



## **Alexandria Township** **Municipal Build-Out Report**

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Prepared by the State of New Jersey Highlands Water Protection  
and Planning Council in Support of the Highlands Regional Master  
Plan: Report on the Results of Modules 1 and 2 of the 2009 Plan  
Conformance Process

August 2009

# ALEXANDRIA TOWNSHIP MUNICIPAL BUILD-OUT REPORT

for  
HIGHLANDS REGIONAL MASTER PLAN CONFORMANCE

## Purpose and Scope

The Highlands Regional Master Plan (RMP) requires that conforming municipalities develop a local build-out analysis that incorporates the policies and objectives of the RMP. Specifically, conforming municipalities are required to “use the Highlands Build-Out Model to develop a local build-out analysis that incorporates RMP policies and objectives to evaluate land use capability and capacity planning” (Objective 6G4c). The RMP build-out process requires a Limiting Factor Analysis to examine three categories of constraints:

1. Land Based Capacity (potential developable lands);
2. Resource Based Capacity (Septic System Yield and Net Water Availability); and
3. Utility Based Capacity (public water and wastewater).

This Municipal Build-Out Report provides the results of the local build-out analysis based on potential developable lands and existing municipal conditions, including sewer and water supply capacity and Net Water Availability where relevant. It incorporates the results of the first two modules of the 2009 Plan Conformance Grants Program: Module 1 “Current Municipal Conditions and Build-Out Analysis,” and Module 2 “Land Use and Resource Capacity Analysis.” Both modules were completed through a detailed process involving a cooperative effort of the municipality and the Highlands Council. This process was designed to ensure use of the most current municipal information available and proper application of RMP requirements in the conduct of all analyses. The results for Alexandria Township are presented in the section “**Full Build-Out and Constraints Summary**” and tabulated in Table 4 below.

The results of the local build-out analysis are for use by conforming municipalities for other planning activities required for Plan Conformance, such as development of Fair Share Plans addressing affordable housing obligations (Module 3). They also will be useful in complying with the New Jersey Department of Environmental Protection (NJDEP) wastewater management planning requirements under the Water Quality Management Planning rules at N.J.A.C. 7:15-5. The results are intended to assess current municipal conditions as they relate to specific RMP policies and objectives. It is important to note that the build-out analysis incorporates many but not every constraint to development included in the RMP, State regulations or local zoning. Future activities under Plan Conformance will address issues such as more refined or current analyses of land availability, resource capacity, resource protection and utility capacity that may modify these results to either increase or decrease the projected build out of the municipality (e.g., reducing build-out

## **Municipal Build-Out Report for Alexandria Township**

projections through land preservation, increasing build-out projections by increasing Net Water Availability or designation of Highlands Redevelopment Areas).

The results of the municipal build-out analysis are designed to be utilized at a municipal scale and are not appropriate for determining if a particular parcel or development project is consistent with the RMP. Therefore, the Highlands Build-Out Model is not intended to be applied at a parcel level to determine the development potential of that parcel, as the municipality must apply additional planning and zoning analyses to determine appropriate future sustainable development.

All of the data and figures regarding specific parcels, including, but not limited to, preserved lands and water and sewer service, are based on a review of currently available information; however, unintentional inaccuracies may occur and may be formally addressed as RMP Updates. Any request for a formal determination to address updated information may be submitted to the Highlands Council in accordance with the RMP policies and procedures for RMP Updates. In addition, this report does not address any Map Adjustments that a municipality may seek to revise the Land Use Capability Zone Map; these will be addressed at a later date.

It is critical to note that this build-out analysis was conducted based on the requirements of Plan Conformance with the RMP, as applied to parcels deemed potentially developable (vacant, oversized and redevelopable) as of early 2009. These results do not include:

- development that has been approved but not completed as of early 2009, which may yield more or less growth than the build-out results calculated for the affected parcels;
- the potential impact of some future development that may be deemed exempt from the Highlands Act, which may yield more or less growth than the build-out results calculated for those lands;<sup>1</sup>
- the potential impact of future redevelopment that may be approved through designation of Highlands Redevelopment Areas or other approvals granted with waivers as authorized by the Highlands Act, which may yield more growth than the build-out results calculated for those lands;
- the potential impact of certain land use restrictions based on State regulations and local ordinances that could not be assessed through a municipal level of analysis; and

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<sup>1</sup> Where such development is located in an approved wastewater service area in the RMP Existing Community Zone (not including the Environmentally-Constrained Sub-Zone) or the Lake Community Sub-Zone, the results should be similar because the build-out analysis used local zoning. Future developments that may be authorized within the Environmentally-Constrained Sub-Zones, Protection Zone or Conservation Zone that use public or community on-site wastewater systems will have significantly different yields than calculated through the RMP build-out process. Likewise, the Septic System Yields for lands that will rely on septic systems may be significantly different from what those allowed by current municipal zoning.

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- any reductions in build-out projections due to land preservation for open space or farmland beyond those preserved lands identified by the municipality through Module 1.

Therefore, the Highlands Municipal Build-Out Report for a municipality is a result of current conditions and application of RMP requirements. It provides a critical planning tool but cannot be used as a definitive prediction of the future or as a basis for parcel-based development potential.

**This is a final Municipal Build-Out Report, which supersedes the Module 1 Summary Report. The results may be used in Module 3 by the municipality in support of its Housing Element and Fair Share Plan and other relevant purposes.**

## **Report Structure**

This Highlands Council report is based on the municipal build-out results from Modules 1 and 2 performed by Alexandria Township and the Highlands Council, in conformance with the Highlands Regional Master Plan (RMP). These results include consideration of potential land availability, utility capacity, municipal zoning in wastewater utility service areas, Septic System Yield and Net Water Availability in accordance with the RMP. The RMP build-out analysis estimates the potential for new development in Alexandria Township, for the entire municipality (see **Full Build-Out and Constraints Summary**, below).

First, the analysis addressed the build-out potential of the available lands, assuming application of RMP requirements for septic system yields and utility service areas without constraints related to the available capacity of public water supply and wastewater utilities or Net Water Availability. Essentially, the land-based build out represents the maximum potential for development in conformance with the RMP if no other constraints exist. Where sewer development is in conformance with the RMP, municipal zoning is used to determine build-out potential. Where septic systems will be used, the RMP requirements apply and the resulting septic system yield is assumed to be entirely residential in nature. To the extent that septic system capacity is used for non-residential development based on a proportional reallocation from residential development, the projected growth will be different than those reported above. Any reallocations of septic system yield will be addressed in Module 3 – Housing Element and Fair Share Plan.

Second, the public water supply and wastewater demands of development projected for the utility service area are compared to the utility capacity available to the municipality, regarding both public water supply and wastewater utilities. Where capacity is insufficient to support the build-out demand, the build-out estimates are reduced.

Third, the resulting water supply demands from build out in both public water supply utility service areas and domestic well service areas are compared to the Net Water Availability for the HUC14 subwatershed. In many cases, this step required information regarding water supply demands from other municipalities, so that the full demands against each HUC14 subwatershed could be assessed. Again, where Net Water Availability is insufficient to support the build-out demand, the build-out estimates are reduced.

Finally, where a wastewater utility had available capacity for a municipality after meeting all build-out demands, the Highlands Council investigated whether sufficient Net Water Availability exists to support the use of all or part of that wastewater utility capacity for such purposes as affordable housing, TDR Receiving Zones and other purposes supported by the RMP.

This report also includes a discussion of technical methods used in the build-out process, including quality control assessments and build-out impact factors.

## Full Build-Out and Constraints Summary for Alexandria Township

### Overview

The Alexandria Township is located within both the Preservation Area and Planning Area. The RMP build-out analysis for Alexandria Township estimates the following new development results for potential developable lands for the entire municipality, which are discussed in detail in the following section and summarized in Table 4:

1. Development in Wastewater Utility Service Areas: 0 residential dwelling units and 0 square feet of non-residential development, resulting in a wastewater demand of 0 gallons per day (gpd), or 0 million gallons per day (MGD), and estimated public water supply demands of 0 gpd, or 0MGD.
2. Development in Septic System Areas: 429 septic systems in the Planning Area for all RMP Land Use Capability Zones and HUC14 subwatersheds, and 13 septic systems in the Preservation Area.

The build-out results based on potential developable lands are not constrained by water supply utility capacity and wastewater utility capacity.

The water supply demands from the build-out are constrained by water availability for two HUC 14 subwatersheds in Alexandria Township, resulting in a constraint on build-out potential equivalent to 71 septic system units, which is 33 percent of the land-based total build-out demand for those two HUC 14 subwatersheds. The water supply demands in the remaining HUC14 subwatersheds are not constrained by water availability.

### Municipal Capacity Conditions and Analysis

A summary of findings on municipal build-out capacity conditions appears in Table 1. It includes the following: potential developable vacant, over-sized and redevelopable lands in the RMP wastewater utility area; potential developable vacant, over-sized and redevelopable parcels in the septic system areas; RMP Septic System Yield; RMP Build-Out Environmentally Constrained lands; available wastewater utility capacity; and available Public Community Water Supply utility capacity.

All figures are the results of an RMP consistency analysis applied to the information supplied by the Highlands Council, as supplemented and verified by Alexandria Township. Each Figure shows all of the parcels that were used in the build-out process, whether for Septic System Yield or for build out of RMP wastewater utility areas.

