

Heat Island Assessment and Mitigation Verona, Essex County, New Jersey



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November 2023

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VERONA** 
Creating a Greener Community

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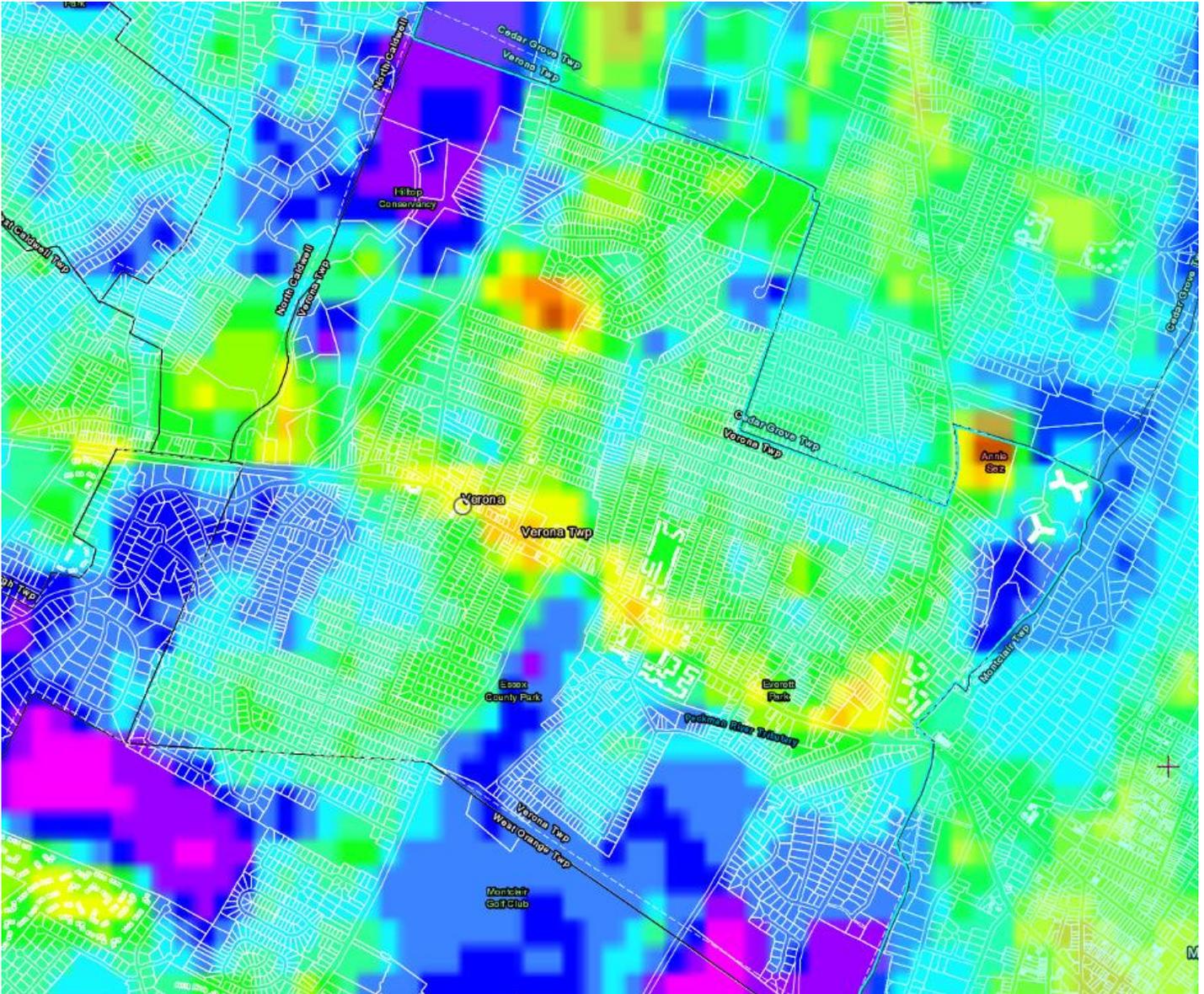
EPA Heat Island Community Actions Database

