

HUC11 Nitrate Dilution Model

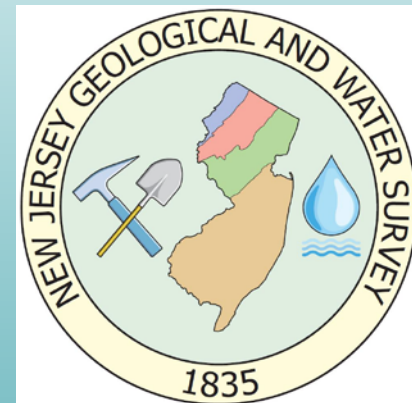
Let's protect our earth



NEW JERSEY DEPARTMENT
OF ENVIRONMENTAL PROTECTION

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NJ Geological & Water Survey
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Goals

- Estimate area that recharges sufficient water to dilute nitrate in effluent to a target concentration
- Reasonable input values
- Consistent methodology
- Defensible

Model

conservation of mass

Nitrate In = Nitrate Out

Nitrate In

- P: occupancy rate
of people per home
- N: nitrate loading rate
pounds nitrate per person per year

Nitrate Out

- R: recharge
inches per year
- T: nitrate after dilution
mg/l
- A: average lot size
acres

Trela Douglas Model

$$4.42 \times P \times N = R \times T \times A$$

- In use in NJ since 1970's
- Wide application
 - ✓ Pinelands
 - ✓ Highlands
 - ✓ Municipalities
- SAB reviewed
- Solve for A

Assumptions

- Septic tank only source of nitrate on lot
- No upgradient sources of nitrate
- All of area provides recharge, no runoff
- Complete mixing of leachate with recharge

Nitrate In Variables

People per Home (P)

- 3
- Highlands uses 4

NO3 loading rate (N)

- 10 lbs/person/home
- Never challenged

Nitrate Out Variables

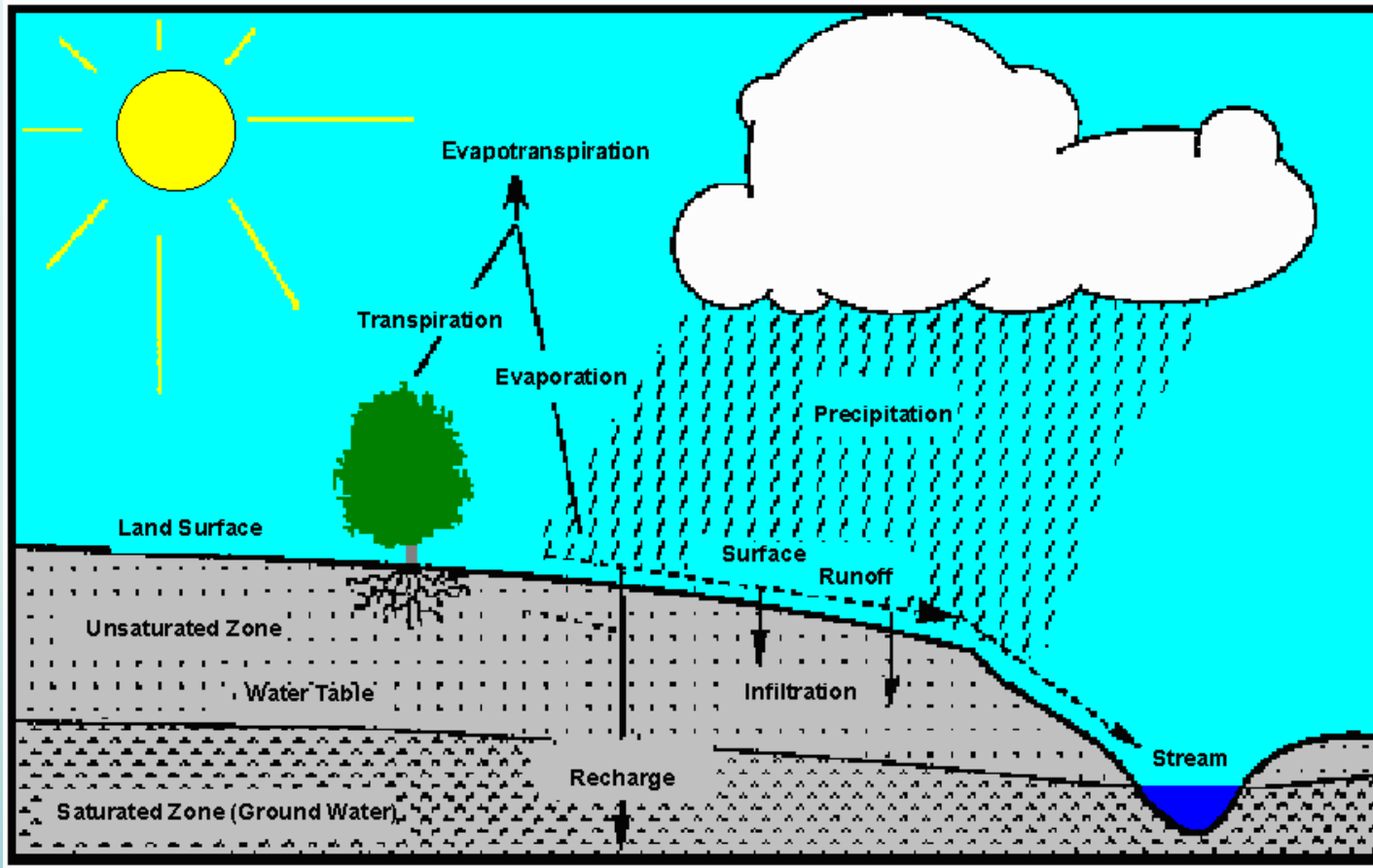
Recharge (R)

