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Completing the Countywide Buildout Analysis using the NJDEP OPSC model

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Wastewater Estimator Model

- 2009 NJDEP released a GIS based model builder application for estimating wastewater buildout and flow
- Completion of the NJDEP model is part of the Countywide Wastewater Management Plan
- Funded by the American Recovery & Reinvestment Act of 2009

NJDEP's Model Methods/Goals

- Use available local /regional data
- Model limitations, a condition of GIS data accuracy and availability (included but not limited 14)
- Establishing sewer service areas and determining estimated flows (Phase 1)
- Establishing allowable septic densities (Phase 2)

Gathering GIS Data & Quality Control

NJDEP GIS data layer	Monmouth County GIS data layer	Layer used
Land Use/Land Cover 2002	Land Use/Land Cover 2007	County
HUC 11 Watersheds	N/A	NJ DEP
Septic density	N/A	NJ DEP
Water Purveyor Areas 1998	N/A	NJ DEP
Sewer Service Area	Sewer Service Area	County
Municipal Boundaries	Municipal Boundaries	County
N/A	Composite Zoning	County
Preserved Farms	Preserved Farms	County
Preserved Open Space	Preserved Open Space	County/NJDEP
N/A	C1 Stream Buffers	County
N/A	C2 Stream Buffers	County

Composite Zoning

Zone Category	Minimum Lot Area*,**,***	du/acre*	FAR *
Single Family Residential			
SF-435	435,000	.3	N/A
SF-260	260,000	.3	N/A
SF-200	200,000	.3	N/A
SF-110	110,000	.3	N/A
SF-80	80,000	.3	N/A
SF-40	40,000	.9	N/A
SF-20	20,000	1.5	N/A
SF-10	10,000	2.9	N/A
SF-05	5,000	4	N/A
SF-0	4,000	8.5	N/A
Multi Family Residential			
MF-24 (24.1+ du/acre)	18,000	42	N/A
MF-15 (15.1-24.0 du/acre)	15,000	12	N/A
MF-8 (8.1-15.0 du/acre)	62,500	10	N/A
MF-0 (0-8.0)	40,000	6	N/A
Multi Use			
MU-24 (24.1+ du/acre)	87,120	27	.6
MU-15 (15.1 -24.0 du/acre)	10,000	16	.6
MU-8 (8.1-15.0 du/acre)	7,500	12	.75
MU-0 (0-8.0)	20,000	4.8	.2

Zone Category	Minimum Lot Area*,**,***	du/acre*	FAR*
Commercial			
C-50	217,800	N/A	.4
C-12.5	20,000	N/A	.6
C-0	7,500	N/A	.65
Office Business			
OB-10	435,600	N/A	.65
OB-01	130,680	N/A	.3
OB-0	20,000	N/A	.6
Research/Office/Warehouse/Laboratory			
ROWL-10	1,742,400	N/A	.18
ROWL-0	88,000	N/A	.20
Industrial			
I-10	871,200	N/A	.55
I-01	130,680	N/A	.25
I-0	25,000	N/A	.4
Conservation/Recreation			
Con/Rec	130,680	N/A	.1

* This number was calculated by finding the median value, whereas half of the calculated values were above or below the middle value in a sample set.

** SF-05, SF-10,SF-20, SF-40 and SF-80 all use the minimum lot area identified in the County Composite Zone Study.

*** Minimum Lot Area is measured in square feet.

NJDEP Model Builder User Guide

C. Bring Application into Tool Bar and Connect Specific Data Layers

1) Within ESRI Arc - Map Version 9.2 - Open Toolbox - right click within toolbox and click on Add Toolbox

2) With provided DEP Land Use / Land Cover 2002 (in Statewide_Data File), re-select the attribute "TYPE02" in LU/LC shapefile and select Water; Urban and Wetlands and save as individual shapefiles. Respectively add the three (3) individual shapefiles to the specific module where the data input connections are located (i.e. Urban to 1st Module – Parcel_Selct.).

3) With Watersheds_HUC11 shapefile and Septic_Dens Excel table (in Statewide_Data File), join using attributes "link" and "HUC11" respectively and export as a new shapefile. This will integrate the septic densities to the shapefile. Add new HUC 11 septic densities shapefile into the the 2nd Module – Base_info.