Executive Summary

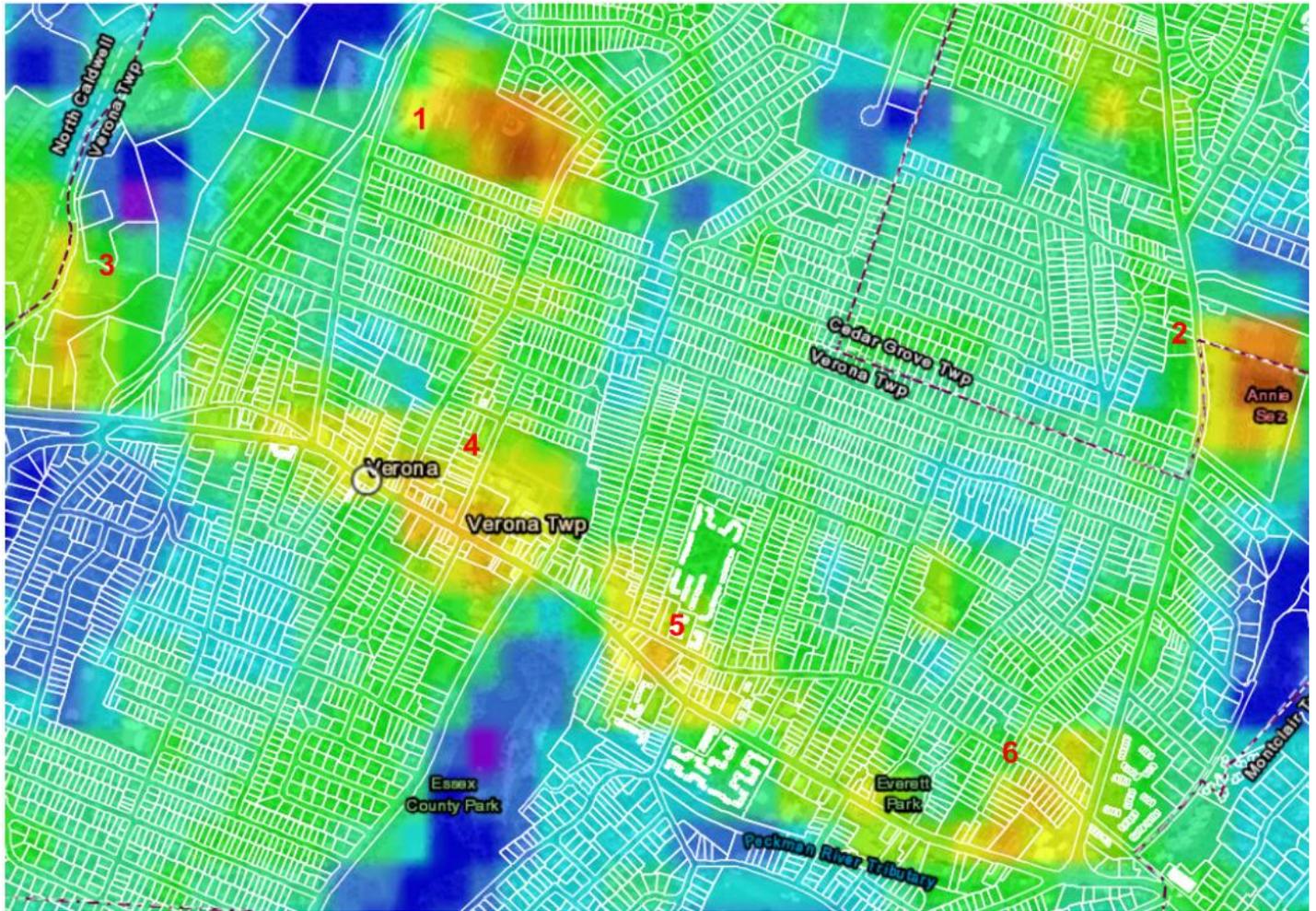
This report is an assessment of the Urban Heat Island Effects experienced by Verona, New Jersey. The Urban Heat Island Effect is the localized increase of temperatures due to the type of infrastructure or activities present. Dark hardscapes that absorb solar radiation and lack of vegetation are the primary causes of this temperature rise. Higher temperatures in turn have a negative impact on the local public health and quality of life, and add to the energy demand for cooling in the summer months. Presently, there are 6 areas of concern or "hotspots", with 2 locations being most critical. These two have been further evaluated with recommended mitigation strategies. The assessment and mitigation strategies will be shared with the Verona planning board to achieve at least 10 points from the Sustainable Jersey certification program. This assessment can also be used to meet new MLUL requirements for the Land Use Element of Verona's Master Plan.

