

**RMP Component:** Smart Growth Component  
**Technical Report:** Build Out Analysis  
**Memorandum Title:** Land Use Characteristics and Zoning Assessment  
**Status:** Preliminary Draft  
**Date:** August 7, 2006 (revised August 24, 2006)

## **ACKNOWLEDGEMENTS**

The Land Use/Land Cover Change Analysis portion of this assessment was prepared by the New Jersey Highlands Water Protection and Planning Council (Highlands Council) based on work performed by the Center for Remote Sensing & Spatial Analysis at Rutgers University.

## **EXECUTIVE SUMMARY**

This technical memorandum outlines the methods used for the Land Use Characteristics and Zoning Assessment (Assessment), which consists of two parts - a Land Use/Land Cover Change Analysis and an analysis of the Highlands Build Out Model's baseline zoning characteristics (Zoning Characteristics Analysis). The Land Use Characteristics and Zoning Assessment follows the changes in land use in the Highlands that have occurred over the past three decades, and considers the future of land use through a study of zoning classifications. By examining land use and zoning, more informed decisions can be made regarding land use planning to insure that land with significant Highlands resources will be protected.

## **INTRODUCTION**

Human development has and will continue to shape the Highlands Region. The Land Use/Land Cover (LULC) Change Analysis looks at past and present land uses and captures the changes that have occurred over the past several decades. The Highlands Build Out Model utilizes land use and municipal zoning data to develop maximum residential and non-residential numerical build out estimates for the Highlands Region. The Build Out Model provides a glimpse into the Region's land use future, and illustrates the implications of zoning choices. For the Land Use Characteristics and Zoning Assessment, municipal zoning will be compared throughout the Highlands Region using consolidated zoning categories. By examining past and present land uses and zoning, informed decisions can be made regarding land use planning. The Land Use Characteristics and Zoning Assessment may also illuminate

opportunities for improving the balance of land uses, which will insure that sensitive Highlands land will be preserved from inappropriate development.

In LULC, “land use” refers to a “description of the way that humans are utilizing any particular piece of land for one or many purposes”, while “land cover” is the “physical material on the surface of any piece of land” (“What is Land Use/Land Cover”, Center for Remote Sensing and Spatial Analysis at Rutgers University). Typically, zoning is the “classification of land by types of uses permitted and prohibited and by densities and intensities permitted and prohibited” (Davidson, M. & Dolnick, F. 2004). Municipal zoning is a policy tool that guides land use decisions in a community. By evaluating historic land use patterns with local zoning decisions, land use conditions and impacts are better understood and may further support regional planning initiatives.

#### **LEGAL REQUIREMENTS FROM THE HIGHLANDS ACT**

The Land Use Characteristics and Zoning Assessment will contribute to the overall development of the Highlands Council’s Regional Master Plan. Specifically, Section 11.a of the Highlands Water Protection and Planning Act (Highlands Act) states that:

*The regional master plan shall include, but need not necessarily be limited to:...*

*(6) A smart growth component that includes an assessment, based upon the resource assessment... of opportunities for appropriate development, redevelopment, and economic growth, and a transfer of development rights program which shall include consideration of public investment priorities, infrastructure investments, economic development, revitalization, housing, transportation, energy resources, waste management, recycling, brownfields, and design such as mixed-use, compact design, and transit villages.*

#### **LAND USE LAND COVER CHANGE ANALYSIS**

LULC is a data layer created by the New Jersey Department of Environmental Protection (NJDEP) that captures the state of land use and natural land cover in a digital Geographical Information Systems (GIS) file. The purpose of the LULC Change Analysis is to examine present day land use in conjunction with patterns documented at specific points in time over the past three decades in the Highlands Region and compare them. Both tabular and spatial data were reviewed as part of this analysis.

LULC utilizes a hierarchical land use classification system which describes data with different levels of detail. The NJDEP 1995/97 Land Use/Land Cover metadata outlines the Anderson Classification system, which includes four digits representing one to four levels of classification: Level I - general, Level II - descriptive, Level III - detailed, and Level IV - most detailed. It is read as follows: the first digit in the code is the Level I general classification. The first two digits indicate the Level II descriptive code, the first three digits provide a more detailed description, and the four digit classification represents the most detailed level of categorization. See Table 1 for an example of how residential land is subcategorized. See Appendix A for 2002 Level I land use classifications descriptions.

Table 1: LULC Categorization Example

Level I	Level II	Level III	Level IV
1000. Urban	1100. Residential	1110. Residential, High Density	1111. Residential, High Density, Single Unit

For this Land Use Land Cover Change Analysis, land use classifications are presented simply by the Level I or the most general classification as outlined in Appendix A. However, in other work undertaken in support of the Regional Master Plan, land use classifications have departed from the Anderson Land Use Land Cover Level I classifications.

In order to coordinate science and planning initiatives, the Council developed a land use codification system. The 13 “Highlands Classifications” will serve henceforth as the land use codification system for work associated with the Highlands Regional Master Plan (RMP). The matrix in Appendix B presents the realm of Anderson LULC (Level I through Level IV) classifications that are being used in the Highlands Region and details how each Highlands Classification is defined. The matrix also indicates how Regional Master Plan resource data layers correlate to the Highlands Classifications. When variations from the Highlands Classifications occur, they will be discussed within the associated technical document.

The Highlands classifications are outlined in the list below:

- Highlands Classification 1, Residential - includes those lands classified as high, medium, and low density, rural, and mixed residential. It contributes to the developed and urban RMP resource data layers.

- Highlands Classification 2, Non-Residential - includes lands classified as commercial, industrial, and mixed urban or built-up lands. It contributes to the developed and urban resource RMP data layers.
- Highlands Classification 2A, Mining - includes lands classified as extractive mining. It contributes to the developed, urban, and other (barren) RMP resource data layers.
- Highlands Classification 3, Developed-Military - includes lands classified as military reservations. It contributes to the developed and urban RMP resource data layers.
- Highlands Classification 4, Developed-Plat - includes lands classified as transportation, communications, utilities, roadways, bridges, airports, stadiums, theaters, cultural centers, and zoos. It contributes to the developed and urban RMP resource data layers.
- Highlands Classifications 4A, Developed-Vegetated - includes developed and undeveloped upland rights-of-way, stormwater basins, cemeteries, recreational lands, and athletic fields associated with schools. It contributes to the developed, urban, altered, and unforested RMP resource data layers.
- Highlands Classification 5 – Transitional includes lands classified as transitional and altered. It contributes to the altered and unforested RMP resource data layers.
- Highlands Classification 6 – Other-Unvegetated - includes lands classified as former military and other urban or built up lands. It contributes to the urban and other (barren) RMP resource data layers.
- Highlands Classification 6A – Other-Vegetated - includes lands classified as phragmites (a common reed), dominated area. It contributes to the urban, altered, and unforested RMP resource data layers.
- Highlands Classification 7 – Agriculture - includes croplands, pasturelands, orchards, vineyards, nurseries, horticultural areas, confined feeding operations, and other agriculture lands. It contributes to the agricultural and unforested RMP resource data layers.
- Highlands Classification 8 – Forest - includes deciduous and coniferous forests with varying crown closures, plantations, mixed forests with varying crown closures, and severely burned upland forests. It contributes to the forest RMP resource data layer.
- Highlands Classification 9 – Wetlands-Forest - includes deciduous, coniferous, and mixed wooded wetlands, and Atlantic white cedar wetlands. It contributes to the forest and wetlands RMP resource data layer.
- Highlands Classification 10 – Wetlands-Agriculture - includes modified and former agricultural wetlands, and contributes to the agricultural layer, wetlands, and unforested RMP resource data layers.

- Highlands Classification 10A – Wetlands-Scrub/Shrub – includes deciduous, coniferous, and mixed scrub/shrub wetlands, and mixed brush and bog wetlands. It contributes to the wetland, forest, and unforested RMP resource data layers.
- Highlands Classification 10B – Wetlands-Emergent – includes herbaceous wetlands and freshwater marshes. It contributes to the wetland and unforested RMP resource data layers.
- Highlands Classification 10C – Wetlands-Urban - includes managed wetland in maintained lawn, modified wetland rights-of-way, cemetery on wetlands, and managed wetlands in built-up maintained recreation areas. This classification contributes to the urban, altered, wetland, and unforested RMP resource data layers.
- Highlands Classification 10D - Wetlands-Other - includes phragmites dominated interior wetlands and modified disturbed interior wetlands, and contributes to the altered, wetland, and unforested RMP resource data layers.
- Highlands Classification 11 – Water - includes streams, canals, natural and artificial lakes, and dredged lagoons. It defines the water RMP resource layer.
- Highlands Classification 12 – Old Field - includes old fields and phragmites dominated old fields. It contributes to the altered and unforested RMP resource data layers.
- Highlands Classification 12A – Successional Forest - includes deciduous, coniferous, and mixed brush/shrublands. It contributes to the altered and forest RMP resource data layers.
- Highlands Classification 13 – Undeveloped-Barren - includes beaches, bare exposed rock, rock slides, and undifferentiated barren lands. It contributes to the other (barren) RMP resource data layer.

## **LAND USE LAND COVER CHANGE ANALYSIS METHODOLOGY**

NJDEP's digital GIS LULC data sets are organized by watershed management areas (WMA) as defined by NJDEP. All WMAs of the LULC were combined to form one data set for the entire Highlands Region. This data was used to study the rate and pattern of change for the time periods from 1986 to 1995, and 1995 to 2002. Note that 1986 and 1995 LULC data are in a finalized format, but the 2002 LULC data has been pre-released as a draft to the Highlands Council in support of development of the Regional Master Plan. Level III of the LULC attribute data was extracted and summarized in order to generate the total area in acres for all land use categories for the three time periods. Transition matrices are tables that

indicate the transition in land uses over time, and were developed for the time periods of 1986 to 1995 and 1995 to 2002. The transition matrices present the changes in LULC Level I land categories during the time periods being evaluated. Note that some changes in land use classification may potentially be due to changes in mapping techniques and improved imagery. The analysis included six Level I categories, including Urban, Agriculture, Forest, Water, Wetlands, and Barren/Transitional. Note that in 1986 LULC data included a Managed Wetlands classification. See Appendix A for additional information on the Managed Wetlands classification.

### LAND USE LAND COVER CHANGE ANALYSIS RESULTS

Appendix C contains the number of acres in each 2002 LULC classification by municipality. The figure entitled “Change of Urban Land within the Highlands (1986-2002)” shows the changes to Urban and Barren lands between 1986 and 2002. It illustrates that lands newly converted to Urban and Barren are scattered throughout the Highlands Region.

