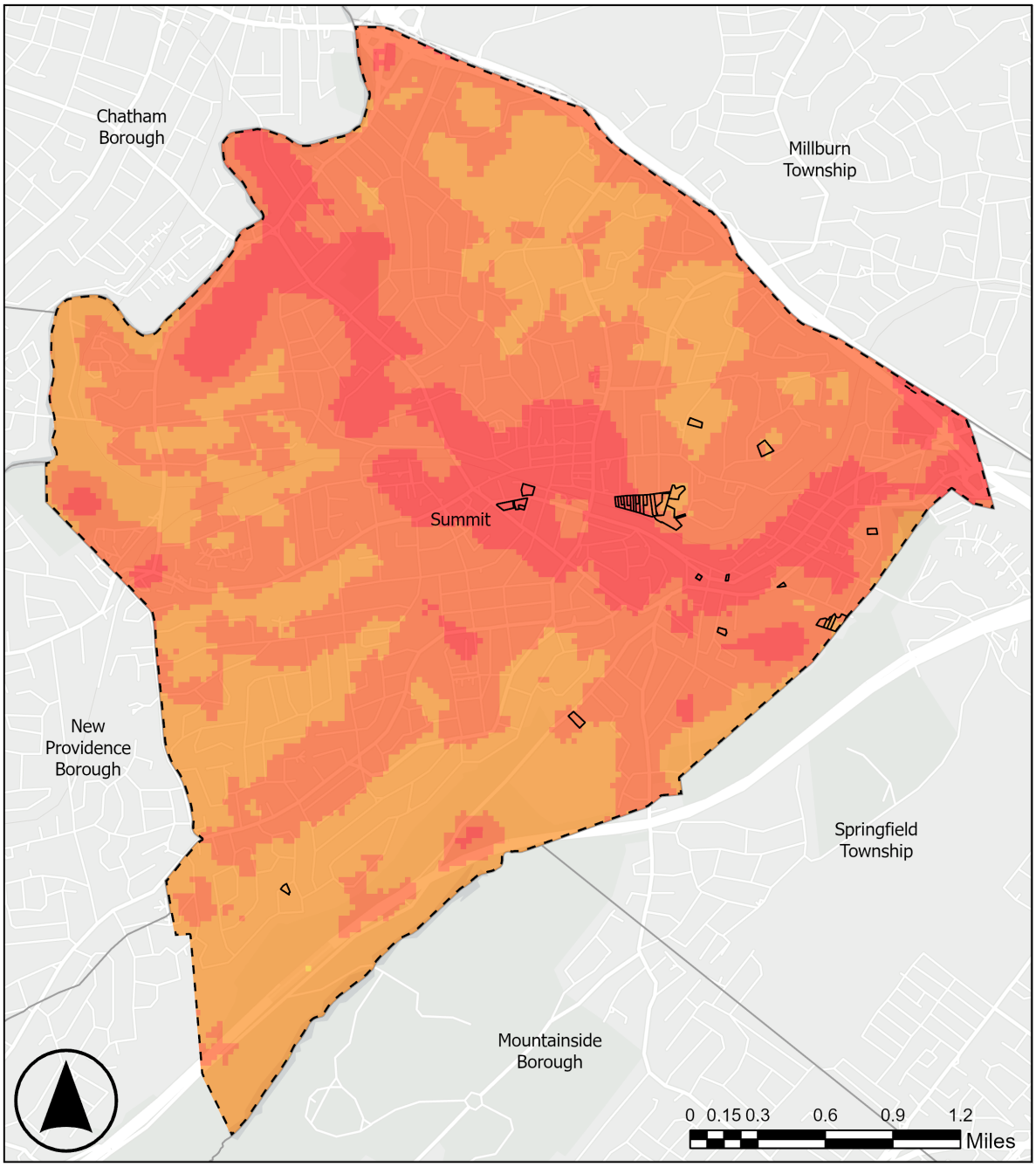
- Areas in need of Redevelopment
- 1% Annual Chance Flood
- Approximate extent of Inland Flood Protection Rule

C. Exposure of Developable Areas

Identifying climate hazard exposure of developable areas is the critical component of this build-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-5 shows the developable areas with respect to land surface temperature. As detailed in Section III.A, temperature projections indicate that Summit may experience increasing heat throughout the century. Since impervious cover, including buildings and streets, traps more heat, Summit shows a pattern of higher temperatures in residential, commercial, and industrial districts located in the downtown core and along major transportation corridors, especially along the Morris and Essex rail line and Morris Avenue. Developable areas are concentrated in downtown Summit experiencing a surge in temperatures above 100 degrees Fahrenheit and may require consideration of heat mitigation strategies for new development. Because green spaces help moderate surface and air temperatures through shading and evapotranspiration, opportunities to reduce impervious coverage and to incorporate additional trees, green roofs, permeable paving, and landscaped buffers within these developable areas should be explored. Such measures would not only help offset projected temperature increases but could also improve stormwater management, reduce building energy demand, and enhance quality of life for residents in surrounding neighborhoods.

Map IV-5. Developable areas and land surface temperature (°F)



LEGEND

Developable Areas

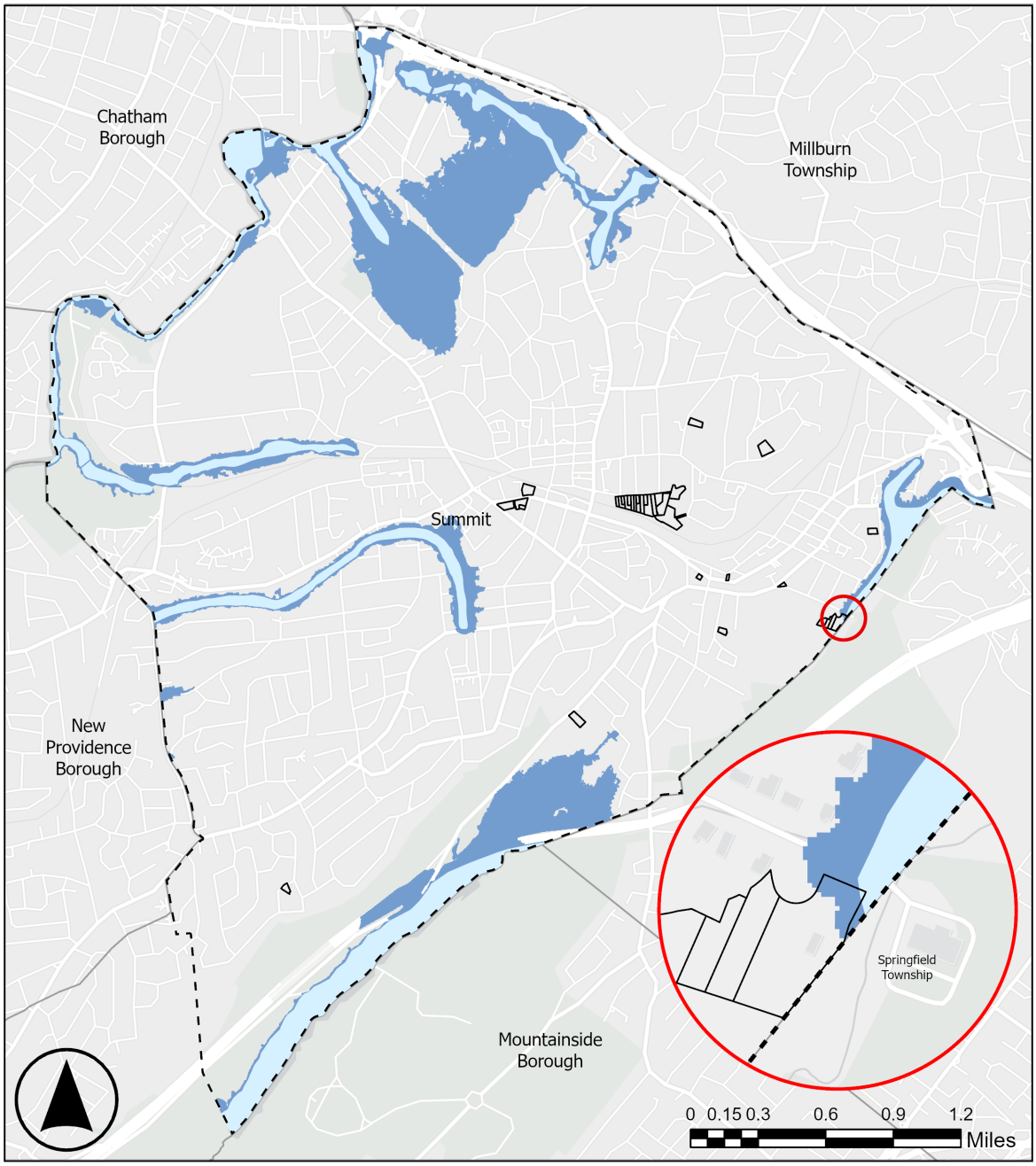
Land Surface Temperature (F)

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

Map IV-6 depicts the flood exposure of developable areas within FEMA 1% annual chance and the NJDEP Inland Flood Protection Rule (FEMA 1% chance plus 3ft) scenarios respectively. Of the 39 developable areas, only one is exposed to limited inundation (1-50%) for both scenarios, while a majority of the 38 developable areas are not impacted by flooding.

Tables IV-4 and IV-5 present the areas impacted by each of these flood measures, respectively. For these flood exposure categories, the number of potential lots is calculated using the 80% gross-to-net conversion factor and minimum lot sizes. For both scenarios, 38 of 39 developable areas are not exposed to flood risk, with 1 area exposed to limited flood risk in the single-family (R-6) zoning district on the eastern edge of the city. The exposure to flooding impacts six potential lots. Even though the potential number of lots is not calculated for the 9 developable areas within the Business and Neighborhood Business districts within this analysis, these areas are not impacted by the flood scenarios. This presents the potential for additional development and hence the potential number of lots would be greater than 75.

Map IV-6. Developable areas within FEMA flood zones



LEGEND

- 1% Annual Chance Flood
- Approximate extent of Inland Flood Protection Rule
- Developable Areas

Table IV-4. Developable areas with development potential exposed within FEMA 1% annual chance flood

Zone	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: B	7	7	107,497	85,998	-	0	-	-	-	0	-	-	-	0	-	-	-
Neighborhood Business: NB	2	2	11,458	9,167	-	0	-	-	-	0	-	-	-	0	-	-	-
Single Family Residential: R-10	5	5	226,024	180,820	18	0	-	-	-	0	-	-	-	0	-	-	-
Single Family Residential: R-15	1	1	15,898	12,718	1	0	-	-	-	0	-	-	-	0	-	-	-
Single Family Residential: R-25	4	4	213,428	170,742	7	0	-	-	-	0	-	-	-	0	-	-	-
Single Family Residential: R-5	15	15	214,186	171,349	34	0	-	-	-	0	-	-	-	0	-	-	-
Single Family Residential: R-6	5	4	64,200	51,360	9	1	43,854	35,083	6	0	-	-	-	0	-	-	-
Grand Total	**39**	**38**	**852,693**	**682,154**	**69**	**1**	**43,854**	**35,083**	**6**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

Table IV-5. Developable areas with development potential exposed within approximate extent of Inland Flood Protection Rule

Zone	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: B	7	7	107,497	85,998	-	0	-	-	-	0	-	-	-	0	-	-	-
Neighborhood Business: NB	2	2	11,458	9,167	-	0	-	-	-	0	-	-	-	0	-	-	-
Single Family Residential: R-10	5	5	226,024	180,820	18	0	-	-	-	0	-	-	-	0	-	-	-
Single Family Residential: R-15	1	1	15,898	12,718	1	0	-	-	-	0	-	-	-	0	-	-	-
Single Family Residential: R-25	4	4	213,428	170,742	7	0	-	-	-	0	-	-	-	0	-	-	-
Single Family Residential: R-5	15	15	214,186	171,349	34	0	-	-	-	0	-	-	-	0	-	-	-
Single Family Residential: R-6	5	4	64,200	51,360	9	1	43,854	35,083	6	0	-	-	-	0	-	-	-
Grand Total	**39**	**38**	**852,693**	**682,154**	**69**	**1**	**43,854**	**35,083**	**6**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

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 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), government facilities (municipal and county buildings, post offices), 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 (e.g., aircraft landing facilities, ferry terminals, public transit stations, gas stations, EV charging stations, hurricane evacuation routes, and rail lines), energy (e.g., power plants), and water systems (e.g., wastewater treatment plants).
- Hazardous facilities and known contaminated sites from which climate hazards may cause 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 Summit may experience increasing heat throughout the century. Increasing temperatures have a variety of impacts on facilities and infrastructure. While heat will not necessarily impact critical facilities themselves, 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. Currently, Summit runs three cooling centers: City Hall (512 Springfield Avenue), Summit

Community Center, and Summit Free Public Library.[13] 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.

Extreme heat also acts as a stressor on New Jersey's energy systems due to increased demand for electricity for cooling and heating.[14] Currently, there are two energy plants in Summit: PPL Renewable Energy Merck Solar (556 Morris Avenue) and Overlook Medical Center (99 Beauvoir Avenue).[15] Heat can impact energy infrastructure, increasing the likelihood of mechanical issues or service disruptions.

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 infrastructure, which is already a high heat generator 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.

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.[16] Summit contains 29 known contaminated sites, one solid and hazardous waste facility, and 11 industrial parcels (see Map V-4).

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 Summit that may be impacted by increasing temperatures. Key transportation infrastructure in Summit is in areas of relatively high land surface temperatures. There is a significant overlap between the critical transportation infrastructure and high land surface temperatures, with most of its transportation assets situated in the zones ranging from 90 to over 110°F. The city's transit station and most of its New Jersey Transit bus stops are situated along the downtown core and the central corridor where temperatures exceed 110°F. Most of the bus stops of the city lack shelters, which might be a point of concern as they are located in heat-stressed zones. All of the EV charging stations in Summit are located in some of the city's hottest areas. 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.

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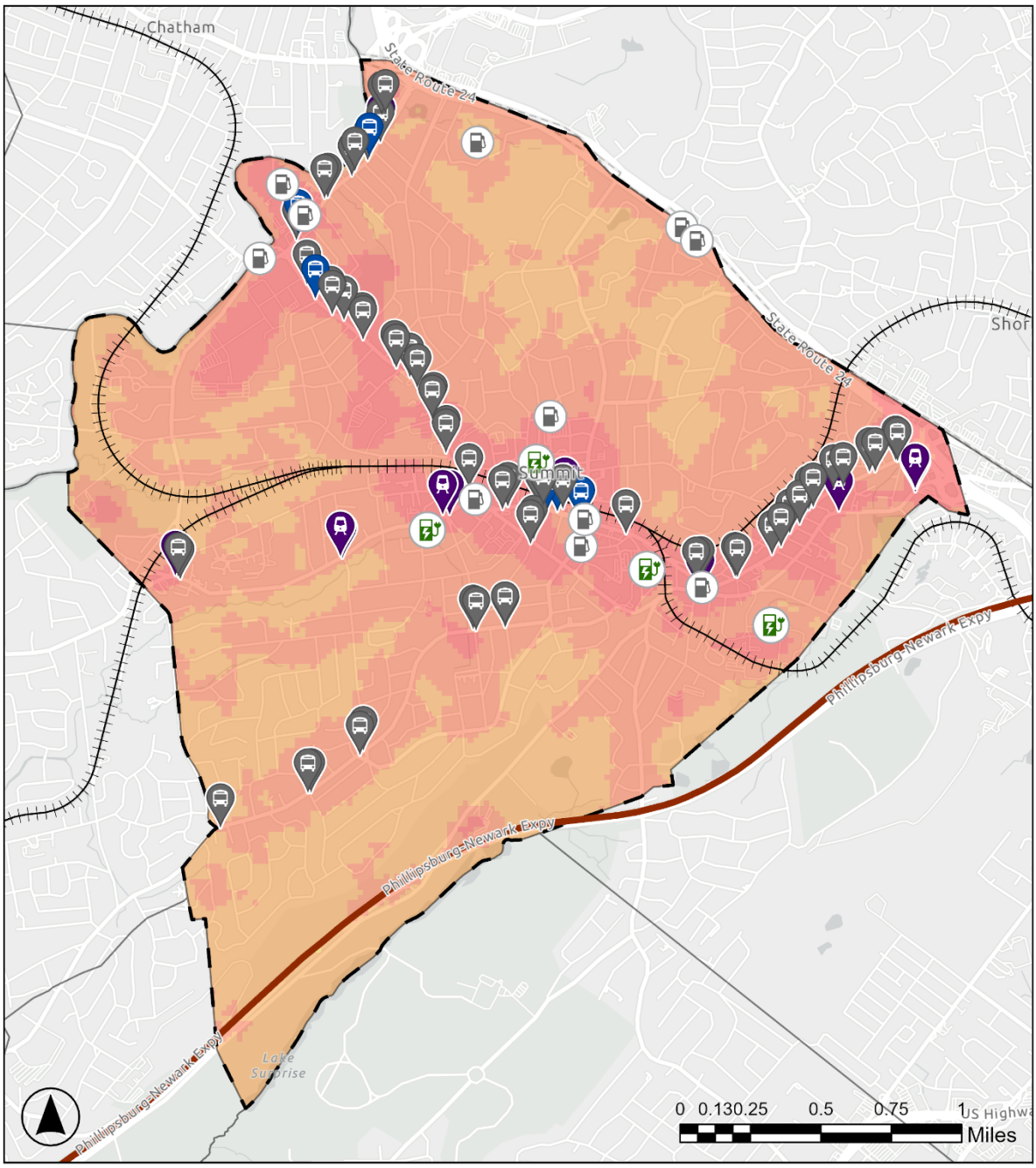
[13] City of Summit. 2023. Cooling Center Notification.

[14] State of New Jersey. 2024. New Jersey Extreme Heat Resilience Action Plan.

[15] Rutgers, The State University of New Jersey. 2025. *NJ HazAdapt* [Dashboard/Map]. NJ Office of Emergency Management. https://njhazadapt.rutgers.edu/explorer/

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

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



LEGEND

- EV Charging Stations
- Gas Stations
- Public Transit Stations
- North American Rail Network Lines

Bus Stops

- No Shelters
- With Shelters

Hurricane Evacuation Routes

- INTERSTATE HIGHWAY

Land Surface Temperature (°F)

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

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. Additionally, increased frequency of extreme precipitation leads to faster rates of degradation and can disrupt maintenance of energy and transportation infrastructure (See discussion of relevant infrastructure in the above section about heat).

Historically, high winds in New Jersey have caused damage to power, communication, transportation, water, and other lifeline systems.[17] 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, Summit'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, some natural gas facilities may be affected due to the need for water to cool down machinery.[18] Currently, one natural gas facility is present in Summit.[19] Drinking water and water treatment may also be impacted. During drought, water use patterns may shift to higher rates of groundwater pumping, which can have implications both for water quality and increased risk of land subsidence. Land subsidence can damage infrastructure such as sidewalks, roads, and rail lines.

[17] New Jersey Office of Emergency Management. 2024. State of New Jersey All-Hazards Mitigation Plan.
[18] Resilient NJ. 2022. A Resilience Action Plan for the Raritan River and Bay Communities Region.
[19] NJ HazAdapt. (2025), https://njhazadapt.rutgers.edu/explorer/

Flood

Transportation infrastructure is particularly vulnerable to flooding when roads and railways become impassable, 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.[20] 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, V-3, and V-4 depict potential flood exposure of Summit's facilities and infrastructure (including critical facilities, government facilities, transportation infrastructure, hazardous sites, and industrial parcels) for both the FEMA 1% annual chance flood zone and the approximate extent of the Inland Flood Protection Rule. 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

A majority of Summit's essential safety and security services and community infrastructure are situated outside these flood zones. However, the analysis identifies vulnerabilities in the transportation infrastructure and industrial sectors. Under the approximate extent of the Inland Flood Protection Rule, two New Jersey Transit bus stops (Broad Street at Middle Ave and Ashland Road & Tulip St) and three gas stations are at risk of inundation. Table V-1 summarizes the number of each type of facility and infrastructure exposed at each flood measure.