Tier 1: Heat Island Assessment - Maps and Inventory

This section contains the New Jersey Heat Island Map developed by Sustainable Jersey. The first two maps show land surface (horizontal surfaces such as land, buildings, and parking lots) temperature generated by Landsat 8 satellite imagery from 2022 (the second one is zoomed in to the labeled hotspots). Dark blue and purple represent the coldest temperatures, whereas dark orange and dark red represent the hottest temperatures. There are 6 areas identified as “hotspots” in Verona. The first two locations are the highest areas of concern.

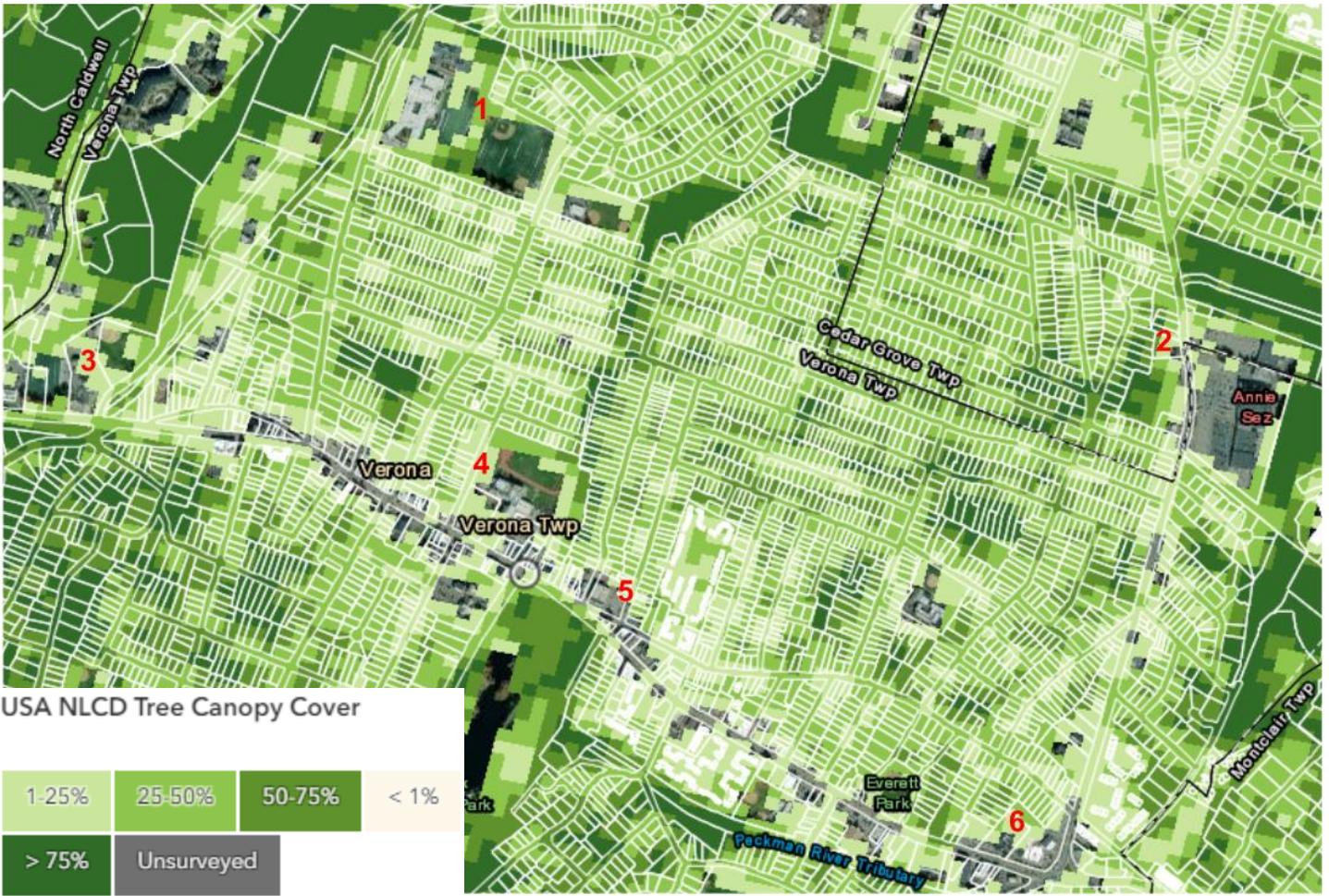


Verona, New Jersey Land Surface Temperature (LST) Map



Verona, New Jersey Land Surface Temperature (LST) Map with Labeled Hotspots