Table 2: Land Use Land Cover Change between 1986 and 2002

Land Use/Land Cover Classification and Series	Total Acres			Change 1986-1995	% Change	Change 1995-2002	% Change
	1986	1995	2002				
Urban (1000)	176,135	197,949	218,202	21,814	12%	20,254	10%
Agriculture (2000)	145,743	128,639	118,184	-17,104	-12%	-10,455	-8%
Forest (4000)	417,621	412,004	402,244	-5,617	-1%	-9,761	-2%
Water (5000)	30,433	32,592	32,406	2,159	7%	-186	-1%
Wetlands (6000)	81,808	78,379	78,866	-3,429	-4%	488	1%
Barren/Transitional (7000)	7,252	9,460	9,120	2,208	30%	-340	-4%

Table 2 shows the changes in all Level I LULC categories between 1986 and 2002. It indicates an approximate 10% increase in Urban land from 197,949 to 218,202 acres (a change of about 20,253 acres) between 1995 and 2002. Upon examination of source data, including the Level III categories related to this change, Rural, Single-unit Residential land use showed the largest increase of all of the Urban categories; increasing by over 10,000 acres. The increase in Urban land is mirrored by a decrease in Agriculture and Forest between 1995 and 2002. Table 2 shows that Agriculture land decreased by approximately 8% (10,455 acres), and Forest land decreased by 2% (9,761 acres). Both Water and Barren/Transitional lands decreased slightly, while Wetlands increased slightly.

# Change of Urban Land within the Highlands (1986-2002)

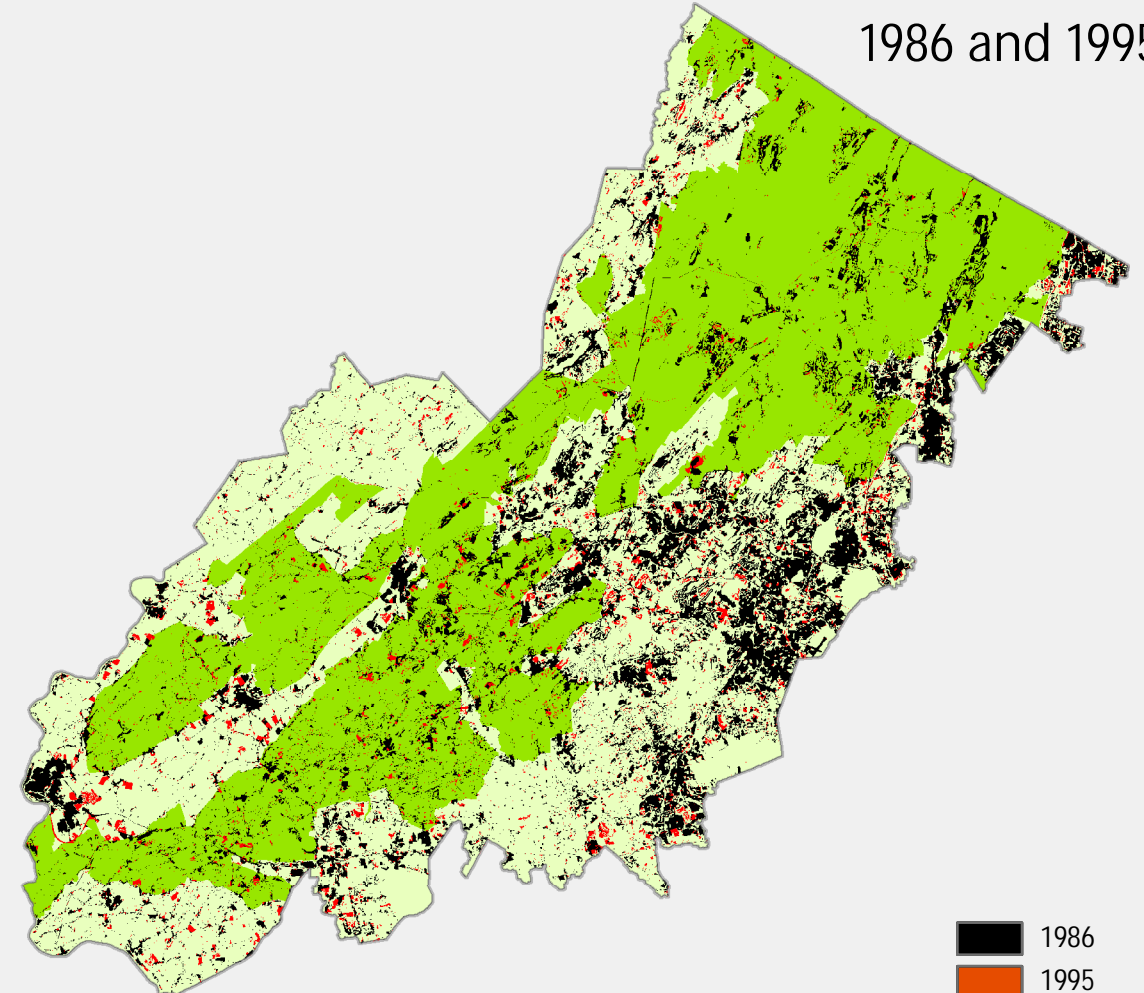
## Legend

- Earlier Year in Comparison Highlands Boundary
- Urban/Barren Land Use
- Highlands Preservation Area
- Later Year in Comparison
- Highlands Planning Area
- Urban/Barren Land Use

Note: The Urban Land Use Class and Barren Land Use Class refer to the Anderson 1000 and Anderson 7000 series Classifications, respectively.

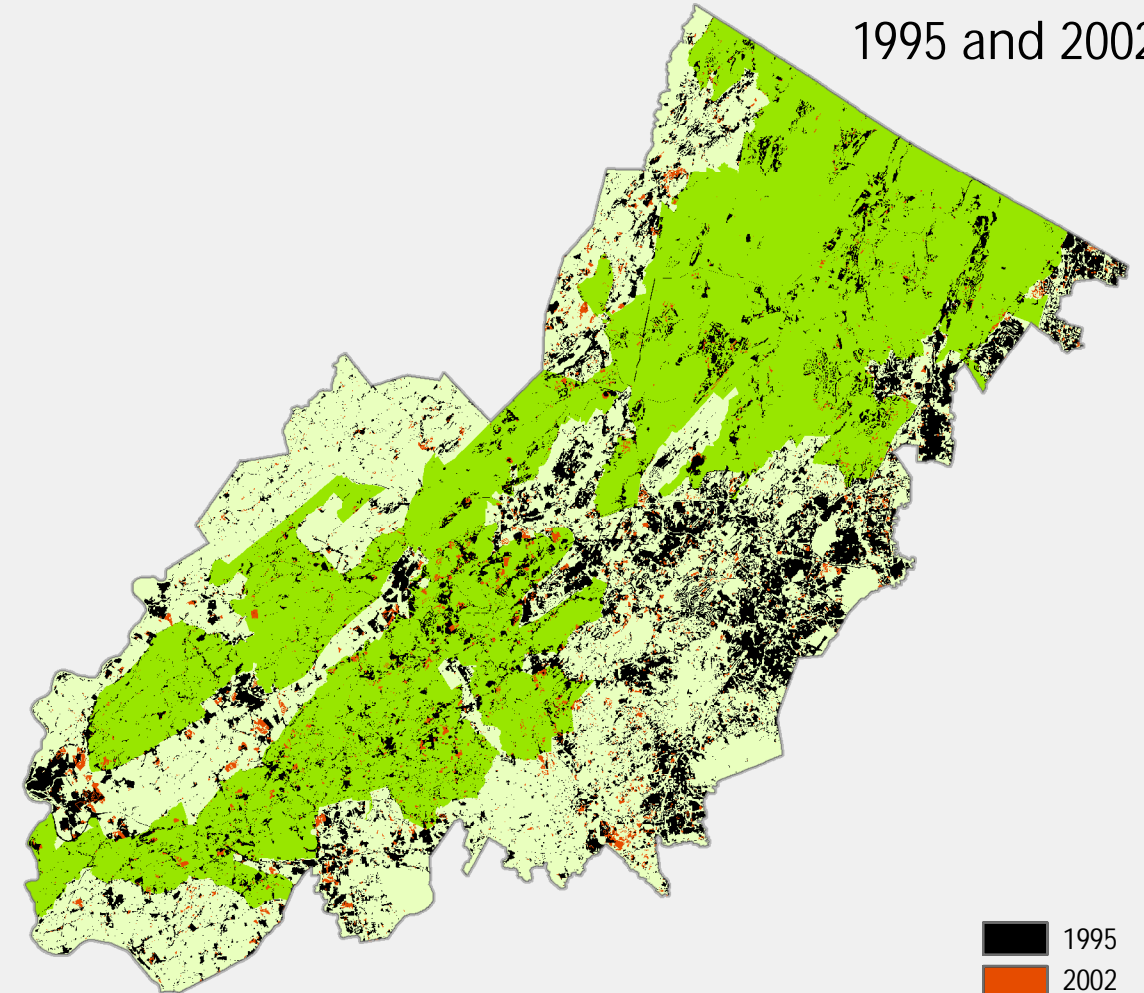
Source:  
New Jersey Highlands Council, 2006  
(Based on NJDEP LULC Data)