A significant finding from this analysis is that two out of the total 29 Known Contaminated Sites, the City Garage and Columbia Cleaners Inc. on Chatham Rd along the northwestern edge of the city, are vulnerable to flooding in the approximate extent of the Inland Flood Protection Rule

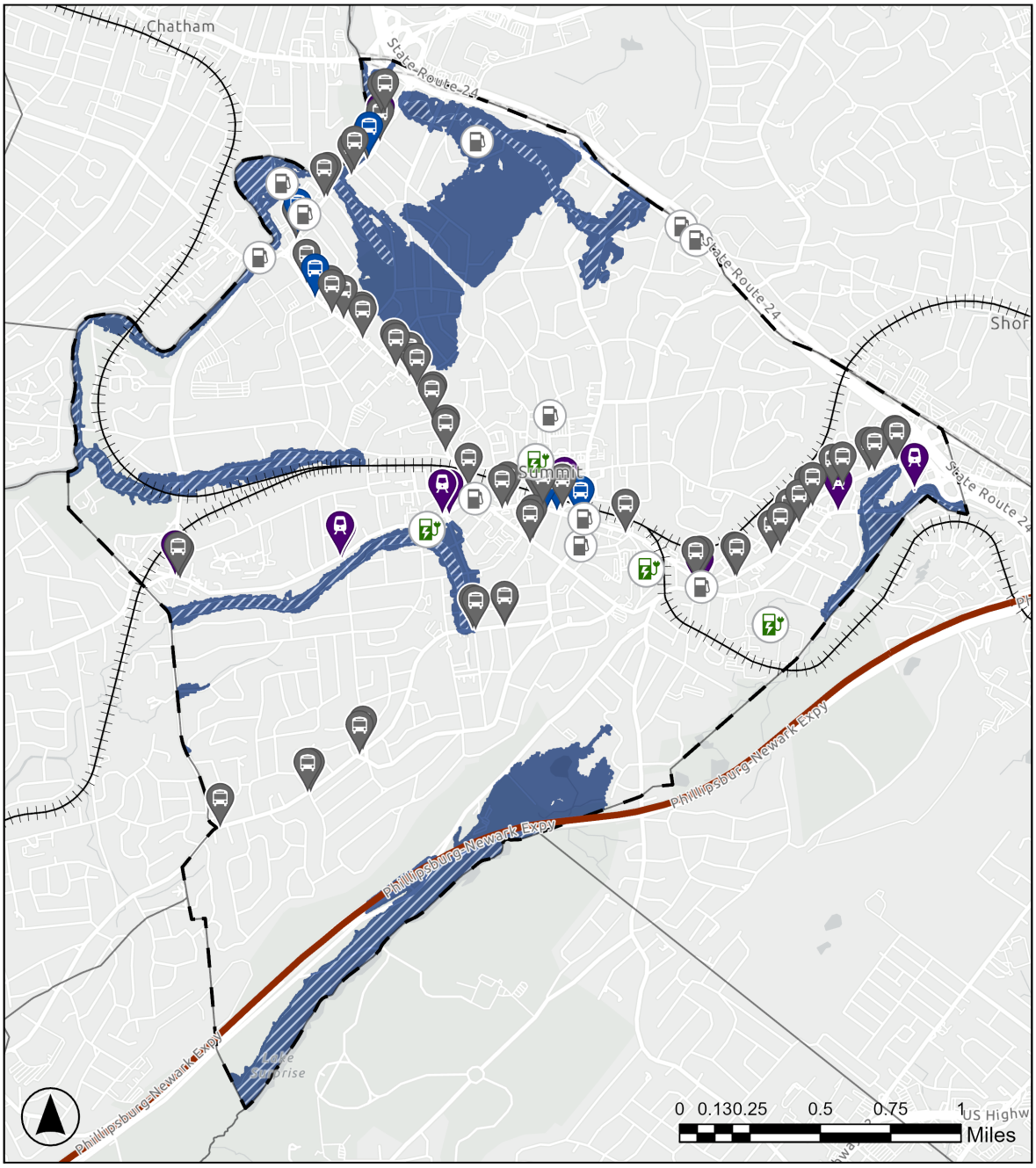
[20] New Jersey Office of Emergency Management. 2024. State of New Jersey All-Hazards Mitigation Plan.

scenario. The Jersey Central Power & Light (JCP&L) industrial facility is vulnerable under both flood scenarios. Table V-2 provides details on the exposure of this industrial parcel, which represents 12 acres at risk with a net equalized value of approximately $5.2 million. The net equalized value includes the land and improvement value and is further explained in Section V.B (MOD-IV Parcel Flood Analysis).

To identify[21] commercial facilities that provide essential shopping and services, Homeland Infrastructure Foundation-Level Data (HIFLD)[22] and USDA SNAP Retailers datasets were reviewed. Although these facilities were not mapped for this analysis because their locations frequently change, they include one grocery store, one pharmacy, and three convenience stores. All of these, with the exception of one convenience store (7-Eleven), are outside the approximate extent of the Inland Flood Protection Rule. These commercial facilities are important for post-storm continuity of services and are typically analyzed in the Hazard Mitigation Plan (HMP). See Section VII.A for discussion of the Union County HMP and City of Summit Annex. From a land use perspective, Summit may consider overall impacts to commercial zoning, which is detailed in Section V.C.

[21] US Department of Homeland Security. 2025. Homeland Infrastructure Foundation-Level Data.
[22] USDA. 2026. SNAP Retailer Location data.

Map V-2. Critical infrastructure within FEMA flood zones



LEGEND

- EV Charging Stations
- Gas Stations
- Public Transit Stations
- North American Rail Network Lines

Hurricane Evacuation Routes

- INTERSTATE HIGHWAY

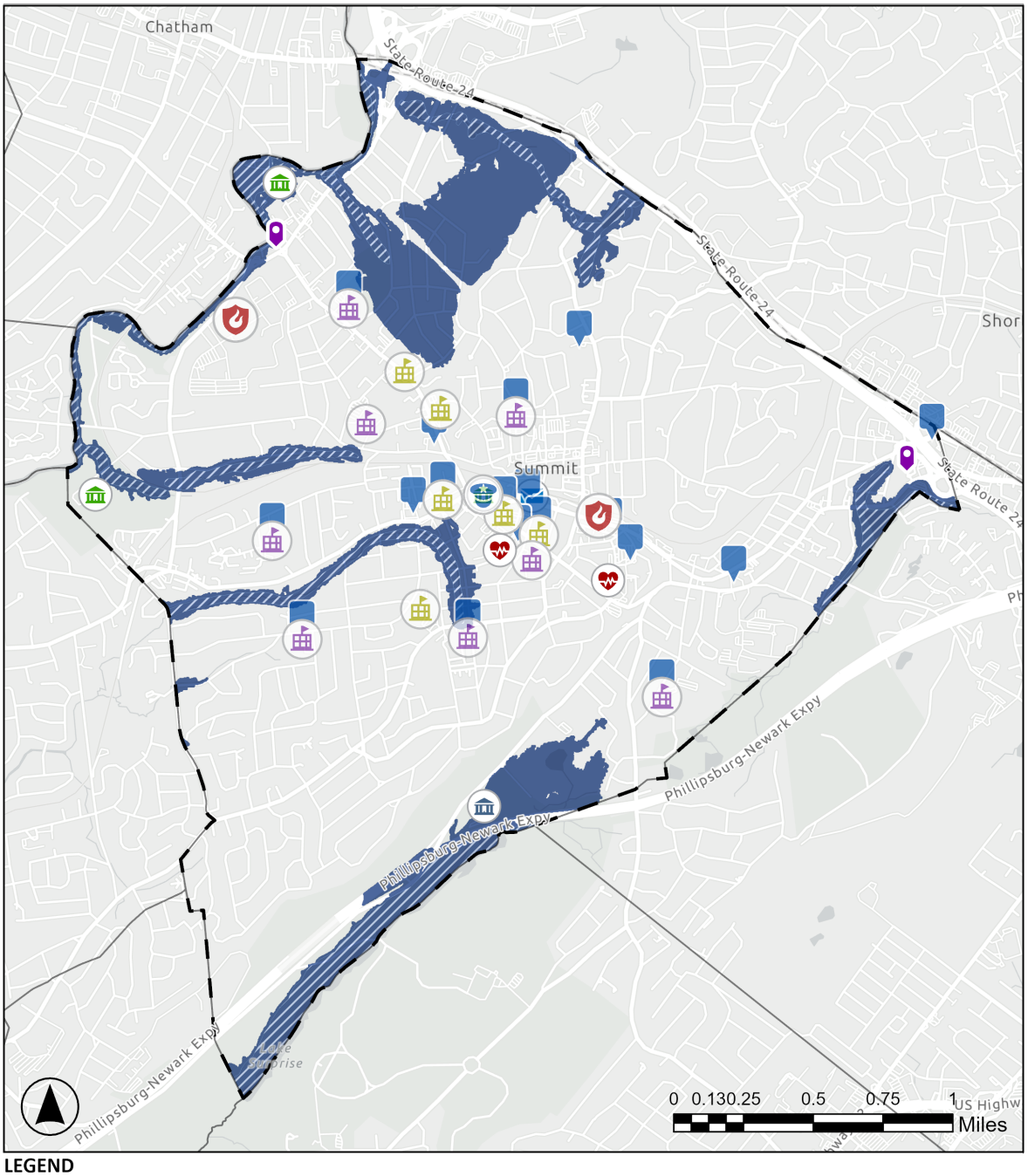
Bus Stops

- No Shelters
- With Shelters

FEMA Flood Zones

- 1% Annual Chance Storm
- Approximate extent of Inland Flood Protection Rule

Map V-3. Critical facilities within FEMA flood zones



LEGEND

Hospitals | Local Law Enforcement | Public Schools | Private Schools | Child Care Centers

Nursing Homes / Assisted Care | Fire and Emergency Medical Service (EMS) Stations

FEMA Flood Zones

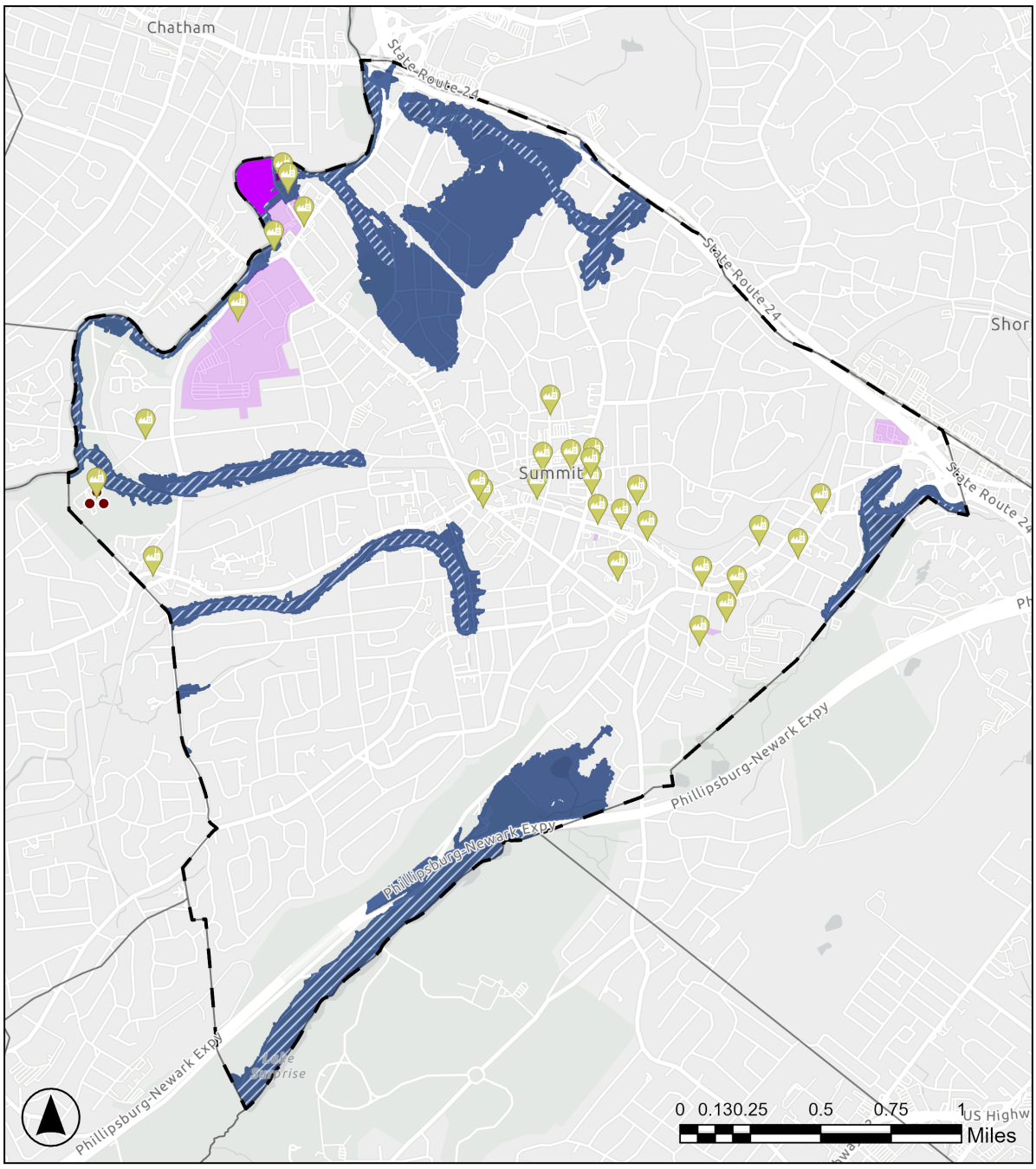
1% Annual Chance Storm

Approximate extent of Inland Flood Protection Rule

Government facilities

Municipal | Post Office | County

Map V-4. Hazardous facilities and industrial parcels within FEMA flood zones



LEGEND

Known Contaminated Sites

Solid and Hazardous Waste Facilities

FEMA Flood Zones

1% Annual Chance Storm

Approximate extent of Inland Flood Protection Rule

Industrial Parcels

Approximate extent of the Inland Flood Protection Rule

FEMA 1% Annual Chance

Not Impacted

Table V-1. Flood exposure of facilities and infrastructure

	Total #	# Exposed in...	
		FEMA 1% Annual Chance Flood	Approximate extent of Inland Flood Protection Rule
Government Facilities			
Municipal facilities	3	0	1
County facilities	1	0	1
Post offices	1	0	0
Safety and Security			
Child care centers	18	0	0
Local law enforcement	1	0	0
Public schools*	9	0	0
Private schools	6	0	0
Fire Stations and EMS Station	2	0	0
Health and Medical			
Hospital	2	0	0
Nursing Homes	2	0	0
Energy			
Power Plants	2	0	0
Transportation			
Public Transit Stations	80	0	2
Gas stations (NJEMS)	11	0	3
EV charging stations	5	0	0
Hurricane evacuation routes	1	0	1
Rail lines	3	1	2
Hazardous Sites			
Known Contaminated Sites	29	0	2
Solid and Hazardous Waste Facilities	1	0	0

*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 Section V.C).

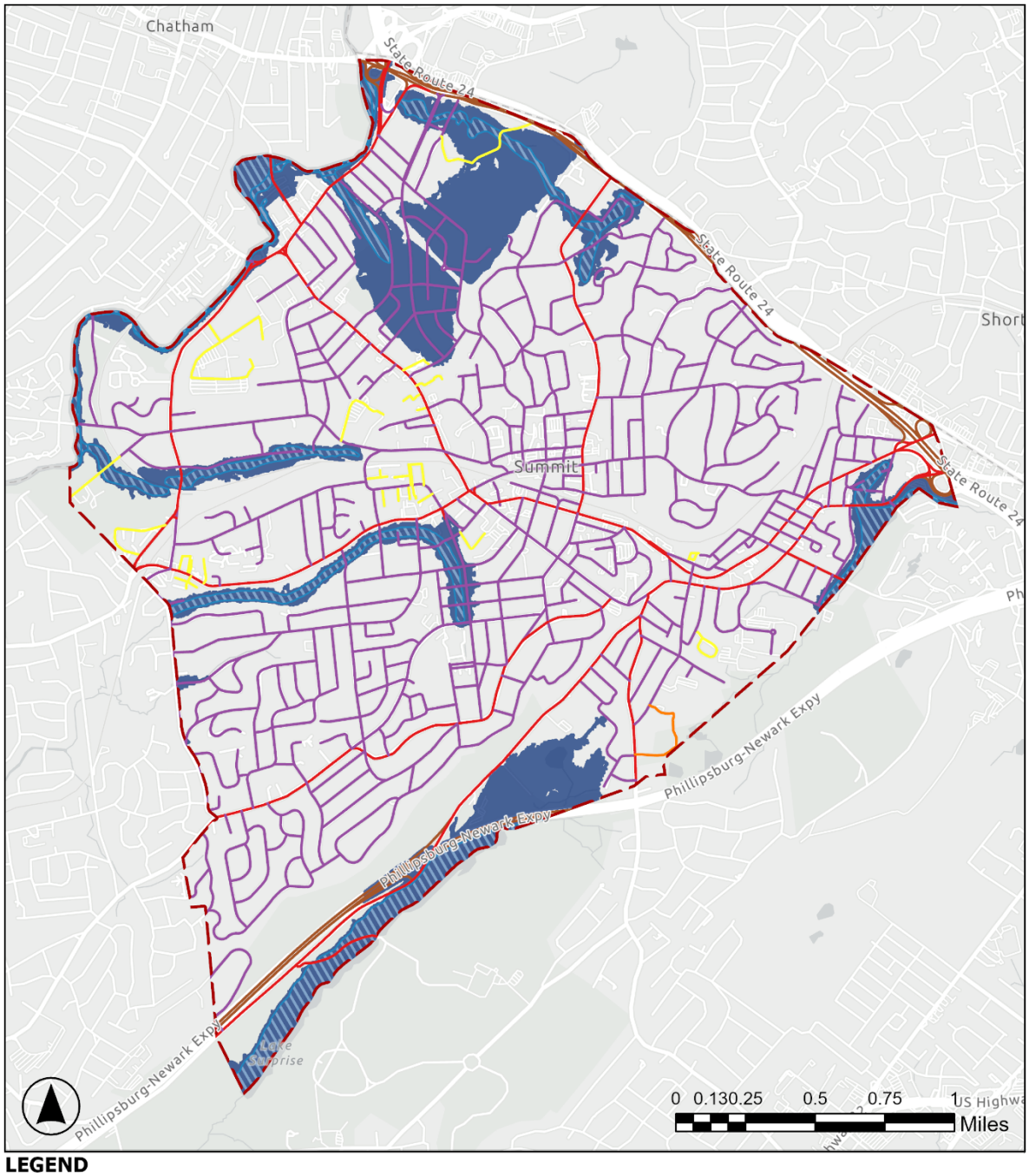
Table V-2. Flood exposure of industrial parcels

	Total # Parcels	Total Acres	Net Equalized Value ($)*	Exposed in...	
				FEMA 1% Annual Chance Flood	Approximate extent of Inland Flood Protection Rule
56 Chatham Rd Jersey Central Power & Light (JCP&L)	1	12	4,735,105	Yes	Yes
45 Chatham Rd Jersey Central Power & Light (JCP&L)	1	<1	464,336	No	Yes

*Net equalized value is the sum of land and improvement value, adjusted to reflect market value.

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. 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-5. Roadway jurisdictions



LEGEND

Road Jurisdiction

- State
- County
- Municipal
- Private
- Other

FEMA Flood Zones

- FEMA 1% annual chance flood zone
- Approximate extent of Inland Flood Protection rule

Wildfire

Wildfire does not pose a significant risk to Summit's municipal facilities and infrastructure. All areas of the municipality are classified as low risk to potential structures, and no wildfire incidents have been documented by NIFC and NOAA 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,[23] 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 New Jersey dataset provides basic information regarding property location, class, and tax value and taxation for each tax parcel in New Jersey.[24] 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. At this threshold, structures are likely to be impacted on most parcels. Municipal equalized valuation ratios, from the New Jersey Division of Taxation's New Jersey 2023 Table of Equalized Valuations,[25] 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 in FEMA 1% annual chance flood zone and the approximate extent of the Inland Flood Protection Rule. 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 subsection; 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 Summit within the FEMA 1% Annual Chance flood zone, detailed in Table V-3 and depicted in Map V-6. A small fraction of Summit's 6,245 residential parcels are located within FEMA 1% annual chance flood zone, with 86 parcels totaling 35 acres and a net equalized value of over $97.9 million at risk. The net equalized value is the sum of land value and improvement value, divided by municipal equalized valuation

[23] US Geological Survey. 2024. How Hot Are Wildfires?
[24] NJ Office of GIS. 2025. Parcel and MOD-IV Composite of New Jersey.
[25] New Jersey Department of the Treasury, Division of Taxation. 2024. *2023 amended table of equalized valuations*.

ratios to reflect assessment values that are closer to true market value.[26] 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.

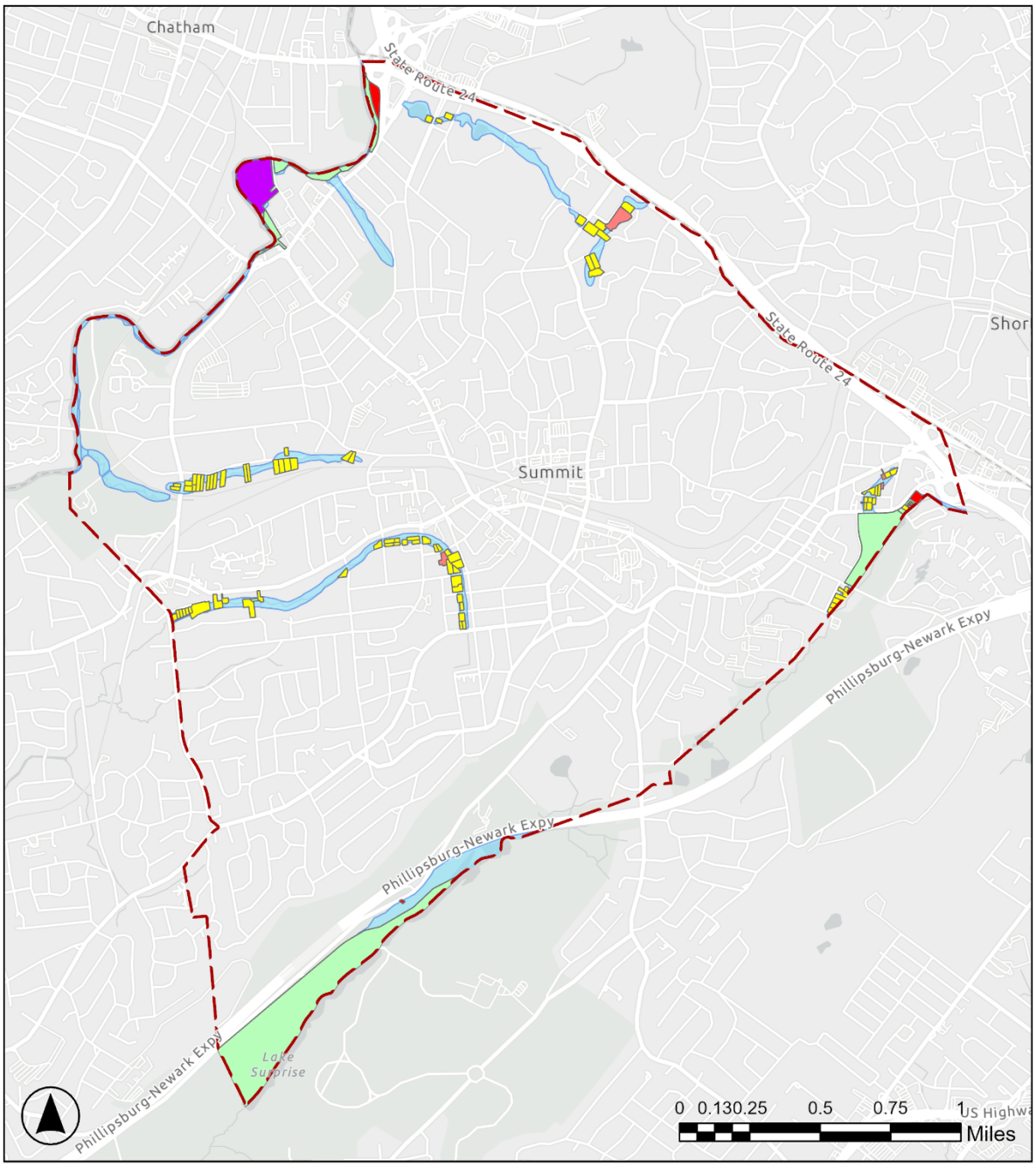
Industrial and commercial parcels also have a low exposure to FEMA 1% annual chance flood, with just one of its 11 industrial parcels and three of its 345 commercial parcels being at risk, with net equalized values of $4.7 million and $10.8 million, respectively. Thirteen parcels of school and public property and five parcels of vacant land are within the flood zone adding approximately $27.9 million and $0.8 million, respectively, to the town's total value at risk.