The next two maps with their legends show the tree canopy layer and the SVI (Social Vulnerability Index) layer of Verona. Comparing these maps with the land surface temperature map, you can see the hot spots correlate to “unsurveyed areas” since these areas are mostly hardscapes. In addition, the SVI assesses the area’s ability to prevent human suffering and financial loss in a disaster by factoring items like poverty, access to transportation, and crowded housing. In general, Verona has a low vulnerability, and the hot spots are evenly spread between the areas with the lowest vulnerability and those in the next highest level.



Verona, New Jersey Tree Canopy Cover Map



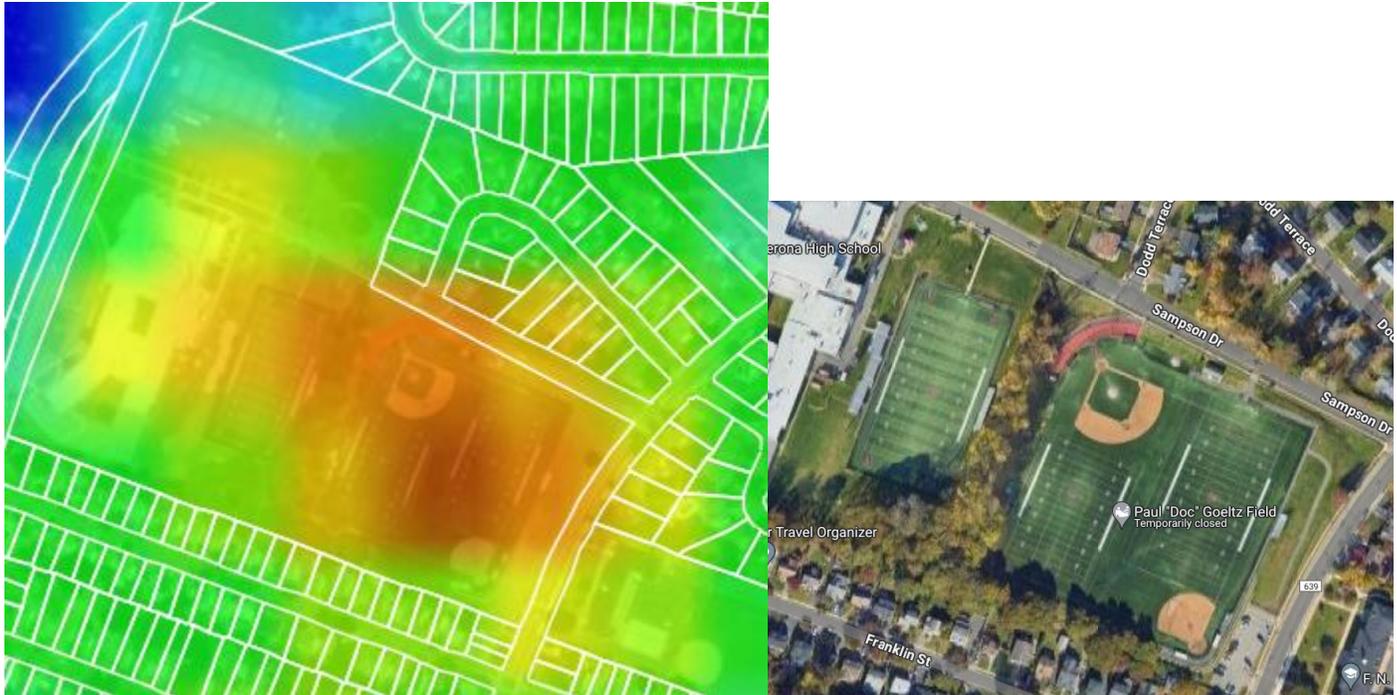
Verona, New Jersey Social Vulnerability Index Map