1986 and 1995



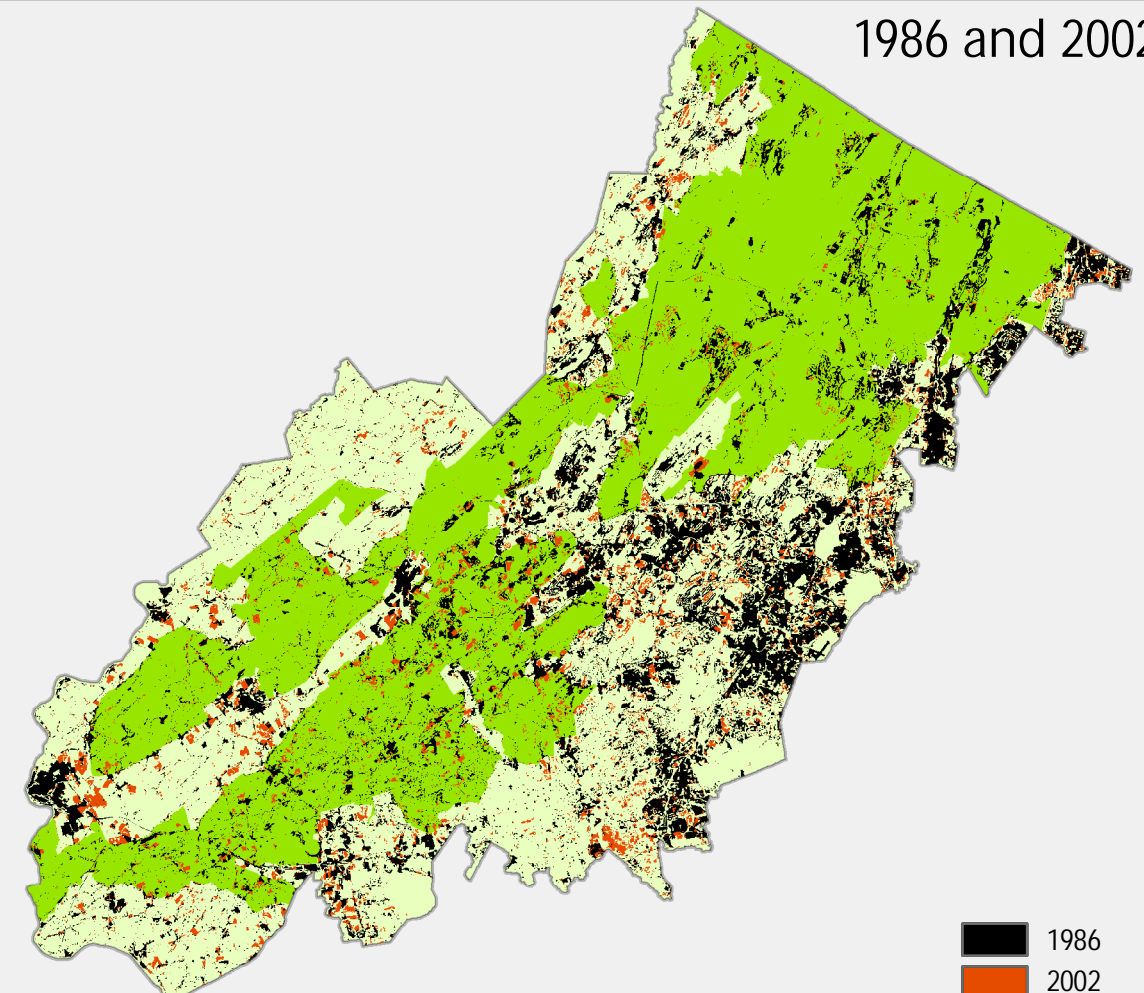
1986  
1995

1995 and 2002

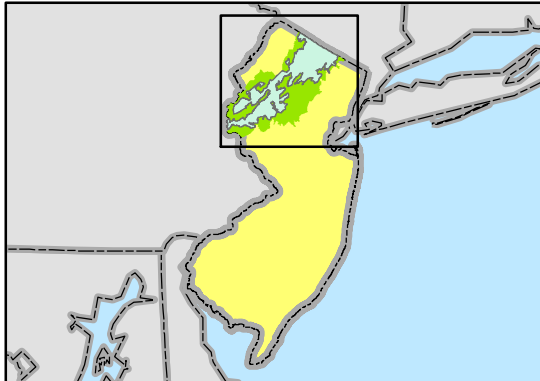
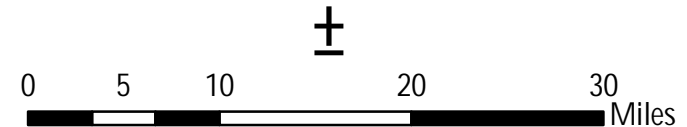


1995  
2002

1986 and 2002



1986  
2002



The information contained on this map is the best available according to the procedures and standards of the New Jersey Highlands Water Protection and Planning Council ("Highlands Council"). The Highlands Council is regularly maintaining the information in its databases and GIS layers in order to maintain the quality and timeliness of the data. However, unintentional inaccuracies may occur, particularly where data or information is derived from sources other than the Highlands Council. The Highlands Council has made every effort to present the information in a clear and understandable way for a variety of users. However, we cannot be responsible for the misuse or misinterpretation of the information presented herein. Therefore, under no circumstances shall the State of New Jersey or specifically, the Highlands Council be liable for any actions taken or omissions made from reliance on any information contained herein from whatever source nor shall the State be liable for any other consequences from any such reliance. Additional sources of information may include NJDOT and NJDEP information work products.

Prepared By:  
New Jersey Highlands Council  
July 2006

Tables 3 and 4 are transition matrices; and display the transition in LULC categories by acres between 1986-1995 and 1995-2000. The columns display the net change in terms of losses and gains in acres for each land use classification, and the rows display where the acres transitioned to or from. For example, Table 3 shows that between 1986 and 1995, there was an overall decrease of 3,429 Wetland acres. The table also shows that between those years, 493 acres of Agriculture land transitioned to Wetlands, and 2,403 Wetland acres transitioned to Urban.

Table 3: Transition Matrix for Level I change 1986 to 1995 (area in acres)

Land Use Land Cover Characteristics Change 1986 – 1995												
LULC Series Code	Urban		Agriculture		Forest		Water		Wetlands		Barren	
	Gain	Loss	Gain	Loss	Gain	Loss	Gain	Loss	Gain	Loss	Gain	Loss
Urban (1000)			2,157	(10,920)	9,817	(20,043)	409	(268)	524	(2,403)	471	(1,532)
Agriculture (2000)	10,920	(2,157)			9,959	(2,817)	183	(75)	493	(1,124)	1,857	(134)
Forest (4000)	20,043	(9,817)	2,817	(9,959)			1,371	(470)	380	(284)	2,399	(863)
Water (5000)	268	(409)	75	(183)	470	(1,371)			472	(1,114)	122	(486)
Wetlands (6000)	2,403	(524)	1,124	(493)	284	(380)	1,114	(472)			588	(214)
Barren (7000)	1,532	(471)	134	(1,857)	863	(2,399)	486	(122)	214	(588)		
Managed Wetlands (8000)	26	(0)	1	(0)	0	(0)	3	(0)	1	(0)	0	(0)
Subtotals	35,192	(13,378)	6,308	(23,412)	21,393	(27,010)	3,566	(1,407)	2,084	(5,513)	5,437	(3,229)
Net Change	21,814		(17,104)		(5,617)		2,159		(3,429)		2,208	

Table 4: Transition Matrix for Level I change 1995 to 2002 (area in acres)

Land Use Land Cover Characteristics Change 1995 – 2002												
LULC Series Code	Urban		Agriculture		Forest		Water		Wetlands		Barren	
	Gain	Loss	Gain	Loss	Gain	Loss	Gain	Loss	Gain	Loss	Gain	Loss
Urban (1000)			557	(6,516)	1,834	(12,651)	14	(41)	113	(855)	498	(3,208)
Agriculture (2000)	6,516	(557)			4,329	(1,741)	22	(5)	943	(261)	1,363	(155)
Forest (4000)	12,651	(1,834)	1,741	(4,329)			21	(31)	126	(78)	2,364	(870)
Water (5000)	41	(14)	5	(22)	31	(21)			434	(266)	102	(103)
Wetlands (6000)	855	(113)	261	(943)	78	(126)	266	(434)			319	(650)
Barren (7000)	3,208	(498)	155	(1,363)	870	(2,364)	103	(102)	650	(319)		
Subtotals	23,271	(3,017)	2,719	(13,174)	7,142	(16,903)	426	(612)	2,267	(1,779)	4,646	(4,986)
Net Change	20,254		(10,455)		(9,761)		(186)		488		(340)	

The transition matrices illustrate the dynamic nature of the land use change process. Table 4 shows a gross increase of 23,271 acres of new Urban land, but also a decrease of 3,017 acres of 1995 Urban lands to other classes by 2002, yielding a net increase of 20,254 acres. Table 4 also shows that between 1995 and 2002, much of the decline in Agriculture land is due to abandonment and natural succession to Forest and Wetlands (approximately 4,329 acres to Forest and 943 acres to Wetlands). As is the nature of the category, Barren/Transitional exhibited changes with significant areas becoming Barren and then transitioning to another category, often Urban.

### ZONING CHARACTERISTICS ANALYSIS

The Highlands Council, working in conjunction with its constituent municipalities, consultants, and other State and local resources, compiled zoning information in order to understand local conditions for potential land development. This zoning information was consolidated into composite zone categories for ease of comparison and evaluation of the Highlands Region. Current (as of November 2005) zoning data from all 88 municipalities in the Highlands Region was collected, including the designated use (residential, commercial, institutional, etc). Shown below in Table 5 are the Highlands Composite Zones.

Table 5: Highlands Region Composite Zones

Highlands Composite Zones	
• Rural Estate	• Age Restricted/Senior
• Rural Residential	• Mixed Use/ Age Restricted
• SF Low Density	• Mixed Use
• SF Medium Density	• Industrial
• SF High Density	• Office/Commercial
• Attached/Townhouse	• Retail
• Garden Apartments	• Institutional/ Open Space

Some of the Highlands Composite Zones have been assigned density ranges. Rural Estate, Rural Residential and Single Family Low Density are all low density zones which range from .05 to 1.00 du/acre. Single Family Medium and High Density zones range from 1.01 to 8.00 du/acre. Attached/ Townhouse and Garden Apartments have the highest densities and

range from 8.01+ du/acre. Lands that are zoned for Institutional or Open Space were grouped for this category. The remaining composite zones, or those zones listed on the right-hand column of Table 5, are more diverse and therefore without specified density ranges. The Highlands Council produced a figure entitled “Highlands Composite Zoning” which illustrates the various composite zones throughout the Highlands Region.

### **ZONING CHARACTERISTICS ANALYSIS METHODOLOGY**

For the purposes of this analysis as well as for graphic representation, certain similar composite zone types were consolidated. Please note that composite zones represent existing municipal base zoning as of November of 2005; overlay zones at the municipal zoning level may permit a different use than the base zoning and were not taken into consideration for purposes of this analysis. After the adoption of the Regional Master Plan, during the Plan Conformance process, municipal zoning will continue to be evaluated. The Industrial, Retail, and Office/Commercial zones were consolidated into one zone called Non-Residential. In addition, the two lowest density zones, Rural Estate and Rural Residential, were consolidated into one zone called Single Family Rural Estate/Residential. Mixed Use, Age Restricted Housing, and Mixed Use/ Age Restricted Housing zones were combined into one zone. Single Family High Density, Garden Apartments and Attached/ Townhouse, all of which are high density residential zones, were combined into one zone. The 2002 Zoning Characteristics Baseline is contained within in Appendix D and presents the percentage of acres of each composite zone type by municipality.




















### **ZONING CHARACTERISTICS ANALYSIS RESULTS**

Graph 1 shows the Highlands Region composite zone breakdown. The SF Rural Estate/ Residential zones represent the largest composite zone component in the Highlands Region, accounting for nearly 490,000 acres, or 57% of all lands. Institutional/Open Space zones are identified as open space, parks, or institutional lands and were not included as buildable lands in this analysis. These lands represent 108,000 acres or 13% of all zoned land in the Highlands Region zones. Both Non-Residential and SF Medium Density composite zones each account for 9% of the area of the region. The remaining zone represents Mixed Use/ Age Restricted Housing; this represents less than 1% or about 11,000 acres.

