

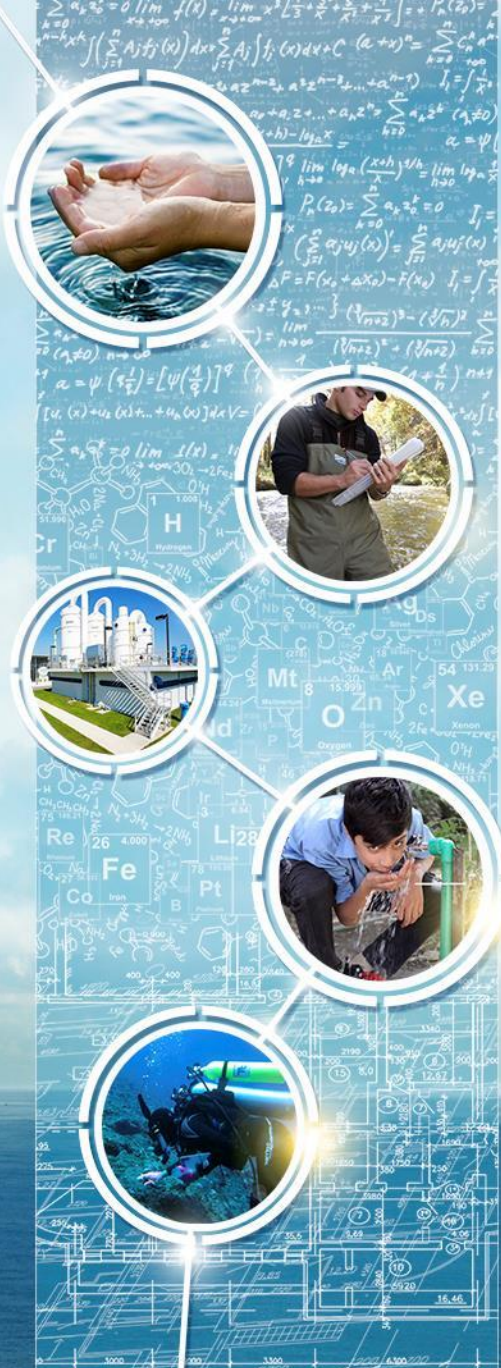


# Wastewater Management Options

October 16, 2017

Chatham County, NC

Victor D'Amato, PE



# Background

- First presentation to Chatham County BOC:  
November, 2001!
  - Individual and Community Wastewater System Options
- Chatham County wastewater management
  - Most development on individual onsite systems (well/septic) or cluster systems (package plants)
  - Bynum WWTP (owned/operated by Chatham Co.)
  - Chatham County Schools
  - Pittsboro and Siler City WWTPs
  - **Comprehensive Plan and UDO effort provides opportunity to be more proactive**

# Subsurface Systems

- Wastewater systems with Subsurface Dispersal are permitted by Chatham County Environmental Health
  - Septic systems and larger systems with a “drainfield”
  - Systems >3,000 gpd must be approved by NC DHHS first



# Surface (Land Application) Systems

- Wastewater systems with Surface Dispersal are permitted by NC DEQ, DWR, Non-Discharge Permitting Unit
  - Spray irrigation and surface drip irrigation systems



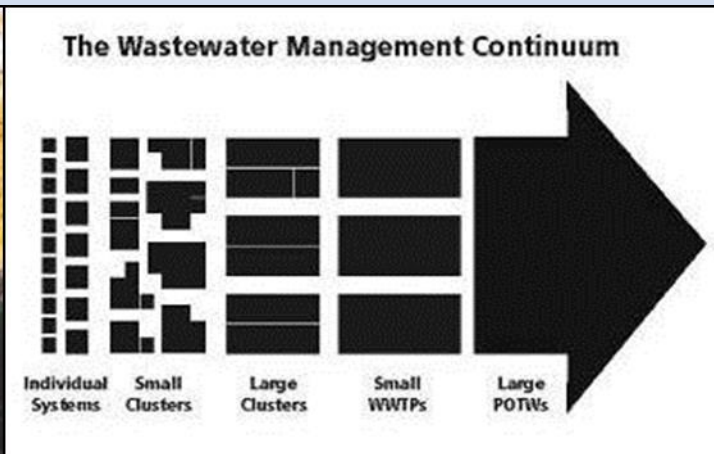
# Discharging Systems

- Wastewater systems with Surface Water Discharge are permitted by NC DEQ, DWR, NPDES Permitting Branch