## Municipal Build-Out Report for Alexandria Township

- **Figure 1** presents the parcel-based potential developable lands and their association with HUC14 subwatersheds and Land Use Capability Zones, which relate to the RMP Septic System Yield values where the parcels will be served by septic systems.
- **Figure 2** presents the parcel-based potential developable lands and the RMP Build-Out Environmentally Constrained lands (i.e., steep slopes, flood prone areas and Highlands Open Water buffers). Some of these areas are within the RMP Environmentally-Constrained Sub-Zones while others are smaller-scale environmental features outside those sub-zones.
- **Figure 3** presents the parcel-based potential developable lands and their association with the RMP utility area<sup>2</sup> for RMP HDSF<sup>3</sup> wastewater utilities.
- **Figure 4** presents the parcel-based potential developable lands associated with the RMP utility area<sup>4</sup> for RMP Public Community Water System utilities.

### RMP Build-Out Developable Land, Over-Sized Lot Analysis and Redevelopable Land

Alexandria Township identified 1,945 acres of potential developable vacant lots and 4,362 acres of potential developable lands on over-sized lots within areas that will be served by septic systems, for a total of 6,307 acres of potential developable Septic System Yield lands. These lands were used as the basis for Septic System Yield, regardless of the extent to which any of the lands were steep slopes, flood prone areas or Highlands Open Water buffers.

In addition, there are no (0) acres of potential developable vacant lands and no (0) acres of identified potential redevelopable land (either over-sized lots or specifically identified by the municipality as being a redevelopment target) within the Existing Area Served by utilities. The municipal information for potential developable lands, over-sized lots and redevelopable land was evaluated by the Highlands Council in accordance with the RMP for the build-out analysis. The results for all report figures are summarized in Table 1.

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<sup>2</sup> The RMP utility area for wastewater includes the Existing Areas Served based on the RMP, plus any NJDEP-approved Sewer Service Area that is within the Existing Community Zone (not including the Environmentally-Constrained Sub-Zone) or the Lake Community Sub-Zone.

<sup>3</sup> HDSF - Highlands Domestic Sewerage Facility. These are wastewater treatment works that provide wastewater treatment primarily of sanitary sewage rather than industrial wastewater as a public utility, and may include service areas and treatment capacities sufficient to support redevelopment and regional growth opportunities. As such, they provide service to multiple parcels under different ownership, rather than to specific developments (e.g., schools, shopping centers, public institutions).

<sup>4</sup> The RMP utility area for public water supply includes the Existing Areas Served based on the RMP, plus any additional properties identified by the municipality that are within the Existing Community Zone (not including the Environmentally-Constrained Sub-Zone) or the Lake Community Sub-Zone.

## Municipal Build-Out Report for Alexandria Township

### RMP Septic System Yield Analysis

There are seven (7) HUC14 subwatersheds located entirely or partially within the Planning Area of Alexandria Township. The RMP Septic System Yield analysis for the Planning Area determined a yield of 421 units for the Conservation Zone, 3 units for the Existing Community Zone and 5 units for the Protection Zone. The RMP Septic System Yield analysis determined a yield of 13 units for the Preservation Area. The total RMP Septic System Yield for Alexandria Township is 442 units. Refer to Table 1 and Figure 1 for additional details.

The build out for septic systems in the Preservation Area identifies the number of septic systems that would be considered permissible under the NJDEP Preservation Area Rules at N.J.A.C. 7:38-3.4. Each vacant or over-sized lot identified through Module 1 and 2 was assessed to determine whether it was of sufficient size to accommodate one or more septic systems, based on NJDEP requirements for 1 unit per 25 acres of non-forested lands, 1 unit per 88 acres of forested lands, or some proportional combination thereof. The yield is assigned by parcel, not by aggregate acreage across multiple parcels, and is compiled for the entire Preservation Area of the municipality as shown in Table 1. Parcels that were too small to accommodate a new septic system under these provisions received no Septic System Yield.

In the Planning Area, the build out for septic systems is based on a yield evaluation for the aggregate of two areas: the acreage of vacant parcels and the net acreage of over-sized parcels. These areas are divided into HUC14 subwatershed/RMP Land Use Capability Zone combinations. Each combination of HUC14 subwatershed and Land Use Capability Zone within the municipality receives its own Septic System Yield, which is not transferable. The yield is based on RMP Policy 2L2, which establishes nitrate targets for each Land Use Capability Zone and incorporates the relevant drought recharge values for each HUC14 subwatershed.

The RMP Septic System Yield is calculated for all potential developable lands reliant on septic systems, which may include lands zoned for both residential and non-residential development. Any yields are provided in “equivalent residential units” which may later be allocated among residential and non-residential development using flow translation factors provided in the *Highlands Regional Build-Out Technical Report* (see Appendix B of this report). Therefore, Septic System Yield calculated for Alexandria Township would equate to 442 residential units only if no yield is allocated to non-residential development. Septic System Yield may be allocated to non-residential development by reducing the number of residential units and increasing the amount of non-residential development proportionally based on relative flows. This allocation process and the implications for affordable housing requirements will be addressed in Module 3 - Housing Element and Fair Share Plan; this analysis is not part of this report. Therefore, no estimate is made here of non-residential development. All development on septic systems is assumed to rely on domestic wells for the purposes of this analysis.

## Municipal Build-Out Report for Alexandria Township

### RMP Build-Out Environmentally Constrained Lands

The RMP Build-Out analysis identified portions of the potential developable lands that are environmentally constrained based on the RMP (i.e., steep slopes, flood prone areas and Highlands Open Water buffers). These constraints were used in the build-out analysis to determine, where wastewater utility service was anticipated based on conformance with the RMP and approved sewer service areas, whether specific parcels had at least 1,400 square feet of unconstrained area. In addition, the nature and extent of these lands may influence the future development of lands in the septic system areas regarding the allocation of Septic System Yield to them and utility lands that are suitable for development. Out of the 6,307 gross developable acres in Alexandria Township, for vacant parcels there is a potential net developable area of 790 acres in the Planning Area and 0 acres in the Preservation Area; for over-sized parcels there is a potential net developable area of 1,231 acres in the Planning Area and 250 acres in the Preservation Area. These values are a summation of the parcel-specific analyses. Refer to Table 1 and Figure 2 for additional details. This analysis should be viewed as an indicator of the level of environmental constraints in potentially developable lands, not as a parcel-based measure of development capacity.

In certain instances, the municipal potential net developable acres may be under-reported relative to actual buildable area conditions, and may even show a zero or negative value. A zero or negative value indicates that a very high degree of environmental constraints exists on the potential developable parcels of the municipality as a whole and especially on the over-sized lots; however, some potential developable lands may still exist. This result reflects the evaluation of over-sized lots and of vacant lots that are partly included in the sewer service build-out analysis. The potential developable acres for over-sized parcels are calculated by subtracting the equivalent of a buildable area for a single unit of development (e.g., one house) under the RMP from the total parcel size. Likewise, some parcels are only partially eligible for sewer development. In both cases the environmental constrained acres for these parcels are calculated based on the entire parcel area due to GIS processing issues. This section of the Municipal Build-Out Report uses a municipal aggregate land area analysis. This information will be used in later aspects of Plan Conformance at a parcel level and not as a municipal land aggregate value. Evaluation of the relationship of septic system yield and buildable lands will be based on the build-out parcel data information and not the Table 1 municipal summary reported values.

As part of that analysis, the municipality will be able to use the database to analyze vacant parcels in septic system areas, to help identify parcels that could be considered to have some reasonable potential for development based on the amount of unconstrained land within them. Further analysis in later phases of Plan Conformance would then identify additional constraints to the realistic development potential of these parcels based on one or more of the following factors:

1. lack of a minimum one-acre contiguous, unconstrained building site;
2. the potential building site is not accessible or access will result in damage to environmentally constrained lands;

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3. application of municipal zoning constraints such as those prohibiting creation of flag lots, landlocked parcels, etc.; or
4. parcel configuration or other parcel-specific issues.

This information on vacant lands with a reasonable potential for development can be used to support the evaluation of Septic System Yield assignment in later phases of Plan Conformance.

### Available HDSF Wastewater Utility Capacity

The HDSF facility serving Alexandria Township is Milford STP, which serves a very small area. The current available Highlands Region capacity for the utility is 0.099 million gallons per day (MGD) (2003 data) for all municipalities served by the system, out of a total permitted system capacity of 0.4 MGD. Milford STP is a utility with service areas in Alexandria Township and other municipalities. The current capacity available to Alexandria Township is not able to be determined at this time, but most likely limited to the parcels served, based upon information developed for the build-out process. There is no wastewater generation from the build out for the facility. Refer to Table 1 and Figure 3 for additional details.

Camp Tecumseh- Salvation Army Camp, Alexandria Township Board of Education, Frenchtown Borough STP, and Alexandria Township BOE- Middle School are Non-HDSF facilities that serve Alexandria Township. There is no wastewater generation for these facilities.

### Available Public Community Water System Utility Capacity

The public water supply utility serving Alexandria Township is the Milford Water Department, which serves a very small area. The current available Highlands Region capacity for the utility is 6.93 million gallons per month (MGM). The current capacity available to Alexandria Township is not able to be determined for this regional utility provider, but most likely limited to the parcels served. There is no public water demand from the build for this facility. Refer to Table 1 and Figure 4 for additional details.

## **Water Availability Constraints**

The build-out results for Alexandria Township, based on developable land and utility capacity, were compared to Net Water Availability by the Highlands Council to determine if Net Water Availability posed an additional constraint on development capacity. This analysis determined the potential for Net Water Availability constraints by HUC14 subwatershed, including water demands from both Alexandria Township and other municipalities and water users that withdraw water from the same HUC14 subwatershed. The Highlands Council determined whether each demand was consumptive or depletive. For the purpose of this analysis, all septic system units were considered to represent a residential land use in accordance with the Highlands Module 2 Build-out Impact Factors presented in Appendix B, and were addressed as consumptive water uses.