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)	6,245	86	35	97,876,364
Apartments (4C)	40	-	-	-
Commercial (4A)	345	3	3	10,783,776
Industrial (4B)	11	1	12	4,735,105
Schools and other Public Property (15A through 15F)	242	13	97	27,917,483
Vacant Land (1)	61	5	3	824,056
Unclassified Land	73	3	1	NA
Total	**7,031**	**111**	**150**	**142,136,783**

[26] 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

- FEMA 1% annual chance flood zone

Parcels Inundated at 50 or more FEMA 1 Chance Annual Flood

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

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. In Summit, forested land is the dominant land cover type, primarily classified as deciduous forest in the Environmental Resources Inventory (ERI) land cover dataset. It occurs mainly in parks, steep slopes, and undeveloped parcels. Wetlands cover approximately 0.9% of land area and are mainly associated with riparian areas and low-lying land along stream corridors. The municipality is drained by Salt Brook and associated tributaries, which flow into the Rahway River and Passaic River watershed systems. Agricultural land accounts for less than 0.1% of land area in Summit (1 acre). Open water covers approximately 1.0% (39 acres) of land area and includes small ponds and stream-related water bodies. 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.

Heat

As detailed in Section III.A, temperature projections indicate that Summit 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.

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.[27] 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.[28] Heavy precipitation and associated runoff increases the rate of streambank erosion and destabilization, which may damage surrounding areas and

[27] New Jersey Office of Emergency Management. 2024. State of New Jersey All-Hazards Mitigation Plan.
[28] NJ Climate Change Alliance. 2022. Forest Resource Considerations for A New Jersey Natural and Working Lands Strategy.

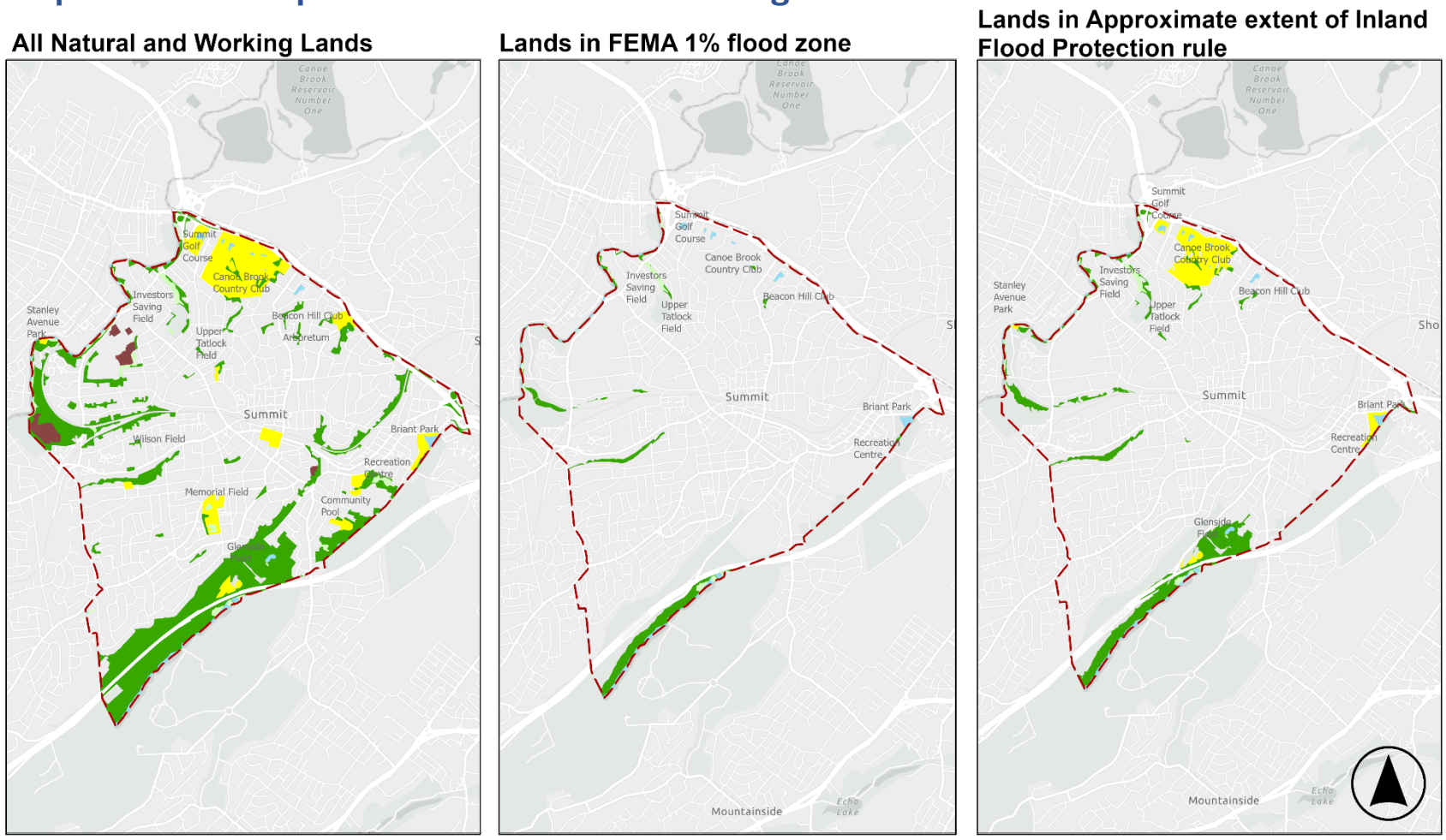
impact water quality.[29] The city's position at the intersection of three watersheds means that intense rainfall events generate rapidly accumulating runoff, and low-lying areas along the Passaic River corridor, Martin's Brook, Salt Brook, and Blue Brook face compounding flood exposure, with upstream development cited in the ERI as a contributing factor to increased flood risk. Considering the parcels already within FEMA's Special Flood Hazard Area, the trend toward more intense and frequent precipitation events directly threatens residential and commercial properties, and the ecological functions of the city's remaining riparian corridors. Moreover, historical precipitation data are no longer sufficient to protect Summit's most flood-exposed communities and assets. 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.

Flood

Natural and working lands help absorb excess rainwater and buffer storm surge, thereby reducing flooding in surrounding areas. However, flooding can damage vegetation, negatively affecting ecosystem health and the agricultural industry. Map V-7 depicts flood risk to natural and working lands in Summit for FEMA 1% annual chance flood zone, and the approximate extent of the Inland Flood Protection Rule. The city does not have any farm parcels. However, parts of its recreational lands and forest lands are impacted by both flood scenarios. Parts of the Watchung Reservation, Union County Open Space & Recreation Park, and Lake Surprise along the southern border of the city and the Canoe Brook Country Club in the northeast are particularly exposed in both flood scenarios. In watersheds, flooding can increase sedimentation and bank erosion, introducing hazardous materials into nearby water bodies and creating conditions favorable to waterborne pollution that may affect local water supplies. In addition to these human health and water quality concerns, flooding threatens ecosystems. Flooding can contribute to the inundation of forests and vegetated lands, damaging vegetation and flora and negatively affecting forest health and the agricultural industry.

[29] 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.

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



Drought

As detailed in Section III.C, Summit's time in drought each year is anticipated to increase throughout the century. Droughts can affect wetlands, forests, agriculture, and other open/green space. While there is minimal agricultural activity within Summit, agriculture-related droughts are common within Union County. Between 2012 and 2022, the United States Department of Agriculture (USDA) issued seven agricultural-related drought declarations in Union County.[30] 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. Additionally, drought in combination with high temperatures can increase the risk of wildfires in natural and working lands, due to an increase in evaporation, dry soil conditions, and large-scale loss of trees and vegetation.

Wildfire

Wildfire does not pose a significant risk to Summit's natural and working lands. All areas of the municipality are classified as low risk to potential structures, and no wildfire incidents have been documented by NIFC and NOAA 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.

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.

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

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 Summit 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, and (d) historic properties. Community assets identified by local stakeholders were categorized as follows (see Appendix B for a list of each place identified):

- **Civic & Community** - Organizations focused on community needs such as social connections and advocacy, including senior centers, youth centers, etc.
- **Businesses** - Shops, restaurants, and other commercial entities providing community services.
- **Cultural** - Museums, galleries, theaters, etc.
- **Recreation** - Playgrounds, parks, trails, ball fields, etc.
- **Religious** - Churches, temples, and other spiritual centers.

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 Summit may experience increasing heat throughout the century. Increasing temperatures can limit a community's ability to access and use various indoor and outdoor community assets, thus impacting social well-being and public health. Lack of air conditioning and crowded living spaces can cause heightened anxiety, disrupt sleep patterns, and stress cardiovascular systems. Children, elderly people, and those with pre-existing conditions are especially at risk. Additionally, the combination of high heat with high humidity increases risk to outdoor occupational groups for heat-related illnesses like heat stroke. With New Jersey projected to warm by 4.1 to 5.7°F by 2050, these risks will intensify significantly for Summit's outdoor workforce without targeted intervention (ERI, 2025).

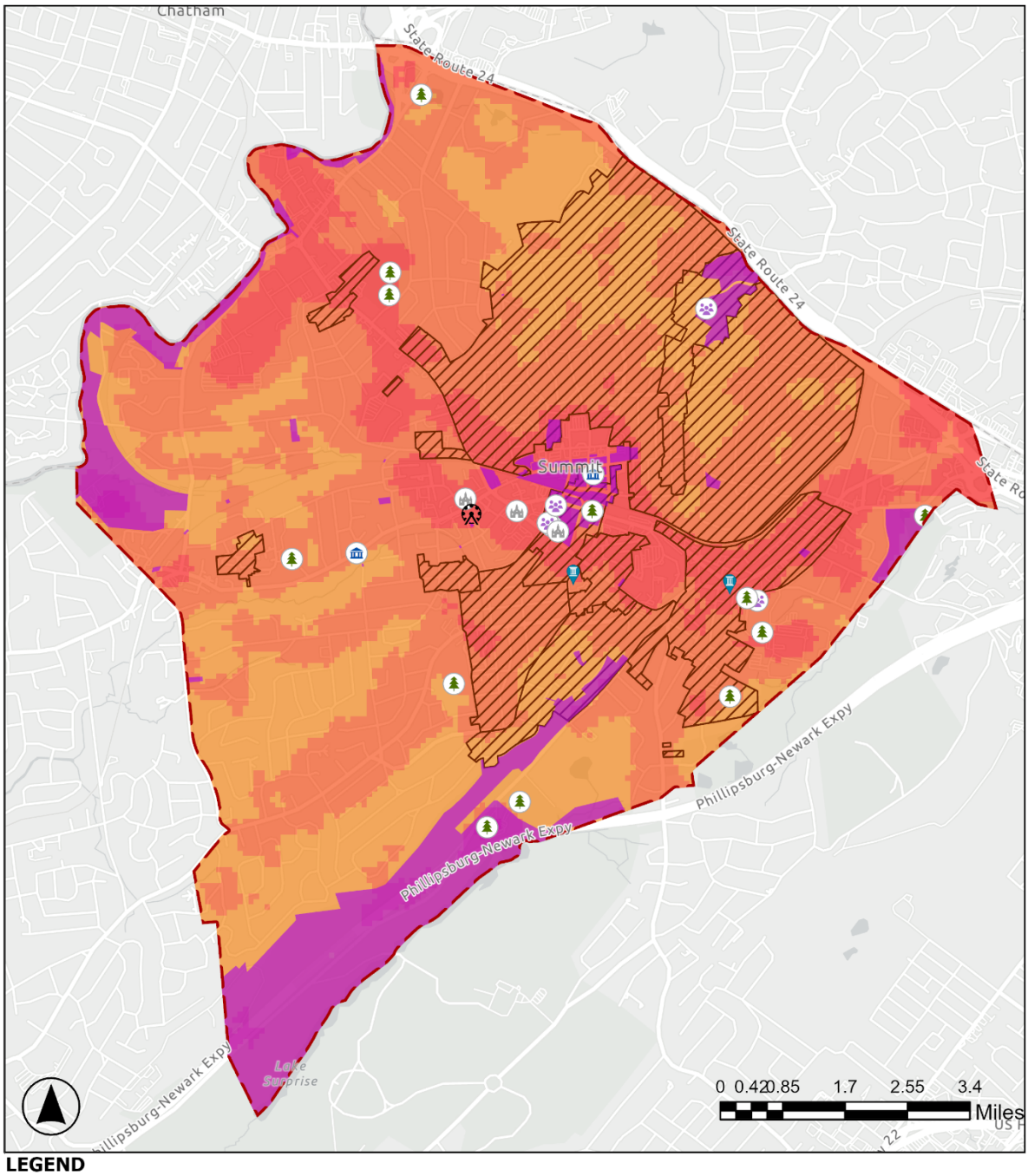
Places of gathering such as parks, libraries, and community centers can provide heat relief. Parks and green spaces can provide heat relief, but these outdoor assets can become unsafe without available shaded areas, trees, and water. Indoor facilities with air conditioning such as libraries, local shops, 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.[31]

Map V-8 shows that the central transit corridor in Summit along the Morris & Essex line experiences land surface temperatures above 110°F. Several of the city's historic buildings, centered around the city's train station, are located in the area. The critical community assets located within this high-heat zone include three shelters, Calvary Episcopal Church, the warming centers at Summit YMCA & Central Presbyterian Church, and the Summit Free Public Library. Due to their location, these facilities may face increased operational strain or could serve as essential cooling centers as rising temperatures drive a greater need for social services.

[31] Filión, N.A., Knutsen, M., and Phillips, S. New Jersey Department of Environmental Protection. 2025. New Jersey Extreme Heat Resilience Action Plan. https://dep.nj.gov/climatechange/resilience/nj-extreme-heat-resilience-action-plan/

Map V-8. Land surface temperature and community assets



LEGEND

Community Assets

- Library
- Arts Venues
- Entertainment and Sporting Venues
- Historic Properties
- Historic Districts

Community asset points from survey

- Business
- Civic & Community
- Recreation
- Religious

Land Surface Temperature 2022 in °F

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

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.[32] Cultural and recreational assets like beaches, boardwalks, and others vital to tourism are some of the most at risk of extreme precipitation.

Drought

As detailed in Section III.C, Summit's time in drought each year is anticipated to increase throughout the century. Drought can exacerbate climate-related effects on social systems. 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.[33]

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 including restrictions on landscaping, gardening, outdoor recreation, and household water use. Spray parks and other water-based recreational amenities may face temporary closures to conserve water.[34]

Flood

Flooding poses both immediate and long-term risks to community assets. For inland residents, the predominant concern is resource availability, especially for those without access to a vehicle. Residents with limited mobility cannot easily access grocery stores, public transit, community or social services, or personal support networks.

Map V-9 depicts potential flood exposure of community assets in Summit for the FEMA 1% annual chance flood zone, and the approximate extent of the Inland Flood Protection Rule. Table V-4 summarizes the number of each type of community asset exposed at each flood measure. Among Summit's community assets identified by residents and municipal staff, only Briant Park is exposed within the FEMA 1% annual chance flood zone. The Summit Playhouse, located near Springfield Ave and New England Ave, is exposed within the approximate extent of the Inland Flood Protection Rule. Several important locations for outdoor recreation are exposed within the

[32] NJDEP. 2023. Outside, Together! A statewide comprehensive outdoor recreation plan for New Jersey.
[33] NOAA. 2025. National Integrated Drought Information System. By Sector: Recreation & Tourism.
[34] State of NJ. 2024. 2024 New Jersey Water Supply Plan.

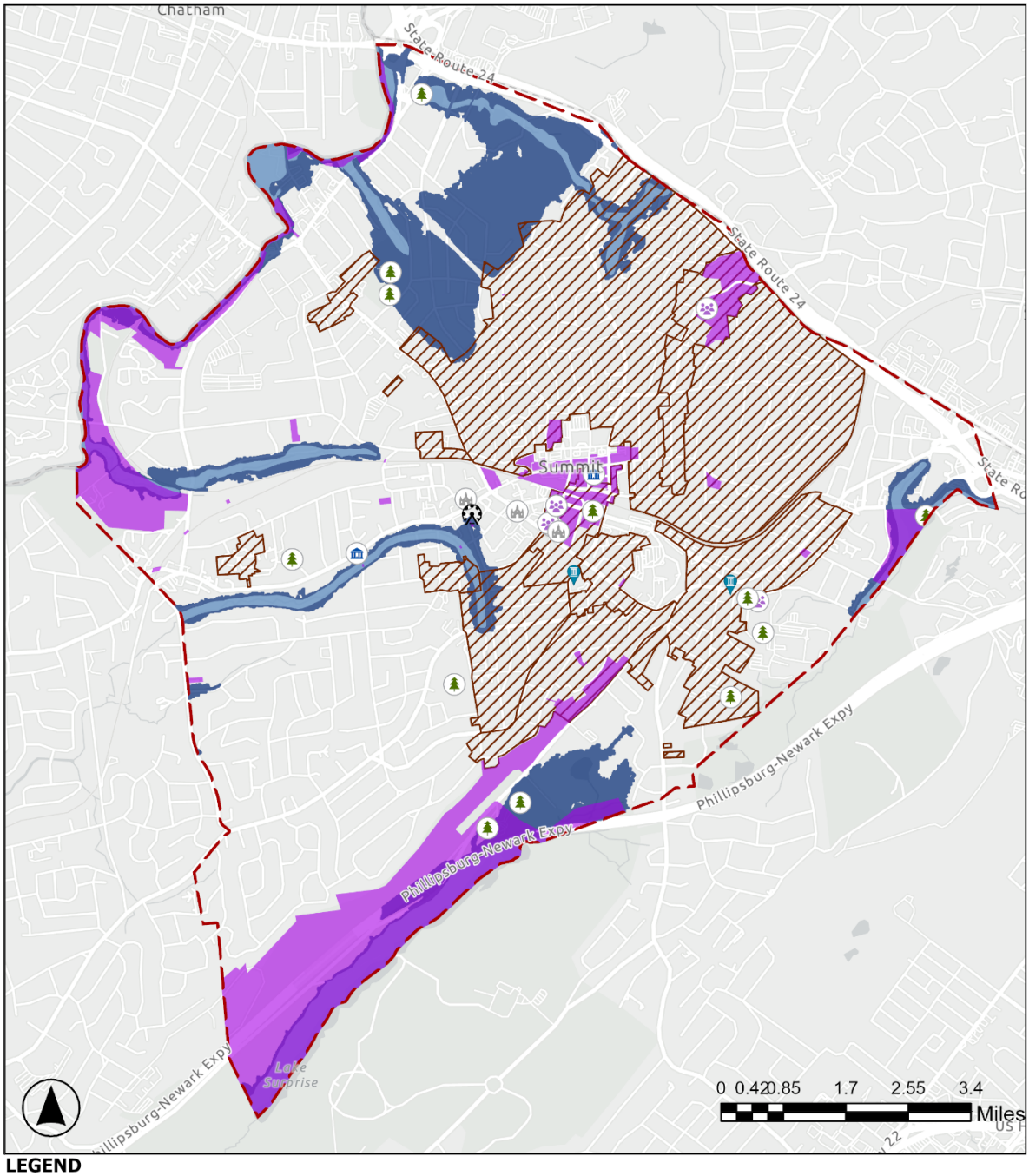
approximate extent of the Inland Flood Protection Rule, including the Watchung Reservation, Tatlock Sports Complex, and the Summit Municipal Golf Course. While locations like the Watchung Reservation are typically more flood resilient and play an important role in stormwater capture, these community assets can become temporarily unavailable for residents and visitors after flooding events.

Map V-10 depicts 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. Table V-5 provides detail on the number of parcels, land area, and value of property exposed.