- Based on average precipitation
- GSR-32 methodology
- What makes it below root zone
- No wetlands, hydric soils, water

Nitrate Target (T)

- 2 mg/l
- Highlands more restrictive

Recharge



“A Method for Evaluating Ground-Water-Recharge Areas in New Jersey” by Charles and others, 1993, GSR-32

Ground-Water-Recharge Calculation Window V4.0

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You may only change the entries in light blue below.
 For land use, soil, and either municipality or HUC14, point to that cell to activate the pull down pick list. Then specify the appropriate entry.
 Enter the lot size (in acres) if desired. This is not mandatory.
 The estimated ground-water recharge for that combination of input parameters is automatically calculated.
 See the Users Guide worksheet for more information.

Parameter	Entry	
Land Use	agricultural - general	
Soil	Woodstown	
How to Specify Location	<input checked="" type="radio"/> Municipality <input type="radio"/> HUC14	
Municipality	Burlington Co., Lumberton Twp.	
Lot Size	4.0 acres	
Basin Factor	1.0 calibration factor	
Estimated ground-water recharge	rate	9.3 inches/year
	volume	1,014,674 gallons/year on this lot

Notes: Method doesn't apply to wetlands, open water and hydric soil.

Lot-Specific Nitrate Dilution Excel File

Time intensive
Different lot size
for every soil &
municipality

OFR 04-1

A Recharge-Based Nitrate-Dilution Model for New Jersey V6.2		
Adjusted Trela-Douglas Model Input Parameters		
parameter	value	units
population density:	3	people/home
human nitrate loading rate	10.0	pounds/person/year
NO ₃ target:	2.00	mg/l
Ground-Water Recharge Methodology Input Parameters		
Soil	Swedesboro	
Municipality	Egg Harbor Twp. (Atlantic Co.)	
Notes		
Under average conditions, recharge on the pervious portions of this lot is approximately	11.9	inches/year
Net average recharge (adjusted for impervious cover)	10.9	inches/year
Minimum recharge area needed to dilute nitrate:		
	3.8 acres/system	Print Results

HUC11 NO3 Model

A Recharge-Based HUC11-Scale Nitrate-Carrying-Capacity Planning Exercise for New Jersey, MS Excel Workbook, version 3.0

County & Municipality	population density	NO ₃ target	human nitrate loading rate
Salem_Pennsville Township	3	2	10
	people/home	mg/l	pounds/person/year

HUC11s in this Municipality		Carrying Capacity of Recharging Land in each HUC11	
#	name	Septic Density (acres/home)	Average Recharge (inches/yr)
02040206020	Pennsville / Penns Grove tribs	11.6	5.7
02040206030	Salem R(above 39d40m14s dam)/Salem Canal	7.2	9.2
02040206040	Salem River (below 39d40m14s dam)	7.6	8.7

Instructions

- 1) In the County & Municipality box click on the green box. Use the drop down menu to specify the county and municipality.
- 2) The Average Recharge column updates automatically.
- 3) Input the population density and nitrate target in the appropriate green boxes. **Note that N.J.A.C. 7:15 requires a maximum nitrate target of 2 mg/L and a minimum population density of 3 persons per household, except in the Highlands. Differing standards apply in the Highlands.**
- 4) The Septic Density column shows the area (assumed to supply recharge at the Average Recharge rate) needed to dilute the input loading of nitrate to the target concentration. This automatically updates based on the data entered in the green boxes.