## Municipal Build-Out Report for Alexandria Township

The results were compared to Net Water Availability, whether for non-deficit (surplus) subwatersheds, or deficit (Conditional Water Availability) subwatersheds. These values, whether from a deficit or surplus subwatershed, are collectively referred to as Net Water Availability. In HUC14 subwatersheds dominated by Conservation Zone lands, the water availability dedicated for agricultural purposes is not used for this analysis.

Based on this analysis, the Highlands Council determined that the following HUC14 subwatersheds, both within the municipality and in other municipalities but relied upon for municipal water supply, have insufficient Net Water Availability to support the build out demand:

<b>Table 2 – Net Water Availability Constraints Analysis – Deficits</b>			
<b>HUC14 Subwatershed</b>	<b>Build-Out Demand (MGD)*</b>	<b>Net Water Availability (MGD)</b>	<b>Shortfall (MGD)</b>
02040105170030 Harihokake Creek (and to Hakihokake Ck)	0.021822	0.0116	-0.010222
02040105170050 Nishisakawick Creek (below 40d 33m)	0.004263	0.0035	-0.000763

\*Subsequent to any reductions due to utility constraints.

Based on these results for these HUC14 subwatersheds, the build-out results based on potential developable land and utility constraints, as reported above, exceed water availability. Not the entire shortfall is a result of build-out in Alexandria Township, as water from each HUC14 subwatershed is shared among municipalities. HUC 02040105170030 has a build out potential in Alexandria Township of 172 septic system units, but requires a 63 septic system unit reduction. HUC 02040105170050 has a build out potential in Alexandria Township of 42 septic system units, but requires an 8 septic system unit reduction. The portion of the shortfall resulting from Alexandria Township represents a constraint on build-out potential of nearly 7,207 gpd of consumptive water use, which is equivalent to a reduction of 33 percent of the total land-based total build-out demand for those two HUC14 subwatersheds only, or 71 septic system units.

For the remaining HUC14 subwatersheds partially or entirely in the municipality, the Highlands Council also assessed the amount of Net Water Availability remaining after build out. The results are in Table 3, which indicates the remaining Net Water Availability for each HUC14 subwatershed (where positive) and the associated public water supply systems that rely upon the HUC14 subwatershed for supply. This information can be used by the municipality to determine whether there is water available to the public water supply system that could support development within any associated wastewater utility service area, whether within the same HUC14 subwatershed or another, for purposes consistent with the RMP as describe above. The wastewater utility must also have remaining capacity available to the municipality. (Note: this available water cannot be used to increase the Septic System Yield beyond the amount calculated by the Highlands Council, nor can it be used to justify creation or expansion of utilities in violation of RMP requirements.) A decision as

## Municipal Build-Out Report for Alexandria Township

to the allocation of this capacity may occur in Module 3 regarding affordable housing needs identified in the Fair Share Plan, or later in the Plan Conformance process regarding other uses. Where a HUC14 subwatershed is relied upon by more than one municipality for water supply, whether on-site or a public water supply system, coordination will be needed among the municipalities to ensure that proposals for additional use do not exceed the remaining Net Water Availability. Also, there may be additional HUC14 subwatersheds not within the municipality that supply water to the municipality, which are not assessed here.

<b>Table 3 – Net Water Availability – Remaining Capacity</b>		
<b>HUC14 Subwatershed</b>	<b>Remaining Net Water Availability (MGD)</b>	<b>Public Water Supply System(s) Reliant Upon the HUC14 Subwatershed (w/ PWSID)</b>
02040105160060 Musconetcong R (Warren Glen to I-78)	0.006046	1003001 Bloomsbury Water Department
02040105170020 Hakihokake Creek	0.017671	2119001 Consumers (Aqua) NJ Water Company (Phillipsburg) 1020001 Milford Water Department
02040105170040 Nishisakawick Creek (above 40d 33m)	0.035743	
02030105020060 Cakepoulin Creek	0.019173	
02030105020030 Mulhockaway Creek	0.069782	
02030105020070 Raritan R SB(River Rd to Spruce Run)	0.198350	1005001 Clinton Water Department
02040105160050 Musconetcong R (I-78 to 75d 00m)	0.061726	

## Final Build-Out Results

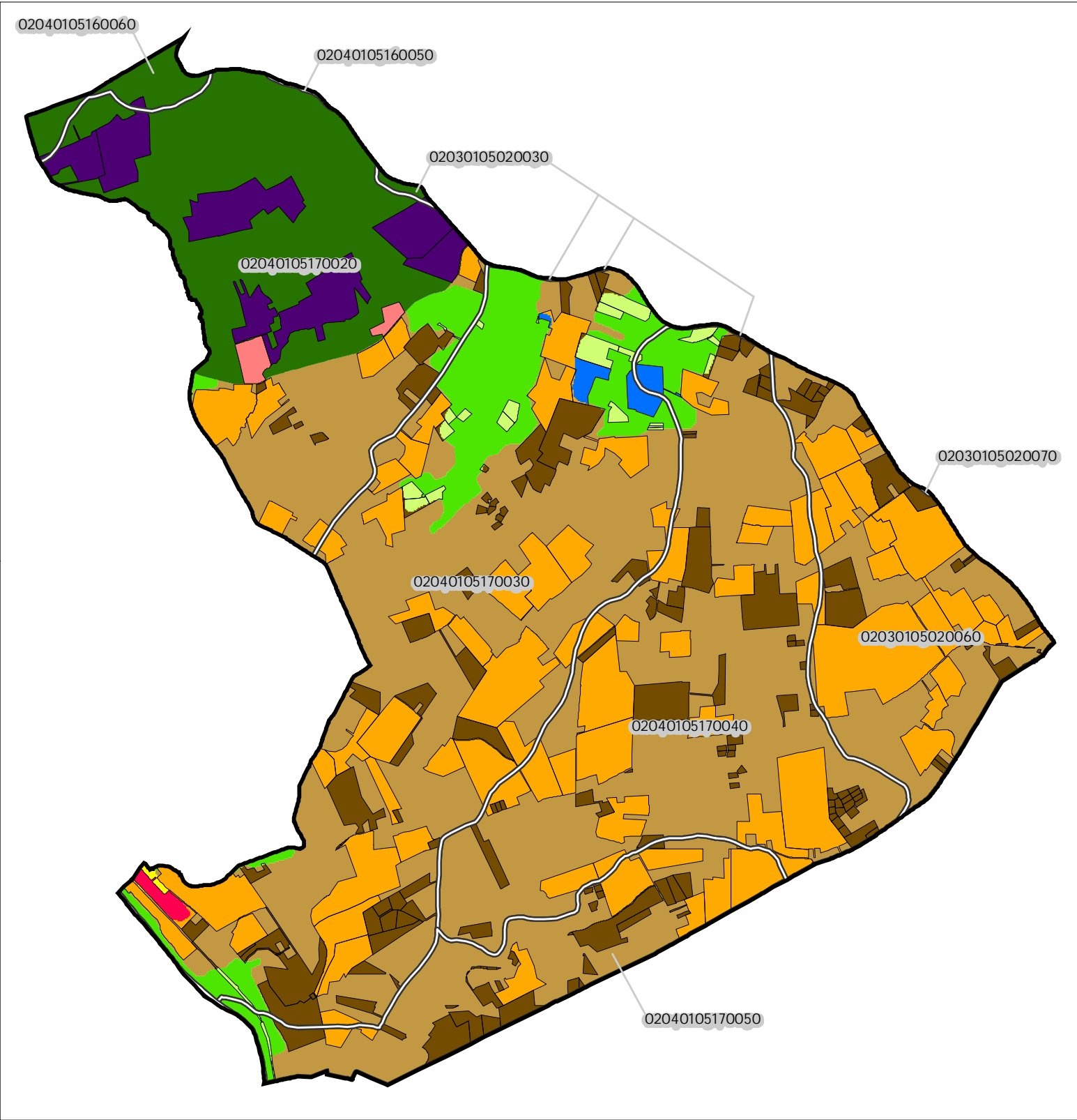
The build-out results for Alexandria Township are summarized in Table 4, based on land based capacity (potential developable land in both wastewater and septic system service areas), utility capacity and resource based capacity (Net Water Availability). These results are to be applied in Module 3 - Housing Element and Fair Share Plan toward the determination of affordable housing obligations. To assist in the evaluation of this information, an Excel file of the Module 2 database has been prepared by the Highlands Council for use in Module 3, where applicable. The Excel file is included on the Module 2 CD.