The below table is a hotspot inventory summarizing the information from all three maps, and corroborated by field visits.

Hotspot #	Color	Address	Type	Tree Canopy Coverage	Overall SVI Score
1	Red	Sampson Drive	Highschool Artificial Turf Field	<1%	<0.25
2	Red	265 Pompton Ave	Strip Mall	<1%	0.25-0.50
3	Orange	Bloomfield Avenue	Municipal Artificial Turf Field	1-25%	<0.25
4	Orange	Bloomfield Avenue	Municipal Town Center	1-25%	<0.25
5	Orange	Bloomfield Avenue	Parking Lot	<1%	0.25-0.50
6	Orange	Bloomfield Avenue	Strip Mall	<1%	0.25-0.50

Tier 2: Heat Island Mitigation Plan

Hotspot 1 - Paul "Doc" Goeltz Field at Verona High School



Hotspot 1 LST Map and Satellite View

Hotspot 1 represents the Verona High School Paul "Doc" Goeltz field. It is roughly a 500' x 500' recreational field with artificial turf. There are some trees around the west and south perimeter of the field, but their shade only reaches a small quadrant, and does not provide protection to a majority of the users.

Artificial turfs, due to their plastic makeup, absorb high amounts of solar energy and can become extremely hot in the summer. A study conducted by Penn State University Center for Sports Surface Research found maximum surface temperatures of artificial turf fields during full sun can average between 140 to 170 degrees F. These high surface-level temperatures can lead to dehydration, burns or blisters, as well as heat stroke.

As an example, below is a surface temperature reading taken on 7/29/2023 at 2:15PM, located at the Goeltz Field intersection of the 50-yard line and endline of the girl's softball field. The air temperature was approximately 90 degrees F, however the surface temperature of the artificial turf was measured at 130 degrees F.



Hotspot 1 LST Reading on 90 Degree Day

Not only does the extra heat generation cause a health concern to the users of the field, but the toxicity is also a documented issue. Compounds such as polycyclic aromatic hydrocarbons (PAHs) and Volatile Organic Compounds (VOCs) are found in the crumb rubber of typical artificial turfs.