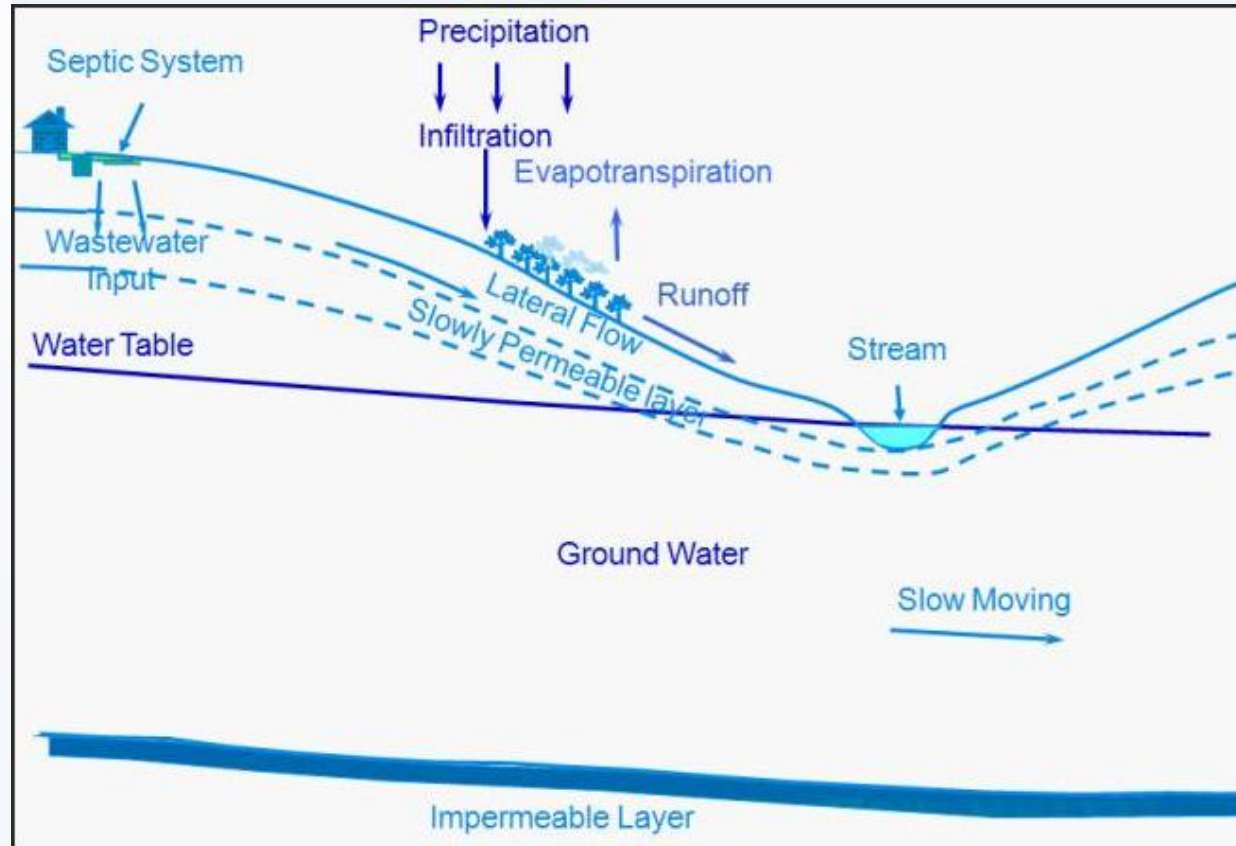
# Distributed Wastewater Management

- **Decentralized systems:** multiple smaller systems
  - Onsite
  - Cluster
- **Centralized systems:** one large system for a given area
- **Distributed management:** all of the above
  - Recognizes the importance of scale in managing water
    - Small systems can be as or more effective than large ones
  - **Recognizes that ALL systems need to be managed**