## Municipal Build-Out Report for Alexandria Township

<b>Table 4 – Municipal Build-Out Results With Resource and Utility Constraints</b>			
	<b>Preservation Area</b>	<b>Planning Area</b>	<b>Totals</b>
<b>Residential units – Sewered</b>	0	0	0
<b>Septic System Yield</b>	13	358	371
<b>Total Residential Units</b>	13	358	<b>371</b>
<b>Non-Residential Jobs – Sewered</b>	0	0	<b>0</b>

Figure 1: Municipal Build-out Report Septic System Yield by HUC14 and LUCM Zone \*

# ALEXANDRIA TOWNSHIP



Potential Undevelopable Lands	Potential Oversized Lots	Potential Developable Lands	Potential Redevelopable Lands
Conservation Zone	in Conservation Zone	in Conservation Zone	in Conservation Zone
Existing Community Zone	in Existing Community Zone	in Existing Community Zone	in Existing Community Zone
Protection Zone	in Protection Zone	in Protection Zone	in Protection Zone
Preservation Area	in Preservation Area	in Preservation Area	in Preservation Area

HUC14 Subwatersheds
 

02040105170040
 

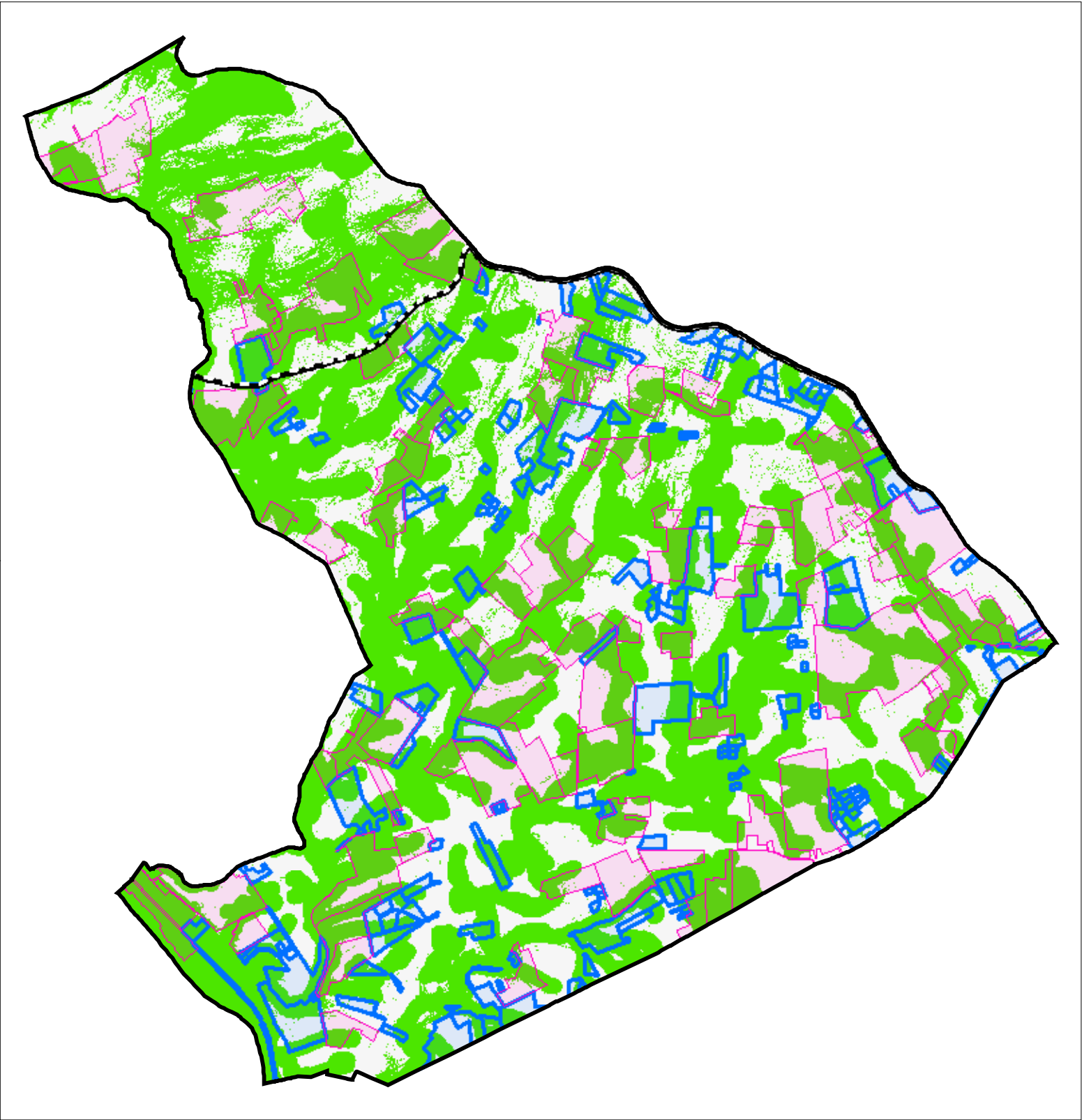
HUC14 ID Number

Miles

0 0.5 1 1.5

\* Refer to Table 1 for Septic System Yield values, indexed by HUC14 ID

Figure 2: Municipal Build-out Report Environmental Constrained Lands



Highlands Build-out Environmental Constrained Lands  
*Constraints:*  
*Highlands Open Water Buffers (300ft)*  
*Flood Prone Areas*  
*Steep Slopes (Moderate and Severe)*

Potential Oversized Lots

Potential Developable Lots

Preservation Area

ALEXANDRIA TOWNSHIP

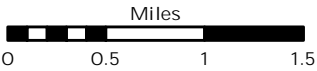
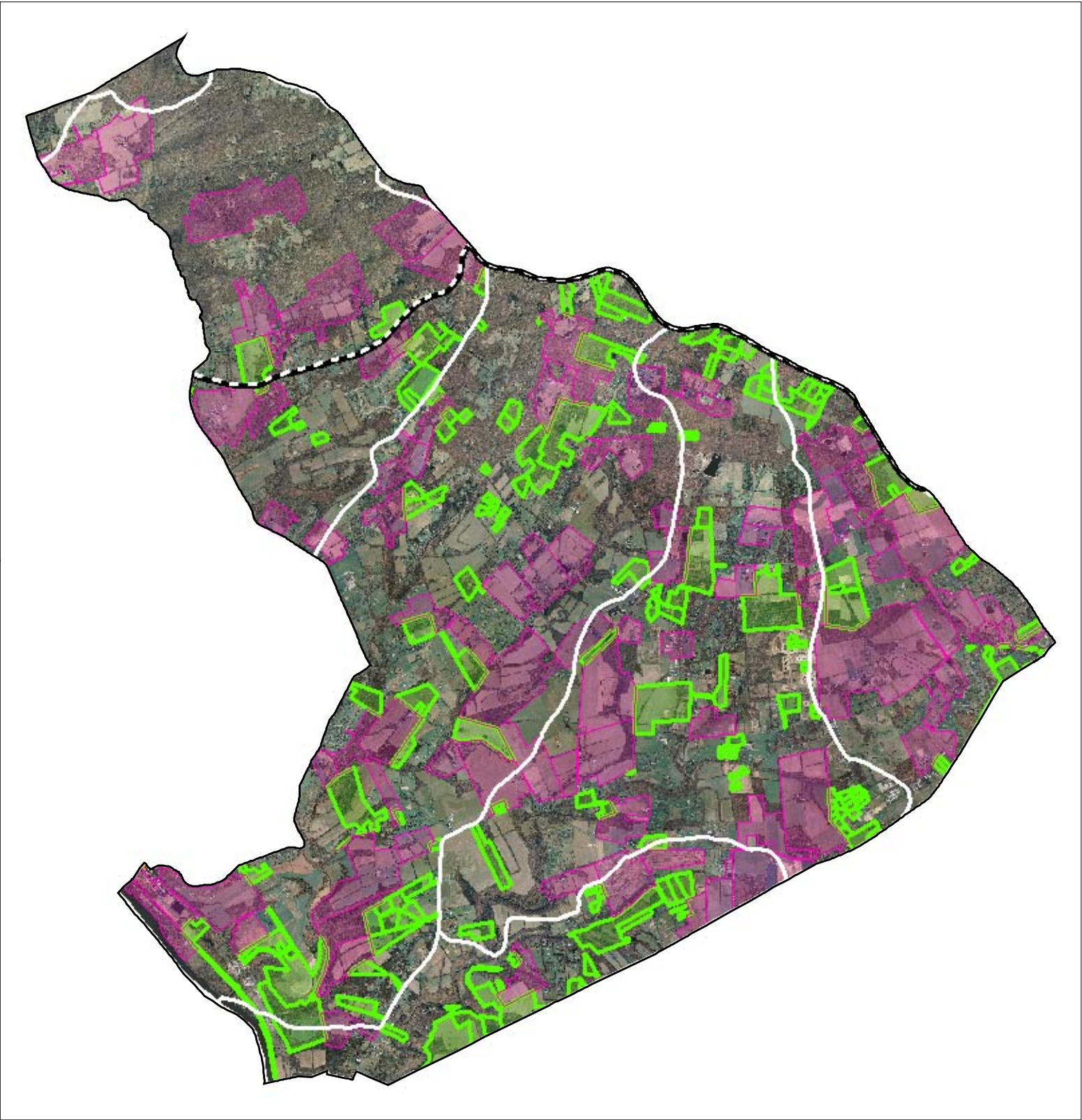


Figure 3: Municipal Build-out Report RMP HDSF Wastewater Utilities



Highlands Domestic Sewerage Facilities "2008 RMP Existing Area Served"