# Highlands Composite Zoning

(Based on Municipal Zoning as of Nov. 2005)

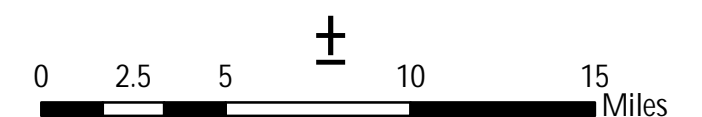
## Legend

<b>Zoning (DU/Acre)</b>		<b>Administrative Boundaries</b>	
	Single Family Estate Residential and Single Family Rural Residential (.05-.5)		County Boundaries
	Single Family Low Density (.51-1)		Municipal Boundaries
	Single Family Medium Density (1.01-3)	<b>Highlands Boundary</b>	
	Single Family High Density (3.01 - 8)		Highlands Preservation Area
	Townhouse Attached and Garden Apartments (8.01 +)		Highlands Planning Area
	Senior or Age Restricted Housing (*)	<b>Roadway Network</b>	
	Mixed Use (*)		Interstate Highways
	Mixed Use/Age Restricted Housing (*)		U.S. Routes
	Industrial(*)		State Routes
	Office/Commercial(*)	* Based on Zoning	
	Retail(*)		
	Institutional/Open Space(*)		

Source:  
New Jersey Highlands Council, 2006  
(Based on Municipal Zoning 11/2005)

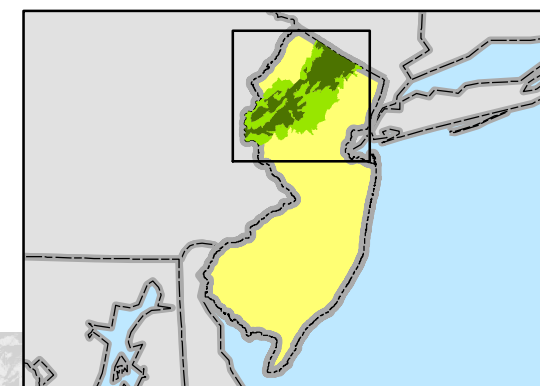
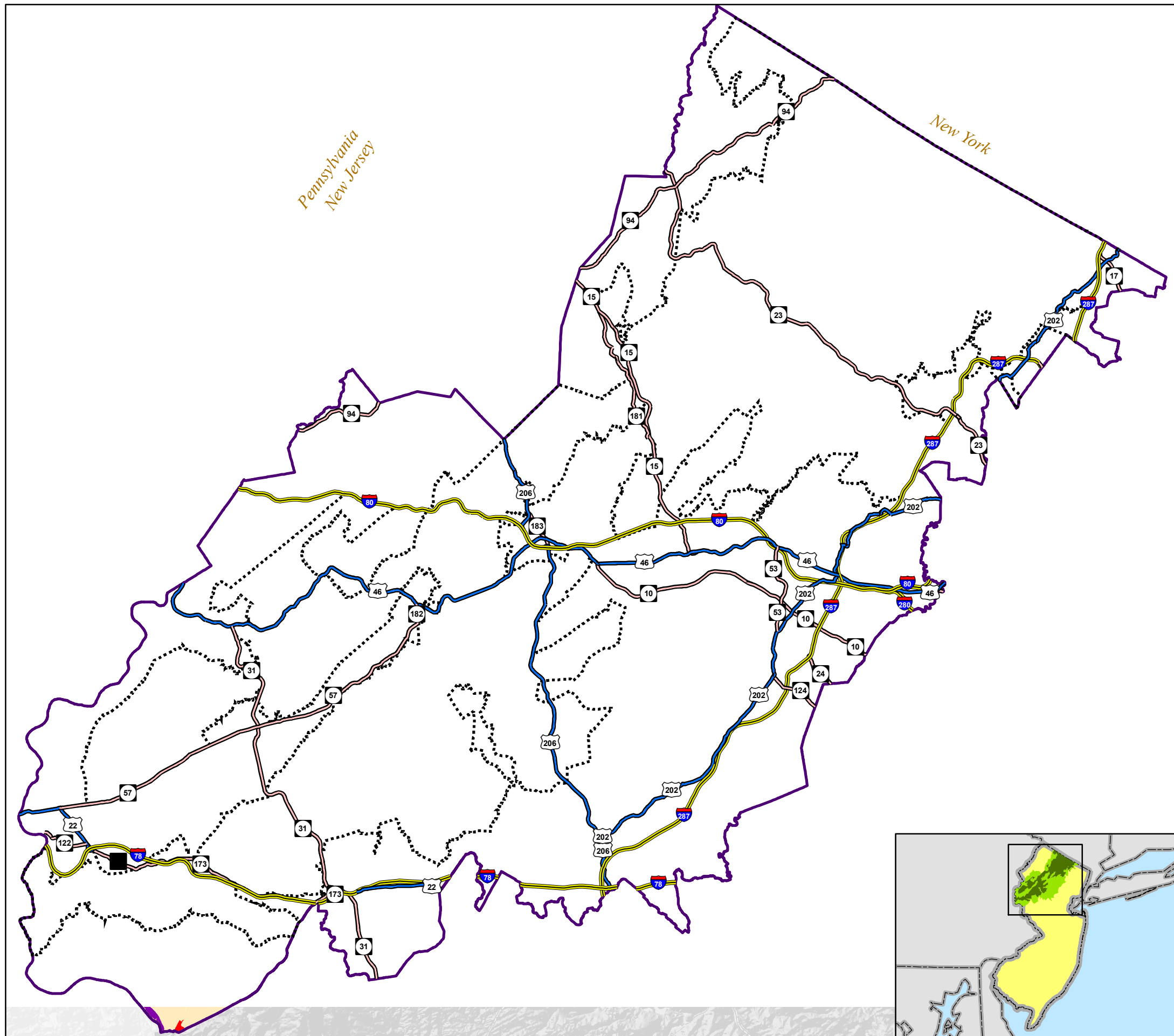
## For Build Out Purposes

The information illustrated in this figure was for the limited purposes of evaluating build-out potential of the Highlands Region based on municipal zoning and state land use regulatory constraints in effect prior to the adoption of the Highland Act and is not intended to reflect the development potential of the Region in accordance with the Highlands Regional master Plan.



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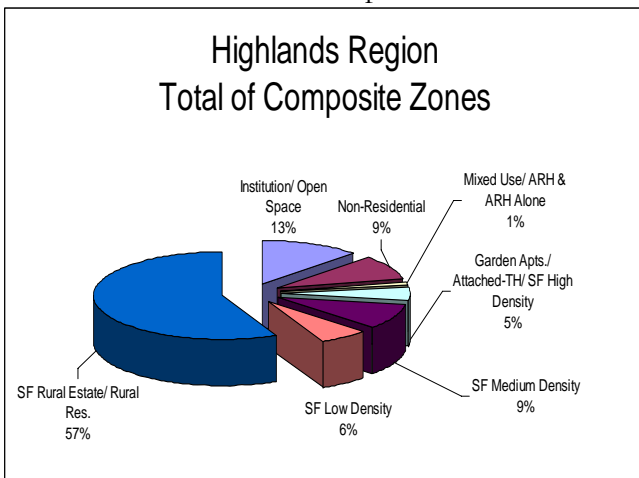
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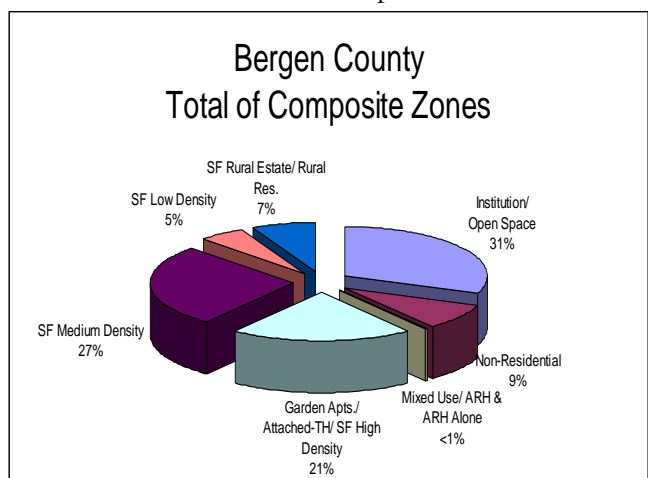
The seven Highlands counties differed with respect to composite zone breakdown. Bergen County, as shown in Graph 2, shows a more proportionate breakdown which includes a smaller percentage of SF Rural Estate/ Residential, and a greater percentage of Institutional/ Open Space as well as medium and higher density zones. Hunterdon, Passaic, Somerset and Warren Counties, shown in Graphs 3, 5, 6 and 8, each have greater proportions of land categorized as SF Rural Estate/Residential. For each of those counties, the remaining composite zones represent less than one-third of the region. Morris and Sussex Counties were also largely SF Rural Estate/Residential (although less so than that of Hunterdon, Passaic, Somerset and Warren Counties); in either case accounting for about 50%. Bergen, Morris and Sussex Counties all show a large percentage of land zoned as Institutional/ Open Space. Note that the zoning spatial coverage for Morris County is parcel based and includes roads/transportation as a spatial representation; therefore the land zoned as Institutional/Open Space includes road/transportation acres.

Graphs 9, 10 and 11 represent the three different Highlands Regions: Planning, Preservation and Split Areas (municipalities that contain lands in both Preservation and Planning areas) respectively. The Planning area can be generally characterized as having more lands which fall into composite zones of higher density. Conversely, within the Preservation area towns, SF Rural Estate/ Residential accounts for over 80% of the land. The Split area, shown in Graph 11, lies somewhere in between the Preservation and Planning areas, with respect to composite zoning patterns.