4) Union Preserved Farms and Total Preserved Open Space (in Statewide_Data File), create a common attribute field to select on in the Geo-database. Example attribute is OS_ADA with specific records tag either OS and ADA respectively.

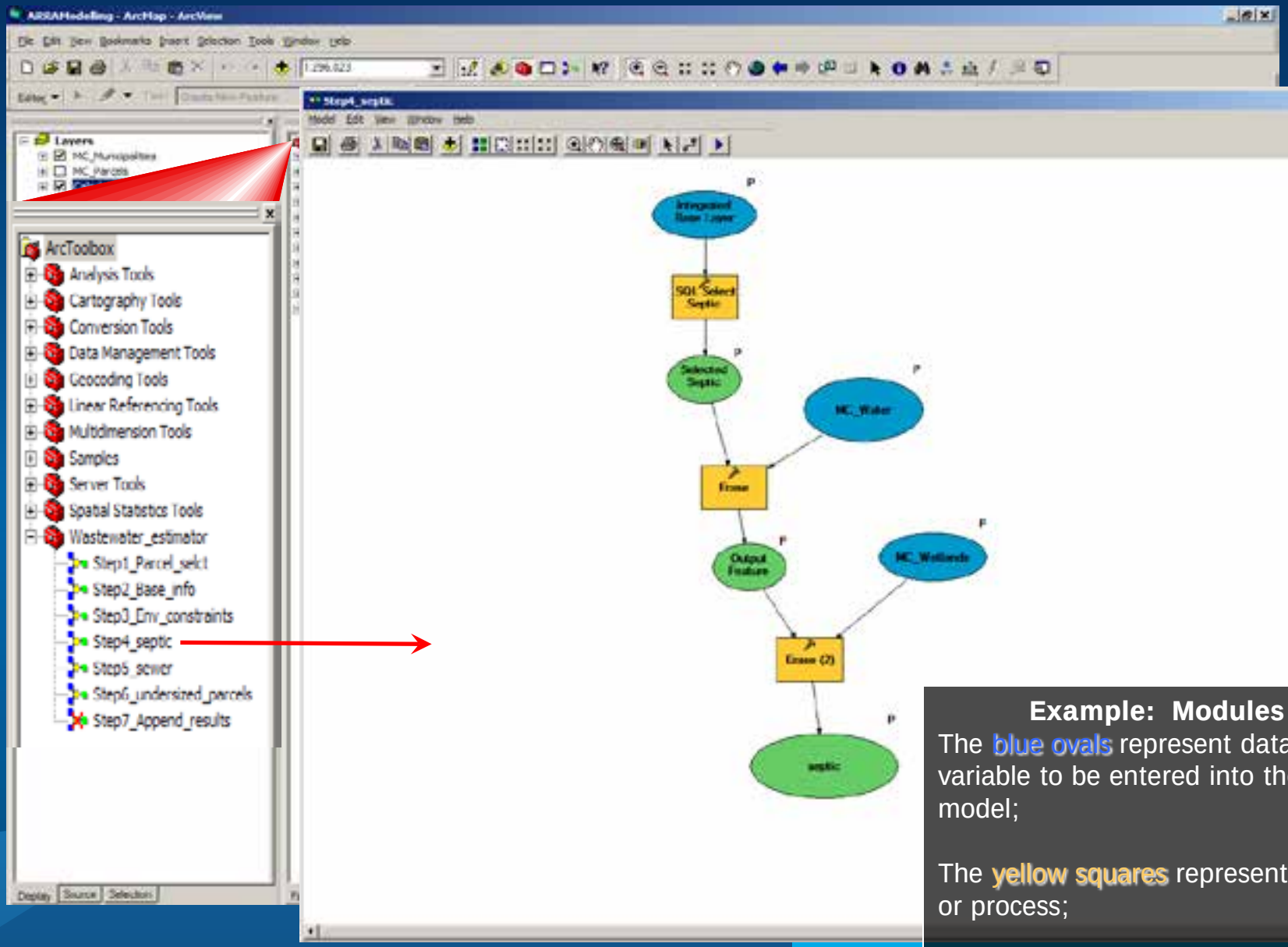
5) Go to file where the "Wastewater_Estimator" (.tbx) is located, add and open.

6) Right click on the 1st module (Parcel Selct) and chose EDIT, connect county specific data to process functions and repeat with other 4 modules. Specific County/ Municipal digital data includes: a) Parcel; b) Zoning; c) Updated Sewer service area; d) Preserved Open space and Farms; e) Specific environmental features.