Milford STP

HUC14 Subwatersheds

Potential Oversized Lots

Potential Developable Lots

Preservation Area

ALEXANDRIA TOWNSHIP

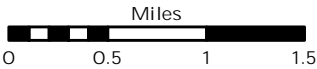
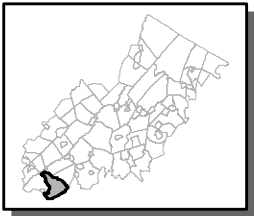
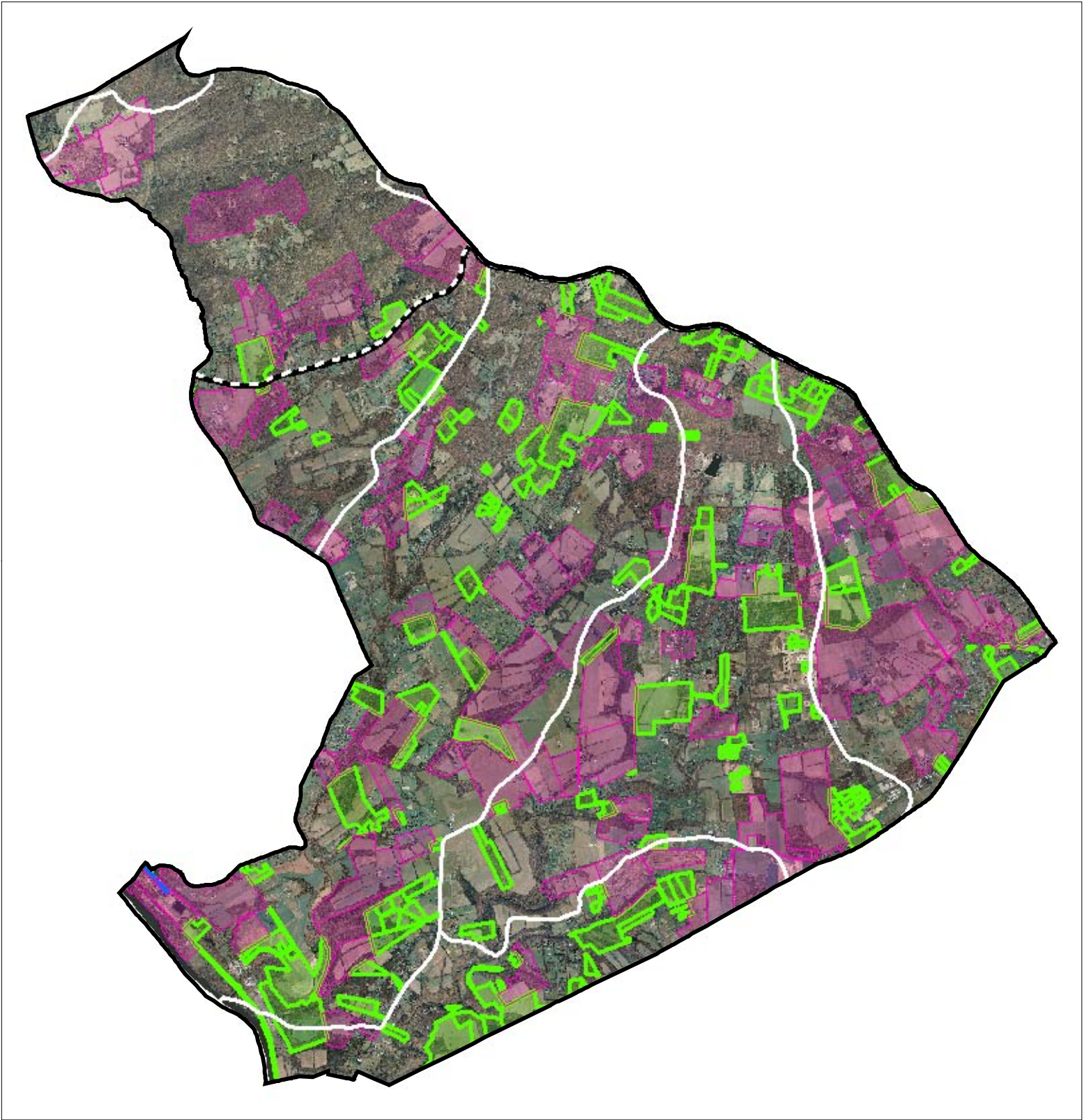





Figure 4: Municipal Build-out Report RMP Public Community Water System Utilities





Public Community Water Systems "2008 RMP Existing Area Served"

 *MILFORD WATER DEPARTMENT*

 HUC14 Subwatersheds

 Potential Oversized Lots

 Potential Developable Lots

 Preservation Area

ALEXANDRIA TOWNSHIP

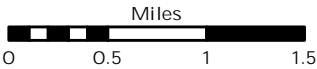


Figure 5: Municipal Build-out Report Final Build-out Results



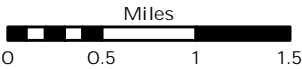
Table 4 - Municipal Build-out Results With Resource and Utility Constraints

	Preservation Area	Planning Area	Totals
Residential Units - Sewered	0	0	0
Septic System Yield	13	358	371
Total Residential Units	13	358	371
Non-Residential Jobs - Sewered	0	0	0



Preservation Area Boundary

ALEXANDRIA TOWNSHIP



Highlands Module 2 Municipal Summary Report

Table 1: RMP Municipal Capacity Conditions based on Module 2 Potential Developable Lands- ALEXANDRIA TOWNSHIP

RMP Build-Out WASTE WATER UTILITY Existing Areas Served (EAS) Analysis							
MUNICIPALITY	WASTEWATER UTILITY	Total Wastewater Generation (MGD) - Planning Area	Total Wastewater Generation (MGD) - Preservation Area	Municipal Assigned Percentage	Current Available Highlands Capacity (MGD)	Municipal Available Wastewater Capacity (MGD)	
ALEXANDRIA TOWNSHIP	NU0021890 / Milford STP / HDSE	0	0	<1%	0.099	NA	
ALEXANDRIA TOWNSHIP	NU0023001 / Camp Tecumseh - Salvation Army Camp / NON-HDSE	0	0	100%	Non-HDSF	Non-HDSF	
ALEXANDRIA TOWNSHIP	NU0027553 / ALEXANDRIA TWP. BOARD OF EDUCATION / NON-HDSE	0	0	100%	Non-HDSF	Non-HDSF	
ALEXANDRIA TOWNSHIP	NU0029831 / Frenchtown Boro STP / NON-HDSE	0	0	100%	Non-HDSF	Non-HDSF	
ALEXANDRIA TOWNSHIP	NU0035670 / Alexandria Twp BOE - Middle School / NON-HDSE	0	0	100%	Non-HDSF	Non-HDSF	
RMP Build-Out POTABLE WATER UTILITY Existing Areas Served (EAS) Analysis							
MUNICIPALITY	WATER UTILITY	Total Water Demand (MGD) - Planning Area	Total Water Demand (MGD) - Preservation Area	Municipal Assigned Percentage	Water Utility Available Capacity (MG/M)	Municipal Available Water Utility Capacity (MG/M)	
ALEXANDRIA TOWNSHIP	1020001 / MILFORD WATER DEPARTMENT / Facility #7	0	0	<1%	6.93	NA	

RMP Build-Out WASTEWATER UTILITY Existing Areas Served (EAS) Analysis Build-out Impact Results

MUNICIPALITY	WASTEWATER UTILITY	Residential Units	Nonresidential Square Feet	People	Jobs
ALEXANDRIA TOWNSHIP	NU0021890 / Milford STP / HDSE	0	0	0	0
ALEXANDRIA TOWNSHIP	NU0023001 / Camp Tecumseh - Salvation Army Camp / NON-HDSE	0	0	0	0
ALEXANDRIA TOWNSHIP	NU0027553 / ALEXANDRIA TWP. BOARD OF EDUCATION / NON-HDSE	0	0	0	0
ALEXANDRIA TOWNSHIP	NU0029831 / Frenchtown Boro STP / NON-HDSE	0	0	0	0
ALEXANDRIA TOWNSHIP	NU0035670 / Alexandria Twp BOE - Middle School / NON-HDSE	0	0	0	0

RMP Build-Out WATER UTILITY Existing Areas Served (EAS) Analysis Build-out Impact Results

MUNICIPALITY	WATER UTILITY	Residential Units	Nonresidential Square Feet	People	Jobs
ALEXANDRIA TOWNSHIP	1020001 / MILFORD WATER DEPARTMENT / Facility #7	0	0	0	0

RMP Build-Out Septic System Yield Analysis

Planning Area	MUNICIPALITY	HUC14	SUBWATERSHED NAME	PLAN C2 YIELD	PLAN EC2 YIELD	PLAN P2 YIELD
ALEXANDRIA TOWNSHIP		02030105020030	Mulhockaway Creek	0	0	0
ALEXANDRIA TOWNSHIP		02030105020060	Cakepoulin Creek	81	0	0
ALEXANDRIA TOWNSHIP		02030105020070	Raritan R 58(River Rd to Spruce Run)	0	0	0
ALEXANDRIA TOWNSHIP		02040105170020	Hakihokake Creek	19	0	0
ALEXANDRIA TOWNSHIP		02040105170030	Harihokake Creek (and to Hakihokake Cr)	164	3	5
ALEXANDRIA TOWNSHIP		02040105170040	Nishisakawick Creek (above 40d 33m)	115	0	0
ALEXANDRIA TOWNSHIP		02040105170050	Nishisakawick Creek (below 40d 33m)	42	0	0
			<i>totals</i>	421	3	5

Preservation Area

MUNICIPALITY	PRES YIELD
ALEXANDRIA TOWNSHIP	13

Table 1: RMP Municipal Capacity Conditions based on Module 2 Potential Developable Lands- ALEXANDRIA TOWNSHIP

RMP Build-Out Potential Developable Lands Analysis						
POTENTIAL DEVELOPABLE VACANT LOT SEPTIC SYSTEM ACRES						
MUNICIPALITY	CZ ACRES - PLANNING	ECZ ACRES - PLANNING	PZ ACRES - PLANNING	PRESERVATION ACRES		
ALEXANDRIA TOWNSHIP	1748		159		38	
POTENTIAL DEVELOPABLE OVERSIZED LOT SEPTIC SYSTEM ACRES						
MUNICIPALITY	CZ ACRES - PLANNING	ECZ ACRES - PLANNING	PZ ACRES - PLANNING	PRESERVATION ACRES		
ALEXANDRIA TOWNSHIP	3660	33	49	620		
POTENTIAL DEVELOPABLE WASTEWATER UTILITY ACRES						
MUNICIPALITY	PLANNING ACRES	PRESERVATION ACRES				
ALEXANDRIA TOWNSHIP	0					
POTENTIAL DEVELOPABLE OVERSIZED LOT WASTEWATER UTILITY ACRES						
MUNICIPALITY	PLANNING ACRES	PRESERVATION ACRES				
ALEXANDRIA TOWNSHIP	0					

