

CUMULATIVE AND SECONDARY IMPACTS

Introduction

As part of the S&RCC project, secondary and cumulative impacts of projected growth associated with center designation were evaluated. Although such assessments are often performed in conjunction with development and transportation projects under federal and state laws stemming from the National Environmental Protection Act (NEPA), there are no universal methodologies for determining potential secondary impacts that might relate to zoning and/or long-range planning. To undertake this assessment, the project team reviewed processes and the intended purpose of evaluations used in other states, and studied several different assessment reports. Given the project's scope and focus on coastal hazard risk, the primary impacts considered for this assessment were those that concentrated on coastal ecosystems and environmental characteristics. Specifically, the planning team evaluated how increases in impervious surface related to changing development might affect: water quality; environmentally sensitive areas¹ and ecological resources; stormwater quantity and quality; marsh migration; and, the potential change in risk of coastal hazards. These metrics reflect NJDEP's existing policies, assessment measures applied by other states that require programmatic impact assessments, and the critical issues identified through the S&RCC project.

In order to determine how this analysis may be integrated into the plan review and endorsement process, the project team evaluated Toms River's proposed CAFRA Center boundary that had been accepted for plan endorsement. This boundary includes a collection of corridors and nodes on the township's mainland. It does not include the barrier island areas because these centers were not included in the township's submission since their designation does not expire. Five areas were analyzed: Environmentally Sensitive Areas (ESA); impervious surfaces; water quality; marsh migration; and risks associated with future coastal storm events. This analysis of the methodology was performed to determine if it 1) provided insightful and useful data on the potential impacts of intensifying development in certain areas; 2) could be performed effectively by municipalities of varying sizes and capabilities; and, 3) needed additional data, resources, or research to be an effective planning tool for use by the state. The results for the Toms River analysis is described below.

Environmentally Sensitive Areas

Toms River Township's ESAs and ecological resources (ERs) include forests, wetlands, critical environmental sites, and areas that provide habitat for threatened and endangered animal species. These data, compiled and published by NJDEP, are illustrated in the maps accompanying this narrative.

The land area of the township is extensively developed, but there are a few preserved areas, including Cattus Island County Park. Approximately 11% of Toms River's remaining ESAs and ERs are encompassed within the boundaries of the CAFRA Center, including one of the largest patches of contiguous forest, found on the *Ciba-Geigy* Chemical Corporation superfund site. Approximately 48 percent of the remaining forested land in the township lies within the center boundary. About one-third of the center's total acreage is covered by forest. These statistics suggest that the newly approved center boundary will likely increase the total amount of impervious cover in the township and could considerably reduce the municipality's existing tree canopy.

The Toms River, which traverses the township, is surrounded by forest, wetland, and potential vernal habitat and contains segments of Category One waters including Trout maintenance waters². Although current state regulations mandate buffers around all wetlands and Category One waters, it is important to identify them because they may still be impacted by adjacent development. Point Island and Mosquito Cove on Cattus Island are designated as Barnegat Bay ecologically sensitive areas where unique aquatic vegetation, wildlife and numerous aquatic species are found. All of the bay waters within

¹ Consistent with the Water Quality Management rules, environmentally sensitive areas include forests, wetlands, T&E species, CAFRA critical environmental sites and riparian zones.

² Category One waters is defined in the existing [Surface Water Quality Standards rules](#) at N.J.A.C. 7:9B-1.4

Toms River support rare or endangered species. Rare plant species can also be found in a portion of the CAFRA Center, proximate to the mouth of Toms River, as well as the two small CAFRA Centers on the North-Eastern portion of the mainland.

The project team also considered how changing the development patterns within the township may affect habitat connectivity across the natural landscape. This is important because, in addition to other benefits, existing contiguous vegetation supports genetic diversity and allows for safe movement of animals through the community. Habitat fragmentation is a driver of population fragmentation and ecosystem decay.