7) In Arc Catalog, go to Wastewater_estimation_052008\ Output_data\ Final_calculations.mdb. Right click on Final_calculations.mdb and import sewer and septic final shapefiles into feature classes. Create SQL queries and pivot tables within the Final_calculations.mdb (Access) to output data results (see SQL and Pivot Tables in Example Geo-database SQL pivot table.mdb).

Please be advised that application is set to the pilot example of Bernards Twp. A majority of the data and data connections need to be modified from this setting and adjusted to each County and Municipality specific data inputs and final output. If needed, the Department will provide assistance to the counties in regards to adjusting the application and any data development. In the State_Data File, data provide is current public downloads to be utilized in the application. Periodically, these files need to be checked for updates at http://www.nj.gov/dep/gis/stateshp.html.

NJDEP GIS Model



Example: Modules

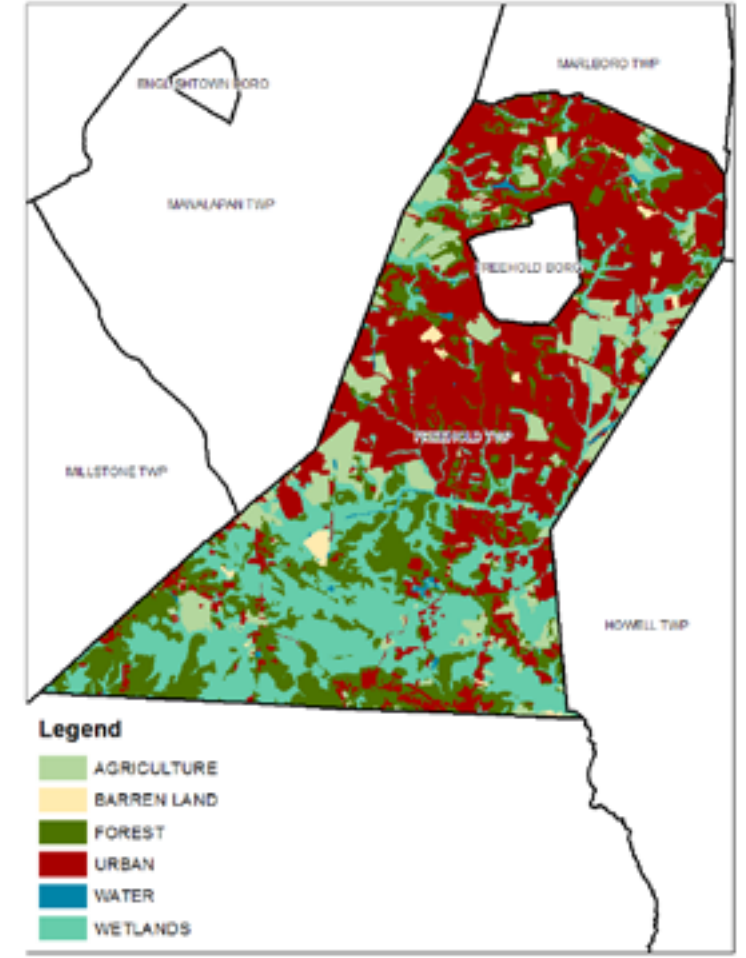
The blue ovals represent data variable to be entered into the model;

The yellow squares represent a tool or process;

And the green ovals represent a result

Freehold Township Pilot Study

- Chosen for it's development history and diverse land use characteristics
- Pilot study was important to see how the available GIS data layers would work within the NJDEP model's modules and into MS Access formula analysis
- Allowed for any adjustments to the NJDEP model modules where necessary



Monmouth County 2007 Land Use/Land Cover

Monmouth County Study

- Revised GIS data for Countywide use
- Ran NJDEP model Countywide
- Resulted in 3 data layers: sewer, septic, septic w/ environmentally sensitive features erased
- Upon a scan of the results, a further refinement of the final data was necessary