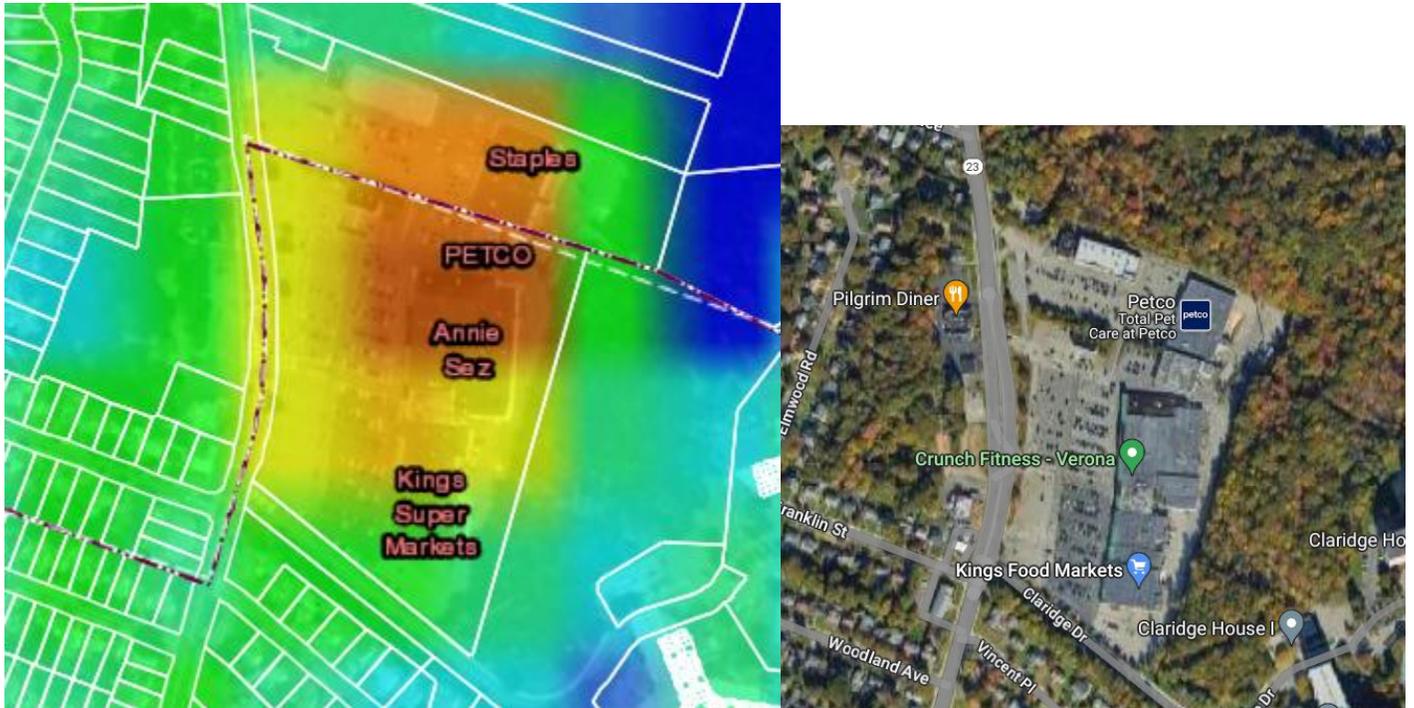
Mitigation Strategies for Hotspot #1 (Goetz Field):

- A) Installation of Trees - Trees should be added to the North and East perimeters of the field. Verona applied for grant funding via the New Jersey Department of Environmental Protection (DEP) with proceeds from the Regional Greenhouse Gas Initiative (RGGI) - for 6 large trees but received a response that the funds were exhausted. Verona will continue to apply for funding for trees for this area of land.

- B) Installation of canopies - Removable canopies can be installed to provide more shade on the fields as needed. These canopies should cover more vulnerable areas such as the player dugout/bleachers and where spectators sit to view a game. There is a possibility these canopies can also run down the middle of the field to provide extra coverage.