See the Users Guide worksheet for more information.

Limitations

- This tool is intended for unsewered areas.
- This tool is not for use in Hudson and Essex Counties.
- No estimates of recharge on hydric soils or wetlands.

Limitations/Features

- Average lot sizes per HUC11
 - ✓ Multiple zonings per municipality, maybe
 - ✓ Need to determine HUC11s
- No credit for NO_3 treatment technology
- Required recharging land per septic system
 - ✓ Eliminate water, wetlands, hydric soils
- Only NO_3 from lot
 - ✓ No credit for nearby areas of clean recharge
 - ✓ No penalty for nearby NO_3 loading

Eliminate water, wetlands, hydric soils

Goal: 6 recharging acres/system

Total lot size = 250 acres

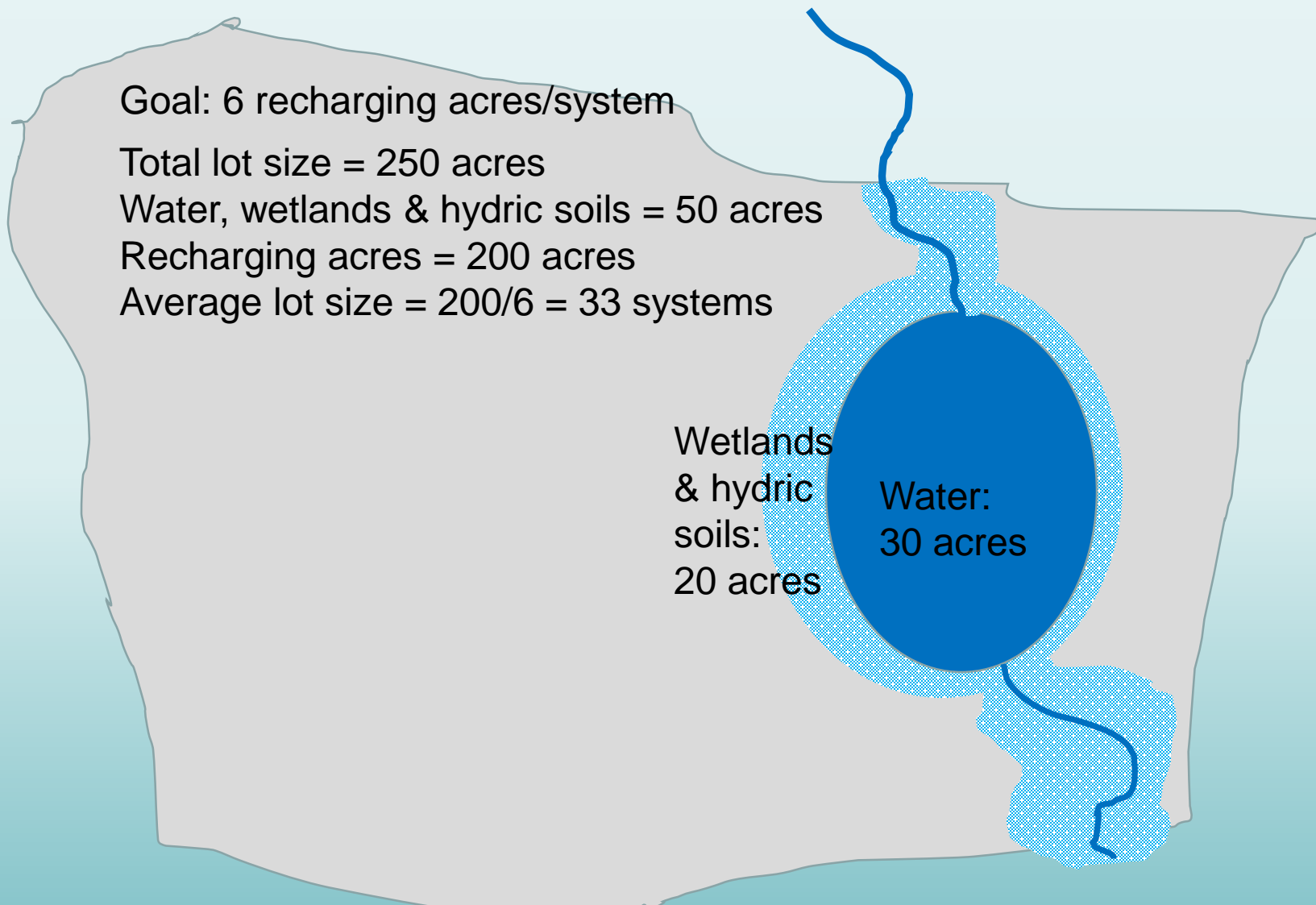
Water, wetlands & hydric soils = 50 acres

Recharging acres = 200 acres

Average lot size = $200/6 = 33$ systems

Wetlands
& hydric
soils:
20 acres

Water:
30 acres

A diagram of a 250-acre lot, represented by a light gray irregular shape. A blue wavy line representing a stream enters from the top and flows through a light blue shaded area representing water, wetlands, and hydric soils. This area is divided into a solid blue oval labeled 'Water: 30 acres' and a light blue stippled area labeled 'Wetlands & hydric soils: 20 acres'. The stream exits the lot at the bottom right.