Monmouth County Study Analysis

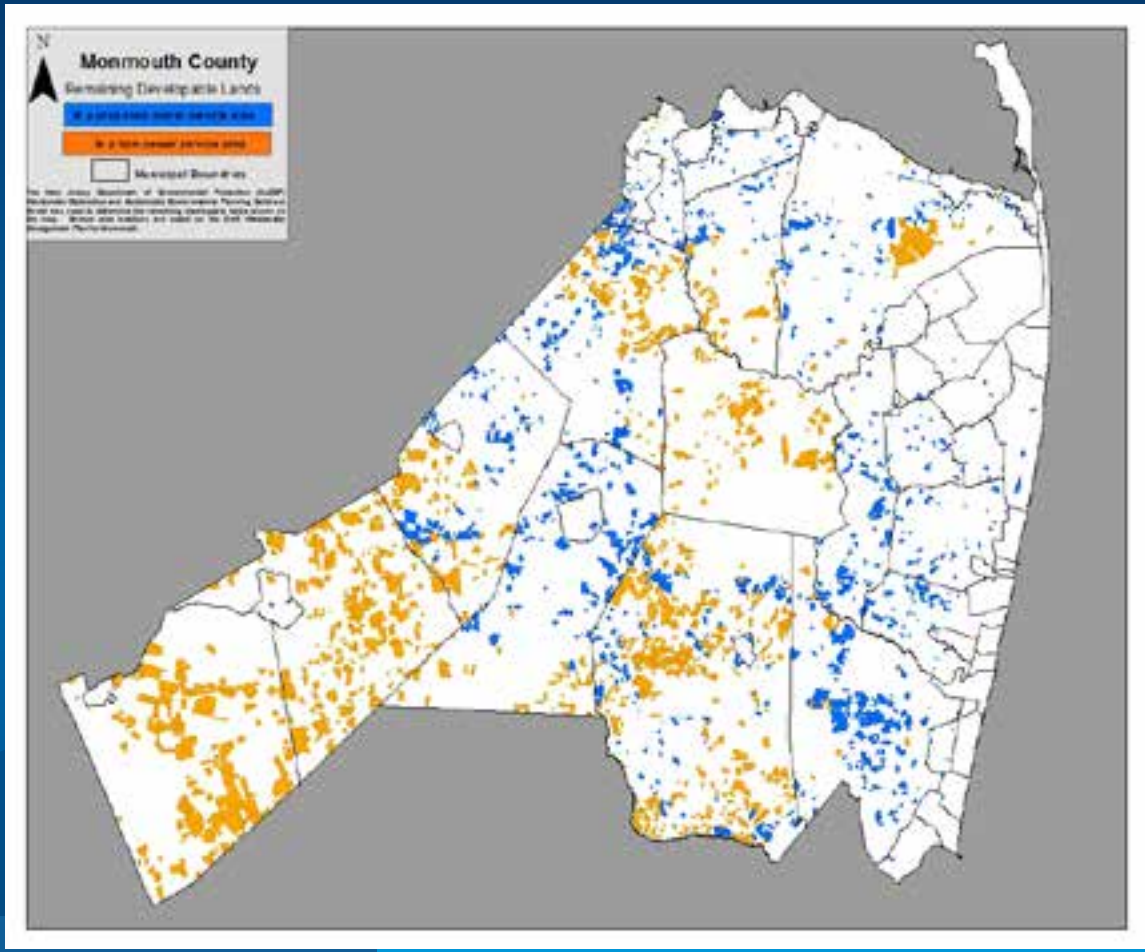
- Analyzed 2 geodatabases
  - NJDEP “raw” data
  - Monmouth County “scrubbed” data
- Each analyzed geodatabase included a “sewer” data layer and a “septic with environmental features erased” data layer that were plugged into the spreadsheet analysis formulas
- Refined the results

Monmouth County Study Analysis

- Tables and maps were distributed to the municipal government officials and planning boards of all 53 municipalities
- Review comments and make adjustments to the build-out results where necessary

2nd Draft - Monmouth County Study & Analysis

- Revised GIS data where necessary (i.e. composite zones, minimum lot sizes, FARs) and ran the NJDEP model
- Used the 1st draft refined data with additional municipal edits as the basis for the 2nd draft study
- Performed a Countywide aerial photograph interpretation analysis to refine results
- Used the refined data to perform the final spreadsheet build-out analysis