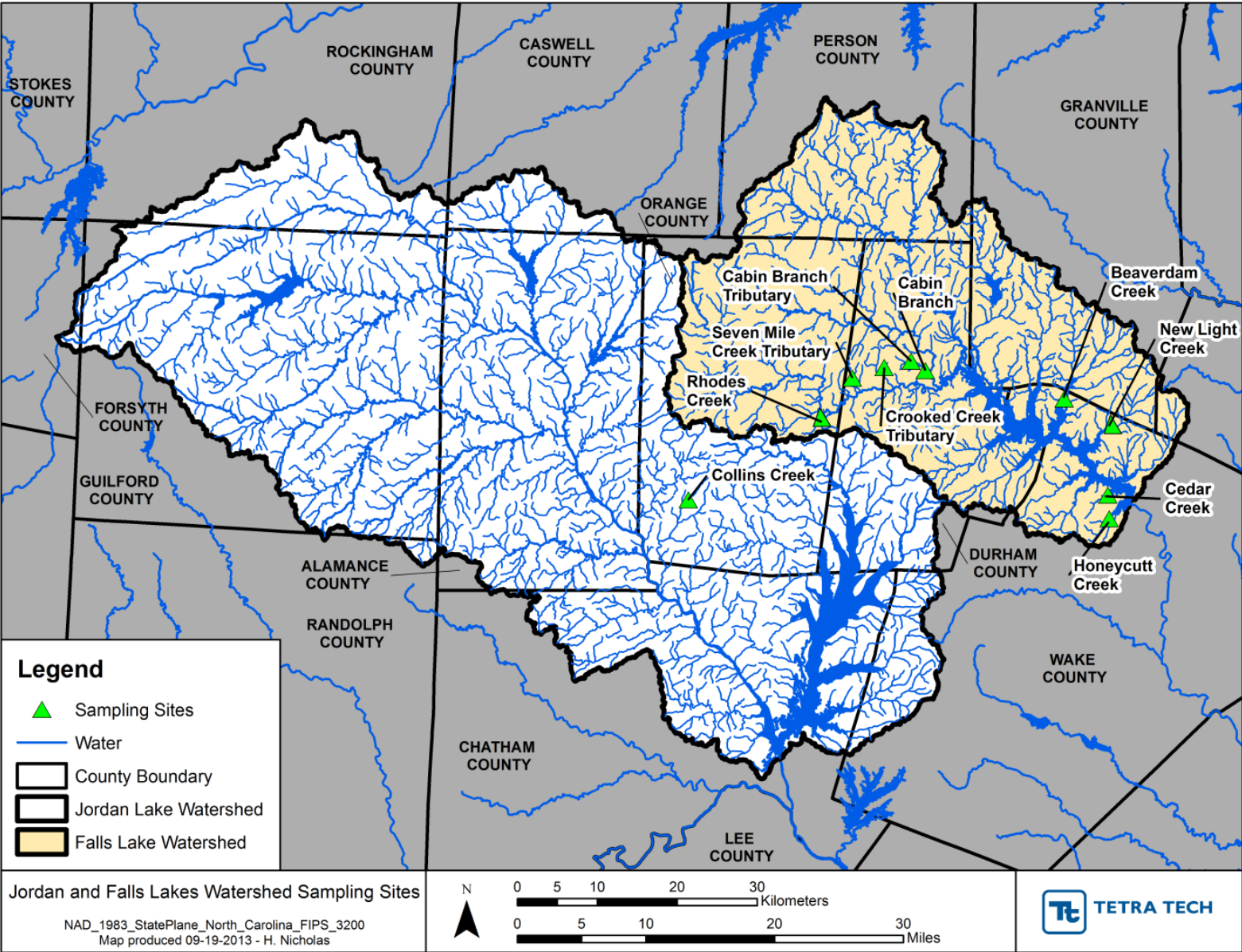


# Benefits: Effective

- Decentralized technologies are robust
- Multiple soil dispersal areas enhance assimilation
- Conserves water/restores local hydrology through groundwater recharge
- Soil is an effective treatment medium