Table V-4. Flood exposure of community assets

	Total #	# Exposed in...	
		FEMA 1% Annual Chance Flood	Approximate extent of Inland Flood Protection Rule
Shelters	5	0	0
Libraries	1	0	0
Entertainment and Sporting Venues	1	0	1
Art Venue	2	0	0
Nursing Homes	2	0	0
Business	2	0	0
Civic & Community	5	0	0
Recreation	12	1	4
Religious	3	0	0

Map V-9. Community assets within FEMA flood zones



LEGEND

Community Assets

- Library
- Arts Venues
- Entertainment and Sporting Venues
- Historic Properties
- Historic Districts

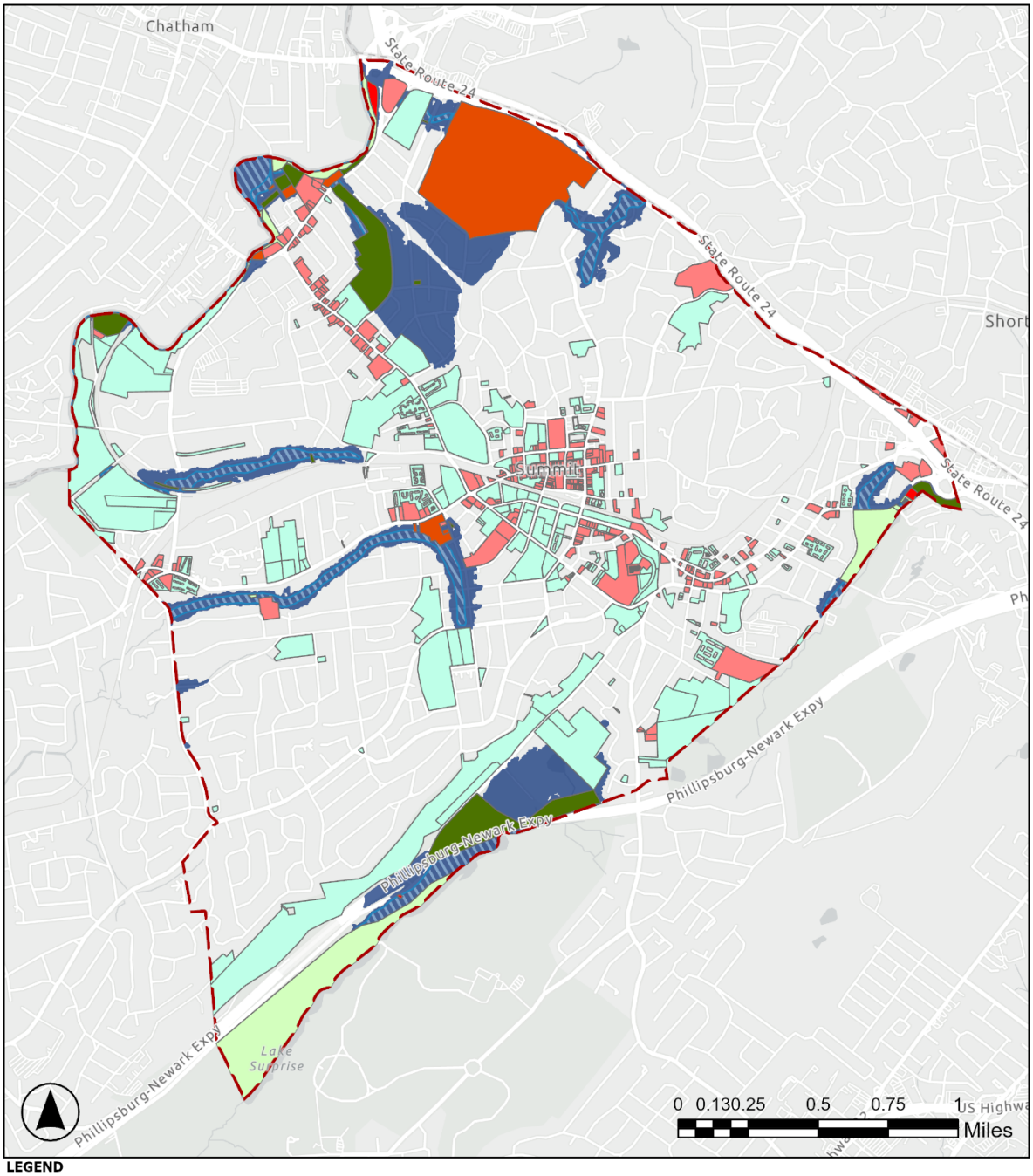
Community asset points from survey

- Business
- Civic & Community
- Recreation
- Religious

FEMA Flood Scenario

- FEMA 1% annual chance flood zone
- Approximate extent of Inland Flood Protection rule

Map V-10. Community asset parcels within FEMA flood zones



LEGEND

Commercial, Public Property, Schools & Other Public Property Parcels in Summit
- Commercial
- Schools and Other Public Property

Parcels Inundated at 50 or more FEMA 1 Chance Annual Flood
- Commercial
- Schools and Other Public Property

Parcels inundated 50% or more in approx. extent of Inland Flood Protection Rule
- Commercial
- Schools and Other Public Property

FEMA Flood Zones
- FEMA 1% annual chance flood zone
- Approximate extent of Inland Flood Protection Rule

Table V-5. Flood exposure of community asset parcels within FEMA flood zones

		Number / land area exposed in...					
		FEMA 1% Annual Chance Flood			FEMA 1% Annual Chance Flood + 3 feet		
MOD IV Property Class	Total # parcels	# Parcels	Acres	Net Equalized Value ($)	# Parcels	Acres	Net Equalized Value ($)
Commercial (4A)	345	3	3	10,783,776	11	132	42,235,804
Schools (15A & 15B)	14	0	0	0	0	0	0
Public Properties (15C)	95	12	96	27,917,483	23	169	69,210,909
Church and Charitable (15D)	77	0	0	0	2	1	3,331,748
Other Exempt (15E & 15F)	56	1	0.45	NA	2	0.68	610,350
Total	**587**	**16**	**100**	**38,701,259**	**38**	**303**	**115,388,811**

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

Wildfire

Wildfire does not pose a significant risk to Summit's community assets. All areas of the municipality are classified as low risk to potential structures, and no wildfire incidents have been documented by NIFC and NOAA 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.[35] 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.[36] This can particularly affect individuals with respiratory conditions (see Section V.D).

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

[36] Mattson, A. 2025. As wildfires increase, New Jersey 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. In 2024, to address some of these challenges, New Jersey passed a new affordable housing law to help enforce the state's existing constitutional requirement for every municipality to provide affordable housing.[37] The law requires municipalities to change their master plan and zoning to accommodate increased development and preservation of affordable low- to moderate-income housing.

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-6 provides data[38] on Summit's Overburdened Communities (OBC), which the New Jersey Environmental Justice Law (N.J. Stat. Ann. 13:1D-157) defines as census block groups with:

- At least 35 percent low-income households; 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

[37] Fair Share Housing Center. 2024. NJ's New Affordable Housing Law Assembly Bill 4/Senate Bill 50.
[38] U.S. Census Bureau. 2024. American Community Survey Five Year Estimates.

Table V-6. Overburdened populations in Summit

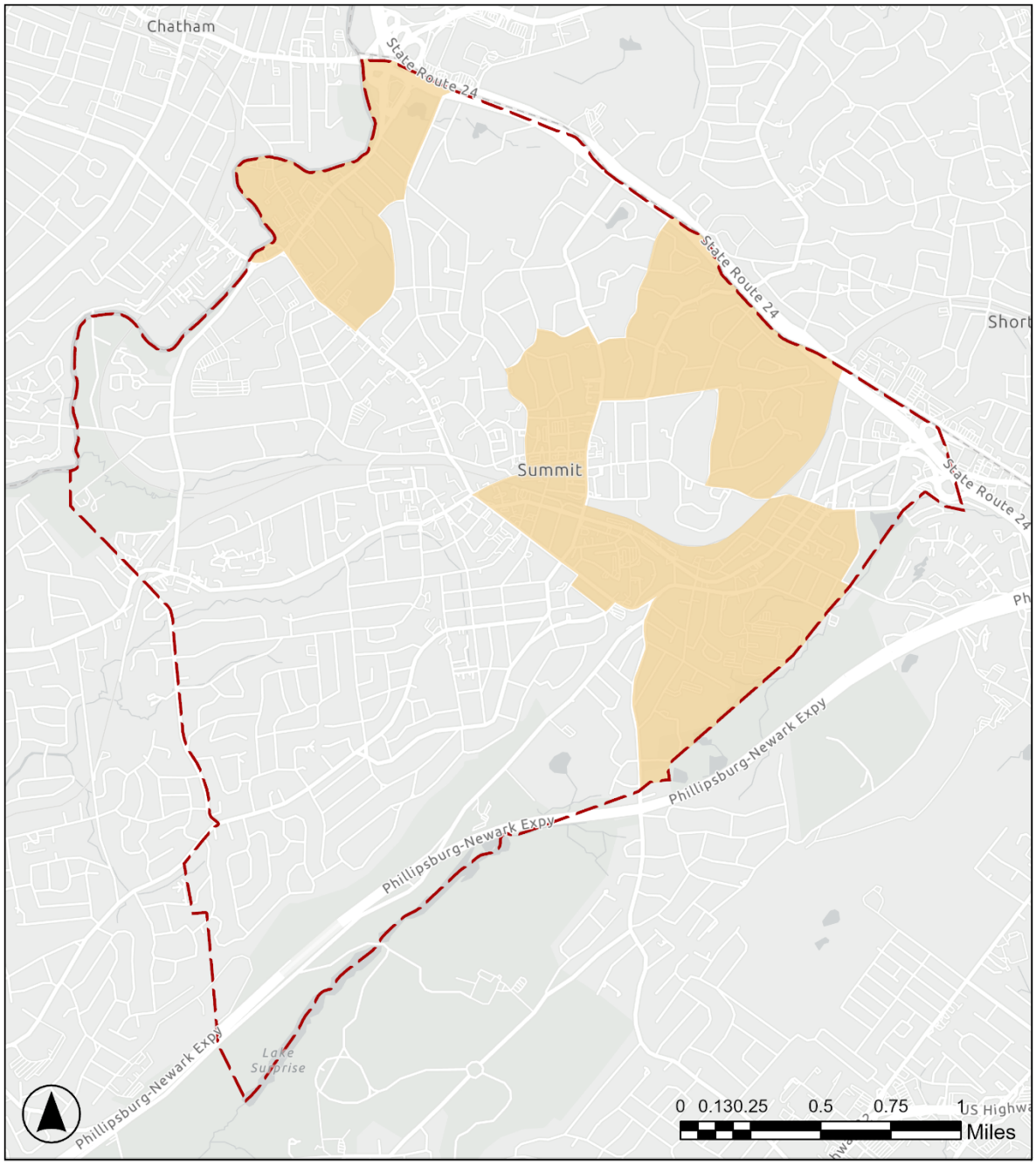
	Population	Percent of Total Population
Low-income*	3,108	13.69
No health insurance	1,340	5.92
Aged 65 and older	3,305	14.56
Aged 17 and younger	5,581	24.58
Disabled	1,352	5.95
Minority	7,476	32.93
American Indian or Alaska Native	0	0
Asian	1,649	7.26
Black or African American	1,342	5.91
Native Hawaiian or Pacific Islander	10	0
Some other race	300	1.32
Two or more races	1,197	5.97
Hispanic	2,978	13.11
Living in group quarters	140	0.6
	Household Estimate	Household Percent
Limited English proficiency households	237	1.04
No vehicle households	487	2.15
Mobile home housing units	10	0
Multi-unit housing units	2,587	11.39

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

The OBC designation facilitates mapping of these vulnerable populations within each municipality statewide.

As depicted on Map V-11, several of Summit's census block groups located in the northern and eastern areas of the municipality are classified as an OBC due to the percentage of minority populations.

Map V-11. Overburdened communities



LEGEND

Overburdened Communities Under the New Jersey Environmental Justice and Law

Minority

Heat

As detailed in Section III.A, temperature projections indicate that Summit 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.[39] 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.[40] Children, elderly people, and those with pre-existing conditions are especially at risk. In Summit, 39.2% of the population is either over 65 years old (14.6%) or under 18 years old (24.6%).

Additionally, the combination of high heat with high humidity may increase risk to outdoor occupational groups for heat-related illnesses like heat stroke.[41] Occupational groups that are particularly vulnerable because of the amount of time spent outside include workers in construction, agriculture, forestry, and natural resource management. High temperatures also increase the concentration of ground-level ozone in the air. This is particularly harmful for individuals with chronic respiratory conditions.[42]

To better understand potential heat stress challenges to residents, Map V-12 depicts housing parcels relative to land surface temperature. Most of Summit's housing is located in areas ranging from 100 to 110°F, partly because impervious surfaces (i.e., buildings, roofs, sidewalks, parking lots, streets, etc.) trap heat. Map V-13 depicts heat island risk relative to the Census Block Groups designated as OBCs. The more northern block group is in an area of higher impervious surface and greater heat island risk. The two census block groups designated as OBCs that are adjacent to Summit's core downtown have moderately high impervious cover and higher heat island risk.

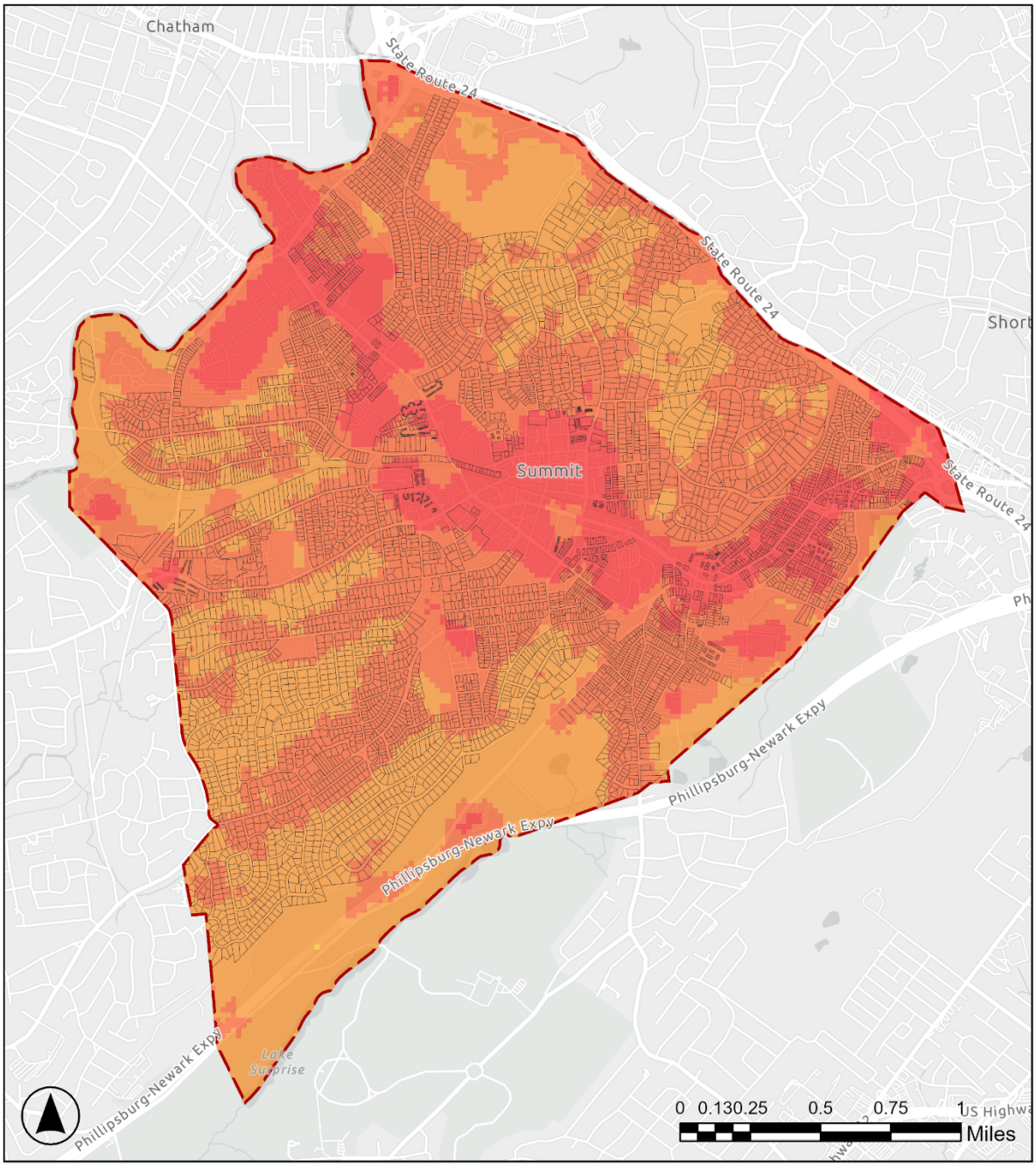
[39] Filión, N.A., Knutsen, M., and Phillips, S. New Jersey Department of Environmental Protection. 2025. New Jersey Extreme Heat Resilience Action Plan. https://dep.nj.gov/climatechange/resilience/nj-extreme-heat-resilience-action-plan/

[40] Moran, D., Whytlaw, J., Herb, J., & Kaplan, M. 2017. New Jersey Climate and Health Profile Report.

[41] NJDEP. 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.

[42] Centers for Disease Control and Prevention. 2022. Heat and chronic conditions.

Map V-12. Land surface temperature (°F) and housing



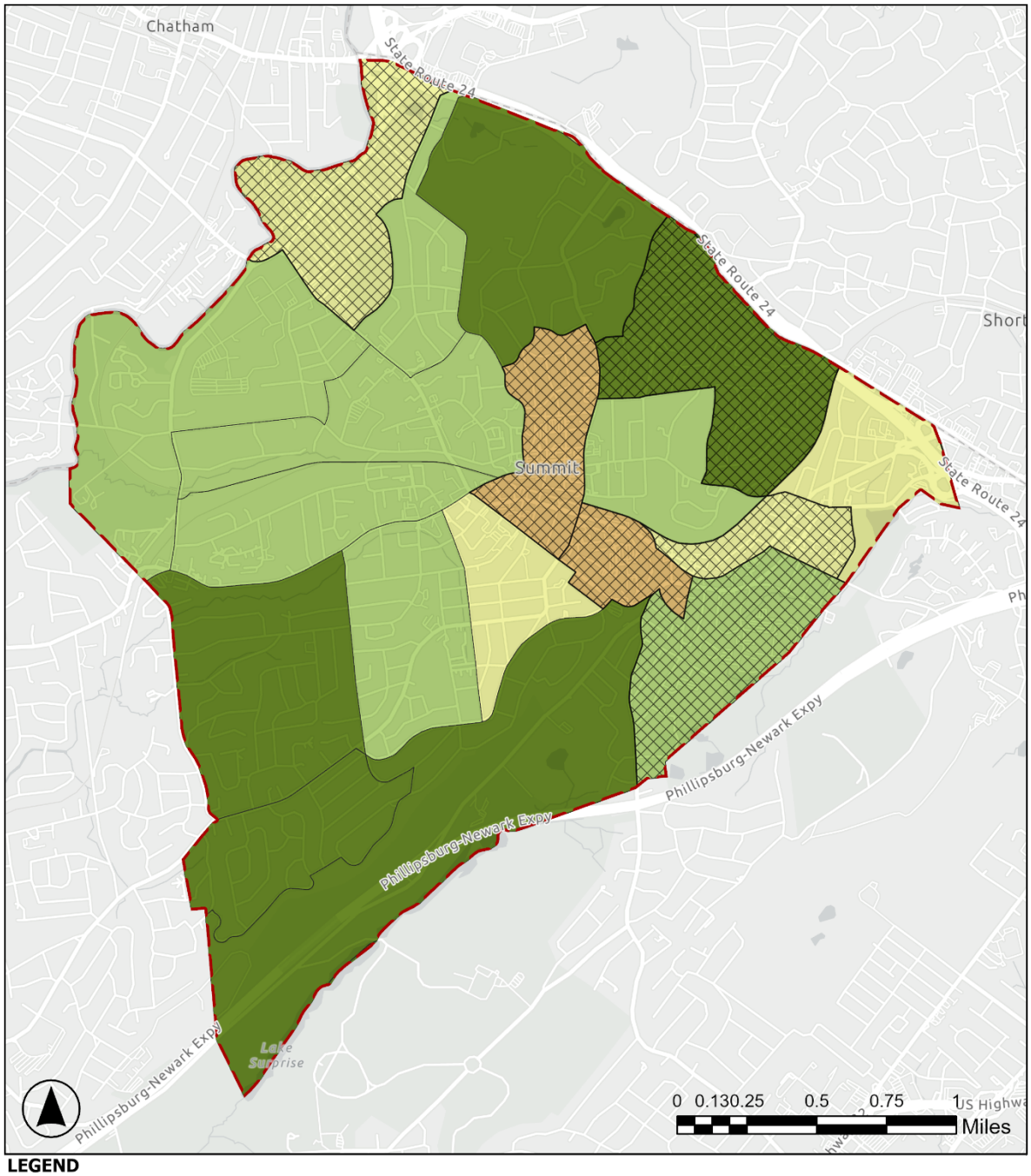
LEGEND

Residential and Apartments

Land Surface Temperature 2022

- Below 80°F
- 80° - 90°F
- 90° -100°F
- 100° - 110°F
- Over 110°F

Map V-13. Heat island risk to Overburdened Communities



LEGEND

Ratio Between Cannopy Cover and Impervious Surface

- Higher Canopy Cover
- Moderately Higher Canopy Cover
- EquivalentCanopy/Impervious Cover
- Moderately Higher Impervious Cover
- Higher Impervious Cover

Overburdened Communities Under the New Jersey Environmental Justice and Law

- Minority

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.[43] 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.[44] According to data from the US Census Bureau, approximately 5.92% of Summit's population does not have health insurance and may be at particular risk of health impacts.[45]

Tropical storms and hurricanes may damage residential buildings, including impacts from tree debris and the loosening of windows or roof shingles. 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, or access to emergency services. Review of summary data on the National Flood Insurance Program in Summit indicates that there are six Repetitive Loss properties and two Severe Repetitive Loss properties with a total of 18 claims paid on these structures since 1978. [46]

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, are considered the most vulnerable due to direct exposure to high-impact storms, limited adaptive capacity, and need for additional time or assistance during evacuations.[47]

Drought

Summit'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, especially in overburdened communities. 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

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[43] 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

[44] 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.