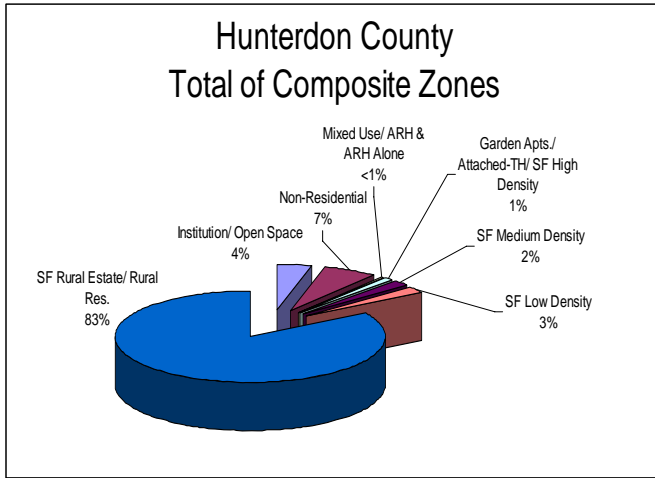
Graph 1



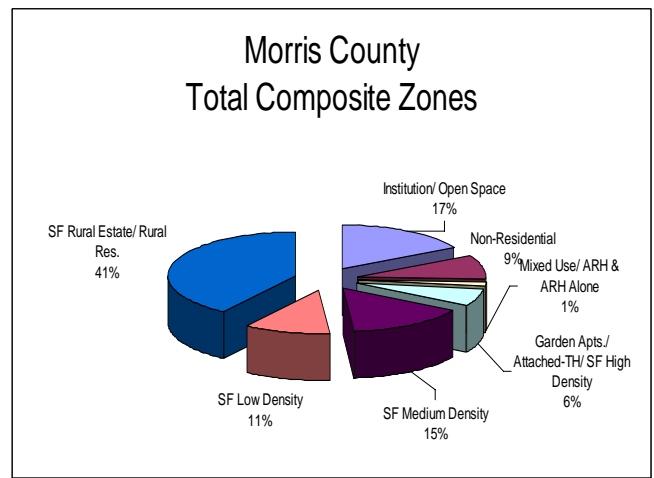
Graph 2



Graph 3

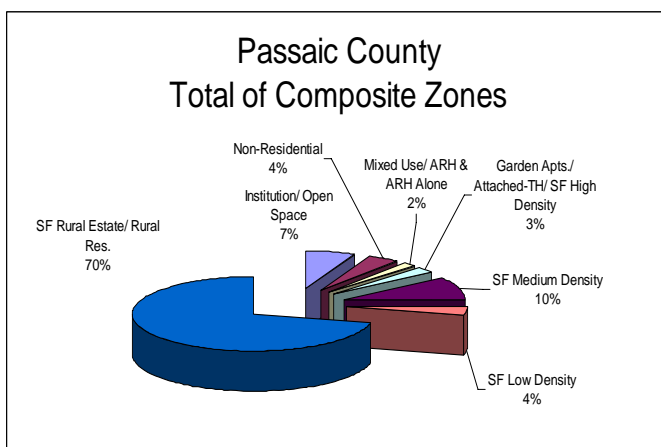


Graph 4 \*

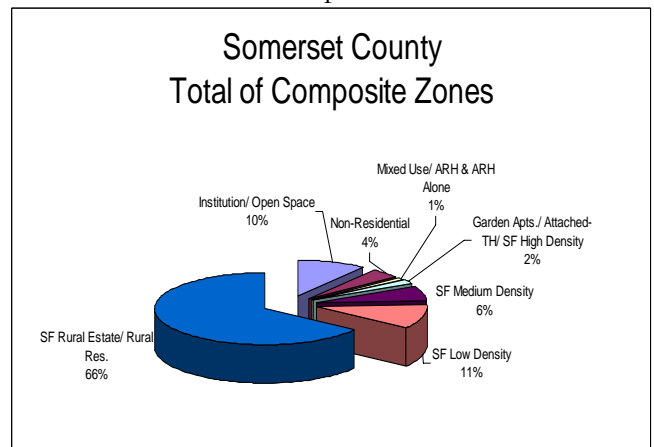


\*Morris County Institutional/Open Space zoning includes roads coverage as derived from parcel based spatial zoning coverage. Morris County Planning Board, 2005.

Graph 5

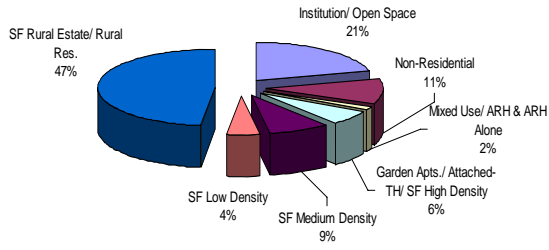


Graph 6



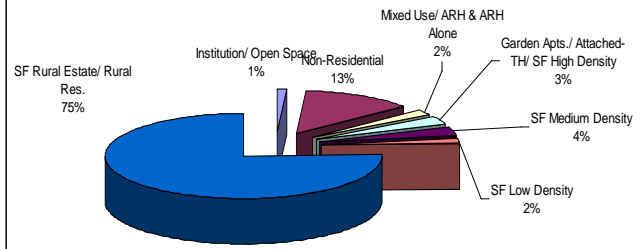
Graph 7

Sussex County  
Total of Composite Zones



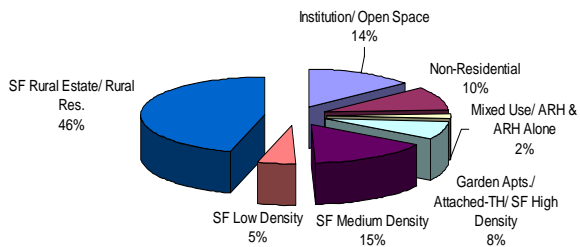
Graph 8

Warren County  
Total of Composite Zones



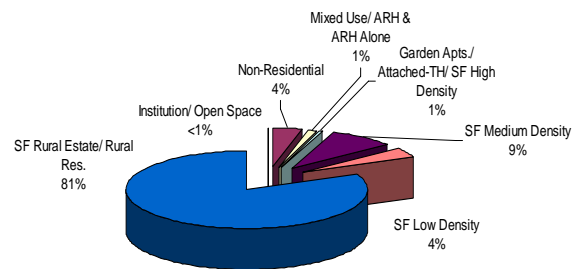
Graph 9

Planning Area  
Total of Composite Zones

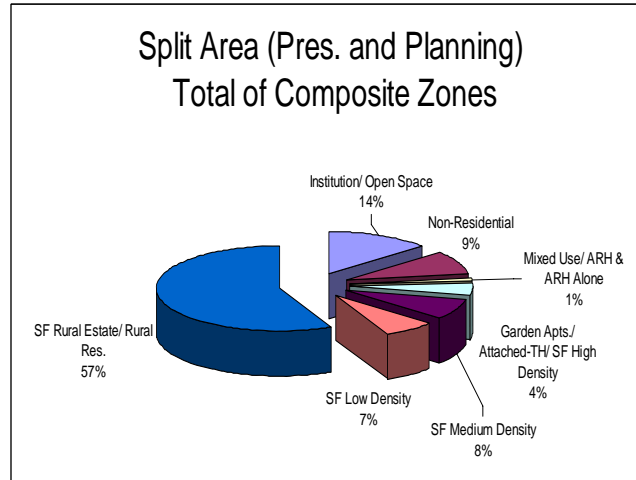


Graph 10

Preservation Area  
Total of Composite Zones



Graph 11



### Next Steps

The LULC Change Analysis evaluated changes over time in land uses. The Zoning Characteristic Analysis compared municipal zoning throughout the Highlands Region. Both analyses contribute to the Highlands Build Out Model baseline information. The Highlands Build Out Model uses land use (including the nature and extent of what pre-Highlands Act lands were to be considered constrained or not available for development due to conservation, preservation, regulatory protection or environmentally sensitive) and zoning data (including the designated use and associated densities) to develop maximum residential and non-residential numerical build out estimates for the Region. The Build Out Model will be run several times in order to capture different land use scenarios within the Highlands Region’s municipalities. The findings from the Land Use Land Characteristics and Zoning Assessment will inform the Build Out Model, which ultimately contributes to the development of the Highlands Regional Master Plan.

## References

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## **Appendix A: NJDEP Modified Anderson System 2002**

This information was contained within NJDEP 2002 Land use/Land cover Update Metadata and was derived from: A Land Use and Land Cover Classification System for Use with Remote Sensor Data, U. S. Geological Survey Professional Paper 964, 1976; edited by NJDEP, OIRM, BGIA, 1998, 2000, 2001, 2002, 2005.

### **1000 URBAN OR BUILT-UP LAND**

“The Level I Urban or Built-up Land category is characterized by intensive land use where the landscape has been altered by human activities. Although structures are usually present, this category is not restricted to traditional urban areas. Urban or Built-up Land Level II categories include Residential; Commercial and Service; Industrial; Transportation, Communication and Utilities; Industrial and Commercial Complexes; Mixed Urban or Built-up; Other Urban or Build-up and Recreational. Included with each of the above land uses are associated lands, buildings, parking lots, access roads, and other appurtenances, unless these are specifically excluded.”

### **2000 AGRICULTURAL LAND**

“This Level I category includes all lands used primarily for the production of food and fiber and some of the structures associated with this production. These areas are easily distinguished from the other categories and represent a significant land use in New Jersey. The Level II categories of Agricultural Land are; Cropland and Pastureland; Orchards; Vineyards; Nurseries and Horticultural Areas; Confined Feeding Operations; and Other environmental concern because of the non-point source pollution associated with confined feeding operations.”

### **4000 FORESTLAND**

“This Level I category contains any lands covered by woody vegetation other than wetlands. These areas are capable of producing timber and other wood products, and of supporting many kinds of outdoor recreation. Forestland is an important category environmentally, because it affects air quality, water quality, wildlife habitat, climate, and many other aspects of the ecology of an area. The Level II categories under Forestland are Deciduous; Coniferous; Mixed Deciduous-Coniferous; and Brushland.”

#### 5000 WATER

“All areas within the landmass of New Jersey periodically water covered are included in this category. All water bodies should be delineated as they exist at the time of data acquisition, except areas in an obvious state of flood. Level I includes four (4) Level II categories; Streams and Canals; Natural Lakes; Artificial Lakes; and Bays and Estuaries. Not included in this category are water treatment and sewage treatment facilities.”

#### 6000 WETLANDS

“The wetlands are those areas that are inundated or saturated by surface or ground waters at a frequency and duration sufficient to support vegetation adapted for life in saturated soil conditions. Included in this category are naturally vegetated swamps, marshes, bogs and savannas which are normally associated with topographically low elevations but may be located at any elevation where water perches over an aquiclude. Wetlands that have been modified for recreation, agriculture, or industry will not be included here but described under the specific use category.”

#### 7000 BARREN LAND

“Barren lands are characterized by thin soil, sand or rocks and a lack of vegetative cover in a non-urban setting. Vegetation, if present, is widely spaced. Barren land such as beaches and rock faces are found in nature but also result as a product of man's activities. Extraction mining operations, landfills and other disposal sites compose the majority of man-altered barren lands.”

#### 8000 MANAGED WETLANDS

“This category was added to provide an Anderson classification code for several types of disturbed wetland areas that did not easily fit into the existing classification categories. Included would be various landscaped or maintained areas that exhibit signs of soil saturation on the imagery, and which are in zones of hydric soils, but which do not support typical wetlands vegetation because of various alterations. Examples of managed wetlands would be storm water swales, saturated portions of golf fairways and other recreational fields, and open lawn areas in business parks, etc. These areas have often been graded, are vegetated typically by various cultivated grasses and often undergo periodic mowing and

other maintenance typical of managed lawn areas. (This code is a legacy code that appears only in the 1986 data set. It has been replaced by codes 1750 and 1850 in the updated data set).”