# Jordan and Falls Lake Watershed Water Quality Monitoring Locations





# NC Piedmont Onsite System Performance

Basin	Stream Order*	Septic-Generated Nutrients		Measured Load in Stream		Percent Septic Load Delivered to Stream	
		TN (lb/d/mi <sup>2</sup> )	TP (lb/d/mi <sup>2</sup> )	TN (lb/d/mi <sup>2</sup> )	TP (lb/d/mi <sup>2</sup> )	TN (%)	TP (%)
Rhodes Creek	unk.	-	-	0.57	0.012	-	-
Seven-Mile Creek	4 <sup>th</sup>	30.4	3.9	0.139	0.0068	0.46	0.18
Cabin Branch	8 <sup>th</sup>	30.2	3.86	0.57	0.0178	1.89	0.46
Crooked Creek	2 <sup>nd</sup>	27.0	3.45	1.53	0.0286	5.67	0.83
Beaverdam Creek	unk.	3.83	0.42	0.20	0.024	5.1	5.7
New Light Creek	unk.	4.68	0.60	0.37	0.033	8.0	5.4
Honeycut Creek	unk.	15.5	1.99	0.33	0.025	2.2	1.3
Cedar Creek	unk.	29.7	3.81	0.66	0.039	2.2	1.0
<b>AVERAGE</b>		<b>20.2</b>	<b>2.6</b>	<b>0.55</b>	<b>0.023</b>	<b>3.6</b>	<b>2.1</b>

- Equivalent “effluent” concentrations: 2.0 mg/l TN, 0.2 mg/l TP

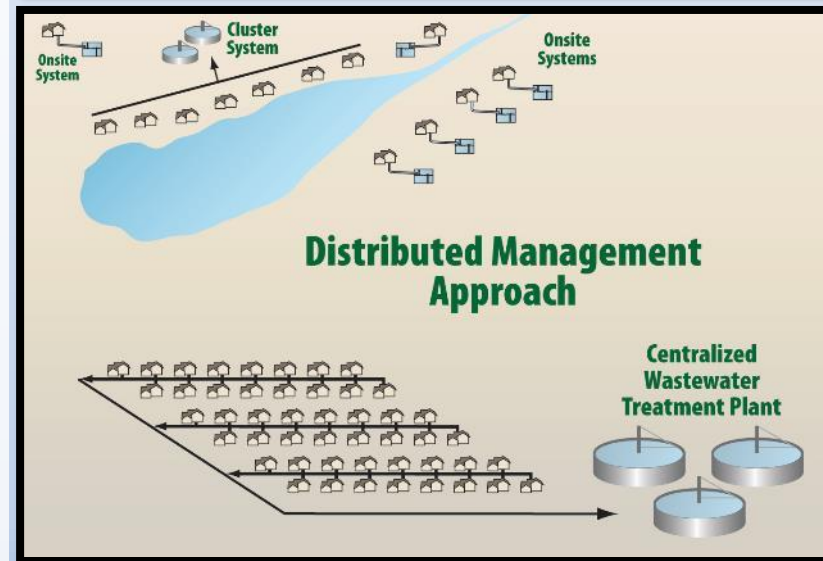
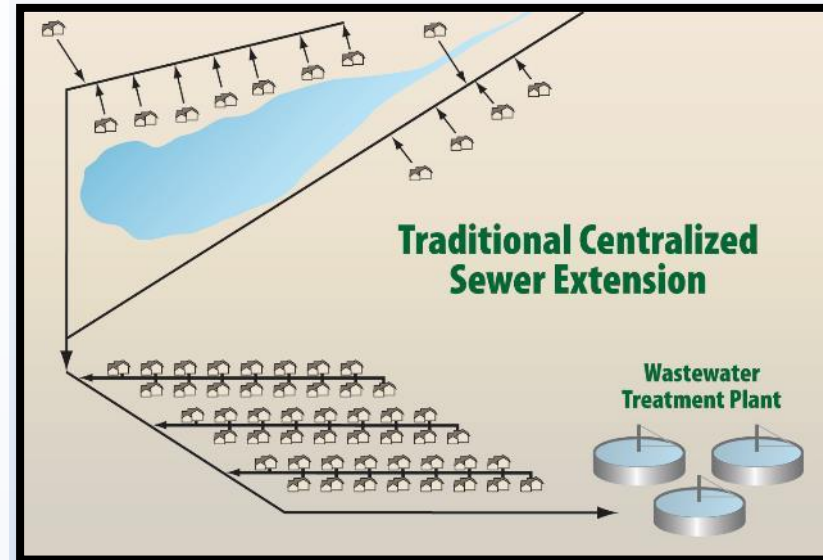
- **Equivalent reductions: 96% TN, 98% TP**