RMP Build -Out Environmentally Constrained Lands Analysis						
Potential Developable Lot Acres						
MUNICIPALITY	POTENTIAL FULL DEVELOPABLE ACRES - Planning Area	ENVIRONMENTAL CONSTRAINED ACRES - Planning Area	NET DEVELOPABLE ACRES - Planning Area	POTENTIAL FULL DEVELOPABLE ACRES - Preservation Area	ENVIRONMENTAL CONSTRAINED ACRES - Preservation Area	NET DEVELOPABLE ACRES - Preservation Area
ALEXANDRIA TOWNSHIP	1907	1117	790	38	39	0
Potential Oversized Lot Acres						
MUNICIPALITY	POTENTIAL FULL DEVELOPABLE ACRES - Planning Area	ENVIRONMENTAL CONSTRAINED ACRES - Planning Area	NET DEVELOPABLE ACRES - Planning Area	POTENTIAL FULL DEVELOPABLE ACRES - Preservation Area	ENVIRONMENTAL CONSTRAINED ACRES - Preservation Area	NET DEVELOPABLE ACRES - Preservation Area
ALEXANDRIA TOWNSHIP	3742	2511	1231	620	370	250

## Overview of Technical Method for Build-Out Analysis

Module 1 “Current Municipal Conditions and Build-Out Analysis” (results of which are incorporated into or modified as appropriate for this report) was based on municipal information regarding potential developable lands (including identification of preserved lands and fully developed lands) and areas currently served with public water supply and wastewater utilities. It also included the current capacity conditions of public water supply and wastewater utilities, and was evaluated for municipal Land Use Capability in accordance with the RMP. The information was initially prepared by the Highlands Council and has been edited and verified by the municipality as representing the best available information on existing potential developable lands, which include vacant, non-preserved lands, as well as partially-developed lands having potential for further development (i.e., over-sized parcels) or redevelopment. The Highlands Council performed a quality control assessment to ensure that the database was technically sufficient for the build-out process (see Appendix A – Module 1). The build-out capacity conditions represent the complete build out of potential developable lands in accordance with the RMP, assuming no constraints other than location within areas served by water supply or wastewater utilities or, for those lands not within a wastewater utility service area, the Septic System Yield based upon RMP Land Use Capability Zone Map policies (which incorporate the NJDEP Rules for the Preservation Area at N.J.A.C. 7:38-3.4). The Module 1 Summary Report was prepared by the Highlands Council and provided to the municipality, which further verified or corrected land availability and municipal zoning information in the report as the first step in Module 2.

The build-out capacity conditions in Module 1 identified the available utility capacity (in units of flow) allocated to the municipality for associated Highlands Domestic Sewerage Facilities (HDSF), on-site wastewater facilities, and Public Community Water Supply Systems. The Highlands Council initially used available capacity information from the *Utility Capacity Technical Report (2008)*, which used 2003 data for wastewater utilities (comparing permitted flows to the rolling maximum three month daily average in million gallons per day, or MGD) and 2004 data for public water supply utilities (comparing permitted flows to the maximum monthly demand, in million gallons per month, or MGM). The available capacity estimates initially assumed that the capacity for regional utilities (i.e., serving more than one municipality) would be allocated on a first-come, first-served basis; available capacity was apportioned among the municipalities based on relative land availability in the service area municipalities. In the Module 1 process, municipalities and regional utilities were requested to provide both updated flow data and any available information on contracted flows for a municipality. Where such information was provided and verified, it was used to update both utility-wide and municipal available capacity estimates.

The build-out impacts analysis within RMP utility areas was performed by the Highlands Council using build-out environmental constraints, municipal zoning and various impact factors (e.g., water demand, sewerage demand, population, jobs) as identified in the *Highlands Regional Build-Out Technical Report (2008)* and listed in Appendix B of this report. This analysis was applied only within the RMP utility service areas, defined as the lands within a NJDEP approved utility service area that are also

## **Municipal Build-Out Report for Alexandria Township**

located within the Existing Community Zone or Lake Community Sub-Zone (not including the Existing Community-Environmentally-Constrained Sub-Zone). Of these lands, only parcels with at least 1,400 square feet of land that is not environmentally constrained based on the RMP (i.e., steep slopes, flood prone areas and Highlands Open Water buffers) were evaluated for build out in RMP utility service areas. Potential developable lands that did not meet the criteria of the build-out RMP utility areas were evaluated as lands contributing to Septic System Yield.

In addition, the RMP Septic System Yield was calculated for the municipality. The build out for septic system areas in the Planning Area is based on the RMP Septic System Yield Analysis and does not incorporate or evaluate the effects of environmental constraints or municipal zoning. The build-out of septic system areas in the Preservation Area is based on the NJDEP Preservation Area Rules at N.J.A.C. 7:38-3.4, as required by the RMP. The total acreage of all vacant lands, the net acreage of over-sized parcels (i.e., the total lot size minus the acreage needed for one lot under the RMP) and redevelopable lands were used in the Septic System Yield analysis. In the Planning Area, the analysis used the nitrate target for the appropriate Land Use Capability Zone and the drought recharge value for the appropriate HUC14 subwatershed. In the Preservation Area, the analysis used the forested and non-forested lands at a parcel level. In keeping with RMP policies, preserved lands (including SADC, Green Acres, federal, State, county and local lands, and land trust properties and conservation easements where known) were excluded from this analysis. Environmentally constrained lands (i.e., steep slopes, flood prone areas and Highlands Open Water buffers) were included in the septic system yield analysis because the methodology assumes a mixture of constrained and unconstrained lands, but will affect how Septic System Yield is allocated in later stages of the Plan Conformance Process.

The information from Module 1 directly supported the Module 2 Land Use and Resource Capacity Analysis, results of which are incorporated into this report. In Module 2, the Highlands Council and the municipality evaluated the build-out impacts and the associated wastewater and water supply demands within the RMP utility areas as identified in Module 1.

In Module 2, municipalities reviewed the RMP build-out impacts for RMP utility areas and verified that they reflect densities allowed by existing municipal zoning. Areas included in the build-out process for sewer service included those lands within the wastewater Existing Area Served, as defined by the RMP, and also those lands within an NJDEP-approved Sewer Service Area that is also within the Lake Community Sub-Zone or the Existing Community Zone (excluding the Existing Community-Environmentally Constrained Sub-Zone). If the existing municipal zoning conditions have changed from the 2005 data used by the Highlands Council, then the municipality provided the current zoning and the Highlands Council revised the build-out impacts accordingly. The Highlands Council performed a quality control assessment to ensure that the database was technically sufficient for the build-out process (see Appendix A – Module 2).

When the land based build out of potential developable lands in Module 1 exceeded the available utility capacity conditions, further analysis by the Highlands Council was required in Module 2 to

## **Municipal Build-Out Report for Alexandria Township**

determine the extent to which the build out was constrained by the lack of utility capacity. In such cases, the land-based build-out potential is lowered proportionately for residential and non-residential development within the service area. It is important to note that no change is made to the Existing Area Served for the utility; only the build-out potential is reduced.

Where utility capacity exceeded the land-based build out of potential developable lands in Module 1, the utility capacity is potentially available for future demands. The municipality will evaluate utility capacity assignment in Module 3 where appropriate to support affordable housing, and in support of later phases of Plan Conformance.

For some HUC14 subwatersheds in the municipality, the projected consumptive or depletive water demand based on both domestic well sources (either as derived from Septic System Yield, which is assumed to be supplied by domestic wells, or within a RMP wastewater utility area served by domestic wells) and water supply utility service indicate that the complete municipal build out of potential developable lands might exceed the Net Water Availability. In such cases, the Highlands Council then calculated Net Water Availability values in Module 2 for use as a further constraint on growth, and determined the extent to which the Net Water Availability would reduce the build out. The Highlands Council also assessed the extent to which the use of remaining wastewater utility capacity (i.e., beyond full build-out), if any, would be constrained by Net Water Availability. This information can be used by the municipality to determine whether the wastewater utility capacity can reasonably be used for purposes consistent with the RMP (e.g., affordable housing projects, TDR receiving zones, Highlands Redevelopment Areas, redevelopment within the Existing Area Served) as provided for by Objective 2K3e. A decision as to the allocation of this capacity will occur in Module 3 regarding affordable housing needs identified in the Fair Share Plan, or later in the Plan Conformance process regarding other uses.

## Appendix A: Technical Sufficiency Review

### MODULE 1

The Module 1 Geodatabase (GDB) and utility capacity spreadsheet information submitted by the municipality were evaluated for technical sufficiency and quality assurance and quality control purposes by the Highlands Council staff. The Highlands Council reviewed the GDB (GDB#1 and GDB#2, with GDB#3, where relevant) to determine that all the changes that the municipality made to the GDB are technically sufficient in order to process for RMP Build-out. All revisions made to a GDB by the Highland Council are reflected in the NJHC\_QA\_QC\_COMMENTS field of the GDB. The same Build-out QA/QC Review method is conducted for both GDB#1 and GDB#2. These results were reviewed by the municipality in Module 2 (see below). Any database issues that were not specifically responsive to the technical sufficiency review and not specific to the Module 1 Build-Out Analysis were flagged in the GDB by the Highlands Council for future reference.

When a municipality received GDB#3 (the updated public water utility database), the Council joined and updated the PWSID data from GDB#3 into GDB#1 so all the Module 1 information was in GDB#1 for build-out processing.

Before a GDB is processed for Build-out, the Highlands Council reviewed the material submitted by the municipality including cover letters and any email correspondence for additional information relevant to the build-out analysis. The Highlands Council utilizes Microsoft Access to process the GDB through the NJHC QA/QC review method to create a Technical Protocol Status (TPS) report that flags all parcels that have contradictory data, as well as a SDE check which identifies inserted, deleted and updated information in the GDB. The Highlands Council utilized the TPS Report and the GDB along with the supporting documentation to evaluate any contradictory data reported as Error Codes on the TPS Report.