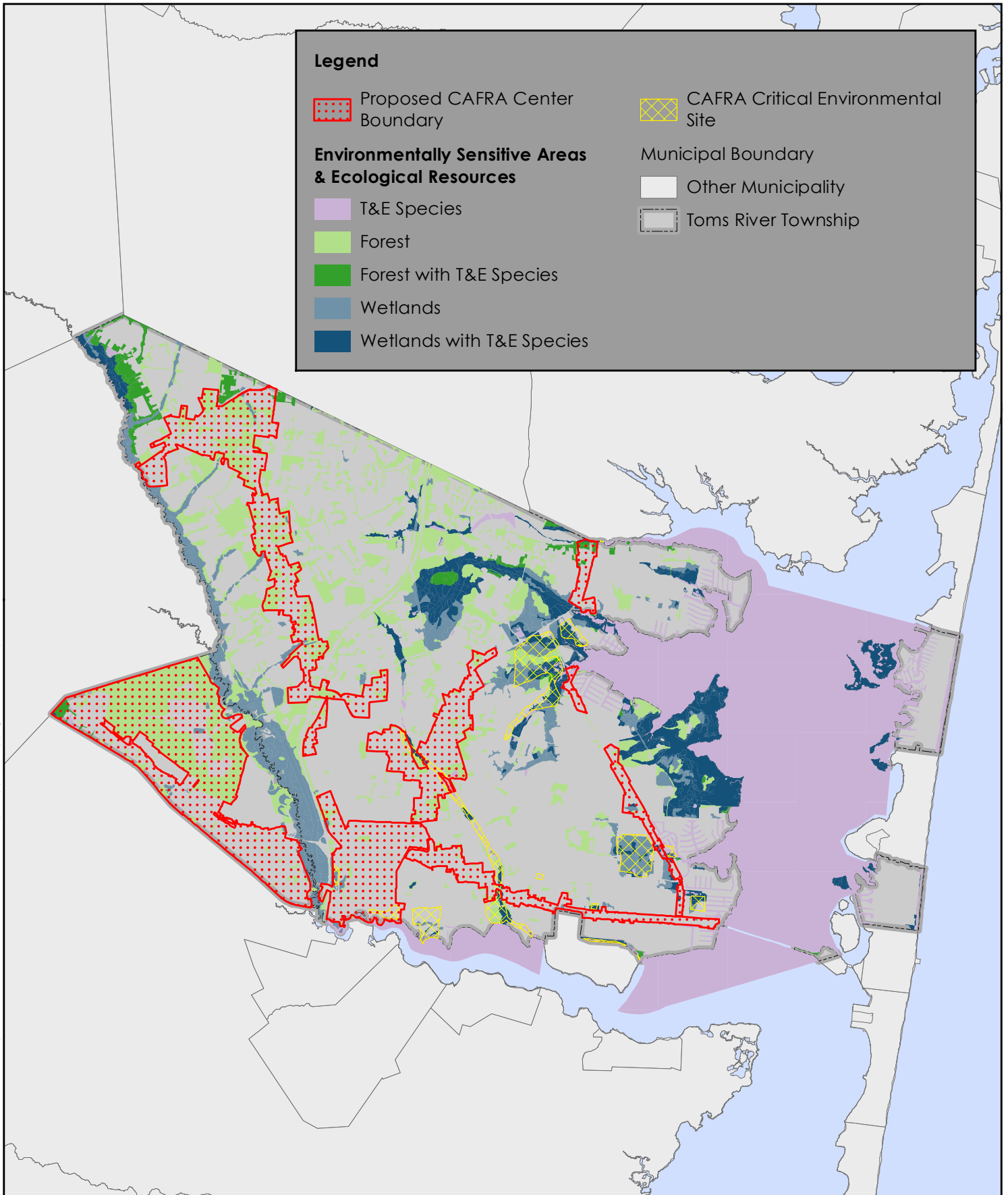
One portion of Toms River's CAFRA Center divides the township on a North-West/South-East axis around Route 9. Development in this location would eliminate many small forest patches, adversely affecting landscape-level ecosystem connectivity between coastal and inland areas of Toms River. Data is not available to indicate which animals may be affected by such increased fragmentation.

*Table 1
Environmentally Sensitive Areas and Ecological Resources Acreages.*

ESA/ER Class	Acres Within CAFRA Center	Percent of CAFRA Center	Acres Within Toms River Township
Supporting State Threatened Species	58	1.04%	1,820
Supporting State Endangered Species	21	0.37%	8,080
Wetlands (2012)	77	1.37%	4,555
Forest (2012)	1,665	29.73%	3,464
CAFRA Critical Environmental Sites	61	1.09%	643
Supporting Rare Plant Species	345	6.17%	4,915

Note: The CAFRA Class overlap is not accounted for in the area totals provided above. Excluding environmentally sensitive areas, Toms River's CAFRA center encompasses 5,600 acres (not including the barrier island portions) and the Township's municipal boundaries encompass 33,716 acres (including waterbodies (bays and streams).