- Corroborated by more recent USGS and ECU data and ChesBay Program work

Data from:  
 NCDENR 2010  
 Berkowitz 2014

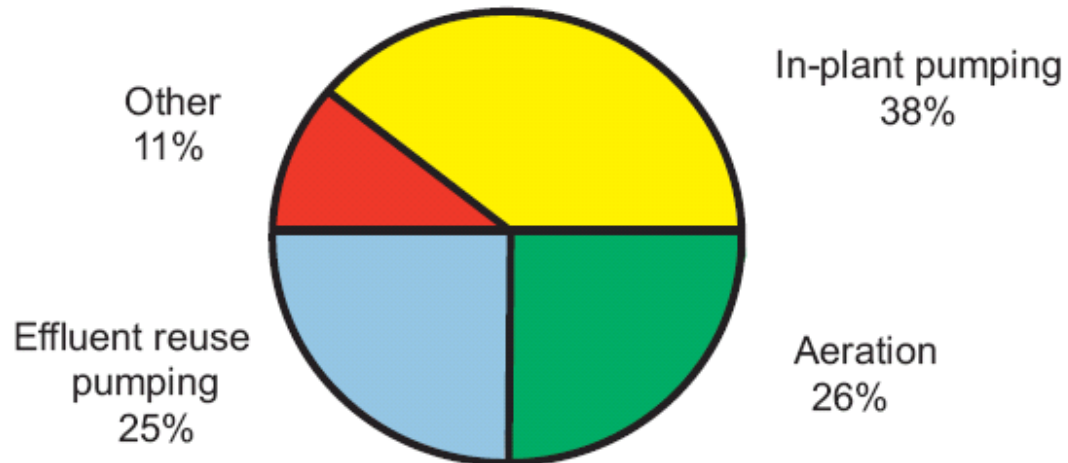
# Benefits: Efficient

- Treatment close to the source and/or reuse requires less energy
- Urban reuse retrofits are more feasible
- *Smart, clean and green* technology
  - **Smart controls:** Remote monitoring of multiple systems
  - **Resource recovery** within facilities
  - **Fit-for-Purpose:** match water quality to intended reuse
  - **Multifunctional:** Landscape/facility integration
  - **Resilient:** Relatively infiltration-resistant; passive ecological treatment