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

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

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

systems, increasing operational costs may be passed down to the consumer. Increasing water supply rates may restrict water access for financially constrained households. Limitations to financial and technical resources further exacerbate a community's vulnerability to drought-related hazards.[48]

Flood

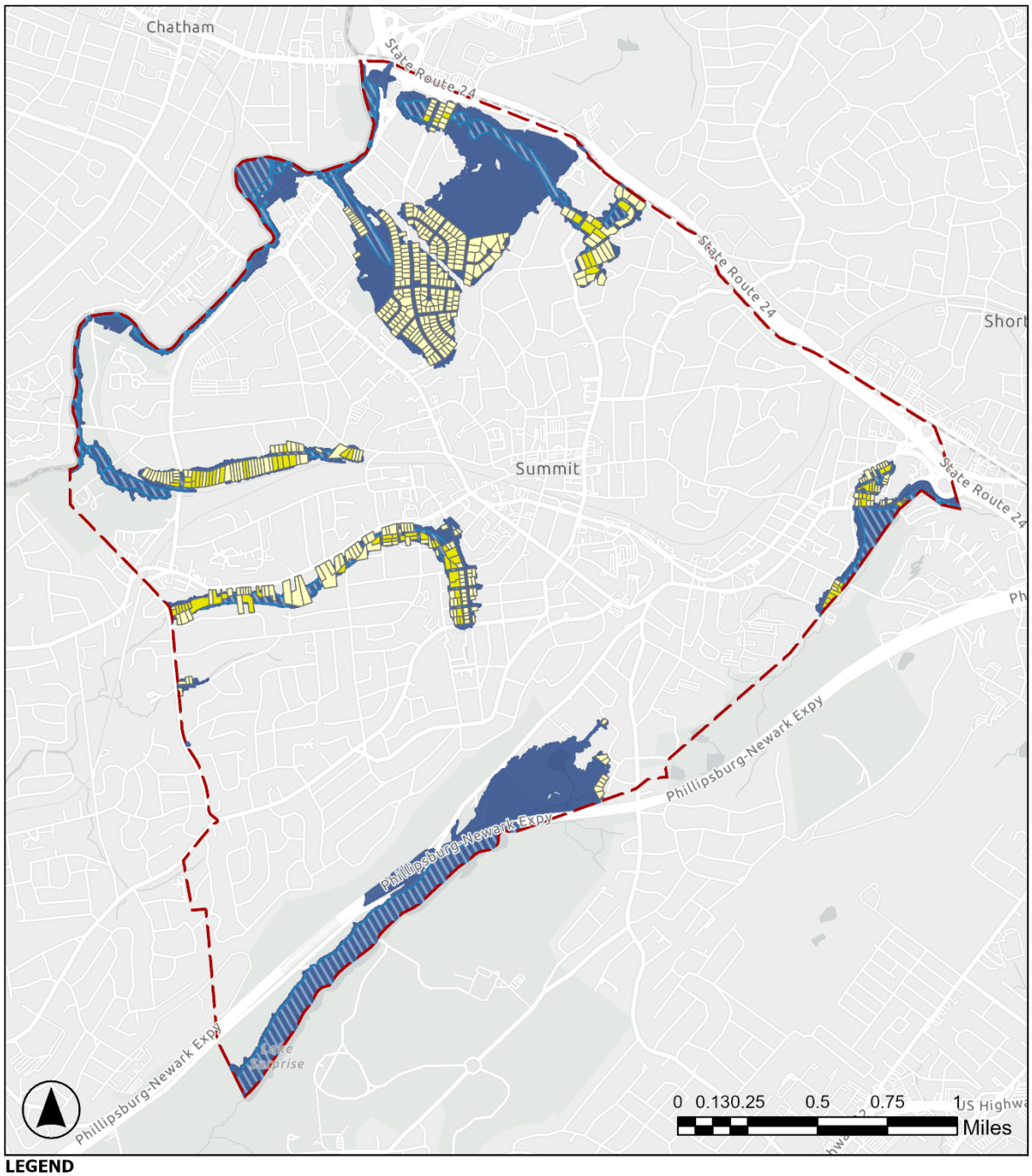
Flooding impacts vulnerable populations by exacerbating existing underlying inequities. In addition to impacts to property, flooding causes physical and mental health impacts. The most direct health impact from flooding is drowning and trauma. Other health impacts from flooding can be the result of increased 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 damage can create financial burdens that disproportionately impact low- to moderate-income families.[49]

Map V-14 depicts the potential flood exposure of housing parcels in Summit for FEMA 1% annual chance flood zone, and the approximate extent of the Inland Flood Protection Rule. Table V-7 provides details on the number of parcels, land area, and value of property exposed.

Approximately 86 of Summit's 6,285 housing parcels are exposed under current flood scenarios. The proportion of housing parcels at risk is projected to increase throughout the century, with 519 parcels within the approximate extent of the Inland Flood Protection Rule.

[48] New Jersey Office of Emergency Management. 2024. State of New Jersey All-Hazards Mitigation Plan.
[49] Interagency Council on Climate Resilience. 2025. New Jersey Statewide Flood Resilience Initiatives.

Map V-14. Housing parcels within FEMA Flood Zones



LEGEND

Parcels Inundated at 50 or more FEMA 1 Chance Annual Flood

- Residential
- Apartments

Parcels inundated 50% or more in approximate extent of Inland Flood Protection Rule

- Residential
- Apartments

FEMA Flood Zones

- FEMA 1% annual chance flood zone
- Approximate extent of Inland Flood Protection rule

Table V-7. Flood exposure of housing parcels within FEMA Flood Zones

		Number / land area exposed in...					
		FEMA 1% Annual Chance Flood			Approximate extent of Inland Flood Protection Rule		
MOD IV Property Class	Total # parcels	# Parcels	Acres	Net Equalized Value ($)	# Parcels	Acres	Net Equalized Value ($)
Residential (2)	6,245	86	35	97,876,364	519	176	561,782,378
Apartments (4C)	40	0	0	0	0	0	0
Total	6,285	86	35	97,876,364	519	176	561,782,378

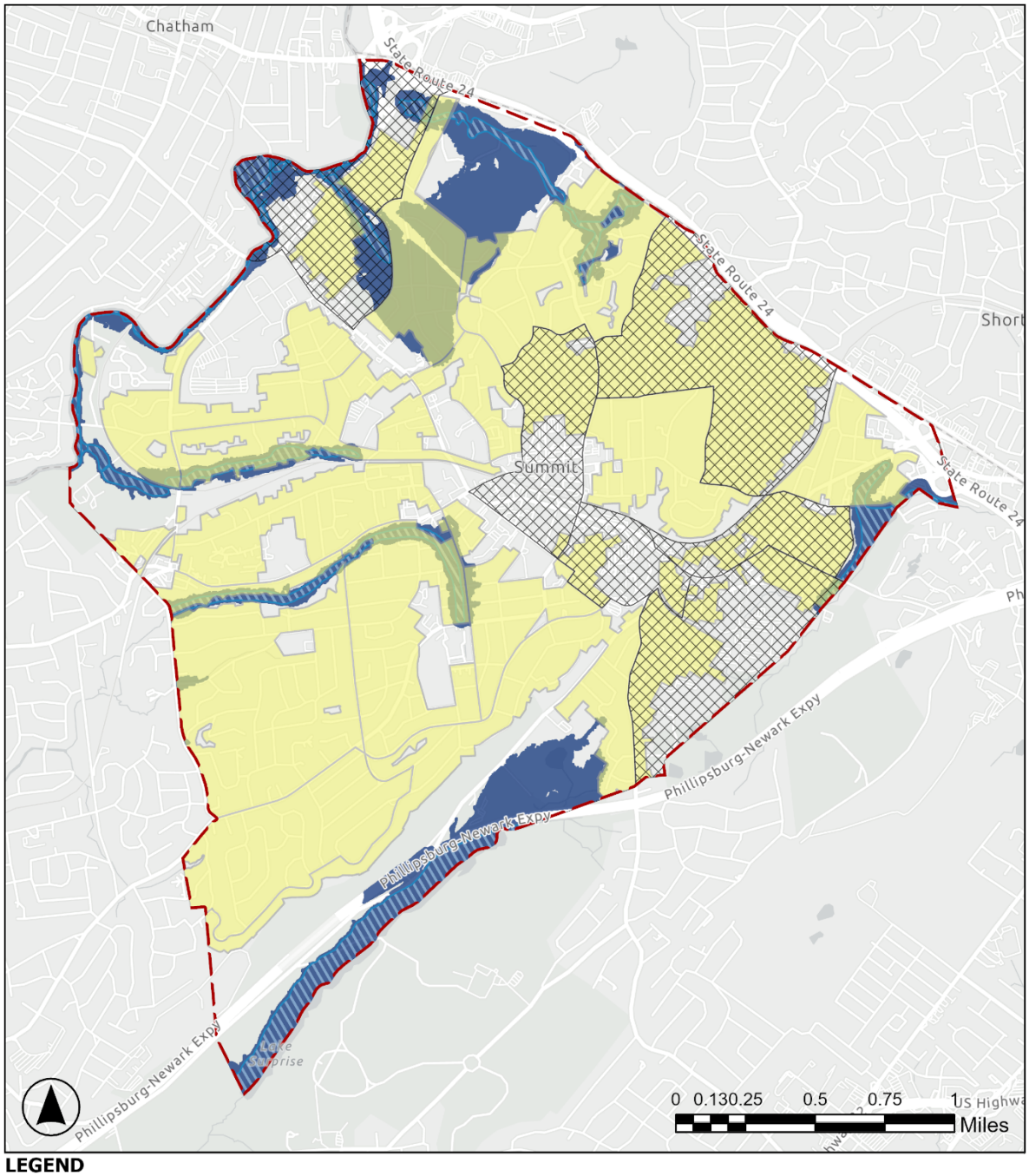
Map V-15 depicts potential flood exposure of OBCs in Summit for each flood measure. Table V-8 summarizes the number of people exposed within Summit's OBC census blocks for each flood measure. A small proportion of Summit's low-income, minority, and limited English proficiency population is exposed within the FEMA 1% annual chance flood zone and the approximate extent of Inland Flood Protection Rule. This exposure indicates a need for planning to address future flood risks to households from OBCs.

Table V-8. Flood exposure of Overburdened Communities

	Total # in OBC census blocks	Estimated number of people exposed in...	
		FEMA 1% Annual Chance Flood	FEMA 1% Annual Chance Flood + 3 feet
Low-income*	1,136	4	8
Minority	3,567	21	58
Limited English proficiency households	106	0	2

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

Map V-15. Overburdened Communities within FEMA flood zones



LEGEND

Census BG Residential LULC

Residential Areas

Overburdened Communities Under the New Jersey Environmental Justice and Law

Minority

FEMA Flood Zones

FEMA 1% annual chance flood zone

Approximate extent of Inland Flood Protection rule

Wildfire

Wildfire does not pose a significant risk to Summit's housing infrastructure. All areas of the municipality are classified as low risk to potential structures, and no wildfire incidents have been documented by NIFC and NOAA 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.[50]

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

VI. Impacts on Master Plan Elements

The NJ MLUL requires a CCRHVA to analyze "the potential impact of natural hazards on relevant components and elements of the master plan," and "provide strategies and design standards that may be implemented to reduce or avoid risks associated with natural hazards." This section addresses these requirements by providing a summary of relevant components of each element of the city's master plan, identifying connections with the current and future climate hazards and exposures identified in this CCRHVA, and offering potential considerations for the city to improve resilience. Summit's master plan was completed in 2000, and the most recent reexamination was in 2016. Table VI-1 lists the master plan documents and elements reviewed and analyzed.

Table VI-1. Summit master plan documents and elements analyzed

Master Plan Documents	Master Plan Elements
• Master Plan 2000 • 2006 Master Plan Reexamination • 2016 Reexamination Plan	**Mandatory Elements** • Statement of objectives, principles, assumptions, policies, and standards (SOPAPS) • Land use plan • Housing element and fair share plan **Optional Elements** • Circulation plan • Community facilities plan • Open space and recreation plan • Conservation plan • Historic preservation • Recycling plan • Compatibility with other plans • Environmental Resource Inventory (ERI)

The primary document for this report is the 2000 Master Plan, superseded by the 2006 Reexamination and the 2016 Summit re:Vision Reexamination Report, where they update or amend the original plan.

A. Master Plan Goals & Objectives

The MLUL requires a municipal master plan to include a "statement of objectives, principles, assumptions, policies and standards" to guide the physical, economic, and social development of the municipality. Those most relevant to climate hazards are:

- Transit, cycling, and pedestrian infrastructure are to be expanded while cutting residential through-traffic;
- Environmental goals cover wetland and floodplain protection, tree canopy, brownfield reclamation, and a potential Passaic River linear park;
- Community facilities, historic landmarks, public art, and green building practices are goals of the city's improvement agenda.
- Protection of floodplains, wetlands, steep slopes, and aquifer recharge areas from development, alongside stormwater management through appropriate drainage guidelines to prevent future drainage problems;
- Rehabilitation and upgrading of the city's sewer system;
- Environmentally sensitive areas are to be identified and preserved citywide, with conservation easements encouraged on privately held sensitive lands to protect against future disturbance;
- The 2006 reexamination further adds an explicit "Green Master Plan" covering sustainable building practices, energy conservation, and brownfield reclamation.

Climate Hazard Connections

The Green Master Plan objective is the strongest direct connection to climate resilience. The energy conservation objective also aligns with climate resilience goals. Other areas of alignment with climate resilience goals include brownfield reclamation, which reduces risk of polluted stormwater runoff from contaminated sites, and landmark tree protection and replacement which strengthens the urban canopy to reduce heat island effects. The Community Forestry Management Plan supports stormwater absorption and urban heat mitigation.

Generally, the goals related to protection of floodplains, wetlands, steep slopes, and aquifer recharge areas from unchecked development, and stormwater management through drainage guidelines will help to prevent future drainage problems. Further, the Passaic River linear park exploration offers a nature-based flood buffer opportunity.

Potential Resilience Considerations

- Strengthen the steep slopes ordinance that limits development in erosion-prone areas to align with growing flooding uncertainty.
- The GIS technology platform committed to in both the 2000 and 2006 plans should be formally expanded to include climate hazard mapping, integrating FEMA Special Flood Hazard Area data and NJDEP Urban Heat Island mapping for a quantified, spatially specific foundation for all future land use and zoning decisions.
- Embed resilience into public facility upgrades through ADA compliance review.
- Cultural resource inventory could be extended to identify climate-vulnerable areas.
- The foundational assumption that no catastrophic natural disaster will derail implementation should be replaced with a climate-informed risk assumption acknowledging that extreme weather events are increasing in frequency and severity in New Jersey
- The plan's policies should incorporate environmental justice as a planning principle, consistent with New Jersey's 2020 Environmental Justice Law, which requires NJDEP to assess environmental and public health stressors in overburdened communities.

B. Land Use Element

Rather than creating a new land use pattern, the land use plan is designed to maintain and stabilize the City's existing land use patterns while addressing ongoing changes. Community stability and diversity are identified as critical to Summit's quality of life. The plan identifies several key land use concerns raised through public outreach: traffic volume and safety; residential and non-residential land use conflicts along business zone fringes; parking pressures, particularly in the Central Retail Business District (CRBD); evolving needs of Overlook Hospital and its surrounding neighborhood; the need to maintain diverse and affordable housing stock; and the vitality of the CRBD. The plan closes with community design principles drawn from Summit's 1985 “Good Neighbor Guidelines,” emphasizing compatible density, preservation of topography and vegetation, contextual building scale, and attention to drainage and environmental impacts in all development decisions.

Climate Hazard Connections

Existing and proposed location, extent, and intensity of development of land to be used in the future for varying types of residential, commercial, recreational, educational, and other public and private purposes, and its relationship with the existing and proposed zone plan and ordinance as part of the land use have a direct connection with CCRHVA land-use guidelines for municipalities. The Master Plan’s emphasis on walkability, tree canopy improvements, open space preservation, and streetscape enhancements directly supports climate resilience objectives related to extreme heat and stormwater management. Expanded street tree canopy and greened public spaces can

help mitigate urban heat island impacts, particularly in more intensely developed commercial and transportation corridors identified in the reexamination.

The promotion of Complete Streets, pedestrian connectivity, and adaptive reuse strategies may improve resilience by reducing automobile dependency, supporting multimodal transportation access during extreme weather events, and encouraging compact, connected development patterns.

The redevelopment focus areas identified in Goal 1, including the Broad Street Corridor and Gateway II zone, may also present opportunities to incorporate climate-informed site design standards, green infrastructure, flood mitigation measures, and resiliency-focused redevelopment requirements into future zoning and redevelopment plans.
In addition, the Summit Parkline initiative and broader open space objectives support opportunities for enhanced stormwater infiltration, urban cooling, recreational access, and ecological connectivity.

Potential Resilience Considerations

- Increase housing for the older population and incorporate flood and storm resiliency measures as laid out in the municipal floodplain management plan/ordinance and the municipal stormwater management plan (MSWMP).

- The statement on standards of population density and development intensity recommended for the municipality could consider CCRHVAs for land-use elements.

- Impervious surface coverage limits should be introduced or strengthened in Summit's Development Regulations Ordinance.

- A heat-sensitive urban design overlay should be introduced for the heat island locations requiring shade canopy, cool surface materials, and green infrastructure as conditions of any new development or redevelopment approval in those areas.

- The Land Use Plan should incorporate NJDEP's 2023 Inland Flood Protection Rule. Any parcels newly falling within this expanded flood hazard area, particularly along the riverbanks, should be subject to updated land use restrictions and development standards.

- The plan's community design standards, currently focused on scale and aesthetic compatibility, should be updated to include green building performance standards.

C. 2025 Housing Element and Fair Share Plan for the Fourth Round

Note: The 2025 HEFSP reviewed for this analysis excludes the twelve appendix items.

Summit's Housing Element and Fair Share Plan (HEFSP) is an affordable-housing compliance plan under NJ state law and is not designed as a hazard-planning document. It projects the City's affordable housing needs and housing stock and includes population and employment characteristics. The New Jersey Department of Community Affairs (DCA) calculated Summit's Fourth Round Present Need at 59 units and Prospective Need at 345 units, which the city accepted in January 2025. As a fully developed municipality with very limited vacant land, Summit conducted a Vacant Land Analysis (VLA), which reduced its Realistic Development Potential (RDP) to 18 units across five identified sites totaling 9.24 acres.

Connections with climate hazards will depend on where housing is located. HEFSP identifies the five specific parcels for RDP. Summit's HEFSP does not currently reference any history or projections for climate hazards, including within the plan's site-selection criteria.

Climate Hazard Connections

The plan acknowledges flooding concerns at 190 River Road (one of the development sites for meeting its affordable housing requirement) due to a nearby Passaic River tributary, citing it as a reason for rejecting a proposed development at that site. This directly links housing development potential to flood hazard exposure relevant to the CCRHVA (Map III-3). The CCRHVA also identifies flooding along the Springfield Avenue and River Road corridors that are also sites for affordable housing, but with no flood overlay or flood screening.

The plan identifies three developments totaling 195 units serving family and senior households, as well as multiple assisted living facilities and group homes serving special needs populations. Since these are income-, age-, and needs-restricted housing facilities, they may face heightened challenges in responding to climate-related disruptions, such as extreme heat or power outages. The plan confirms that, given the near total absence of vacant land (only 0.59% of total acreage), future housing growth will be concentrated as infill development along major corridors such as Morris Avenue, Springfield Avenue, and Broad Street. Dense urban infill development in established corridors typically increases impervious surface coverage, which can intensify localized stormwater runoff, a concern relevant to the CCRHVA. The Morris Avenue site is within the area of high heat island severity identified in the CCRHVA, and the residents served there are among the most heat-vulnerable populations.

There are several opportunities to incorporate exposure to climate hazards, floodplain considerations, and resilience standards in Summit's HEFSP while still allowing the city to meet its housing goals.

Potential Resilience Considerations

- Consider enhanced risk communication and evacuation assistance for units housing older populations.
- Future iterations of the HEFSP can incorporate requirements that all future affordable housing development sites be evaluated against CCRHVA flood mapping, and that development standards incorporate appropriate flood-resistant construction techniques where applicable.
- Future iterations of the HEFSP can incorporate heat provisions — tree canopy and shade, cool roofs and materials, and cooling-capable common areas — to any approvals for affordable housing located in the heat island corridor.
- Build impervious-cover and stormwater management into inclusionary and overlay-zone standards.
- Make the CCRHVA a site-suitability input to the next HEFSP and its VLA.

D. Circulation Plan Element

The 2000 Master Plan Circulation Element established a roadway hierarchy classifying streets into freeways, primary and secondary arterials, collectors, and local roads. It identified numerous high traffic accident locations, recommended a comprehensive citywide traffic study, and proposed specific intersection and signal improvements. The element addressed pedestrian safety and sidewalk gaps, particularly at the NJ Transit overpass on Springfield Avenue and along Broad Street. Mass transit via NJ Transit rail service to New York and Newark is identified as a key regional asset. The 2006 Reexamination reaffirmed circulation objectives with added emphasis on expanding sidewalks and bike routes where feasible, improving pedestrian safety, and maintaining attractive gateways through landscaping, signage, and traffic calming techniques. The 2006 document contains no new full Circulation Element beyond updated objectives.