Appendix B: Data Dictionary - Highlands Land Use Classifications

Highlands Classification			
1	Residential	9	Wetlands - Forest
2	Non-Residential	10	Wetlands - Agriculture
2A	Mining	10A	Wetlands – Scrub/Shrub
3	Developed - Military	10B	Wetlands – Emergent
4	Developed - Plat	10C	Wetlands - Urban
4A	Developed - Vegetated	10D	Wetlands - Other
5	Transitional	11	Water
6	Other – Unvegetated	12	Old Field
6A	Other - Vegetated	12A	Successional Forest
7	Agriculture	13	Undeveloped Barren
8	Forest		

RMP Component	Resource Layer Source:
BO	Build Out Analysis
FI	Forest Integrity
HOW	Highlands Open Water
Rip	Riparian Corridor Analysis
SA	Sustainable Agriculture
SS	Steep Slope Analysis

Highlands Classification	2002 Anderson LULC Classification			RMP Resource Data Layer									
	Series Name/#	2002_Code	2002 Label	Developed	Urban	Altered (Vegetated / Nonagricultural)	Agricultural	Forest	Water	Wetland	Unforested (Open Vegetated)	Other (Barren) (Non-Vegetated)	
				Resource Layer Source:	BO	Rip	SA	FI	HOW	HOW	SS	BO	
1	Residential	Urban/1000	1110	RESIDENTIAL, HIGH DENSITY, MULTIPLE DWELLING		1	1						
		Urban/1000	1120	RESIDENTIAL, SINGLE UNIT, MEDIUM DENSITY		1	1						
		Urban/1000	1130	RESIDENTIAL, SINGLE UNIT, LOW DENSITY		1	1						
		Urban/1000	1140	RESIDENTIAL, RURAL, SINGLE UNIT		1	1						
		Urban/1000	1150	MIXED RESIDENTIAL		1	1						
2	Non-Residential	Urban/1000	1200	COMMERCIAL/SERVICES		1	1						
		Urban/1000	1300	INDUSTRIAL		1	1						
		Urban/1000	1500	INDUSTRIAL/COMMERCIAL COMPLEXES		1	1						
		Urban/1000	1600	MIXED URBAN OR BUILT-UP LAND		1	1						
2A	Mining	Barren Land/7000	7300	EXTRACTIVE MINING		1	1					1	
3	Developed - Military	Urban/1000	1211	MILITARY RESERVATIONS		1	1						
4	Developed - Plat	Urban/1000	1400	TRANSPORTATION/COMMUNICATIONS/UTILITIES		1	1						
		Urban/1000	1410	MAJOR ROADWAY		1	1						

Highlands Classification	2002 Anderson LULC Classification		RMP Resource Data Layer										
	Series Name/#	2002_Code	2002 Label	Resource Layer Source:	Developed	Urban	Altered (Vegetated / Nonagricultural)	Agricultural	Forest	Water	Wetland	Unforested (Open Vegetated)	Other (Barren) (Non-Vegetated)
					BO	Rip	SA	FI	HOW	HOW	SS	BO	
		Urban/1000	1419	BRIDGE OVER WATER		1	1						
		Urban/1000	1440	AIRPORT FACILITIES		1	1						
		Urban/1000	1810	STADIUM, THEATERS, CULTURAL CENTERS AND ZOOS		1	1						
4A	Developed - Vegetated	Urban/1000	1462	UPLAND RIGHTS-OF-WAY, DEVELOPED		1	1	1				1	
		Urban/1000	1463	UPLAND ROW, UNDEVELOPED		1	1	1				1	
		Urban/1000	1499	STORMWATER BASIN		1	1	1				1	
		Urban/1000	1710	CEMETERY		1	1	1				1	
		Urban/1000	1800	RECREATIONAL LAND		1	1	1				1	
		Urban/1000	1804	ATHLETIC FIELDS (SCHOOLS)		1	1	1				1	
5	Transitional	Barren Land/7000	7500	TRANSITIONAL AREAS				1				1	
		Barren Land/7000	7400	ALTERED LANDS				1				1	
6	Other - Unvegetated	Urban/1000	1214	FORMER MILITARY; INDETERMINATE USE			1						1
		Urban/1000	1700	OTHER URBAN OR BUILT-UP LAND			1						1
6A	Other - Vegetated	Urban/1000	1741	PHRAGMITES DOMINATE URBAN AREA			1	1				1	
7	Agriculture	Agriculture/2000	2100	CROPLAND AND PASTURELAND				1				1	
		Agriculture/2000	2200	ORCHARDS/VINEYARDS/NURSERIES/HORTICULTURAL AREAS				1				1	
		Agriculture/2000	2300	CONFINED FEEDING OPERATIONS				1				1	
		Agriculture/2000	2400	OTHER AGRICULTURE				1				1	
8	Forest	Forest/ 4000	4110	DECIDUOUS FOREST (10-50% CROWN CLOSURE)					1				
		Forest/ 4000	4120	DECIDUOUS FOREST (>50% CROWN CLOSURE)					1				
		Forest/ 4000	4210	CONIFEROUS FOREST (10-50% CROWN CLOSURE)					1				
		Forest/ 4000	4220	CONIFEROUS FOREST (>50% CROWN CLOSURE)					1				
		Forest/ 4000	4230	PLANTATION					1				
		Forest/ 4000	4311	MIXED FOREST (>50% CONIFEROUS WITH 10%-50% CROWN CLOSURE)					1				
		Forest/ 4000	4312	MIXED FOREST (>50% CONIFEROUS WITH >50% CROWN CLOSURE)					1				
		Forest/ 4000	4321	MIXED FOREST (>50% DECIDUOUS WITH 10-50% CROWN CLOSURE)					1				
		Forest/ 4000	4322	MIXED FOREST (>50% DECIDUOUS WITH >50% CROWN CLOSURE)					1				
		Forest/ 4000	4500	SEVERE BURNED UPLAND FOREST					1				
9	Wetlands - Forest	Wetlands/ 6000	6210	DECIDUOUS WOODED WETLANDS					1		1		
		Wetlands/ 6000	6220	CONIFEROUS WOODED WETLANDS					1		1		
		Wetlands/ 6000	6251	MIXED FORESTED WETLANDS WITH DECIDUOUS DOMINANT					1		1		
		Wetlands/ 6000	6252	MIXED FORESTED WETLANDS WITH CONIFEROUS DOMINANT					1		1		

Highlands Classification		2002 Anderson LULC Classification			RMP Resource Data Layer									
Series Name/#		2002_Code	2002_Label	Resource Layer Source:	Developed	Urban	Altered (Vegetated / Nonagricultural)	Agricultural	Forest	Water	Wetland	Unforested (Open Vegetated)	Other (Barren) (Non-Vegetated)	
					BO		Rip	SA	FI	HOW	HOW	SS	BO	
		Wetlands/ 6000	6221	ATLANTIC WHITE CEDAR WETLANDS					1		1			
10	Wetlands - Agriculture	Agriculture/2000	2140	MODIFIED AGRICULTURAL WETLANDS				1			1	1		
		Agriculture/2000	2150	FORMER AGRICULTURAL WETLAND				1			1	1		
10A	Wetlands - Scrub/Shrub	Wetlands/ 6000	6231	DECIDUOUS SCRUB/SHRUB WETLANDS					1		1	1		
		Wetlands/ 6000	6232	CONIFEROUS SCRUB/SHRUB WETLANDS					1		1	1		
		Wetlands/ 6000	6233	MIXED SCRUB/SHRUB WETLANDS WITH DECIDUOUS DOMINANT					1		1	1		
		Wetlands/ 6000	6234	MIXED BRUSH AND BOG WETLANDS WITH CONIFEROUS DOMINATE					1		1	1		
10B	Wetlands - Emergent	Wetlands/ 6000	6240	HERBACEOUS WETLANDS							1	1		
		Wetlands/ 6000	6120	FRESHWATER MARSHES							1	1		
10C	Wetlands - Urban	Urban/1000	1750	MANAGED WETLAND IN MAINTAINED LAWN GREENSPACE		1	1				1	1		
		Urban/1000	1461	WETLAND RIGHTS-OF-WAY (MODIFIED)		1	1				1	1		
		Urban/1000	1711	CEMETERY ON WETLAND		1	1				1	1		
		Urban/1000	1850	MANAGED WETLAND IN BUILT-UP MAINTAINED RECREATION AREA		1	1				1	1		
10D	Wetlands - Other	Wetlands/ 6000	6241	PHRAGMITES DOMINATE INTERIOR WETLANDS			1				1	1		
		Wetlands/ 6000	6113	PHRAGMITES DOMINATED INTERIOR WETLANDS			1				1	1		
		Barren Land/7000	7430	MODIFIED DISTURBED WETLANDS			1				1	1		
11	Water	Water/ 5000	5100	STREAMS AND CANALS						1				
		Water/ 5000	5200	NATURAL LAKES						1				
		Water/ 5000	5300	ARTIFICIAL LAKES						1				
		Water/5000	5420	DREDGED LAGOON						1				
12	Old Field	Forest/ 4000	4410	OLD FIELD (< 25% BRUSH COVERED)			1					1		
		Forest/ 4000	4411	PHRAGMITES DOMINATE OLD FIELD			1					1		
12A	Successional Forest	Forest/ 4000	4420	DECIDUOUS BRUSH/SHRUBLAND			1		1					
		Forest/ 4000	4430	CONIFEROUS BRUSH/SHRUBLAND			1		1					
		Forest/ 4000	4440	MIXED DECIDUOUS/CONIFEROUS BRUSH/SHRUBLAND			1		1					
13	Undeveloped-Barren	Barren Land/7000	7100	BEACHES									1	
		Barren Land/7000	7200	BARE EXPOSED ROCK, ROCK SLIDES, ETC.									1	
		Barren Land/7000	7600	UNDIFFERENTIATED BARREN LANDS									1	

## Appendix C

### Municipal Acres by 2002 Land Use/Land Cover Types\*

MUNICIPALITY	URBAN	AGRICULTURE	FOREST	WATER	WETLANDS	BARREN
MAHWAH TOWNSHIP	5,494	134	9,436	357	1,262	62
OAKLAND BOROUGH	2,541	25	2,587	169	233	74
ALEXANDRIA TOWNSHIP	2,943	7,235	5,779	160	1,555	79
BETHLEHEM TOWNSHIP	2,487	3,012	7,072	34	662	44
BLOOMSBURY BOROUGH	229	163	200	12	20	-
CALIFON BOROUGH	305	31	279	12	-	4
CLINTON TOWN	518	120	147	60	76	-
CLINTON TOWNSHIP	6,431	4,033	7,457	2,649	1,054	70
GLEN GARDNER BOROUGH	389	83	453	9	40	24
HAMPTON BOROUGH	352	245	296	3	60	-
HIGH BRIDGE BOROUGH	788	30	655	29	56	-
HOLLAND TOWNSHIP	3,110	4,243	6,537	288	1,055	66
LEBANON BOROUGH	367	36	105	-	53	15
LEBANON TOWNSHIP	3,631	3,627	11,293	135	1,489	88
MILFORD BOROUGH	347	93	282	61	25	-
TEWKSBURY TOWNSHIP	4,240	5,899	9,105	99	916	76
UNION TOWNSHIP	2,941	3,033	4,821	1,155	1,099	97
BOONTON TOWN	1,095	21	367	91	12	7
BOONTON TOWNSHIP	1,624	166	2,954	170	490	23
BUTLER BOROUGH	1,037	-	228	18	33	4
CHESTER BOROUGH	637	53	214	1	115	-
CHESTER TOWNSHIP	4,389	2,077	10,014	79	2,073	63
DENVILLE TOWNSHIP	3,660	179	3,151	431	705	35
DOVER TOWN	1,311	-	341	29	56	9
HANOVER TOWNSHIP	4,160	11	1,131	110	1,378	88
HARDING TOWNSHIP	3,166	1,512	4,495	125	3,847	16
JEFFERSON TOWNSHIP	4,631	96	17,950	1,775	2,595	283
KINNELON BOROUGH	3,245	7	7,513	647	804	79
MENDHAM BOROUGH	2,004	448	1,072	28	262	14
MENDHAM TOWNSHIP	3,423	723	6,592	140	619	36
MINE HILL TOWNSHIP	792	33	833	43	165	60
MONTVILLE TOWNSHIP	5,463	120	3,982	267	2,274	126
MORRIS TOWNSHIP	5,990	226	3,094	65	728	17
MORRIS PLAINS BOROUGH	1,253	2	343	22	32	6
MORRISTOWN TOWN	1,559	-	265	60	30	10
MOUNTAIN LAKES BOROUGH	993	-	593	149	124	1
MOUNT ARLINGTON BOROUGH	746	2	586	397	42	10
MOUNT OLIVE TOWNSHIP	5,778	1,231	9,062	681	2,465	778
NETCONG BOROUGH	417	-	92	32	22	-
PARSIPPANY-TROY HILLS TOWNSHIP	8,752	101	3,461	1,085	2,619	197
PEQUANNOCK TOWNSHIP	2,775	129	761	164	642	64
RANDOLPH TOWNSHIP	6,576	215	5,022	145	1,478	99
RIVERDALE BOROUGH	725	-	429	15	20	130
ROCKAWAY BOROUGH	983	-	182	31	160	1
ROCKAWAY TOWNSHIP	5,517	148	17,478	2,275	3,324	664
ROXBURY TOWNSHIP	5,461	176	5,860	551	1,694	277
VICTORY GARDENS BOROUGH	89	-	4	-	-	-