# Wastewater Utility Energy Use

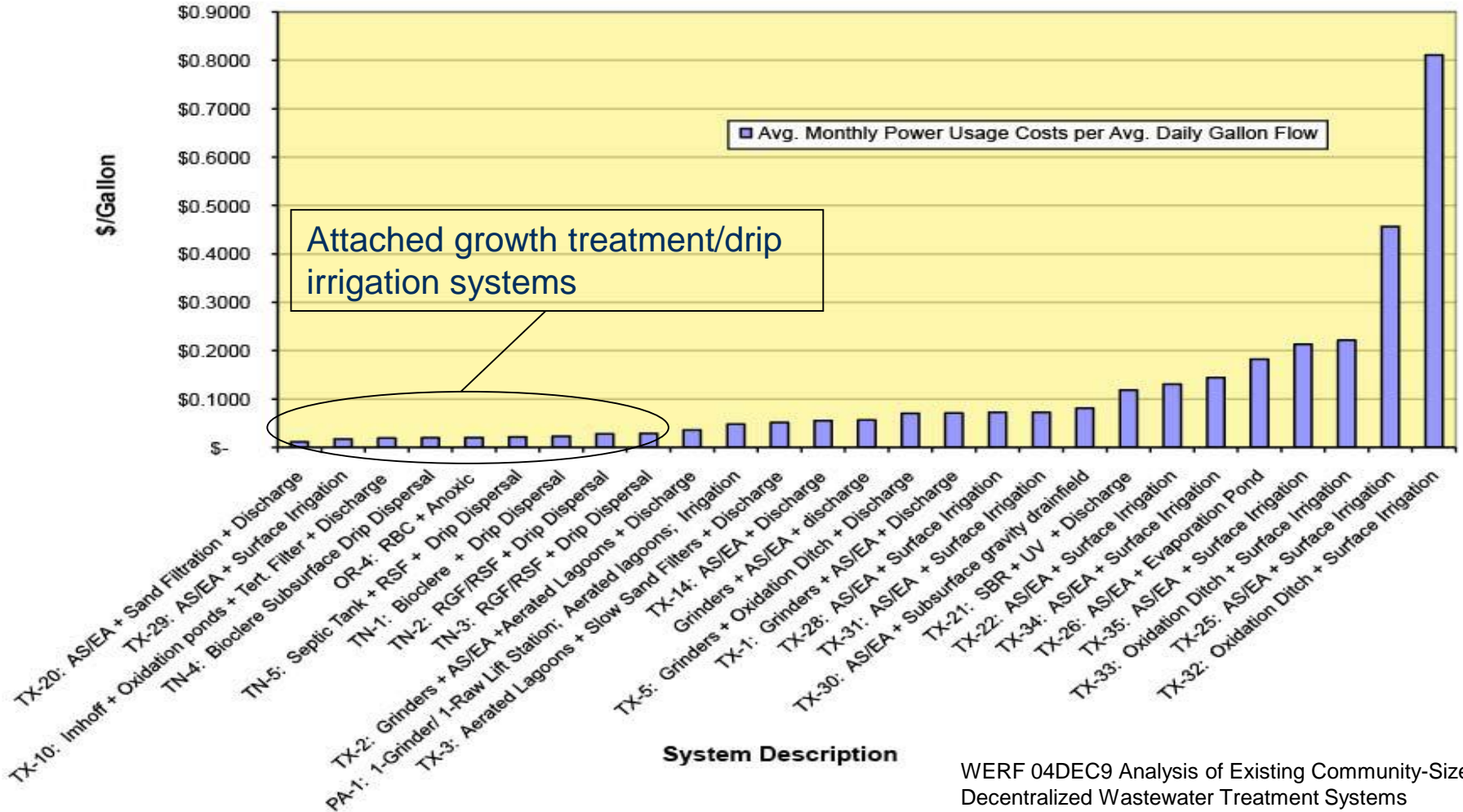
**National Association of Clean Water Agencies (NACWA)  
Survey of Energy Use**  
47 Respondents used 2.1 billion kWh of electricity



T. Jones, "Water-Wastewater Committee: Program Opportunities in the Municipal Sector: Priorities for 2006," presentation to CEE June Program Meeting, June 14, 2006, Boston, MA. Available online at [http://www.cee1.org/cee/mtg/6-06\\_ppt/jones.pdf](http://www.cee1.org/cee/mtg/6-06_ppt/jones.pdf).