Climate Hazard Connections

The 2000 plan's identification of drainage as a component of roadway maintenance, specifically the recommendation that the citywide traffic study address sidewalks, road conditions, and infrastructure priorities, is relevant to flood exposure on key roadways.

The element identifies several low-lying and infrastructure-constrained corridors, including River Road, Passaic Avenue, and Springfield Avenue, all of which are referenced in the context of accident history and improvement needs. Given that the Passaic River corridor runs through or adjacent to several of these routes, their exposure to flooding is implicit in the plan's geographic context. The 2006 Reexamination's emphasis on maintaining drainage as part of sidewalk and bike

route improvements aligns with the CCRHVA's concern for recurrent flooding impacts on pedestrian and vehicular infrastructure.

The emergency evacuation route framework should be formally evaluated against the NJDEP's updated 2023 Inland Flood Protection Rule's expanded flood hazard boundaries. River Road, Passaic Avenue, and Springfield Avenue, all identified in the 2000 plan as high-volume corridors, run in proximity to or through the Passaic River flood corridor and should be assessed for flood exposure under both current 100-year storm scenarios and projected mid-century precipitation increases as referenced in Section III.

Potential Resilience Considerations

- The citywide traffic study recommended in the 2000 plan, which calls for analysis of roadway conditions and capital improvement priorities, provides a direct mechanism to incorporate long-term flood exposure projections into infrastructure planning.
- The 2000 plan's identification of River Road, Passaic Avenue, and Springfield Avenue as high-volume corridors warrants assessment of their flood exposure given their proximity to the Passaic River corridor.
- The 2006 Reexamination's emphasis on drainage maintenance as part of sidewalk and bike route improvements could be extended to address stormwater flooding on key routes.
- The plan's encouragement of mass transit use provides an existing framework that could be strengthened as a climate-resilient alternative to flood-exposed roadways.

E. Community Facilities Element

The 2000 Master Plan Community Facilities Element inventories and assesses municipal facilities including City Hall, police, fire, first aid, library, schools, and parking garages. Major capital improvements were undertaken in the 1990s, modernizing most facilities. The element notes that the city undertook extensive sewer replacement and modernization of several pumping stations. School enrollment increased by 41 percent since 1994, creating space and parking pressures across all levels. The element recommends continued maintenance, coordination with the Capital Improvement Program, and regional cooperation with surrounding municipalities and utility companies, particularly on public utility issues given anticipated significant technological changes. The 2006 Reexamination updates community facilities objectives to reflect changing demographic characteristics, adds evaluation of ADA compliance, encouragement of public art placement, and an inventory of cultural resources. No new full Community Facilities Element is present in the 2006 document beyond updated objectives.

Climate Hazard Connections

The 2000 plan identifies four sewer pumping stations at Constantine Place, Chatham Road, River Road, and Glen Avenue. Given their locations, particularly the River Road station in proximity to the Passaic River corridor, these represent infrastructure with flood-exposure relevance. The element notes that storm sewers service all developed areas of the city with 1,140 drainage inlets maintained throughout, directly relevant to stormwater management under increased flood risk. The Fire Department building on Broad Street and the First Aid Squad on Summit Avenue are identified as critical emergency response facilities. Their continued adequacy for current and future needs is noted, though no climate or hazard vulnerability assessment of these facilities is present in either document.

Potential Resilience Considerations

- The four sewer pumping stations identified at Constantine Place, Chatham Road, River Road, and Glen Avenue warrant specific flood vulnerability assessment given their critical role in the City's sanitary infrastructure.
- The 1,140 storm drainage inlets identified as maintained throughout the City represent a key asset whose capacity under intensified and unpredictable flooding should be evaluated.
- The element's recommendation for regional cooperation on public utility issues provides a platform for coordinating climate resilience upgrades to shared infrastructure.
- The Capital Improvement Program coordination mechanism established in the element provides a vehicle for incorporating climate vulnerability findings into facility upgrade priorities.
- Schools and other infrastructure development and renovation should consider CCRHVA guidelines.
- The 2006 Reexamination's ADA compliance review of public facilities provides an existing process that could be extended to incorporate hazard resilience standards.

F. Recreation and Open Space Element

The 2000 Master Plan Recreation and Open Space Element identifies the City as operating seven parks totaling 79 acres, a nine-hole golf course, and a community swimming pool. County parks including Briant Park, Hidden Valley Park, Passaic River Park, and the Watchung Reservation supplement City facilities. The element notes growing pressure on existing facilities from increased youth sports participation. Twelve additional open space parcels are identified for potential acquisition, several of which contain wetlands, steep slopes, and Critical Environmental Site designations. The element recommends upgrading existing facilities, creating physical links between City and County parks, and exploring a linear park along the Passaic River. The 2006

Reexamination carries forward all objectives with added encouragement of public-private partnerships and creative funding opportunities for open space. No new full Recreation Element is present in the 2006 document.

Climate Hazard Connections

The 2000 plan identifies the Passaic River Park as a largely undeveloped linear park along the Passaic River containing approximately 133 acres across Summit, Berkeley Heights, and New Providence. Given the Passaic River's documented flood history in the region, this corridor represents direct flood hazard exposure, though the plan does not frame it in those terms. The New Jersey American Water Company parcel along Glenside Avenue is identified as containing wetlands, designated a Critical Environmental Site in the State Development and Redevelopment Plan, and recommended for priority acquisition. This directly corresponds to aquifer recharge and flood buffer functions relevant to the CCRHVA.

The Duke Holt/Landmark property along Glenside Avenue is described as containing steep slopes that are “not conducive to development” and where “construction would be detrimental to the natural environment,” directly relevant to erosion and surface runoff hazard. The abandoned railroad right-of-way traversing the Celanese property is identified as a proposed pedestrian and open space connection. Its route through the southern portion of the City passes through areas relevant to stormwater and flood corridor management.

Potential Resilience Considerations

- The recommendation to acquire the New Jersey American Water Company parcel containing wetlands and designated as a Critical Environmental Site directly supports long-term flood buffer and aquifer protection resilience.
- The Passaic River linear park exploration stated in both the 2000 and 2006 documents represents a nature-based open space opportunity along a flood-prone corridor that could be aligned with CCRHVA flood exposure findings.
- The recommendation to create physical links between City and County parks, particularly along the Rahway Valley rail line connecting East Summit to Briant and Hidden Valley Parks, could serve as a green infrastructure corridor supporting stormwater management.
- The public-private partnerships and creative funding mechanisms encouraged in the 2006 Reexamination provide a financing pathway for hazard-area open space acquisition aligned with CCRHVA recommendations.
- The twelve parcels identified for potential open space acquisition, several containing wetlands and steep slopes, represent specific opportunities to expand the City's natural hazard buffer network.

G. Conservation Plan Element

The 2000 Master Plan Conservation Element identifies environmentally sensitive areas including the Passaic River corridor, Watchung Reservation, and New Jersey American Water Company lands along Glenside Avenue. The city adopted a steep slopes ordinance regulating development on slopes of 15 percent or greater, targeting erosion, siltation, flooding, surface water runoff, and pollution of potable water supplies. A Community Forestry Management Plan was adopted to inventory, replace, supplement, and maintain shade trees along City streets and parkland. Recommendations include acquiring remaining undeveloped land, preparing a Natural Resources Inventory, reviewing development regulations including stormwater management standards, and implementing best management practices for pesticide and fertilizer use. The 2006 Reexamination reaffirms all conservation objectives and adds two new objectives: development of a Green Master Plan covering sustainable building practices, energy conservation, recycling, and educational outreach; and brownfield reclamation. Landmark tree protection and replacement is added as a new emphasis.

Climate Hazard Connections

The 2000 plan's steep slopes ordinance targets erosion, siltation, flooding, and surface water runoff as the direct purposes of regulating development on slopes of 15 percent or greater. This represents the most direct climate hazard connection in either document, directly addressing runoff and flood risk at the development level.

The protection of floodplains, wetlands, steep slopes, and aquifer recharge areas from development directly corresponds to the CCRHVA's concern for preserving natural systems that buffer against flood, drought, and water quality hazards. The recommendation to review stormwater management standards and dwelling unit density, soil removal, steep slope, and tree preservation regulations for strengthening directly aligns with the CCRHVA's infrastructure and land use vulnerability findings.

The 2006 Reexamination's Green Master Plan objective covering sustainable building practices and energy conservation represents the strongest direct climate mitigation signal in either document. The identification of the Passaic River corridor and the New Jersey American Water Company lands as priority conservation areas directly corresponds to flood corridor and aquifer vulnerability documented in the CCRHVA.

Potential Resilience Considerations

- Connect drought projection findings from Section III to the city's goals to conserve water through aquifer recharge and water conservation, as outlined in the Action Plan for a Sustainable Summit (2008).
- Incorporate areas vulnerable to stormwater and flash flooding identified in Section III into initiatives studying the cause and extent of this flooding as mentioned in the 2006 reexamination.

- Continue to implement the steep slopes ordinance and address community concerns as mentioned in the 2006 reexamination.

- Connect the city's green and sustainable building practices, as mentioned in the 2006 reexamination, to extreme heat and heat island exposures identified in Section V.

H. Historic Preservation Plan Element

The 2000 Master Plan Historic Preservation Element formally designates 12 historic districts and 44 individual historic sites identified through the Union County Historic Sites Survey. The Historic Preservation Commission implements the program through review of building permit applications on structures 50 years or older in designated districts, advisory comments on planning and zoning applications, and public education. The 2006 Reexamination reaffirms all historic preservation objectives and adds guidance on upgrading older buildings to capitalize on their architectural character and adding design standards to the Development Regulations Ordinance. No new full Historic Preservation Element is present in the 2006 document.

Climate Hazard Connections

Neither the 2000 plan nor the 2006 Reexamination contains direct climate hazard connections within the Historic Preservation Element. However, several of the 44 individually designated historic sites and 12 historic districts are located along Springfield Avenue, Morris Avenue, and Broad Street, corridors identified elsewhere in the plan as experiencing traffic and drainage challenges. The element does not assess flood or climate exposure of these assets. The element's acknowledgment that competing forces of growth and development create vulnerability for historic resources could be expanded to include climate hazards as an additional threat.

Potential Resilience Considerations

- The Historic Preservation Commission's existing review process for structures 50 years or older in designated districts provides an established mechanism through which climate vulnerability of historic assets could be assessed and addressed.

- The recommendation to develop financial incentives including tax credits for facade preservation and building rehabilitation could be extended to incorporate climate-resilient building upgrades for historic structures

- The 2006 Reexamination's addition of design standards to the Development Regulations Ordinance for historic buildings provides an opportunity to embed flood and climate resilience standards within the historic preservation review framework.

- Incorporate some of the findings from Section V on the exposure of the community's assets, including historic sites, to climate hazards.

I. Recycling Plan Element

The 2000 Master Plan Recycling Element establishes the City's comprehensive recycling program operated through the Division of Public Works. Residential curbside collection is provided twice monthly and a drop-off compost and recycling center operates on New Providence Avenue. The city consistently recycles over 50 percent of its solid waste, processing non-recyclable waste through a Transfer Station to the Resource Recovery Facility in Rahway. Recommendations include continuing to promote recycling, amending the Zoning Ordinance to establish standards for on-site recyclable enclosures, and pursuing State reinstatement of the tonnage grant reimbursement program. The 2006 Reexamination does not contain a dedicated Recycling Element; recycling is referenced only within the Green Master Plan objective under Conservation.

Climate Hazard Connections

Neither the 2000 plan nor the 2006 Reexamination contains direct climate hazard connections within the Recycling Element. The Transfer Station on New Providence Avenue is identified as located on County-leased land surrounded by Passaic River Park, placing it in proximity to the Passaic River flood corridor, though no flood vulnerability of this facility is noted in the text.

Potential Resilience Considerations

- The Transfer Station identified as located on New Providence Avenue surrounded by Passaic River Park warrants flood vulnerability assessment given its proximity to the Passaic River corridor and its critical role in the City's solid waste management infrastructure.
- The 2006 Reexamination's inclusion of recycling within the Green Master Plan objective provides a policy foundation for aligning the recycling program with broader climate resilience and sustainability goals.

J. Compatibility with Other Planning Efforts

The 2000 Master Plan Compatibility Element examines alignment with master plans and zoning of all bordering municipalities, the 1998 Union County Master Plan, and the New Jersey State Development and Redevelopment Plan. Summit is identified as almost entirely within the Metropolitan Planning Area and as a Regional Center under the State Plan. The CRBD is identified as a pedestrian-oriented core district. The Canoe Brook Country Club is designated an Environmentally Sensitive Planning Area overlaying the Buried Valley Aquifer serving Essex and Union Counties. Four Critical Environmental and Historic Sites are identified: lands along Glenside Avenue adjacent to the Watchung Reservation, the area east of the CRBD between the NJ Transit Morristown Line and Edgewood Road, the area at the junction of the NJ Transit Gladstone Branch and Morristown Line, and the Reeves-Reed Arboretum on Hobart Avenue. The 2006 Reexamination does not contain a dedicated Compatibility Element.

Climate Hazard Connections

The retention of the Canoe Brook Country Club's Environmentally Sensitive Planning Area designation is directly justified in the text by its overlay of the Buried Valley Aquifer, which serves as a water supply for Essex and Union Counties. This represents a direct water supply vulnerability connection relevant to the CCRHVA.

The three Critical Environmental and Historic Sites identified, particularly the Glenside Avenue lands containing wetlands and steep slopes, and the Passaic River area, directly correspond to flood corridor and ecological vulnerability documented in the CCRHVA.

The State Plan's identification of Summit as a Metropolitan Planning Area community where redevelopment is the predominant form of future growth directly implies that climate vulnerability must be addressed through redevelopment standards rather than greenfield controls.

Potential Resilience Considerations

- Align Summit's planning with county-wide and statewide climate resilience initiatives.
- Specifically assess the climate impacts on the Buried Valley Aquifer, identified as a water supply for Essex and Union Counties and protected through the Environmentally Sensitive Planning Area designation.
- The Critical Environmental and Historic Sites identified along Glenside Avenue and the Passaic River corridor provide a mapped foundation that could be directly integrated into the CCRHVA's hazard exposure analysis.
- Incorporate climate resilience standards into all future redevelopment approvals.

K. Environmental Resource Inventory

The October 2025 draft Environmental Resource Inventory (ERI) is a 160-page environmental baseline document prepared by The Land Conservancy of New Jersey, under a 2024 Sustainable Jersey grant. It frames climate change as a central theme throughout, with the following chapters most relevant to the CCRHVA:

- Land Use / Land Cover (Chapter 1)
- Vegetation (Chapter 2)
- Hydrology (Chapter 4)
- Wetlands (Chapter 5)

- Riparian and Flood Zones (Chapter 6)
- Geology and Topography (Chapter 7)
- Climate (Chapter 9)
- Climate Change (Chapter 10)
- Air Quality (Chapter 11)
- Known Contaminated Sites (Chapter 12)

The three chapters dealing with water resources are where the ERI and CCRHVA have the most key connections.

Climate Hazard Connections

The ERI chapters on Climate and Climate Change largely overlap and are consistent with the CCRHVA characterizations and the direction of climate change projections. They agree on the concentration of heat islands in central Summit, and on OBC heat-island exposures. However, there are some notable differences in the sources, timeframes, and projections in the two documents. They diverge, for example, on the time horizon provided and projected increase in temperature, and they use different, though complementary, scales and frameworks to determine heat islands.

The three ERI chapters on water resources are the most strongly connected to the CCRHVA's flood hazard and exposure findings. For example, both documents align on the identification of flood zones (ERI Map 13 and Figures 10-14 and CCRHVA Map III-3) and both reference the NJDEP Inland Flood Protection Rule. The Great Swamp's function of storing floodwaters establishes a hydrological connection between regional open space preservation and Summit's flood risk management. Also, the scarcity of wetlands at less than one percent of land cover is a limiting factor in the City's natural flood buffering capacity, connecting directly to the CCRHVA Section V. B's discussion of natural and working lands as flood buffers. The ERI also points out that developments on or around riparian zones can deplete the ecological capacity of these zones to retain floodwater and it identifies drainage problem locations.

The ERI reinforces and localizes many of the hazards named for Summit in the CCRHVA, such as the pluvial flooding and heat hazards. For example, regarding flooding, the ERI discusses streams that are "non-supporting" of storm runoff, and regarding heat, it links high impervious surface coverage to increased risk of extreme surface temperatures in areas with little tree coverage. It then identifies heat island locations as well as areas of higher tree canopy that lower heat island effect. Both documents also mention that high temperatures can accelerate the life cycles of insect pests as a threat to forest health.

There are some aspects of the ERI that could be more explicitly tied to the impacts of climate change. For example, the ERI discusses both landslide risks and erosion risks as becoming higher because of changing storm patterns but doesn't include or reference future climate change-based rainfall projections. Likewise, it doesn't address climate-driven intensification of runoff when it describes development regulations on steep slopes. ERI's stormwater design targets are anchored in historical conditions and will be undersized as they do not consider the higher and more intense rainfall amounts projected by the CCRHVA.

The ERI connects climate change to declining air quality through two pathways: higher temperatures increasing evaporation of particulate matter components and increasing ozone exposure, and the increasing frequency and severity of wildfires generating smoke that travels to New Jersey. The CCRHVA's heat projections directly increase the drivers of ground-level ozone formation, reinforcing this ERI point. The CCRHVA does not consider regional and national wildfire effects on Summit but classifies all of Summit as low risk for wildfires. Both framings (effects from wildfires elsewhere and also the local risks of wildfire) could be valuable to consider.

The ERI documents Summit's known contaminated sites and notably five stormwater outfalls from former Exxon facilities discharging to the Passaic River and Martin's Brook via storm sewer. Under increased precipitation and flooding scenarios, these outfalls represent pathways for climate-driven contamination of surface waters. Both documents contain these findings.

Potential Resilience Considerations

- Update the ERI Chapter 1 stormwater design-storm citation to reference both the RCE 2-year design storm (3.4 inches / 24 hours, historical baseline) and the CCRHVA Table III-4 mid-century and late-century projections for the same return period (3.67 inches / 3.77 inches).
- Add a Chapter 1 cross-reference to CCRHVA Map III-2 (heat island risk) and Section V.D Map V-13 (OBC heat island exposure) to make explicit that the ERI's impervious-surface data and the CCRHVA's heat island analysis are reinforcing of each other.
- Tie the ERI's 1986–2020 land use change table to a forward-looking commitment of no-net-loss of forest and wetlands acreage, with the rationale grounded in the CCRHVA's heat island and pluvial flooding findings.
- Establish a forward-looking tree-canopy expansion target, with priority application to identified higher-heat-island zones and OBC census block groups.
- Add a climate-change context layer to the ERI's invasive-species and forest-health-threats inventory (Chapter 2), connecting to the warming winters, longer growing seasons, and pest life-cycle acceleration that the CCRHVA predicts will facilitate their establishment and spread.

- Pair the ERI Chapter 4 City Drainage Assessment Report Category I locations with CCRHVA Section III.B rainfall-intensity projections (Table III-4) to produce a climate-adjusted capacity assessment for each location.
- Frame the Beekman Road Culvert replacement explicitly as a climate-adaptation capital project, designed to capacity standards consistent with CCRHVA Table III-4 storm projections. This would serve as a precedent for treating drainage infrastructure replacement city-wide as climate-resilience work.
- Develop a coordinated approach to the convergence of the ERI Chapter 4 stormwater discharge points (Table 9) and CCRHVA Section V.A flood-exposed contaminated sites to specifically address the compound risk that flood inundation could mobilize pollutants into the stormwater system.
- Advance the Passaic River linear park (cross-referenced in the Master Plan record and in CCRHVA Section VI) as a wetland-and-riparian restoration and flood-buffer project.
- Update the Steep Slope Ordinance review process to incorporate climate-driven rationale (CCRHVA Section III.B rainfall-intensity projections) into assessments and decision-making.
- Frame Summit's aquifer recharge findings within CCRHVA Section III.C drought projections.
- Establish a single climate-baseline reference table for Summit planning processes that consolidates data sources, projections and timeframes.
- Add a wildfire-smoke air-quality protocol to Summit's emergency-preparedness framework, distinct from the risk of wildfires to structures.
- Develop a coordinated flood-and-contamination response plan for the two CCRHVA-identified flood-exposed contaminated sites.
- Explicitly connect ozone-formation with heat as an air-quality and climate planning concern.
- Topographic variability across the city should be incorporated into a neighborhood-level vulnerability assessment to identify which areas face the highest compound risk from both floodplain proximity and stormwater runoff concentration.
- The three identified heat island locations, Overlook Medical Center, Summit High School, and the Bristol Myers Squibb campus, should be prioritized for targeted urban greening, cool roof programs, and shade infrastructure.
- Summit's overburdened communities should be priority areas for urban greening, traffic calming, and emissions reduction measures that simultaneously address air quality and heat hazard.

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 Summit's following plans:

- Union County Hazard Mitigation Plan (including Summit municipal annex)
- Floodplain Management Plan (including Drainage Assessment Report)
- Stormwater Management Plan (as updated by the Stormwater Pollution Prevention Plan)
- Capital Improvement 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 Summit to improve resilience to climate-related hazards.

A. Union County Hazard Mitigation Plan and Summit Municipal Annex

Every county in New Jersey has a Hazard Mitigation Plan (HMP), which identifies and ranks the potential hazards and vulnerabilities that face the county and outlines goals and mitigation actions. Additionally, HMPs are required in order for counties to qualify for disaster mitigation funding from FEMA. The 2026 Union County HMP is the third update to the original 2010 plan. This section uses this most recent update as the base plan for the county and also references the 2026 draft Summit jurisdictional annex as the source of Summit-specific hazard rankings and mitigation actions.