Data from the Natural Heritage Program indicated that portions of the designated center contained a grid suggesting the presence of a rare plant. However, these data were not shown on the Environmentally Sensitive Areas & Ecological Resources map included with this narrative because the locations of these flora are withheld from the public data to protect the species. However, because the mapping is generalized, including Heritage Program data as an ESA may exclude land that is appropriate for dense development. Therefore, it is recommended that the township initiate a Natural Heritage Program inquiry to establish the final proposed boundary. Through this inquiry the municipality will be supplied with a list of species that have been sighted within the boundaries of the proposed ESA. From that list, the township can confirm if any habitats for thriving rare plants would be jeopardized by intensified development within the proposed boundary. In such event, NJDEP should work with the municipality to either modify the boundary or review the township's existing regulations to ensure that any proposed development or redevelopment project would not adversely impact the rare flora within the CAFRA area. Although CAFRA permitting protects these plants from major development, the permits do not address all development projects within a designated center (e.g. single-family residential



**ENVIRONMENTALLY SENSITIVE
AREAS & ECOLOGICAL RESOURCES**

CUMULATIVE AND SECONDARY IMPACTS ANALYSIS
SUSTAINABLE & RESILIENT COASTAL COMMUNITIES REPORT
TOWNSHIP OF TOMS RIVER
OCEAN COUNTY, NEW JERSEY



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NOTES:
1. 2016 center boundary provided by Office for Planning Advocacy.
2. Environmentally Sensitive Areas & Ecological Resources determined using data obtained from NJDEP GIS website: www.state.nj.us/dep/gis/
3. Municipal boundaries obtained from New Jersey Geographic Information Network (NJGIN).

0 4,250 8,500 Feet

Map Projection: NAD 1983 StatePlane New Jersey FIPS 2900 Feet

development). Therefore, it may be appropriate for the township to consider more stringent review standards in areas that are included in the Natural Heritage Program Database.

Impervious Surfaces

One of the anticipated impacts of center designation is the likely increase in impervious surfaces within the area slated for development. To ascertain the extent of such increase, the project team reviewed data on the existing impervious surfaces within the center boundary and then estimated how much such coverage could increase under a maximum development scenario. As of 2012, there were approximately 2,132 acres of impervious surface within Toms River Township, according to NJDEP Land Use/Land Cover GIS data. Approximately 1,321 acres of existing impervious surface are located on lots that have already reached or exceeded CAFRA's 80% coverage limit. Assuming the entire center is covered to the CAFRA 80% maximum impervious surface under build-out conditions, the amount of impervious surface cover would more than double to 4,631 acres. Increases in impervious surfaces have been associated with increased stormwater runoff, pollutant loading, water temperature, and as a consequence, water quality degradation.

Water Quality

Although impervious surface acreage can be used as a surrogate for water quality, if possible it is best to compare existing land uses to projected land uses to evaluate how nutrient loading and water quality may be impacted. Although the township is largely developed, development density could be increased and expanded under current zoning.

The township's zoning regulations establish residential, commercial, and industrial zoning districts. Most of its residential zones have been excluded from the center designation because CAFRA regulations do not apply to single-family homes. Currently, one of the most underused zoning classes within the center boundary is the industrial zone. The largest contiguous industrial zone overlaps with a large patch of contiguous forest area on the Ciba-Geigy Chemical Corporation superfund site. Potential re-development of this site could result in a significant decrease in forest cover within the CAFRA Center.

Business and commercial zones also make up a significant portion of the township's CAFRA Centers zoning. Development within these zones can adversely affect water quality by introducing high amounts of impervious surface cover typically associated with business and/or commercial uses.

Table 2.
Unit Areal Loading Model Results

	TSS (Kg/Yr)	TN (Kg/Yr)	TP (Kg/Yr)
2012 Land Use	2,412,915	15,461	2,122
Zoning Buildout Land Use	3,636,279	20,156	2,996
Increase in Loading with Buildout	1,223,364	4,695	875
Percent Increase in Loading with Buildout	50.7%	30.4%	41.2%

For the purposes of this study, areas within the center boundary were assumed to be "built-out" to the maximum extent possible under current zoning. Under buildout conditions, total suspended sediment (TSS) loading is expected to rise approximately 50%, total nitrogen (TN) loading approximately 30%, and total phosphorous (TP) loading approximately 40%. Although this analysis does not account for the stormwater management requirements that will likely be imposed under state regulations, it does suggest that water quality may continue to be a concern in the region as development intensity

increases. The fact that not all development is subject to water quality management rules adds to that level of concern.