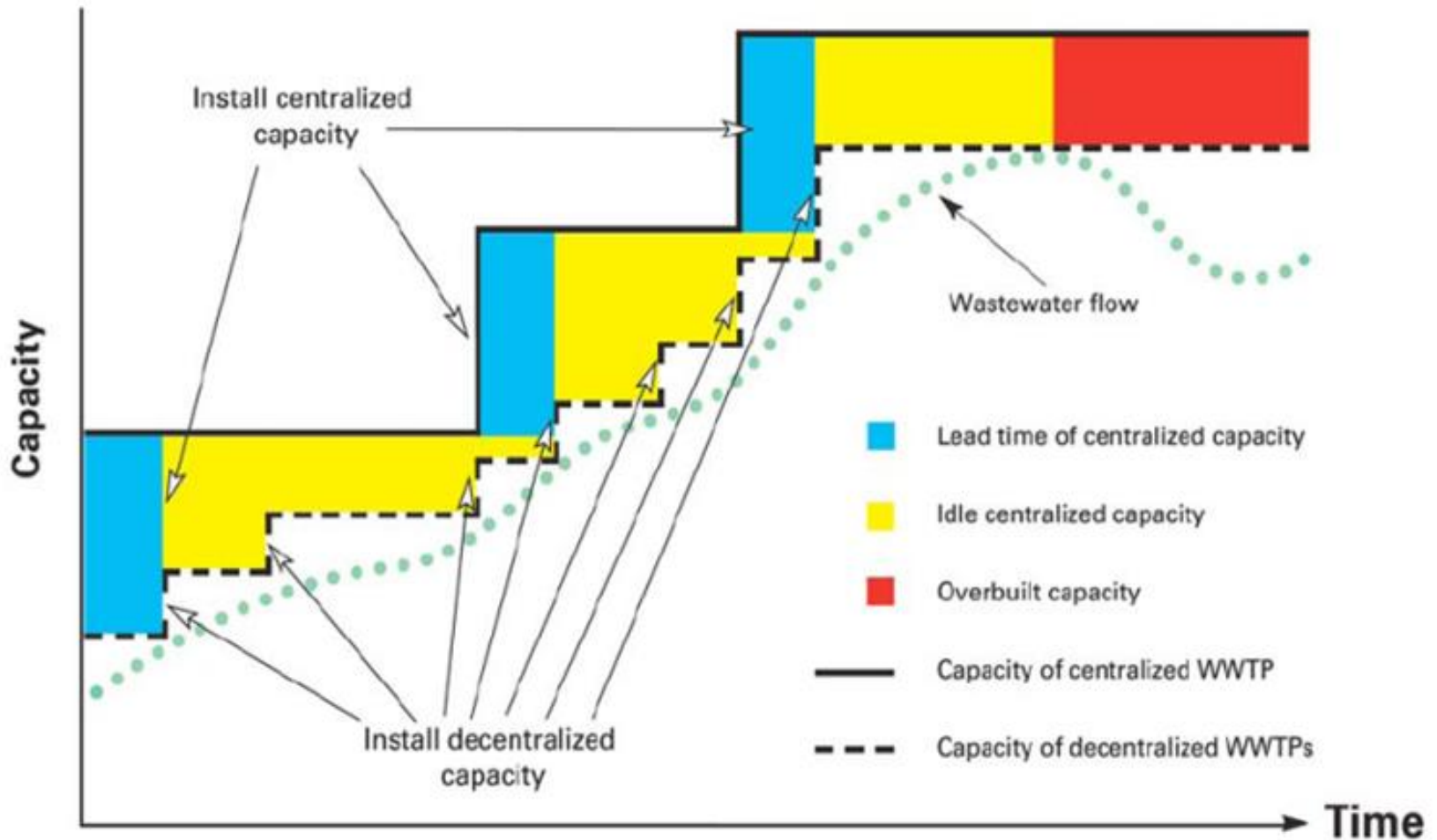
# Power Demands of Decentralized Systems

FIGURE 3  
Average Monthly Reported Power Usage Costs Per Gallon of Reported Average Daily Flow.



# Benefits: Affordable

“Pay as You Grow” or “Right-Sized, Just-in-Time”