Only need to dilute NO3 from lot – no credit or penalty

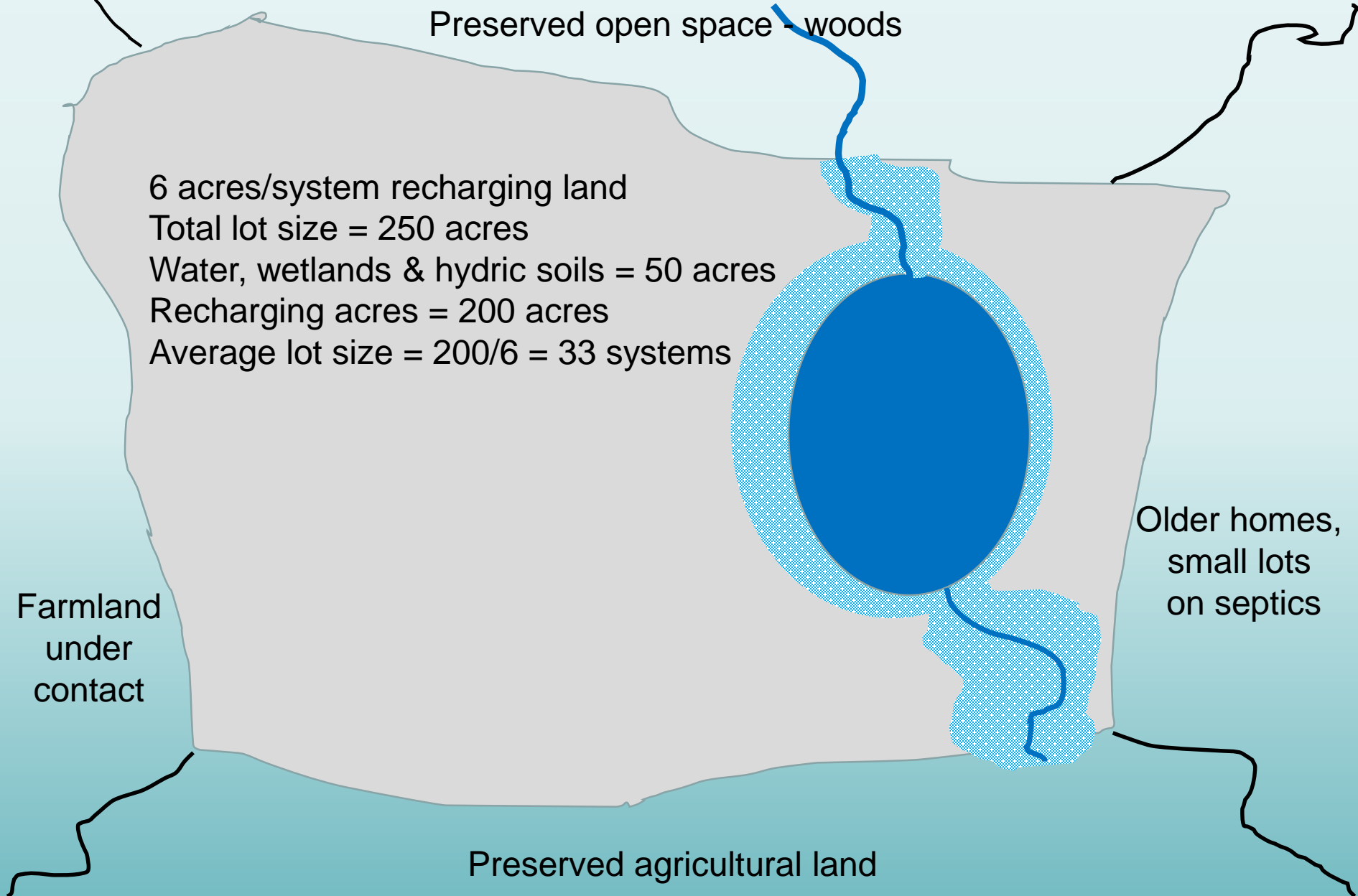
Preserved open space - woods

6 acres/system recharging land
Total lot size = 250 acres
Water, wetlands & hydric soils = 50 acres
Recharging acres = 200 acres
Average lot size = $200/6 = 33$ systems