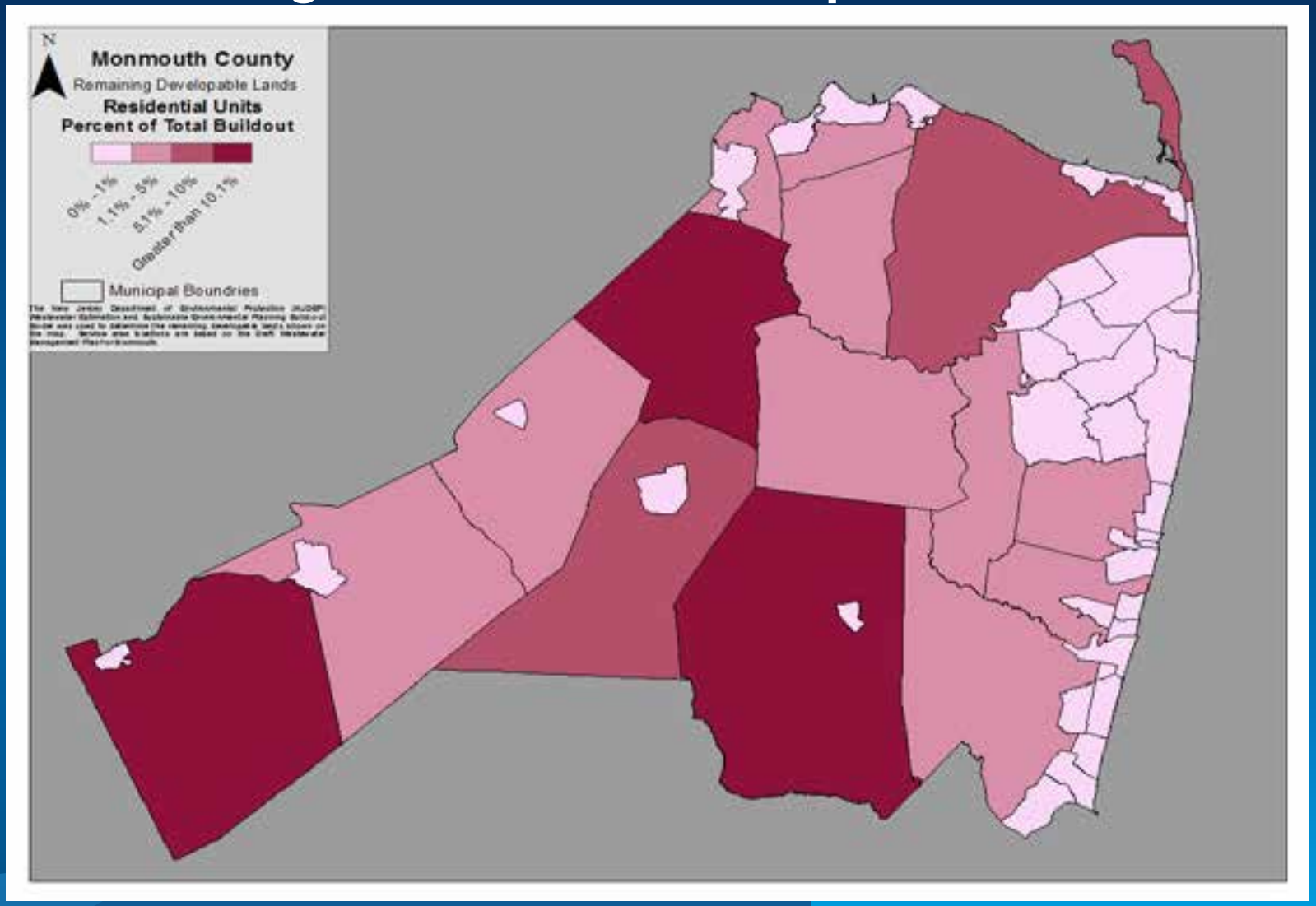
Countywide Results

MUNICIPALITY	NJDEP Wastewater Estimator Totals - MCPB August 2012		Percentage of Total Model Buildout	
	RESIDENTIAL UNITS	NON RESIDENTAL AREA (Acres)	RESIDENTIAL UNITS	NON RESIDENTAL AREA (Acres)
HOWELL TWP	3,280	224.6	25.8%	10.5%
MARLBORO TWP	1,388	106.5	10.9%	5.0%
UPPER FREEHOLD TWP	1,291	117.2	10.2%	5.5%
MIDDLETOWN TWP	927	87.8	7.3%	4.1%
FREEHOLD TWP	650	124.8	5.1%	5.8%
TINTON FALLS BORO	605	65.6	4.8%	3.1%
MANALAPAN TWP	598	720.4	4.7%	33.6%
MILLSTONE TWP	583	108.5	4.6%	5.1%
WALL TWP	505	262.3	4.0%	12.2%
NEPTUNE TWP	475	175.9	3.7%	8.2%
ABERDEEN TWP	392	10.4	3.1%	0.5%
HOLMDEL TWP	389	59.1	3.1%	2.8%
HAZLET TWP	378	6.3	3.0%	0.3%
OCEAN TWP	262	15.4	2.1%	0.7%
COLTS NECK TWP	233	4.2	1.8%	0.2%
RED BANK BORO	110	0.0	0.9%	0.0%
KEYPORT BORO	100	2.1	0.8%	0.1%
LONG BRANCH CITY	84	1.1	0.7%	0.1%
HIGHLANDS BORO	83	0.0	0.7%	0.0%
MATAWAN BORO	64	2.9	0.5%	0.1%
EATONTOWN BORO	50	15.8	0.4%	0.7%
SHREWSBURY BORO	36	2.2	0.3%	0.1%
ATLANTIC HIGHLANDS BORO	30	22.6	0.2%	1.1%
KEANSBURG BORO	28	2.4	0.2%	0.1%
BRIELLE BORO	25	1.6	0.2%	0.1%
WEST LONG BRANCH BORO	21	0.0	0.2%	0.0%
OCEANPORT BORO	19	0.0	0.1%	0.0%

Countywide Results (2)