Marsh Migration

In addition to the impacts of development on impervious surfaces, water quality, and environmental resources, the project team examined methodologies to evaluate potential impacts of development on the ability of marshes to migrate inland. This is a new area of scientific study and an emergent concern for areas with rising sea levels. The project team looked for examples of geospatial tools and approaches that model undeveloped upland areas that may have the capability to accommodate salt marshes as sea levels rise.

The Maine Geological Survey developed a tool that could be used to model these conditions and help plan for future coastal hazards. The Maine Geological Survey Highest Annual Tide tool uses tide predictions to identify the highest annual tide along the coast. The highest annual tide (HAT) represents the most inland extent where salt marshes could thrive. The HAT line modeled with sea level rise suggests where marshes will try to move inland as water levels rise, if they are not hindered by upland development. Modeling marsh migration in the state may allow communities to prioritize conserving coastal upland areas that could support marshes in the future.

Unfortunately, due to limited back bay tidal fluxes and coarse topography data, the tool was limited in terms of what it could accurately map for Toms River Township. However, in other locations around the state the tool may be very useful and applicable. Given the level of technical knowledge required to perform this analysis and the importance of consistency in methodology and assumptions, it is recommended that this analysis be conducted by analysts at NJDEP for the state. If the HAT line for the state can be established, it may be useful to require communities to consider the potential future salt marsh extents when preparing land-use and development plans.

Proximity to Coastal Hazard Zones

The last metric considered in this secondary impacts analysis was the potential effect of the proposed center on risk. In Toms River, the vast majority of the proposed center is located outside of the defined coastal hazard zones created for this S&RCC project (Table 3, Figure 3). The 0.2 percent flood zone in 2050 would put approximately 5.6% of the CAFRA Center at risk.

While only 0.16% of the CAFRA center will be within the Mean Higher High Water (MHHW) tide range in 2050; this land may be inhabitable in the future due to the frequency of flooding. The greatest overlap between the CAFRA center boundary and the modeled risk zones is found in downtown Toms River (see Coastal Hazards Zones Map). If this boundary line remains unchanged, the Township's economy may be more vulnerable to disruption from storms if that area does not account for potential changes in future storm risk. The FEMA V zones were not used for this study because New York City successfully appealed FEMA's 2015 Preliminary Flood Insurance Rate Maps. Until the map revisions, which are presently underway, are completed, the extent of the zone boundaries remains uncertain. However, since the township is seeking to develop a dense downtown within the coastal floodplain, it would be prudent to consider the potential impacts of wave action within the CAFRA center.

This analysis was undertaken to identify areas within the designated CAFRA center that may experience higher risk in the future in order to limit development in zones most likely to undergo flooding from high tides, such as land subject to MHHW. Another objective of the analysis is to highlight those areas that may benefit from additional risk planning and mitigation efforts.