The county HMP profiles 25 hazards, and states that "impacts from climate change and sea- level rise are addressed in each applicable hazard" (Table 2.3-2), so this acknowledgment of climate hazards is a key aspect of connection between the plan and climate hazards. The annex also states that the city will upgrade infrastructure to accommodate the increasingly frequent storms, an acknowledgement of climate change-related hazards. However, while the Summit annex aligns well with the CCRHVA's hazard rankings for flooding, it does not align on the heat hazard, as the CCRHVA and County both rank heat as a high hazard, while the Summit annex ranks it as low.

Climate Hazard Connections

The HMP connects with climate hazards strongly, as many of the hazards addressed are climate-related, such as flooding, extreme precipitation, storms, wildfire, and heat. The HMP and annex agree that flooding is a high hazard, and most of the Summit mitigation actions are to mitigate flooding. The 2026 annex also documents extreme precipitation events in recent years and notes their increasing frequency. The annex's FEMA-zone screen, though, does not coincide with the approximate extent of the Inland Flood Protection Rule that the CCRHVA identifies as Summit's projected area of risk, which would include more residential exposures and specific facilities exposed (including two NJ Transit stops, three gas stations, rail lines, the JCP&L facility, and two contaminated sites) (Tables V-1, V-2). The HMP documents are consistent with CCRHVA projections in treating drought as a low-to-moderate risk. And although the annex ranks wildfire as a medium hazard for Summit, it carries no mitigation actions for it, which is consistent with the negligible wildfire risk outlined in the CCRHVA.

While the 2026 county HMP ranking of extreme temperature and heat as a high risk (Table 2.3-2) aligns with the CCRHVA, Summit's 2026 annex ranks heat low and carries no heat mitigation actions. On housing and people, the 2026 annex identifies the OBCs but, like the County plan, does not tie Summit's socially vulnerable populations to specific hazard exposure the way the CCRHVA does.

Potential Resilience Considerations

- Reconcile Summit's low municipal heat ranking against Union County's high ranking and the heat hazard projected in the CCRHVA (Tables III-1 and III-2).
- Add heat mitigation actions such as cooling-center capacity, school air-conditioning, bus-stop shade, and targeted tree-canopy/impervious-surface measures.
- Consider a Climate Adaptation Plan.
- Future iterations of the municipal annex should refer to climate change projections for flooding such as the Inland Flood Protection Rule.
- Cross-reference specific flood-exposed assets (as named in CCRHVA Tables V-1 and V-2) into Summit's flood-action prioritization.
- Link OBCs to specific heat and flooding hazard exposures.
- Reference the CCRHVA's Summit- and county-specific projections in future updates.

B. Floodplain Management Plan (including Drainage Assessment Report)

Summit does not have a Floodplain Management Plan, but instead the 2023 municipal floodplain ordinance (Chapter 27) and also a 2020 Drainage Assessment Report (DAR), which are treated together here to function as floodplain development guidance in lieu of an explicit plan. The key components of the documents that relate to climate hazards are their focus on identifying flooding locations in Summit, and on minimizing flood losses and managing development and other alterations to minimize flood damage.

The ordinance adopts the FEMA 2006 flood study and map, and the Local Design Flood Elevation (LDFE) as the elevation standard. There is no climate-related language in the floodplain ordinance. The DAR catalogs locations in Summit that suffer from pluvial flooding and divides them into three categories based on severity. It is based on historical events and does not consider the effect of climate change on future precipitation projections.

Climate Hazard Connections

The strongest and most direct connection is that these documents describe, regulate and manage flooding, which is an identified climate hazard. However, the Summit floodplain ordinance does not explicitly reference the CCRHVA's future flood scenario (Map III-5) based on the NJDEP Inland Flood Protection Rule. However, through referencing the new NJDEP rule, it essentially operates under the Inland Flood Protection Rule standard for new construction even if it's not clearly stated.

The DAR's named flooding locations fall on the same waterways as the CCRHVA's fluvial flood map (Map III-3). The ordinance then governs what is built in those mapped areas. The locations are places where stormwater overwhelms drainage infrastructure during intense rainfall. However, the CCRHVA provides increased precipitation projections (Tables III-4 and III-5) that would directly affect the drainage capacity deficits that the DAR catalogs, such as undersized catch basins and failing storm sewers and culverts. These future climate change-based projections are not incorporated into the DAR's problem assessments.

Another climate hazard connection is that Chapter 27 also regulates contamination risk within the flood hazard area. The CCRHVA identifies the specific exposed contaminated sites as the City Garage and Columbia Cleaners on Chatham Road.

Potential Resilience Considerations

- Tie the DAR's annual prioritization to the CCRHVA's flood exposure findings.
- Incorporate future climate-adjusted precipitation (CCRHVA Tables III-4 and III-5) as a basis in the DAR's diagnosis and sizing of drainage conveyance infrastructure.
- Add a proactive pathway for existing structures in the mapped extent of the Inland Flood Protection Rule to reach the elevated standards in order to address building-level risk before damage occurs.
- Cross-reference the critical facility and hazardous site provisions (Chapter 27) against the specific exposed assets flagged in the CCRHVA (Tables V-1 and V-2).

C. Stormwater Management Plan and Stormwater Pollution Prevention Plan

Summit's 2005 Stormwater Management Plan (SWMP) is the base plan, as required by New Jersey code, containing elements that address groundwater recharge and stormwater quality and quantity. Its goals (p.3) are to reduce flood damage; "minimize, to the extent practical, any increase in stormwater runoff from any new development"; reduce soil erosion; "assure the adequacy of existing and proposed culverts and bridges;" maintain groundwater recharge; and limit nonpoint pollution.

The 2020 Stormwater Pollution Prevention Plan (SPPP) is the permit compliance plan that updates the operational, inventory, and maintenance layers of the SWMP. It does not update design-storm or performance standards.

The key aspects of these documents that relate to the CCRHVA are that they address the issue of stormwater management and projections of increasing frequency and severity of rainstorms.

Climate Hazard Connections

The SWMP is intended to manage and reduce risks of rainfall, and the CCRHVA projects that rainfall will intensify in average inches of rain per storm and in frequency of storms. The standards currently included in Summit's plan are calibrated based on historic precipitation, so that projected future rainfall will exceed the design basis for management of stormwater infrastructure.

The SPPP's operational forms inventory and maintain the same physical assets (e.g., transit stops, gas stations, rail lines) the CCRHVA places in the flood zone, so that the SPPP's catch-basin, inlet, outfall, and facilities-maintenance regime (Forms 8, 9, 12, 13) governs the stormwater infrastructure serving those areas. This is strong alignment, but the maintenance and inspection scheduling is condition- or event-based ("recurring problems," debris, scouring), and not keyed to the CCRHVA's flood-exposure mapping.

Potential Resilience Considerations

- Use current, climate-adjusted precipitation standards for the design storm, and where feasible, a forward-adjusted design storm, so sizing reflects projected rather than historical rainfall.
- Bring the municipal ordinance and the MSWMP into line with the 2021 NJDEP green-infrastructure amendments, which prioritize runoff reduction at source.
- Revisit the "no build-out analysis" finding and align it with the CCRHVA buildout section.
- Target the SPPP's inventory and maintenance priorities using an overlay of the CCRHVA's facility exposure findings.
- Establish a recurring capacity check at locations of recorded rainfall exceedance against the CCRHVA's updated precipitation projections (Tables III-4, III-5).

D. Capital Improvement Plan

Summit's 2025 Capital Budget and Capital Improvement Program ("the CIP") document reviewed for this section is a department-rollup of eight city departments, each with an estimated total cost, a six-year funding schedule, and a funding-source breakdown. Because there is little to no project detail, it is difficult to assess any connections to the CCRHVA or to climate hazards. The CIP is the statutory Capital Budget and Capital Improvement Program required under state law and serves as a planning instrument for intended spending but not a commitment or authorization to spend.

Of the eight departments in the CIP, five of them could have relevance to the CCRHVA and could plausibly contain climate-relevant work, including Community Services (flood/stormwater), Sewer Utility (flood/stormwater), Parking (flood/heat), Community Programs (emergency or heat mitigation facilities), and Fire (heat/storm/flood). The department-level presentation, however, identifies no specific work.

Climate Hazard Connections

The CIP contains no climate change, hazard, resilience, mitigation, adaptation, or vulnerability language anywhere in its text, and no reference to the CCRHVA. The document is purely fiscal and statutory with no specific named projects or locations. It is likely but cannot be confirmed that the Sewer Utility may fund stormwater and drainage infrastructure — the capital spending most relevant to the rainfall intensification the CCRHVA projects. Likewise, the Departments of Community Services, Community Programs, and Fire might include facilities for storm sheltering or heat mitigation as suggested by the CCRHVA in response to heat, storm, and flood events, and Parking projects may include flood and heat mitigation measures. None of this, however, can be confirmed but only speculated.

Potential Resilience Considerations

- Add project-level detail to the capital program so that climate hazard exposures (precipitation, heat, OBC impact) can be assessed as a planning input for projects.
- Attach a climate/CCRHVA rationale and reference to capital lines for drainage, cooling, and emergency facilities, which could position eligible projects for federal and state resilience grants.

VIII. Appendices

Appendix A: Description of City of Summit

City of Summit (henceforth, "Summit") is located in Union County, New Jersey. Surrounding municipalities include New Providence to the west, Berkeley Heights to the southwest, Mountainside to the south, Springfield Township to the southeast, Millburn (Essex County) to the northeast, and Chatham Borough (Morris County) to the northwest.

Summit is located in the northeastern part of New Jersey, spanning 6.0 square miles, and is situated in the hills of Watchung Reservation at an elevation of 450 feet. Map A-1 depicts Summit's location. Settled in 1710, the location of the town along the Passaic River facilitated transportation and trade. The City of Summit was incorporated in 1899. Originally a farming community, the city became a popular resort area after the Civil War due to its landscape and its proximity to New York City. Presently, Summit is primarily a residential community with light industry and is located in the most densely populated region of the state.

The first railroad was introduced in Summit in 1869 and today the city has numerous rail and bus connections to Newark and New York City. The city has a vibrant art and culture environment fostered through its several artistic, recreational, and nature-based facilities that include the Visual Arts Center of New Jersey, Summit Public Library, and the Reeves-Reed Arboretum. The city's heritage is anchored by its historical landmarks such as the Grand Summit Hotel, the Carter House headquarters of the Summit Historical Society (1747), and the Summit Opera House (1894).

Map A-1. City of Summit



LEGEND

NJ

Municipal Boundaries

Summit

Demographics

According to the 2023 American Community Survey,[51] Summit's residential population is 22,512. The population density is approximately 3,790.3 people per square mile. Table A-1 includes detailed demographic information for Summit.

Table A-1. Demographic data for Summit, Union County, New Jersey

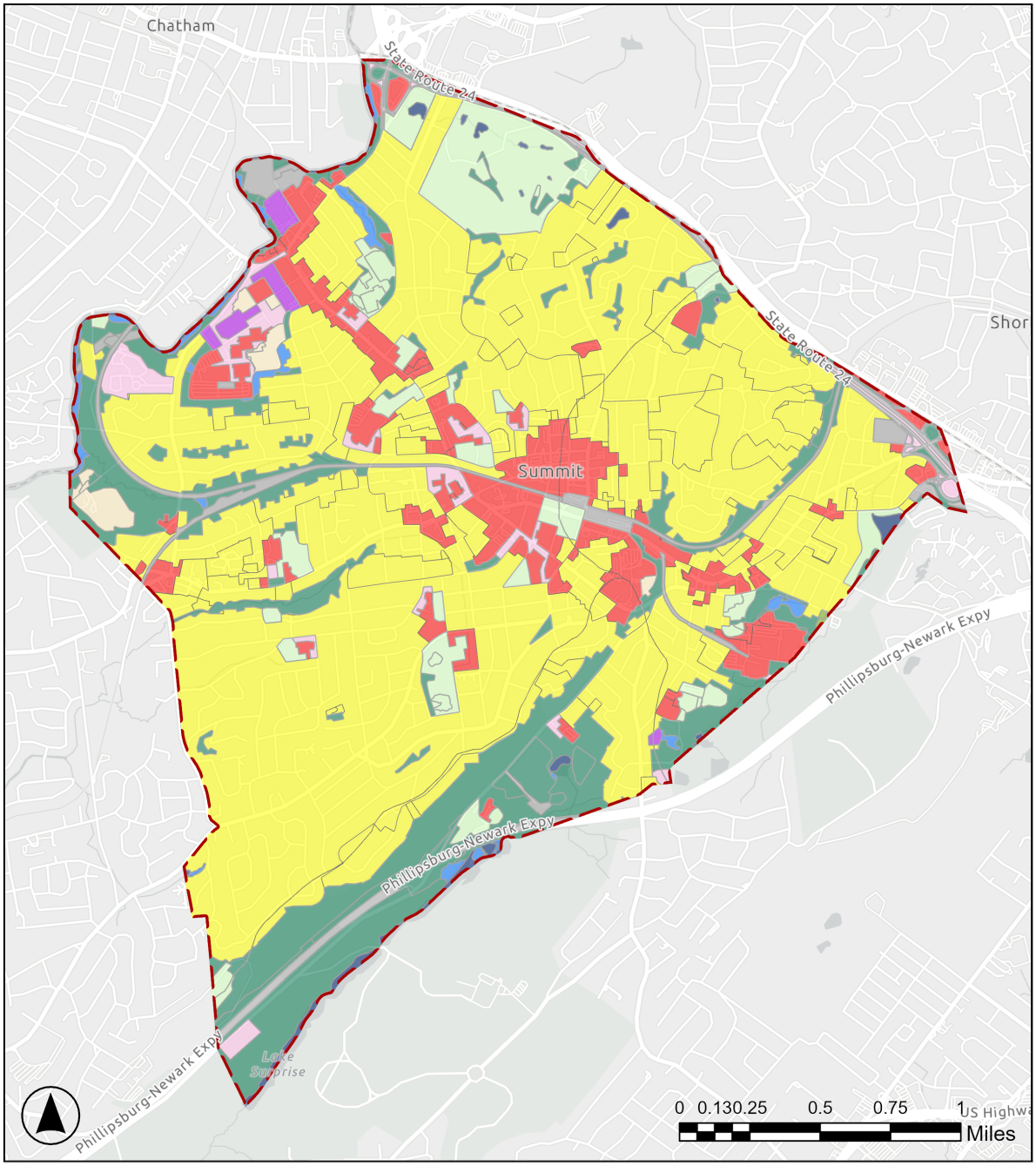
	New Jersey	County	City
Total population	9,267,014	557,549	22,512
Population density	1,260 people/mile^2	5,598.6 people/mile^2	3,790.3 people/mile^2
Population change (2020 to 2023)	+381,596	+2,341	+519
Median age	40.1	39.1	40.6
Population below 18	2,031,322	134,776	5,709
Population above 65	1,599,816	84,844	2,991
Median Household Income	$101,050	$101,963	$199,107
Persons in poverty	889,287	133,786	2,523

Land Uses

Summit is a suburban city characterized by dense residential neighborhoods and a central commercial spine. Almost 60% of its land area is occupied by residential land use, spread across almost the entire city, and apartment buildings that are concentrated near the commercial core of the city. Following residential, public property is the second significant land use in Summit covering 509 acres. This includes schools and other public buildings along with several recreational parks, sports fields, and forest land. Commercial activities are concentrated near the historic downtown along the Morris & Essex rail line and along Morris Avenue specifically in the northwestern edge of the city. Industrial land use is also concentrated on the northwestern edge of the town with a total area of 116 acres. Map A-2 depicts Summit's land use and land cover. Table A-2 and Map A-3 detail property parcels and classes.

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

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



LEGEND

Land Use and Land Cover 2020

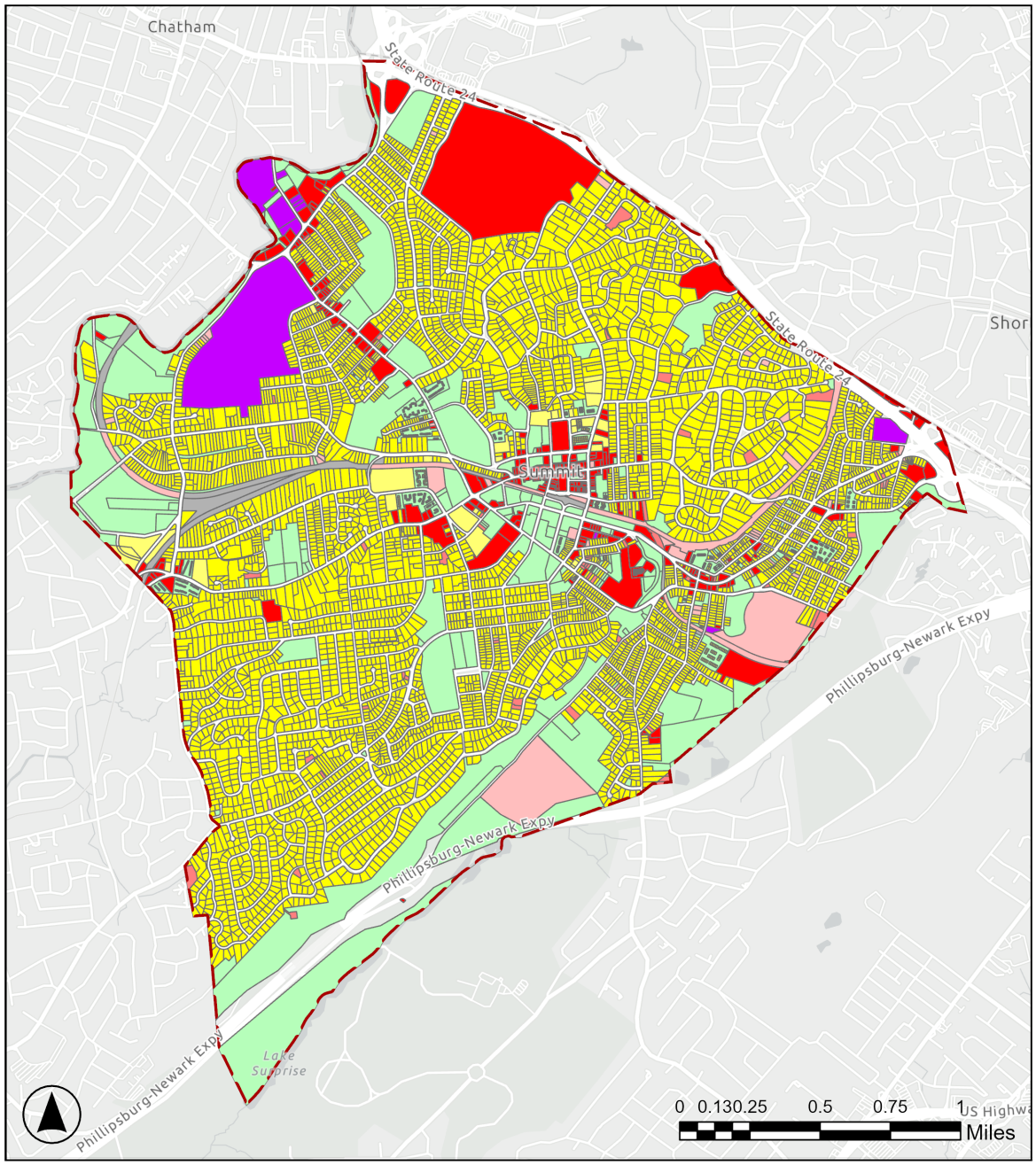
- Residential
- Commercial
- Industrail and Commercial
- Industrial
- Mixed or Other Urban
- Transportation, Communication and Utilities
- Recreational
- Agricultural
- Forestland
- Water
- Wetlands
- Barren Lands

Table A-2. Summit parcels by property class

Property class	Number of parcels	Area in acres
Residential (2)	6,245	1,861
Apartments (4C)	40	46
Commercial (4A)	345	273
Industrial (4B)	11	116
Education (15A and 15B)	14	102
Public Property (15C)	95	509
Church and Charitable (15D)	77	55
Cemeteries (15E)	1	23
Farmlands (3A and 3B)	-	-
Transportation (5A and 5B)	14	35
Other Exempt (15F)	55	44
Vacant Land (1)	61	23
Unclassified Land	73	122
Total	**7,031**	**3,210**

(Source: Parcels and MOD-IV Composite of New Jersey)

Map A-3. City of Summit parcels and property classes



LEGEND

PROP_CLASS

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

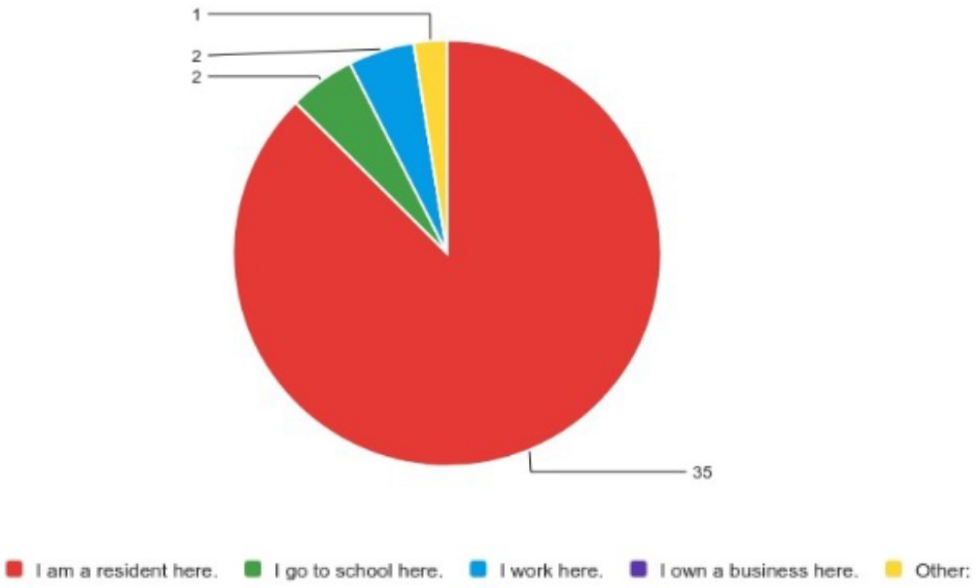
(Source: Parcels and MOD IV Composite of New Jersey)

Appendix B: Public Engagement Summary

The city advertised the CCRHVA public engagement opportunities through its municipal website and email starting on May 4, 2026. The in-person meeting was held on May 14, 2026, at city hall. 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, 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 two weeks from May 4 to May 18, 2026, and had 35 responses. Input from the in-person meeting and the survey was used to refine the hazard analyses and maps in Sections III and V.