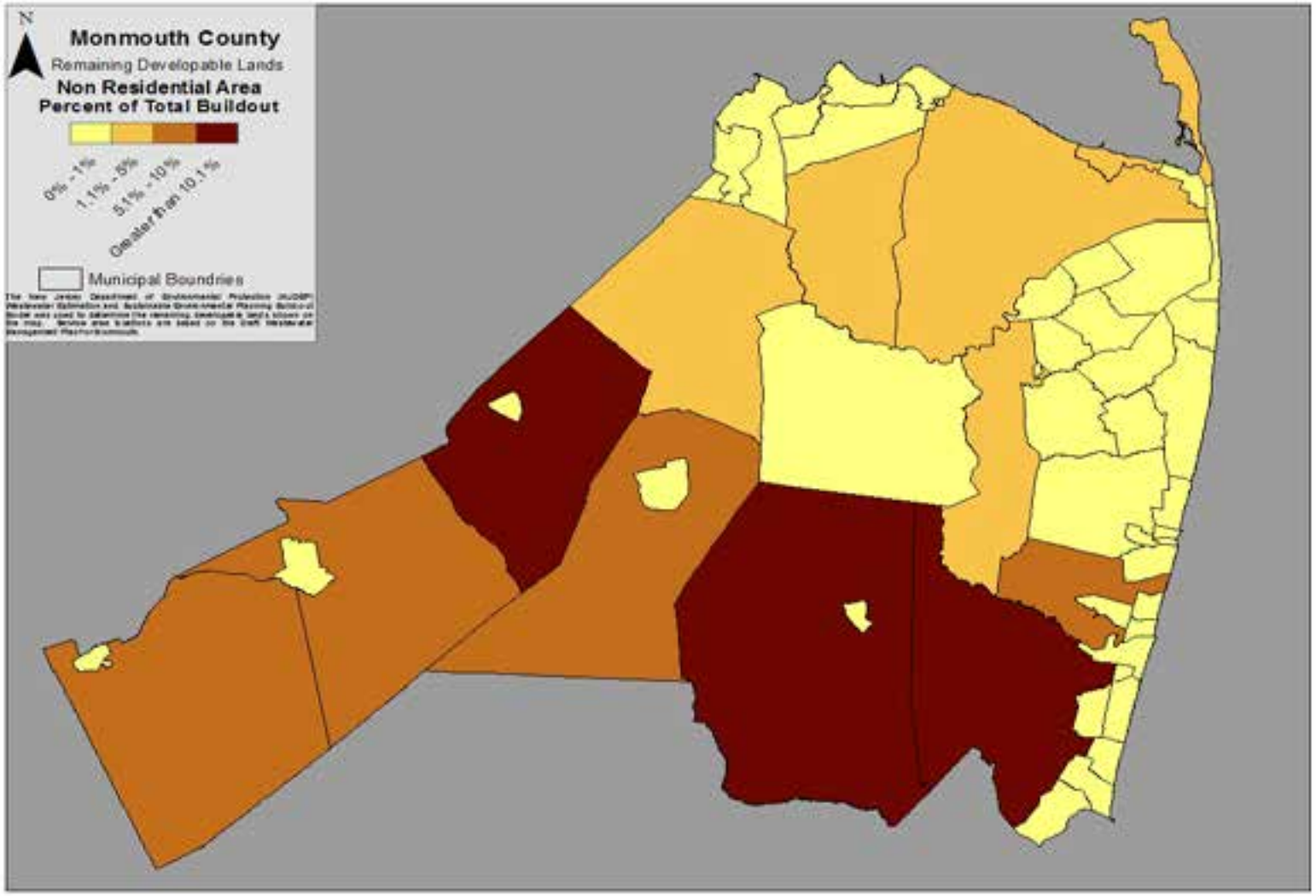
MUNICIPALITY	NJDEP Wastewater Estimator Totals - MCPB August 2012		Percentage of Total Model Buildout	
	RESIDENTIAL UNITS	NON RESIDENTAL AREA (Acres)	RESIDENTIAL UNITS	NON RESIDENTAL AREA (Acres)
NEPTUNE CITY BORO	18	0.3	0.1%	0.0%
UNION BEACH BORO	17	0.0	0.1%	0.0%
SPRING LAKE HEIGHTS BORO	16	0.0	0.1%	0.0%
FARMINGDALE BORO	10	0.0	0.1%	0.0%
FREEHOLD BORO	10	1.7	0.1%	0.1%
ROOSEVELT BORO	8	0.0	0.1%	0.0%
ENGLISHTOWN BORO	3	0.2	0.0%	0.0%
FAIR HAVEN BORO	3	0.0	0.0%	0.0%
LITTLE SILVER BORO	3	0.0	0.0%	0.0%
ALLENHURST BORO	0	0.0	0.0%	0.0%
ALLENTOWN BORO	0	0.0	0.0%	0.0%
ASBURY PARK CITY	0	0.0	0.0%	0.0%
AVON BY THE SEA BORO	0	0.0	0.0%	0.0%
BELMAR BORO	0	0.0	0.0%	0.0%
BRADLEY BEACH BORO	0	0.0	0.0%	0.0%
DEAL BORO	0	0.0	0.0%	0.0%
INTERLAKEN BORO	0	0.0	0.0%	0.0%
LAKE COMO BORO	0	0.0	0.0%	0.0%
LOCH ARBOUR VILLAGE	0	0.0	0.0%	0.0%
MANASQUAN BORO	0	0.0	0.0%	0.0%
MONMOUTH BEACH BORO	0	0.0	0.0%	0.0%
RUMSON BORO	0	0.0	0.0%	0.0%
SEA BRIGHT BORO	0	0.0	0.0%	0.0%
SEA GIRT BORO	0	0.0	0.0%	0.0%
SHREWSBURY TWP	0	0.0	0.0%	0.0%
SPRING LAKE BORO	0	0.0	0.0%	0.0%
COUNTY TOTALS	**12,694**	**2,142.0**	**100%**	**100%**

Resulting Residential Development Potential



Redevelopment was not accounted for in the model buildout & may effect development potential for certain municipalities.

Resulting Non-Residential Development Potential



Redevelopment was not accounted for in the model buildout & may effect development potential for certain municipalities.

Conclusion

- The NJDEP model was not without its limitations in both function and accuracy
  - Lack of instruction
  - Missing and/or out-of-date data
  - No recognition of the modifications that need to be made to the NJDEP model due to instructional and data limitations
- The NJDEP model results should not be accepted without vetting out errors
- The NJDEP model results should be compared and contrasted to other build-out models
- Completion of the NJDEP model is best suited to a user with a professional level of GIS knowledge with the availability of a higher licensed software package.

Recommendations

- Guidance! Guidance! Guidance!
  - The model developer needs to evaluate the data and calculations the end user will be completing
  - Use an area equivalent example
- Take into consideration that the boundaries of the data layers used by the model will not line up exactly
- As development occurs and zoning changes in the County the buildout results should be re-examined to make adjustments to the data
- The results of the model should not be considered resolute. The results may be further refined to include a flexible range of possible buildout outcomes.

Project Timeline