The TPS report created by the Highlands Council identifies parcels that may contain contradictory data in the GDB and therefore not process correctly in the build-out. There are 11 Error Codes and 5 Data Conditions that may potentially be flagged by the Highlands Council within a GDB. The identification of an Error Code may or may not result in an edit by the Council. If an edit was required in order to technically correct the GDB for build-out processing, the edit was conducted by the Highlands Council and recorded in the GDB. The following is a list of the TPS Error Codes and Data Conditions that may be applicable to the municipality:

- **Error Code 01: Municipal Verification Field Missing** - every verifiable field and row should include the Module 1 verifier's name. If a row was blank, the NJHC QA/QC reviewer would populate the field with the verifier's name or consult with the municipality as required, and enter a comment in the NJHC\_QA\_QC\_COMMENTS field in the GDB.

## Municipal Build-Out Report for Alexandria Township

- **Error Code 02: Parcels identified as both a Condo and Open Space** - the Highlands Council evaluated the parcel's development and land preservation status to determine if the necessary data fields were populated correctly by the municipality.
- **Error Code 03: Parcels identified as both Developable and Open Space** - the Highlands Council evaluated the parcel's development status and land preservation status and determined if the necessary data fields were populated correctly by the municipality.
- **Error Code 04: Parcels identified as Oversized or Redevelopable and missing the oversized or redevelopable acreage value** - the Highlands Council would either consult with the municipality in order to edit the data field or utilized the GDB information to determine the missing value.
- **Error Code 05: Parcels identified as Oversized or Redevelopable that were also listed as Not Developable** - the Highlands Council evaluated the parcel and edited the PARC\_STAT\_DEV\_STATUS data field accordingly.
- **Error Code 06: Parcels identified as connected to a wastewater utility however no System Provider was identified** - the Highlands Council would consult with the municipality and/or review the GDB and supporting documentation in order to edit the missing entry.
- **Error Code 07: Parcels identified as a "Yes" indicating they are currently both connected and not connected to a wastewater utility** - the Highlands Council edited Not Developable, oversized or redevelopable parcels in the wastewater no connect field to a "No." and if the parcel is vacant and developable then the Highlands Council edited the wastewater existing served field to a "No."
- **Error Code 08: Parcels identified as being connected to a wastewater utility and also identified as vacant or developable** - the Highlands Council evaluated these parcels to see if they are developable, redevelopable or oversized and edited and documented accordingly in the GDB.
- **Error Code 09: Parcels identified as connected to a public water utility however no System Provider was identified** - the Highlands Council would consult with the municipality and/or review the GDB and supporting documentation in order to edit the missing entry.
- **Error Code 10: Parcels identified as a "Yes" indicating they are currently both connected and not connected to a public water utility** - the Highlands Council edited Not Developable, oversized or redevelopable parcels in the public water no connect field to a "No." and if the parcel is vacant and developable then the Highlands Council edited the public water existing served field to a "No."
- **Error Code 11: Parcels identified as being connected to a public water utility and also identified as vacant or developable** - the Highlands Council evaluated these parcels to see if they are developable, redevelopable or oversized and edited and documented accordingly in the GDB.

## Municipal Build-Out Report for Alexandria Township

- **Data Condition 1: Parcels identified as Not Developable due to Environmental Constraints or Inadequate Lot Geometry** - these parcels were evaluated in septic served areas to ensure that the environmentally constrained parcels in the GDB were not a water body and therefore not appropriate for inclusion in the RMP Septic System Area analysis. Otherwise, vacant parcels indicated to be “Not Developable” due to environmentally constrained lands were included in the Septic System Yield analysis. Parcels that were identified as an inadequate lot geometry but developable with an adjacent parcel may require further review by the municipality to ensure that the build-out process was applied correctly because the Highlands Council is not able to discern the adjacent parcel record that is in common ownership and referenced by the municipality.
- **Data Condition 2: Parcels identified as having a WW Utility with a Contractual Allocation** were flagged in the TPS Report.
- **Data Condition 3: Parcels identified for PW Utility with a Contractual Allocation** were flagged in the TPS Report.
- **Data Condition 4: Parcels containing entries as “OTHER” with associated comments** were reviewed to see if the proper data field associated with the comment had been completed correctly and to assist in the review of the GDB information.
- **Data Condition 5: Parcels with entries in any of the “Comment” data fields-** the Council reviewed this information as a means to assist in GDB technical evaluation and QA/QC review.

In addition to going through the TPS Report as described above, the Council evaluated all open space parcels to ensure they are technically correct in the GDB. The Council also reviewed parcels that have no provider listed for public water or wastewater to ensure that there are no “Yes” data fields in the utility connection status data field, as these parcels are on septic/domestic wells and not relevant regarding a utility connection status in the GDB. Lastly, the Council QA/QC reviewer initialed and dated the GDB to complete the TPS Report and QA/QC Review process.

The municipality then received a modified GDB that:

1. incorporated the results of all edits by the Highlands Council;
2. merged the final results of GDB’s #1 and, where applicable, #2 and #3 into a single GDB;
3. identified the parcels that were processed for build out as potential developable vacant, redevelopable and over-sized lots in both septic system and sewer areas; and
4. incorporated additional fields used by the Highlands Council in running the build-out process, including municipal zoning for potential developable vacant and redevelopable parcels associated with sewer service conforming with RMP requirements, and having at least 1,400 square feet of land that is not environmentally constrained. Where such parcels were associated with public water supply service, they were also evaluated for water demands.

## **Municipal Build-Out Report for Alexandria Township**

The Municipal Conditions Geodatabase may include in some cases duplicate parcel records within the municipality. These duplicates derive from the process of creating a spatial representation of parcels in GIS. The Highlands Council has taken the necessary steps to avoid double counting of developable duplicate parcels, in the summary reports and in the geodatabase and any derivatives thereof.

### **MODULE 2**

In Module 2, the municipality completed a final check on parcel information and verified the municipal zoning applicable to parcels that were processed for build out in RMP utility areas. Where edits were made and returned to the Highlands Council, the Council incorporated the edits and, where necessary, performed a revised build-out analysis, the results of which are reflected in this report.

**Please note that the Type A and Type B edits conducted by the municipality were reviewed by the Highlands Council and only when an edit was relevant to the RMP Build-out analysis was it incorporated and re-processed for build-out analysis as required.**

#### **Type A Edits – Tabular**

- The information will be updated in the GDB as indicated.
- The nature and extent of the information may or may not affect the build-out results.
- Type A tabular edits that require a revised build-out will be processed and reported as a Module 2 Municipal Build-out Summary Report.

#### **Type A Edits – Spatial**

- The revised spatial information will be reviewed in accordance with the Module 1 Technical Review Protocols.
- Type A spatial edits that require a revised build-out will be processed and reported as a Module 2 Municipal Build-out Summary Report.

#### **Type B Edits – Municipal Zoning**

- The information will be updated in the GDB as indicated.
- Updated zoning changes only affect parcels in RMP utility areas.
- Type B edits that require a revised build-out will be processed and reported as a Module 2 Municipal Build-out Summary Report.

## Appendix B – Highlands Module 2 Build-Out Model Impact Factors

Highlands Zone Type	Comparison Zone/Unit Type	Source	Region	Density Dwelling unit (du)/acre *	Efficiency Factor % (1)	Average Household Size (2)	Average School Children in Household (2)	Percent Impervious (3)	Consumptive/Depletive Water Use includes Indoor demand (gpd per person) plus outdoor demand as (gpd per unit) multiplied by Consumptive/Depletive Use Coefficient (4)	Public Water System Demand (5)	Public Wastewater System Generation (6)
SF Estate Residential or (PA-5)	Single-family Detached 4-5 BR	Statewide NJ Demographic Multipliers (2)	Northern <sup>1</sup>	0.05 to 0.20 (0.17 maximum)	95	3.809	1.072	0.075* acres	(75 gpd/person + 50 gpd/unit) * Consumptive/Depletive Coefficient	100 gallons per person per day	75 gallons per person per day
	Single-family Detached 4-5 BR		Central <sup>2</sup>								
SF Rural Residential, Resource Residential, or (PA-4B)	Single-family Detached 4-5 BR	Statewide NJ Demographic Multipliers (2)	Northern <sup>1</sup>	0.21 to 0.5 du/acre (0.17 maximum)	95	3.809	1.072	0.075* acres	(75 gpd/person + 50 gpd/unit) * Consumptive/Depletive Coefficient	100 gallons per person per day	75 gallons per person per day
	Single-family Detached 4-5 BR		Central <sup>2</sup>								
SF Low Density or (PA-4)	Single-family Detached 4-5 BR	Statewide NJ Demographic Multipliers (2)	Northern <sup>1</sup>	0.51 to 1.0 du/acre (1.16 maximum)	80	3.809	1.072	0.075* acres	(75 gpd/person + 50 gpd/unit) * Consumptive/Depletive Coefficient	100 gallons per person per day	75 gallons per person per day
	Single-family Detached 4-5 BR		Central <sup>2</sup>								
SF Medium Density, Suburban Residential, or (PA-3)	Single-family Detached 4-5 BR	Statewide NJ Demographic Multipliers (2)	Northern <sup>1</sup>	1.01 to 3.0 du/acre (3.81 minimum)	75	3.137	0.607	26.7	(75 gpd/person + 30 gpd/unit) * Consumptive/Depletive Coefficient	100 gallons per person per day	75 gallons per person per day
	Single-Family Detached, 2-3 BR		Central <sup>2</sup>								
SF High Density or (PA-2)	Single-Family Detached, 2-3 BR	Statewide NJ Demographic Multipliers (2)	Northern <sup>1</sup>	3.01 to 8.0 du/acre (7.04 minimum)	75	2.578	0.367	33.7	(75 gpd/person + 5 gpd/unit) * Consumptive/Depletive Coefficient	75 gallons per person per day	75 gallons per person per day
	Single-Family Attached, 2-3 BR		Central <sup>2</sup>								
Attached/Townhouse or (PA-1)	Single-Family Attached, 2-3 BR	Statewide NJ Demographic Multipliers (2)	Northern <sup>1</sup>	8.01 to 16.0 du/acre (9.78 minimum)	75	2.477	0.296	45.7	(75 gpd/person + 5 gpd/unit) * Consumptive/Depletive Coefficient	75 gallons per person per day	75 gallons per person per day
	Single-Family Attached, 2-3 BR		Central <sup>2</sup>								