Q1 – How would you describe your relation to City of Summit? Select all that apply. – Selected Choice

35 responses



Q1_5 Other: - Text

1 Responses

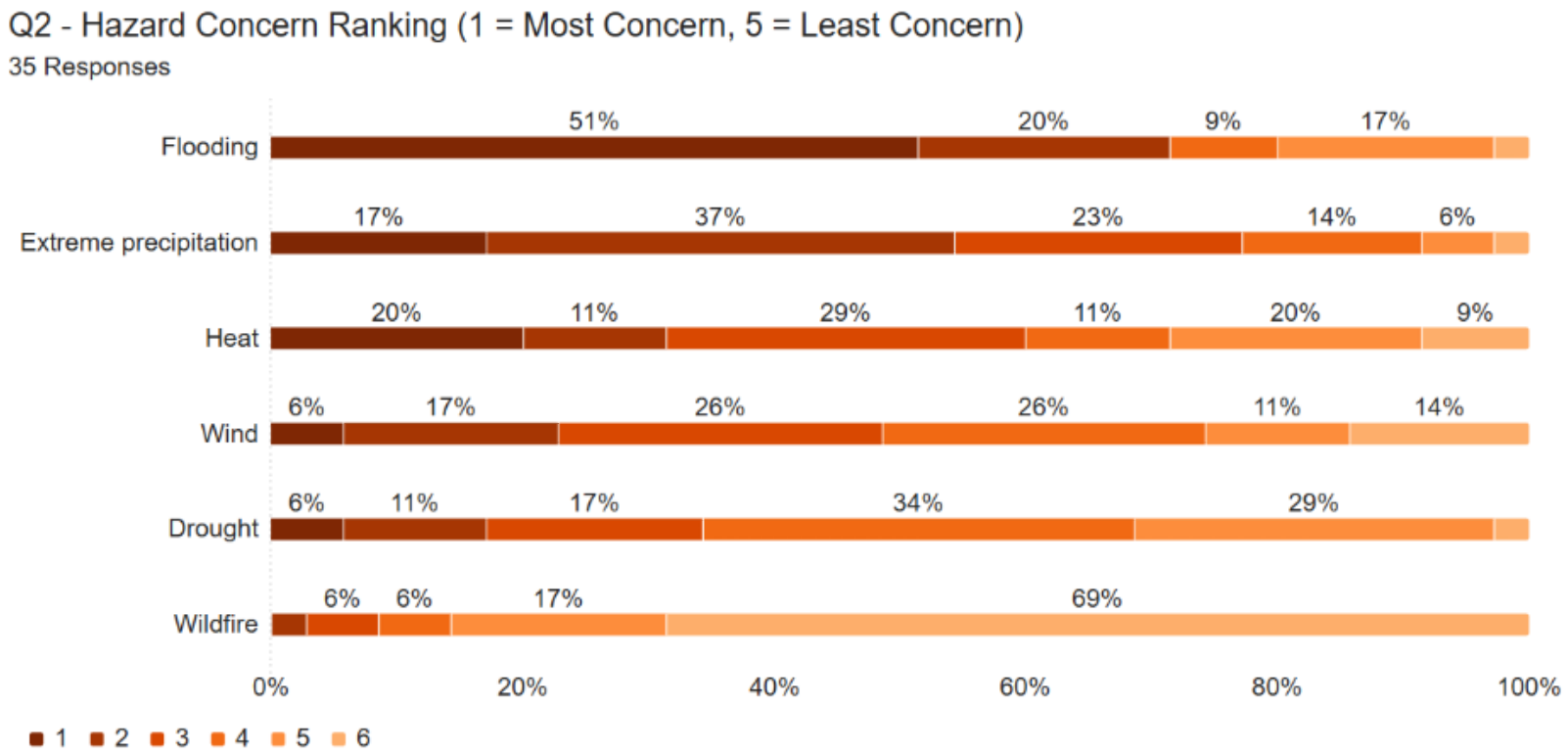
Volunteer for the city

Q2 - Rank each hazard according to your level of personal concern for Summit City, 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	2.29
2	Extreme Precipitation	2.63
3	Heat	3.26
4	Wind	3.63
5	Drought	3.77
6	Wildfire	5.43

Continued on next page


Q2 - Hazard Concern Ranking (1 = Most Concern, 5 = Least Concern)
35 Responses
Flooding
51%
20%
9%
17%
Extreme precipitation
17%
37%
23%
14%
6%
Heat
20%
11%
29%
11%
20%
9%
Wind
6%
17%
26%
26%
11%
14%
Drought
6%
11%
17%
34%
29%
Wildfire
6%
6%
17%
69%
0%
20%
40%
60%
80%
100%
1
2
3
4
5
6

Q3 - How frequently are you personally affected by these hazards in Summit City?

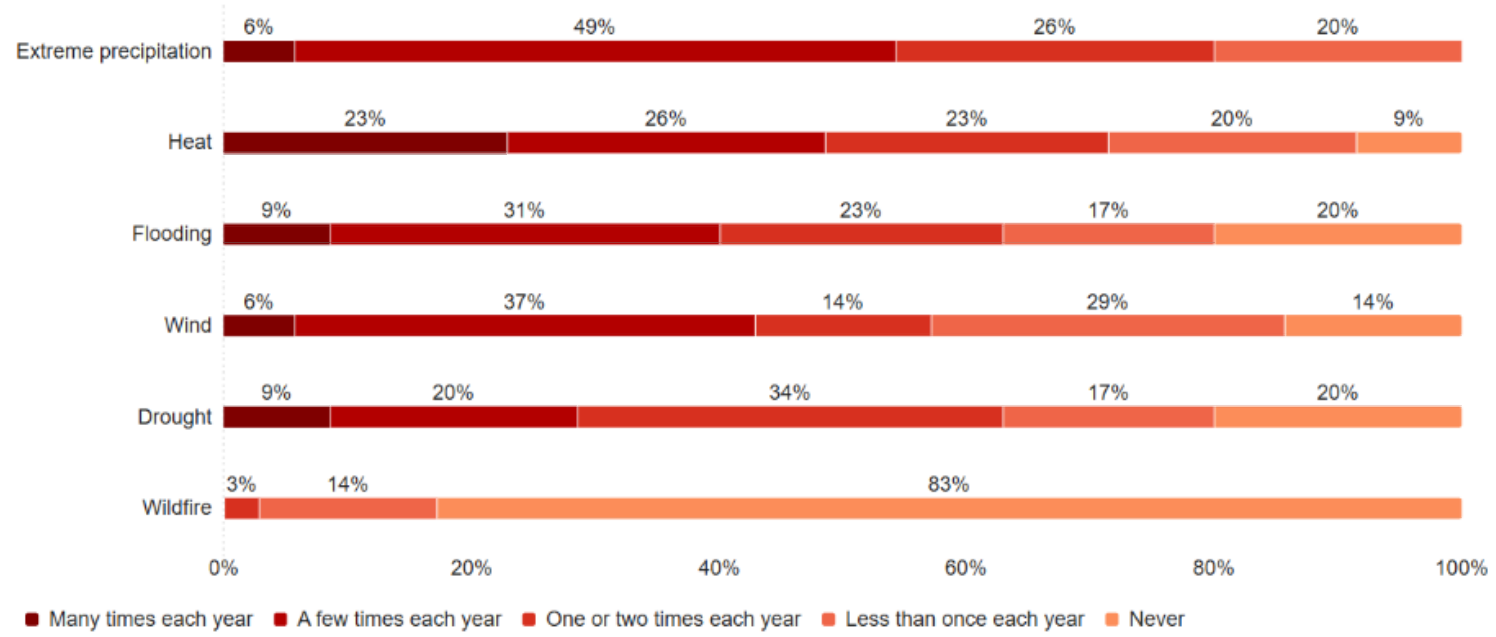
Note: Higher average indicates more frequently impacted. (Scale: Many times each year=5, A few times each year=4, 1 or 2 times each year=3, Less than once each year=2, Never=1).

Rank	Hazard	Average
1	Extreme precipitation	3.40
2	Heat	3.34
3	Flooding	2.91
4	Wind	2.91
5	Drought	2.80
6	Wildfire	1.20

Continued on next page

Q3 - How frequently are you personally affected by these hazards in City of Summit?

35 Responses



Q4 - Please share details below about up to three important places in Summit City. 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
St Theresa Church
Christ Church
Memorial Field / Soldiers Memorial Fields
Summit Train Station / New Jersey Transit Train Station
Springfield Ave Downtown Shopping Area
Village Green / Town Green
Summit Recreation Center / Rec Center
Public Schools / Jefferson Elementary
47–53 Shunpike Road
Downtown Summit / Downtown Area
Mountain Avenue
Watchung Reservation
Overlook Hospital / Overlook Medical Center
Briant Park

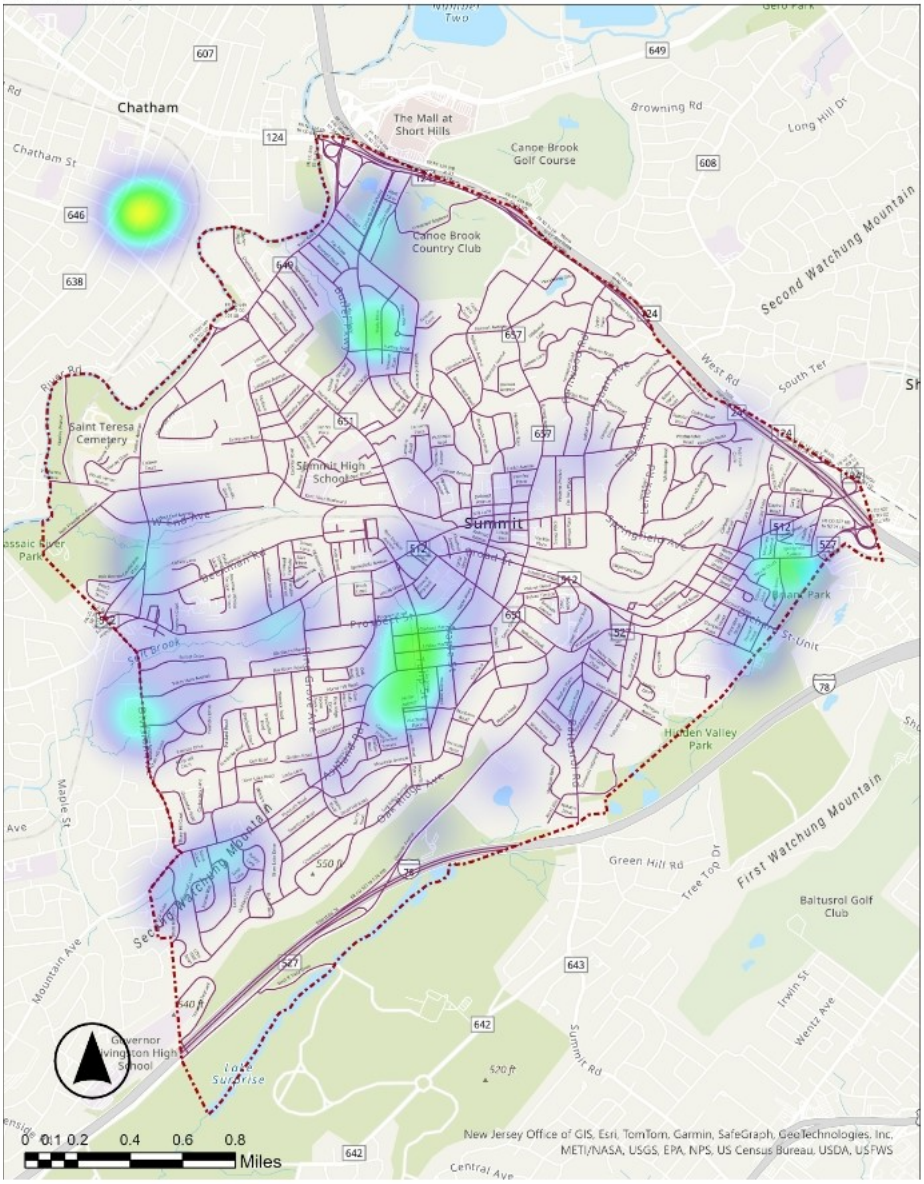
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Community Pool / Summit Family Aquatic Center / Aquatic Center
Summit YMCA / YMCA
Tiny Forest
Reeves-Reed Arboretum
Summit Municipal Golf Course
Glenside Field
Memorial Field Club House / Field House
Community Center
Parks / Sports Fields
Central Presbyterian Church
City Hall
Historic Buildings in Town
Butler Parkway
Grace Refrigerator

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

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 III-4.

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

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

Heat
I'm a volunteer for a Memory Cafe held at Christ Church. We have had to cancel our July and August gatherings due to extreme heat
High heat during the summer frequently occurs throughout Summit
2025
we have excessive heat every summer.
There have been some extreme heat waves - July 2025. I have not had a direct event related to heat.
various years, strain on power grid resulting in brown outs/ black outs.
Heat has definitely increased and for longer durations of time.
2025
Everywhere! Heat has caused drought which affects everyone’s yards
Many days that the heat index and humidity combined make it too hot to be outside. Some of the schools are not air conditioned very well in certain classrooms and they get so hot. Summer and into the early fall this is a problem.

Continued on next page

Every summer gets hotter
Have not noticed

Wind
High winds are consistently becoming a hazard. 2 years ago, we had a large tree that was damaged removed before it could fall on a house in high wind. Often high winds accompany rainstorms causing branches to fall and occasionally trees.
Large downed trees and branches throughout town. Various downed utility poles. Happens 2-5 times per year depending on number of storms with high winds.
December 2023 - trees blown down on Oakland Place
Winds have become stronger
We had a microburst in 2019 or so that took down trees and damaged our neighbor's fence.
October 2011 wind and freezing rain took out electric lines and we were without electricity for 2 weeks. There was an another wind and rain episode within a couple years where we were without electricity for 10 days. I can't remember dates.
various years, knocked down trees, power lines, 7+ days without power. Downed electrical dangers.
Wind and storms are concerning because they have increased in intensity. Tornado watches and warnings are more regular when they used to not exist in this area of the country.
2025
Everywhere! It rattles the shutters on our house. Our old house was a wind tunnel!
Wind can be such an issue with all the trees here and above ground wires. Would be better if we had buried utilities. We have had downed wires by our house.
periodic windstorms - our home is surrounded by large mature trees, so we worry.

Drought
Our garden plants feel the impact of summer drought.
Drought in 2024 with dry leaves everywhere during fall.
Seems like we are constantly in drought conditions - the past 4-5 summers
Throughout the region during the Summer of 2025
we have a drought every summer.

Continued on next page

The droughts over the past few years have required additional watering of newly-planted trees.(Summer 2022; October 2024; October 2025)
The past few years have had drought conditions (I believe) in the fall. It's kind of remarkable with the monsoon-like rains we have in the summers, but still there's been drought.
2025
Everywhere! (See above)
2025 there was a big drought year which led to water restrictions and wildfires that were near Summit during the spring and early summer.
more frequently. We are still in one now.
Affected trees, plants and grass

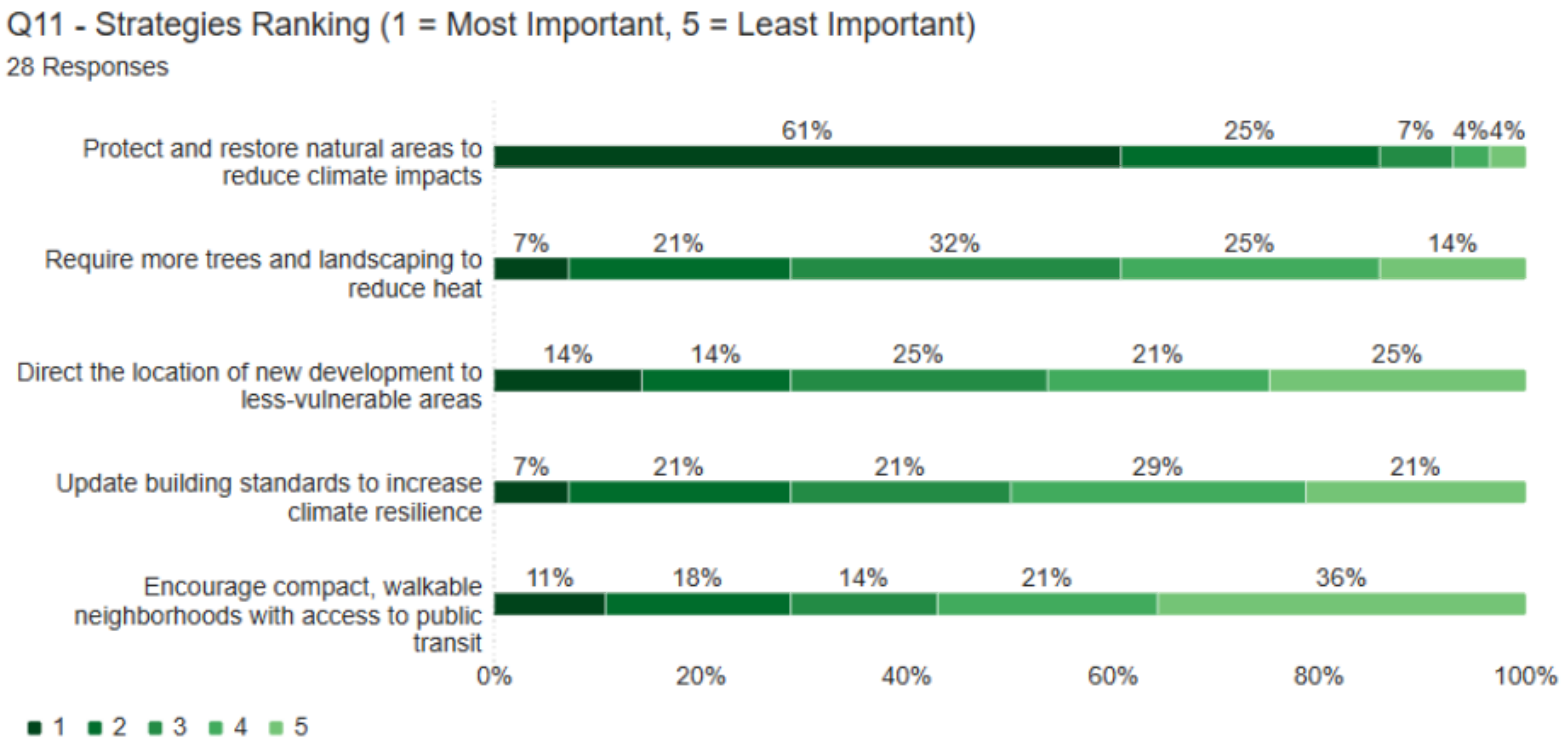
Wildfire
Fortunately, we have not had wildfires in our area. However, the last 2 years we have had smoke from Canadian wildfires making it necessary to stay indoors
Smoke from wildfires in Western US and Canada covered the region with dense smoke during the summer of 2025 and previous summers
There were wildfires reported off I-78 last summer near Summit.
Smoke from the Canada wildfires a few years ago was horrible, and I believe there were also wildfires in New Jersey at times.
2024 Canada
Wildfires in 2025 near Summit but not in Summit. 2026 has seen some New Jersey wildfires already.
I fear this is an under-appreciated risk in Summit, given wildfires in other areas of northern New Jersey. It hasn't happened here yet, but many parts ofsaare heavily wooded.
Have not seen fires.

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 rank = higher priority.

1	Protect and restore natural areas to reduce climate impacts	1.64
2	Require more trees and landscaping to reduce heat	3.18
3	Direct the location of new development to less-vulnerable areas	3.29
4	Update building standards to increase climate resilience	3.36
5	Encourage compact, walkable neighborhoods with access to public transit	3.54

Continued on next page


Q11 - Strategies Ranking (1 = Most Important, 5 = Least Important)
28 Responses
Protect and restore natural areas to reduce climate impacts
61%
25%
7%
4%
4%
Require more trees and landscaping to reduce heat
7%
21%
32%
25%
14%
Direct the location of new development to less-vulnerable areas
14%
14%
25%
21%
25%
Update building standards to increase climate resilience
7%
21%
21%
29%
21%
Encourage compact, walkable neighborhoods with access to public transit
11%
18%
14%
21%
36%
0%
20%
40%
60%
80%
100%
1
2
3
4
5

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

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/apps/mapviewer/index.html?webmap=9f8adca918b0467bbcf74f5c06918e22

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

Map III-5. Areas potentially subject to the Inland Flood Protection Rule – https://services1.arcgis.com/ze0XBzU1FXj94DJq/arcgis/rest/services/NJ_FEMA_FP3_4_9_2024/FeatureServer

Map III-6. Wildfire risk to potential structures and select historic wildfires - NJ Wildfire Risk Explorer and Wildland Fire Incident Locations | National Interagency Fire Center