- C) Turf cooling - options of watering the fields down or purchasing a product like TCool.
- D) Restrict use of artificial turf - use of artificial turf in future development and maintenance projects should be restricted. Verona should consider the use of a natural turf system that is durable, low maintenance, and drains well.
- E) Restricted use for Health Safety - One of the first steps to take is to have someone regularly monitor the temperature levels at the surface of the sports field when it's scheduled for use on hot days. It's also helpful to post signs to alert parents and players to avoid using the field during times of high heat. Many park and rec agencies and school systems, like New York City Parks and Montgomery County Public Schools (MCPS) in Maryland, are already on board with this recommendation put forth by the Safe Healthy Playing Fields Coalition. MCPS developed the following heat guidelines that apply to and are posted at all its artificial turf fields:
- Anytime the outdoor temperature exceeds 80 degrees, coaches exercise caution in conducting activities on artificial turf fields.
 - When outdoor temperatures exceed 90 degrees, coaches may hold one regular morning or evening practice (before noon or after 5 p.m.).
 - When the heat index is between 91–104 degrees between the hours of noon and 5 p.m., school athletic activities are restricted on artificial turf fields to one hour, with water breaks every 20 minutes.

Hotspot 2 - Pilgrim Shopping Plaza



Hotspot 2 LST Map and Satellite View

Hotspot 2 represents the Pilgrim Shopping Plaza. It is roughly a 700' x 1200' strip mall with a large asphalt parking lot and buildings with dark roofs. There are trees around the north, east, and south perimeter of the plaza, but their shade only reaches a small area, and does not provide protection to a majority of the users.

Dark roofs and large asphalt parking lots are common causes of hotspots. Darker colored materials absorb more solar radiation and generate more heat. In addition, hot roofs increase the indoor temperature of a building which adds to the energy consumption during summer months. The Verona New Jersey Sustainability Committee has attempted to reach the owners of the Pilgrim Shopping Plaza to bring awareness to this hotspot and to discuss possible easy solutions.

Mitigation Strategies for Hotspot #2 (Pilgrim Plaza):

- A) Increase albedo - Albedo is the amount of solar radiation reflected from an object or surface. This is inversely proportional to how much heat gets absorbed and trapped in the localized area. Lighter colors have higher albedo. Simply painting the roofs white, using lighter color pavements, or adding reflective material will increase the albedo and reduce the Heat Island Effect.

B) Green Infrastructure - There are opportunities within the parking lot to plant vegetation and trees. The picture below shows existing drainage areas that are small for the space with minimal vegetation. Not only will this provide needed shade, but adding green infrastructure can improve the natural drainage and water runoff capture of the area. Pervious pavement could be included to aid in water drainage/capture. In addition, breaking up the large asphalt parking lot with green infrastructure elements (with naturally higher albedo) will allow the trapped heat to escape more efficiently.



Hotspot 2 Poor Green Infrastructure

C) Awnings - Awnings over the store fronts would at least block the sun from hitting the concrete walkway between the parking lot and the store fronts. They'd also keep the sun from flooding into the store windows. Some of the businesses don't want pull-down shades because they prefer customers to see into their stores.

Conclusion

One may think that Heat Islands would only appear in urban cities but they are a cause for concern in Verona as well. With the rise in extreme temperatures we are witnessing, Verona should consider mitigation plans for the 2 current hot spots, the 4 'orange' spots (that have increased in a 6-year period), and any future development plans. Special consideration should be given to vulnerable populations in relation to extreme heat. The Town Council should be made aware that these hot spots exist and any other governing bodies, including sports organizations. This report will be shared with the Board of Education.

Sustainable Verona recommends implementing some of the recommended mitigation strategies outlined in this report. It is recommended to start with Hotspot #1 since Verona has control over the space. The committee will continue to reach out to the owners of the Pilgrim Shopping Plaza. The committee recommends exploring and implementing alternatives to artificial turf, incorporating green infrastructure, and increasing albedo for any future maintenance and development projects.