*Table 3.
Coastal Hazard Zones within the CAFRA Center*

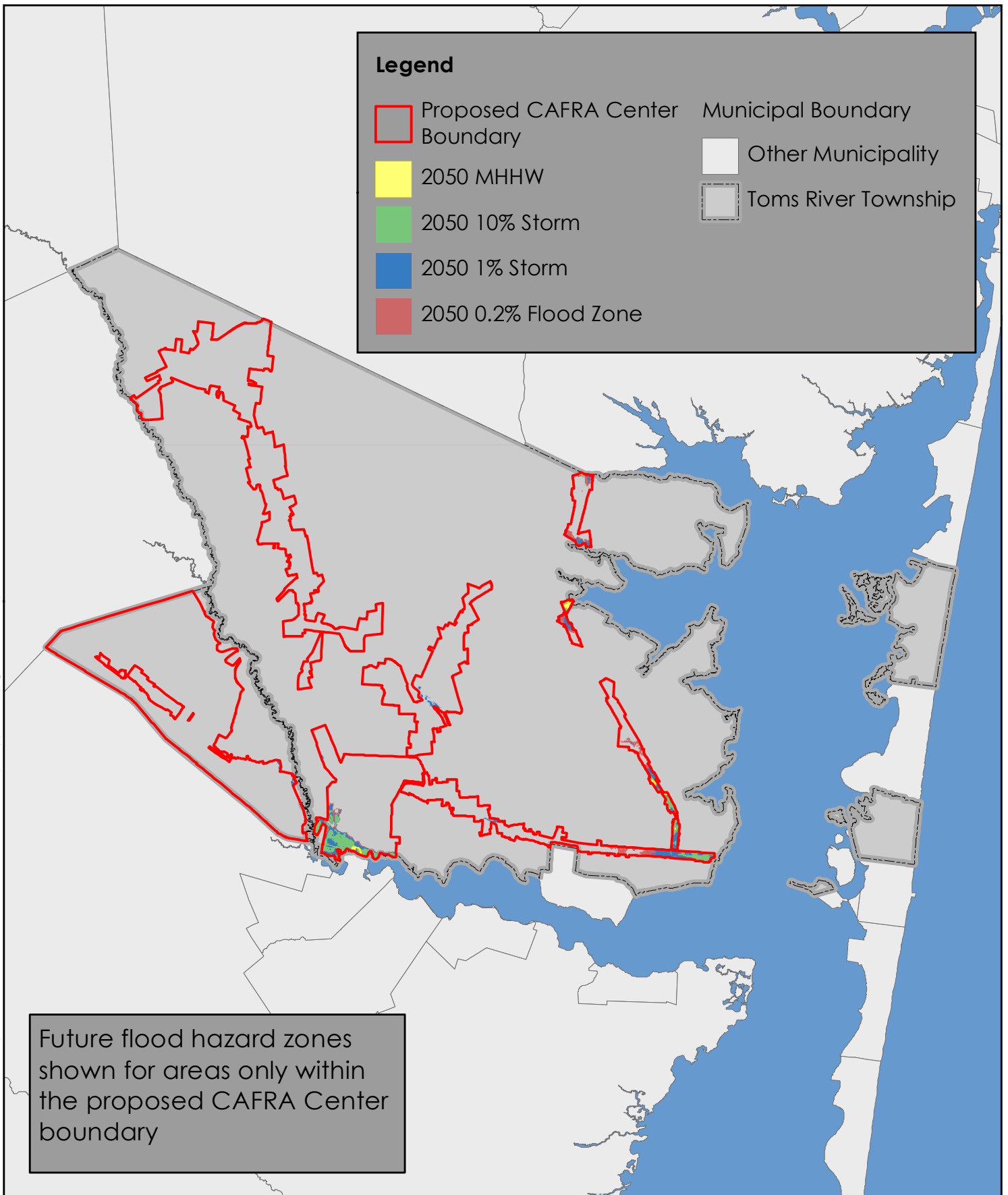
Coastal Hazard Area	Acres Within CAFRA Center	Percent of Coastal Hazard Area in CAFRA Center
MHHW	9	0.15%
10% Storm	138	2.46%
1% Storm	266	4.75%
0.2% Flood zone	312	5.57%

Conclusion

This assessment examined methods that could be mandated or recommended to evaluate cumulative and secondary impacts of coastal development. Given the scope of this project, the evaluation focused on impacts to ecological resources and risk from coastal hazards. Applicants pursuing plan endorsement and center designation could use approaches similar to those described above to evaluate the potential impacts to natural areas and corridors, endangered and threatened flora and fauna, impervious surfaces, water quality, marsh migration and exposure to coastal hazards.

Each assessment included used data that are available for all communities within the state. With the exception of the HAT tool, each can be accomplished with GIS, but does not require significant modeling. The assessments provide some information about how the landscape may change under the proposed center designation boundary, which may inform the municipal responsibilities negotiated through the Plan Implementation Agreements.

File: P:\1463\Projects\1463002\GIS\MapDocs\Coastal_Haz_85x11.mxd, 6/12/2017, Drawn by thopper, Copyright Princeton Hydro, LLC.



COASTAL HAZARD ZONES

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NOTES:

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2. Future flood hazard zones modeled by Princeton Hydro.
3. Municipal boundaries obtained from New Jersey Geographic Information Network (NJGIN).



Map Projection: NAD 1983 StatePlane New Jersey FIPS 2900 Feet