MUNICIPALITY	URBAN	AGRICULTURE	FOREST	WATER	WETLANDS	BARREN
WASHINGTON TOWNSHIP	7,687	5,260	11,383	180	4,080	128
WHARTON BOROUGH	837	1	350	18	138	18
BLOOMINGDALE BOROUGH	1,123	16	4,052	299	328	125
POMPTON LAKES BOROUGH	1,231	-	406	172	158	38
RINGWOOD BOROUGH	2,857	44	11,880	2,222	924	105
WANAQUE BOROUGH	1,397	8	3,181	894	370	86
WEST MILFORD TOWNSHIP	6,519	268	35,674	3,845	5,363	223
BEDMINSTER TOWNSHIP	3,063	6,246	6,277	177	1,069	51
BERNARDS TOWNSHIP	7,843	705	3,792	108	2,899	289
BERNARDSVILLE BOROUGH	3,395	651	3,946	48	167	57
FAR HILLS BOROUGH	716	713	1,404	46	258	12
PEAPACK GLADSTONE BOROUGH	1,142	863	1,579	41	63	5
BYRAM TOWNSHIP	2,255	66	9,938	870	1,242	133
FRANKLIN BOROUGH	1,060	226	1,058	76	385	39
GREEN TOWNSHIP	1,689	2,591	4,768	162	1,239	29
HAMBURG BOROUGH	424	36	174	21	81	17
HARDYSTON TOWNSHIP	2,673	1,410	12,413	493	3,476	347
HOPATCONG BOROUGH	2,331	64	3,823	1,020	571	144
OGDENSBURG BOROUGH	475	14	635	29	264	14
SPARTA TOWNSHIP	5,977	1,276	12,551	1,375	3,119	571
STANHOPE BOROUGH	552	-	484	242	114	12
VERNON TOWNSHIP	6,803	2,037	25,939	1,906	7,935	99
ALLAMUCHY TOWNSHIP	1,254	2,258	5,959	194	3,209	38
ALPHA BOROUGH	486	419	161	27	5	-
BELVIDERE TOWN	594	32	256	33	30	-
FRANKLIN TOWNSHIP	1,695	7,135	5,251	127	718	149
FRELINGHUYSEN TOWNSHIP	1,390	3,570	8,428	211	1,629	50
GREENWICH TOWNSHIP	1,926	3,455	1,069	42	151	134
HACKETTSTOWN	1,394	69	565	80	249	15
HARMONY TOWNSHIP	1,763	5,877	5,969	923	638	223
HOPE TOWNSHIP	1,247	3,140	5,612	179	1,480	45
INDEPENDENCE TOWNSHIP	1,731	1,441	5,493	116	3,857	121
LIBERTY TOWNSHIP	1,189	581	4,908	167	767	25
LOPATCONG TOWNSHIP	1,808	1,363	1,234	43	77	195
MANSFIELD TOWNSHIP	2,620	4,618	9,956	94	1,649	78
OXFORD TOWNSHIP	647	589	1,654	73	800	91
PHILLIPSBURG TOWN	1,616	45	334	84	21	6
POHATCONG TOWNSHIP	1,308	3,881	2,962	252	216	117
WASHINGTON BOROUGH	893	8	233	-	73	54
WASHINGTON TOWNSHIP	3,044	3,559	3,913	86	772	201
WHITE TOWNSHIP	2,290	5,425	8,158	401	1,043	467

\*Source: This table was derived from NJDEP 2002 LULC data.

Appendix D: New Jersey Highlands Land Use Characteristics and Change

Land Use Characteristics Baseline (2002) HC Build Out Project

County	Municipality	Highlands Area	Composite Zone Type	Institutional/ Open Space	Non-Residential (Commercial, Industrial, Retail)	Mixed Use/ Age Restricted Housing	Garden Apts./ Attached-TH/ SF High Density	ARH (Age Restricted)	SF Medium Density	SF Low Density	SF Rural Estate/ Residential
BERGEN	MAHWAH TOWNSHIP	Split	Total of Composite Zone	40.7%	7.3%	0.0%	26.5%	0.0%	22.3%	3.1%	0.0%
BERGEN	OAKLAND BOROUGH	Split	Total of Composite Zone	0.5%	12.7%	1.7%	2.5%	0.0%	40.9%	11.1%	28.8%
HUNTERDON	ALEXANDRIA TOWNSHIP	Split	Total of Composite Zone	2.9%	6.1%	0.0%	0.0%	0.0%	0.0%	0.0%	90.9%
HUNTERDON	BETHLEHEM TOWNSHIP	Split	Total of Composite Zone	0.0%	6.3%	0.0%	0.0%	0.0%	0.0%	5.3%	88.2%
HUNTERDON	BLOOMSBURY BOROUGH	Preservation	Total of Composite Zone	0.0%	27.0%	0.0%	13.0%	0.0%	14.6%	0.0%	40.1%
HUNTERDON	CALIFON BOROUGH	Preservation	Total of Composite Zone	0.0%	6.6%	1.4%	0.0%	0.0%	31.1%	18.6%	37.9%
HUNTERDON	CLINTON TOWN	Split	Total of Composite Zone	24.0%	29.1%	0.0%	17.9%	0.0%	27.8%	0.0%	0.0%
HUNTERDON	CLINTON TOWNSHIP	Split	Total of Composite Zone	0.0%	15.5%	0.2%	2.3%	0.0%	1.3%	0.0%	80.5%
HUNTERDON	GLEN GARDNER BOROUGH	Preservation	Total of Composite Zone	0.9%	12.8%	0.0%	11.7%	0.0%	7.8%	2.7%	63.2%
HUNTERDON	HAMPTON BOROUGH	Split	Total of Composite Zone	0.0%	17.1%	0.0%	7.6%	0.0%	18.4%	3.8%	55.9%
HUNTERDON	HIGH BRIDGE BOROUGH	Planning	Total of Composite Zone	33.4%	9.9%	0.0%	11.5%	0.0%	18.2%	6.2%	18.9%
HUNTERDON	HOLLAND TOWNSHIP	Split	Total of Composite Zone	0.0%	2.0%	0.0%	0.2%	0.6%	0.0%	0.0%	97.1%
HUNTERDON	LEBANON BOROUGH	Planning	Total of Composite Zone	0.0%	58.9%	0.0%	8.8%	0.0%	30.3%	0.0%	0.0%
HUNTERDON	LEBANON TOWNSHIP	Split	Total of Composite Zone	0.0%	3.6%	0.0%	0.0%	0.0%	0.4%	8.6%	87.3%
HUNTERDON	MILFORD BOROUGH	Planning	Total of Composite Zone	6.9%	18.2%	0.0%	7.6%	0.0%	35.8%	0.0%	30.4%
HUNTERDON	TEWKSBURY TOWNSHIP	Split	Total of Composite Zone	0.0%	0.1%	0.5%	0.0%	0.0%	0.1%	2.6%	96.6%
HUNTERDON	UNION TOWNSHIP	Split	Total of Composite Zone	29.7%	5.1%	1.0%	1.3%	0.0%	2.2%	0.0%	60.6%
MORRIS	BOONTON TOWN	Planning	Total of Composite Zone	15.7%	16.4%	0.0%	67.4%	0.0%	0.0%	0.0%	0.0%
MORRIS	BOONTON TOWNSHIP	Split	Total of Composite Zone	4.6%	3.4%	0.2%	1.1%	0.0%	15.0%	15.3%	59.8%
MORRIS	BUTLER BOROUGH	Planning	Total of Composite Zone	14.9%	18.3%	2.4%	50.8%	0.0%	13.0%	0.0%	0.0%
MORRIS	CHESTER BOROUGH	Planning	Total of Composite Zone	7.9%	25.4%	0.0%	0.0%	0.0%	0.0%	26.3%	39.2%
MORRIS	CHESTER TOWNSHIP	Split	Total of Composite Zone	36.6%	0.5%	0.3%	0.0%	0.0%	0.6%	1.1%	60.8%
MORRIS	DENVILLE TOWNSHIP	Split	Total of Composite Zone	14.0%	10.2%	0.9%	12.2%	0.0%	44.3%	11.2%	7.0%
MORRIS	DOVER TOWN	Planning	Total of Composite Zone	16.3%	22.3%	4.3%	48.3%	0.0%	8.4%	0.0%	0.0%
MORRIS	HANOVER TOWNSHIP	Planning	Total of Composite Zone	29.4%	28.5%	1.3%	10.1%	0.0%	30.6%	0.0%	0.0%
MORRIS	HARDING TOWNSHIP	Planning	Total of Composite Zone	46.4%	0.8%	0.4%	0.8%	0.0%	1.7%	0.0%	49.7%
MORRIS	JEFFERSON TOWNSHIP	Split	Total of Composite Zone	3.5%	6.3%	3.1%	2.1%	0.0%	13.8%	6.2%	65.1%
MORRIS	KINNELON BOROUGH	Split	Total of Composite Zone	5.1%	0.9%	1.3%	0.2%	0.0%	0.0%	92.3%	0.0%
MORRIS	MENDHAM BOROUGH	Planning	Total of Composite Zone	4.7%	0.3%	1.2%	8.0%	0.0%	7.5%	19.5%	58.1%
MORRIS	MENDHAM TOWNSHIP	Planning	Total of Composite Zone	5.1%	0.0%	0.0%	0.0%	0.0%	2.6%	4.3%	87.7%
MORRIS	MINE HILL TOWNSHIP	Planning	Total of Composite Zone	7.2%	19.1%	5.8%	10.3%	0.0%	57.1%	0.0%	0.0%
MORRIS	MONTVILLE TOWNSHIP	Split	Total of Composite Zone	8.6%	11.3%	0.0%	2.3%	0.0%	34.3%	18.5%	24.9%
MORRIS	MORRIS PLAINS BOROUGH	Planning	Total of Composite Zone	12.4%	24.0%	0.0%	15.5%	0.0%	47.6%	0.0%	0.0%
MORRIS	MORRIS TOWNSHIP	Planning	Total of Composite Zone	9.6%	7.7%	2.0%	5.8%	0.0%	34.0%	0.0%	40.7%
MORRIS	MORRISTOWN TOWN	Planning	Total of Composite Zone	21.5%	9.7%	3.0%	57.2%	0.0%	8.2%	0.0%	0.0%
MORRIS	MOUNT ARLINGTON BOROUGH	Split	Total of Composite Zone	32.2%	6.5%	0.0%	21.1%	0.0%	30.0%	8.5%	0.0%
MORRIS	MOUNT OLIVE TOWNSHIP	Split	Total of Composite Zone	32.1%	14.5%	0.6%	6.3%	0.0%	6.2%	21.2%	19.2%
MORRIS	MOUNTAIN LAKES BOROUGH	Planning	Total of Composite Zone	31.0%	6.5%	0.0%	3.6%	0.0%	57.3%	0.0%	0.1%
MORRIS	NETCONG BOROUGH	Planning	Total of Composite Zone	13.0%	23.0%	8.7%	49.6%	0.0%	4.9%	0.0%	0.0%
MORRIS	PARSIPPANY TR HLS TWP	Planning	Total of Composite Zone	23.7%	16.9%	2.8%	8.2%	0.0%	40.9%	5.4%	2.1%
MORRIS	PEQUANNOCK TOWNSHIP	Split	Total of Composite Zone	11.5%	17.4%	6.2%	28.0%	0.0%	20.4%	3.2%	13.1%
MORRIS	RANDOLPH TOWNSHIP	Split	Total of Composite Zone	28.1%	8.4%	0.7%	1.8%	0.0%	21.5%	23.4%	15.9%
MORRIS	RIVERDALE BOROUGH	Planning	Total of Composite Zone	17.9%	32.3%	3.5%	15.5%	0.0%	30.1%	0.0%	0.0%
MORRIS	ROCKAWAY BOROUGH	Planning	Total of Composite Zone	12.3%	36.2%	0.0%	27.6%	0.0%	23.1%	0.0%	0.0%
MORRIS	ROCKAWAY TOWNSHIP	Split	Total of Composite Zone	3.3%	7.3%	0.9%	11.0%	0.4%	4.5%	0.0%	72.4%