## Appendix B – Highlands Module 2 Build-Out Model Impact Factors

Highlands Zone Type	Comparison Zone/Unit Type	Source	Region	Density Dwelling unit (du)/acre *	Efficiency Factor % (1)	Average Household Size (2)	Average School Children in Household (2)	Percent Impervious (3)	Consumptive/Depletive Water Use includes Indoor demand (gpd per person) plus outdoor demand as (gpd per unit) multiplied by Consumptive/Depletive Use Coefficient (4)	Public Water System Demand (5)	Public Wastewater System Generation (6)
	Single-Family Attached, 2-3 BR	Statewide NJ Demographic Multipliers (2)	Northern <sup>1</sup>			2.477	0.296				
	Single-Family Attached, 2-3 BR		Central <sup>2</sup>			2.296	0.292				
Garden Apartment or (PA-1)				16.01 + du/acre (9.78 minimum)	70			57.1	(75 gpd/person + 5 gpd/unit) * Consumptive/Depletive Coefficient	75 gallons per person per day	75 gallons per person per day
	5+ Units (Own/Rent), 2-3 BR	Statewide NJ Demographic Multipliers (2)	Northern <sup>1</sup>			2.262	0.308				
	5+ Units (Own/Rent), 2-3 BR		Central <sup>2</sup>			2.342	0.373				
Mixed use/Age Restricted Housing (percent mix based on 40% residential and 60% non-residential as Office/Commercial)		Municipal Zoning		Apply zone density and FAR value Note: Use Retail/Commercial Impact factors for non-res %	70	Varies Based on zoning Du/Acre description	0.00	68.8	(75 gpd/person + 5 gpd/unit) * Consumptive/Depletive Coefficient	75 gallons per person per day	75 gallons per person per day
Mixed use (percent mix based on 40% residential and 60% non-residential as Office/Commercial)		Municipal Zoning		Apply zone density and FAR value Note: Use Retail/Commercial Impact factors for non-res %	70	Varies Based on zoning Du/Acre description	Varies Based on zoning Du/Acre description	42.0	(75 gpd/person + 5 gpd/unit) * Consumptive/Depletive Coefficient	75 gallons per person per day	75 gallons per person per day
Senior or Age restricted Housing		Municipal Zoning		Varies Based on zoning Du/Acre description	70	Varies Based on zoning Du/Acre description	0.00	60.3	(75 gpd/person + 5 gpd/unit) * Consumptive/Depletive Coefficient	75 gallons per person per day	75 gallons per person per day

### Highlands Build-Out Residential Impact Factors – Sources

\* Residential dwelling units generated by the build-out model include both market rate and affordable units.

(1) Source: Efficiencies are given as a percentage, between 0 and 100, where a 100 value means complete efficiency (no land lost to development), and a 0 value means no buildings will be estimated for that land use. For example an efficiency of 70% may be representative of developable land that has a 10% set aside for parks and 20% for roads (100% - 10% - 20% = 70%). Project determined values.

(2) Source: Who Lives in New Jersey Housing? New Jersey Demographic Multipliers, The Profile of Occupants of Residential and nonresidential Development, Listokin, D., Voicu, I., Dolphin, W., Camp, M. Center for Urban Policy Research, Rutgers University, November 2006. Northern NJ values were applied to Bergen, Morris, Sussex and Warren County municipalities. Central NJ values were applied to Hunterdon and Somerset County municipalities. Research, Rutgers University, November 2006. Northern NJ values were applied to Bergen, Morris, Sussex and Warren County municipalities. Central NJ values were applied to Hunterdon and Somerset County municipalities.

1 Table II-C-1 North Region of New Jersey Total Persons and Persons by Age (2000) (p. 85)

(3) Source: NCNBR, Rutgers University, April 27, 2006. The impervious surface area for new dwelling units large lot zoned areas (\*) is based on an average 15% impervious surface value (per NJDEP LU/LC) and a project determined average homestead area of 0.50 acres. No impact value is attached to the remaining undeveloped area. The impact percentage factors for the other residential composite zones represent weighted averages of NJ Highlands Percent Impervious Surface for all residentially developed lands in that composite zone. The raw data was obtained by overlaying NJ Highlands Zoning and DEP 2002 LU/LC spatial data files, and extracting the calculated percent impervious surface area attached to each LU/LC residential developed land polygon and the acres of associated developed land in each intersecting municipal zone polygon. The impervious surface areas in each municipal zone within the composite zone were aggregated and then divided by the total developed residential land area, to produce a weighted IS average for each composite zone.

(4) Source: Center for Urban Policy Research (CUPR), September 2000. NJGS Consumptive Use Coefficients. For consumptive uses, a factor of 29% is utilized. For depletive uses, a factor of 100% is used

(5) Source: NJDEP N.J.A.C. 7:10 Safe Drinking Water Act Regulations Adopted November 4, 2004, 7:10-12.6 Water Volume Requirements and State Plan Impact Assessment

(6) Source: NJDEP N.J.A.C. 7:14A-23.3 Pollutant Discharge Elimination System: Technical Requirements For TWA Applications; Projected flow criteria

## Appendix B – Highlands Module 2 Build-Out Model Impact Factors

Highlands Composite Zone Type	Floor Area Ratio	Efficiency Factor % (1)	Region	Jobs per 1,000 sf (2)	Percent Impervious (3)	Consumptive/Depletive Water Use multiplied by Consumptive/Depletive Use Coefficient (4)	Public Water System Demand (5)	Public Wastewater System Generation (6)
Office/Commercial	Based on zoning	80	Northeast US	2.99	78.3	0.125 gpd/sf * Consumptive/Depletive Coefficient	0.125 gallons/day/sf	0.10 gallons/day/sf
Retail	Based on zoning	80	Northeast US	1.63	72.5	0.125 gpd/sf * Consumptive/Depletive Coefficient	0.125 gallons/day/sf	0.10 gallons/day/sf
Industrial	Based on zoning	80	Northeast US	1.11	53.4	25 gpd/person * Consumptive/Depletive Coefficient	25 gallons per person per day	25 gallons per person per day

### Highlands Build-Out Non-Residential Impact Factors – Sources

- (1) Source: Efficiencies are given as a percentage, between 0 and 100, where a 100 value means complete efficiency (no land lost to development), and a 0 value means no buildings will be estimated for that land use. For example an efficiency of 70% may be representative of developable land that has a 10% set aside for parks and 20% for roads (100% - 10% - 20% = 70%). Project determined values.
- (2) Source: Who Lives in New Jersey Housing? New Jersey Demographic Multipliers, The Profile of Occupants of Residential and nonresidential Development. Listokin, D., Voicu, I., Dolphin, W., Camp, M. Center for Urban Policy Research, Rutgers University. November 2006.
  - a Table II-1-3 Commercial - Office Employees per 1,000 Square Feet of Gross Floor Area (GFA) (p. 136) (Reported Northeast mean value).
  - b Table II-1-4 Commercial – Retail Employees per 1,000 Square Feet of Gross Floor Area (GFA) (p. 139) (Value derived by averaging the mean number of employees per 1,000 sq. ft. of GFA for retail (excluding mall), retail (enclosed mall), and retail (strip shopping mall) space in the Northeast).
  - c Table II-1-6 Industrial – Warehouses Employees per 1,000 Square Feet of Gross Floor Area (GFA) (p. 143) (Value derived by averaging the mean number of employees per 1,000 sq. ft. of GFA for Non-Refrigerated and Refrigerated space in the Northeast).
- (3) Source: NCNBR, Rutgers University, April 27, 2006. The impervious surface area for new dwelling units large lot zoned areas (\*) is based on an average 15% impervious surface value (per NJDEP LU/LC) and a project determined average homestead area of 0.50 acres. No impact value is attached to the remaining undeveloped area. The impact percentage factors for the other residential composite zones represent weighted averages of NJ Highlands Percent Impervious Surface for all residentially developed lands in that composite zone. The raw data was obtained by overlaying NJ Highlands Zoning and DEP 2002 LU/LC spatial data files, and extracting the calculated percent impervious surface area attached to each LU/LC residential developed land polygon and the acres of associated developed land in each intersecting municipal zone polygon. The impervious surface areas in each municipal zone within the composite zone were aggregated and then divided by the total developed residential land area, to produce a weighted IS average for each composite zone.
- (4) Source: Center for Urban Policy Research (CUPR), September 2000. NIGS Consumptive Use Coefficients. For consumptive uses, a factor of 29% is utilized. For depletive uses, a factor of 100% is used
- (5) Source: NJDEP N.J.A.C. 7:10 Safe Drinking Water Act Regulations Adopted November 4, 2004, 7:10-12.6 Water Volume Requirements and State Plan Impact Assessment
- (6) Source: NJDEP N.J.A.C. 7:14A-23.3 Pollutant Discharge Elimination System: Technical Requirements For TWA Applications; Projected flow criteria