Farmland
under
contact

Older homes,
small lots
on septics

Preserved agricultural land



Use DEP's GEOWEB for HUC11s

The screenshot displays the NJ-GeoWeb interface. At the top, the logo for NJ-GeoWeb and NJDEP (New Jersey Department of Environmental Protection) is visible. Below the logo is a search bar and a toolbar with various navigation and tool icons. The main map area shows a detailed view of the Pennsville region, including labels for Churchtown, Glenside, Central Park, Pennsville, Marshalltown, Slaps Corner, and Mannington. The map features various colored overlays representing different geographic features and administrative boundaries. A 'Map Content' panel is open on the right side, showing a list of layers. The 'Active Layer' is set to 'Watersheds (HUC11)'. The panel includes a search bar and a list of layers with checkboxes. The 'Base Layers' section is expanded, showing several checked options: 'Municipalities', 'Roads NJ (Centerlines) (1:4999 to 1:999 scale)', and 'ZIP Codes (1:29999 to 1:999 scale)'. Other layers include 'Well Head Protection Areas (Community)', 'Purveyor', 'Water Source Areas', and 'Well Head Protection Areas (Non-Community)'. The bottom of the interface shows a scale bar (0.9 mile), a scale value of 59,878.34, and coordinates: Easting (X) : 202,942.37, Northing (Y) : 283,444.34.

NJ-GeoWeb new jersey nidep department of environmental protection help data descriptions

Searches

Advanced Tools

© NJDEP Delaware

Map Content

Map Content

Right-click a layer for more functions

Active Layer: Watersheds (HUC11)

- Well Head Protection Areas (Community)
- Purveyor
- Water Source Areas
- Well Head Protection Areas (Non-Community)
- Land
- Base Layers
 - Municipalities
 - Place Names
 - Parcels Data (Block and Lot)
 - Roads NJ (Centerlines) (1:50000 to 1:5000 scale)
 - Roads NJ (Centerlines) (1:4999 to 1:999 scale)
 - Major Roads (up to 1:200000 scale)
 - Major Roads (1:200000 to 1:999 scale)
 - ZIP Codes (up to 1:30000 scale)
 - ZIP Codes (1:29999 to 1:999 scale)

0.9 mile

Scale 1: 59,878.34 GO

Easting (X) : 202,942.37 , Northing (Y) : 283,444.34

References

www.nj.gov/dep/wrm/index.html

<http://www.nj.gov/dep/wqmp/guidance.html>

Nitrate Dilution Model Related Information

- ▶ [Nitrate as a Surrogate for Assessing Impact of Development Using Individual Subsurface Sewage Disposal Systems on Ground Water Quality](#)
May 21, 2007
- ▶ [A Recharge-Based Nitrate-Dilution Model for New Jersey, v7 for Excel 2010](#) (MS Excel)
- ▶ [A Recharge-Based HUC 11-Scale Nitrate-Carrying-Capacity Planning Exercise for New Jersey, MS Excel Workbook version 3.0](#) (MS Excel Workbook)
- ▶ [A Recharge-Based Nitrate-Dilution Model for Small Commercial Establishments in New Jersey, v2.2](#) (MS Excel)
- ▶ [Map of New Jersey Septic Densities Based on Regional HUC 11 Analysis](#) - this map depicts statewide variations in HUC 11 septic densities
- ▶ [Septic Density per HUC 11](#) (MS Excel) - average acres per individual subsurface sewage disposal system, HUC 11s by County and HUC 11s by Municipality

References

www.njgeology.org

Reference	Link
Recharge report GSR 32	http://www.njgeology.org/pricelst/greport/gsr32.pdf
Recharge Excel	http://www.state.nj.us/dep/njgs/geodata/dgs99-2.htm
Nitrate Dilution Report	http://www.state.nj.us/dep/njgs/pricelst/ofreport/ofr04-1.pdf
Nitrate Dilution Excel	http://www.state.nj.us/dep/njgs/geodata/dgs02-6.htm
Nitrate Dilution IC	<a href="http://www.state.nj.us/dep/njgs/enviroed/infocirc/nitrat
edilutionFAQ.pdf">http://www.state.nj.us/dep/njgs/enviroed/infocirc/nitrat edilutionFAQ.pdf

Thank You

Questions?