Appendix D: New Jersey Highlands Land Use Characteristics and Change

Land Use Characteristics Baseline (2002) HC Build Out Project

County	Municipality	Highlands Area	Composite Zone Type	Institutional/ Open Space	Non-Residential (Commercial, Industrial, Retail)	Mixed Use/ Age Restricted Housing	Garden Apts./ Attached-TH/ SF High Density	ARH (Age Restricted)	SF Medium Density	SF Low Density	SF Rural Estate/ Residential
MORRIS	ROXBURY TOWNSHIP	Split	Total of Composite Zone	41.0%	21.7%	1.4%	3.4%	0.0%	24.9%	0.0%	7.4%
MORRIS	VICTORY GARDENS BOR.	Planning	Total of Composite Zone	14.3%	15.3%	3.4%	50.8%	0.0%	0.0%	0.0%	0.0%
MORRIS	WASHINGTON TOWNSHIP	Split	Total of Composite Zone	3.4%	3.7%	0.3%	0.3%	0.0%	2.4%	8.9%	80.8%
MORRIS	WHARTON BOROUGH	Planning	Total of Composite Zone	16.0%	26.8%	1.0%	35.1%	0.5%	19.9%	0.0%	0.0%
PASSAIC	BLOOMINGDALE BOROUGH	Split	Total of Composite Zone	38.6%	4.2%	0.4%	16.7%	0.0%	12.1%	2.8%	24.3%
PASSAIC	POMPTON LAKES BOROUGH	Planning	Total of Composite Zone	18.6%	17.9%	0.0%	7.1%	0.0%	56.1%	0.0%	0.0%
PASSAIC	RINGWOOD BOROUGH	Preservation	Total of Composite Zone	0.0%	5.0%	0.5%	0.0%	0.0%	10.5%	8.7%	75.1%
PASSAIC	WANAQUE BOROUGH	Split	Total of Composite Zone	47.3%	11.4%	8.2%	11.5%	0.0%	7.9%	8.5%	5.5%
PASSAIC	WEST MILFORD TOWNSHIP	Preservation	Total of Composite Zone	0.0%	2.9%	1.3%	0.6%	0.0%	7.8%	2.2%	85.2%
SOMERSET	BEDMINSTER TOWNSHIP	Split	Total of Composite Zone	8.5%	3.2%	2.5%	0.9%	0.0%	0.3%	1.6%	82.8%
SOMERSET	BERNARDS TOWNSHIP	Planning	Total of Composite Zone	21.4%	7.2%	0.2%	0.8%	0.0%	15.5%	23.0%	31.7%
SOMERSET	BERNARDSVILLE BOROUGH	Planning	Total of Composite Zone	0.0%	2.1%	0.0%	6.0%	0.0%	2.6%	10.5%	78.8%
SOMERSET	FAR HILLS BOROUGH	Planning	Total of Composite Zone	0.0%	0.0%	0.5%	1.1%	0.0%	0.0%	0.0%	97.6%
SOMERSET	PEAPACK GLADSTONE BOR.	Planning	Total of Composite Zone	0.0%	7.5%	0.0%	3.9%	0.0%	8.0%	17.4%	63.2%
SUSSEX	BYRAM TOWNSHIP	Split	Total of Composite Zone	0.0%	11.4%	0.0%	9.9%	0.0%	35.3%	0.0%	43.4%
SUSSEX	FRANKLIN BOROUGH	Planning	Total of Composite Zone	8.2%	13.3%	2.4%	9.0%	0.0%	5.6%	3.7%	57.4%
SUSSEX	GREEN TOWNSHIP	Split	Total of Composite Zone	0.0%	10.6%	0.0%	0.0%	0.0%	0.0%	5.0%	84.3%
SUSSEX	HAMBURG BOROUGH	Planning	Total of Composite Zone	7.3%	43.0%	8.6%	39.5%	0.0%	0.0%	0.0%	0.0%
SUSSEX	HARDYSTON TOWNSHIP	Split	Total of Composite Zone	38.0%	7.9%	7.7%	1.7%	0.0%	5.1%	0.0%	39.7%
SUSSEX	HOPATCONG BOROUGH	Split	Total of Composite Zone	0.0%	14.9%	5.5%	0.5%	0.0%	41.9%	4.9%	31.7%
SUSSEX	OGDENSBURG BOROUGH	Split	Total of Composite Zone	13.0%	17.0%	5.0%	3.5%	0.0%	47.9%	0.0%	12.7%
SUSSEX	SPARTA TOWNSHIP	Split	Total of Composite Zone	18.6%	9.1%	0.5%	8.5%	0.0%	6.6%	0.0%	56.5%
SUSSEX	STANHOPE BOROUGH	Planning	Total of Composite Zone	0.0%	22.3%	0.0%	10.1%	0.0%	43.0%	14.4%	9.5%
SUSSEX	VERNON TOWNSHIP	Split	Total of Composite Zone	46.6%	13.5%	0.0%	10.3%	0.0%	3.8%	8.6%	17.1%
WARREN	ALLAMUCHY TOWNSHIP	Split	Total of Composite Zone	28.7%	2.6%	0.4%	1.2%	0.0%	5.3%	15.3%	46.6%
WARREN	ALPHA BOROUGH	Planning	Total of Composite Zone	5.4%	34.1%	2.0%	29.7%	0.0%	0.0%	0.0%	27.7%
WARREN	BELVIDERE TOWNSHIP	Planning	Total of Composite Zone	4.9%	39.7%	4.4%	33.3%	0.0%	16.5%	0.0%	0.0%
WARREN	FRANKLIN TOWNSHIP	Split	Total of Composite Zone	0.0%	8.3%	0.4%	0.0%	0.0%	1.0%	0.0%	90.3%
WARREN	FREHLINGHUYSEN TOWNSHIP	Planning	Total of Composite Zone	0.0%	0.9%	0.9%	0.0%	1.1%	0.0%	0.0%	97.0%
WARREN	GREENWICH TOWNSHIP	Split	Total of Composite Zone	0.0%	27.6%	0.0%	8.6%	0.0%	5.2%	10.8%	47.8%
WARREN	HACKETTSTOWN TOWN	Split	Total of Composite Zone	14.2%	29.0%	1.6%	32.3%	0.0%	23.1%	0.0%	0.0%
WARREN	HARMONY TOWNSHIP	Split	Total of Composite Zone	0.0%	13.8%	1.1%	0.0%	0.0%	2.9%	0.0%	82.0%
WARREN	HOPE TOWNSHIP	Planning	Total of Composite Zone	0.0%	3.8%	0.0%	0.0%	0.0%	0.7%	0.0%	95.1%
WARREN	INDEPENDENCE TOWNSHIP	Split	Total of Composite Zone	0.0%	10.9%	0.9%	1.0%	0.0%	0.0%	0.5%	86.8%
WARREN	LIBERTY TOWNSHIP	Split	Total of Composite Zone	0.0%	5.5%	0.0%	1.7%	0.0%	3.5%	0.0%	89.5%
WARREN	LOPATCONG TOWNSHIP	Split	Total of Composite Zone	0.0%	22.9%	0.7%	9.5%	0.0%	12.7%	6.5%	47.4%
WARREN	MANSFIELD TOWNSHIP	Split	Total of Composite Zone	0.0%	9.8%	1.0%	0.0%	0.0%	5.6%	0.0%	83.6%
WARREN	OXFORD TOWNSHIP	Split	Total of Composite Zone	0.0%	13.1%	0.0%	6.7%	0.0%	4.4%	33.5%	40.6%
WARREN	PHILLIPSBURG TOWNSHIP	Planning	Total of Composite Zone	0.0%	32.8%	66.8%	0.0%	0.0%	0.0%	0.0%	0.0%
WARREN	POHATCONG TOWNSHIP	Split	Total of Composite Zone	7.5%	12.3%	0.0%	8.8%	0.0%	4.1%	0.0%	67.2%
WARREN	WASHINGTON BOROUGH	Planning	Total of Composite Zone	6.3%	24.0%	0.0%	56.4%	0.0%	12.1%	0.0%	0.0%
WARREN	WASHINGTON TOWNSHIP	Split	Total of Composite Zone	0.7%	10.5%	2.8%	0.9%	0.0%	7.3%	0.0%	77.9%
WARREN	WHITE TOWNSHIP	Split	Total of Composite Zone	0.0%	21.6%	0.8%	0.5%	0.0%	0.0%	1.2%	75.6%