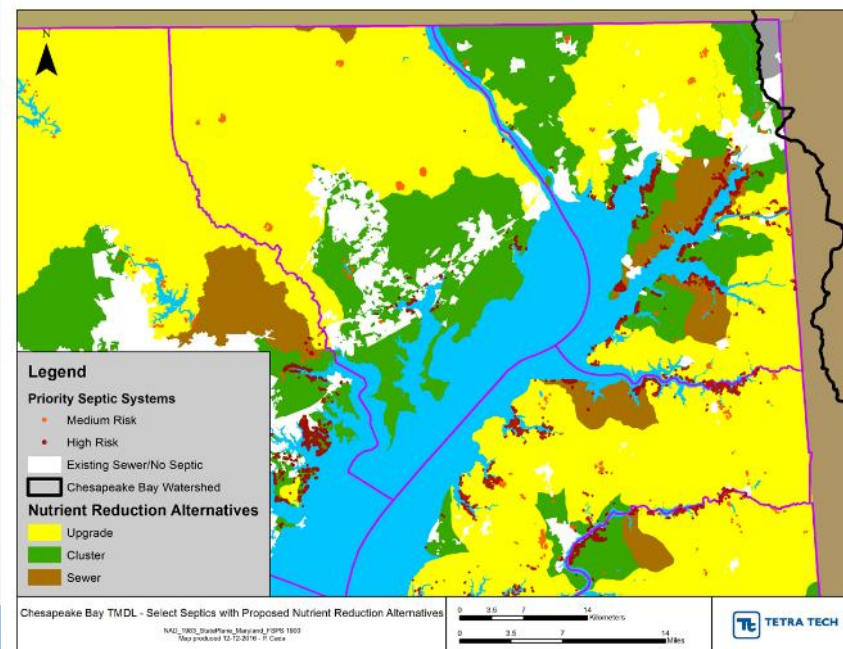
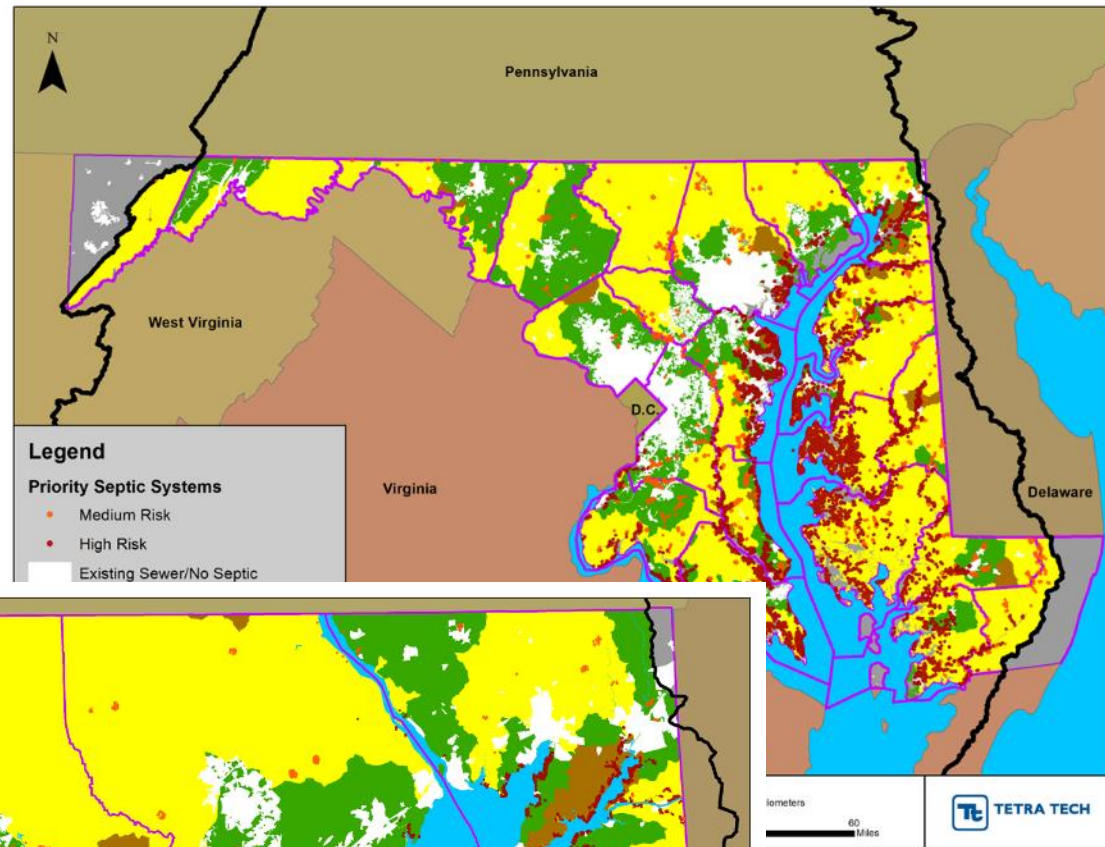


# Treatment Technologies

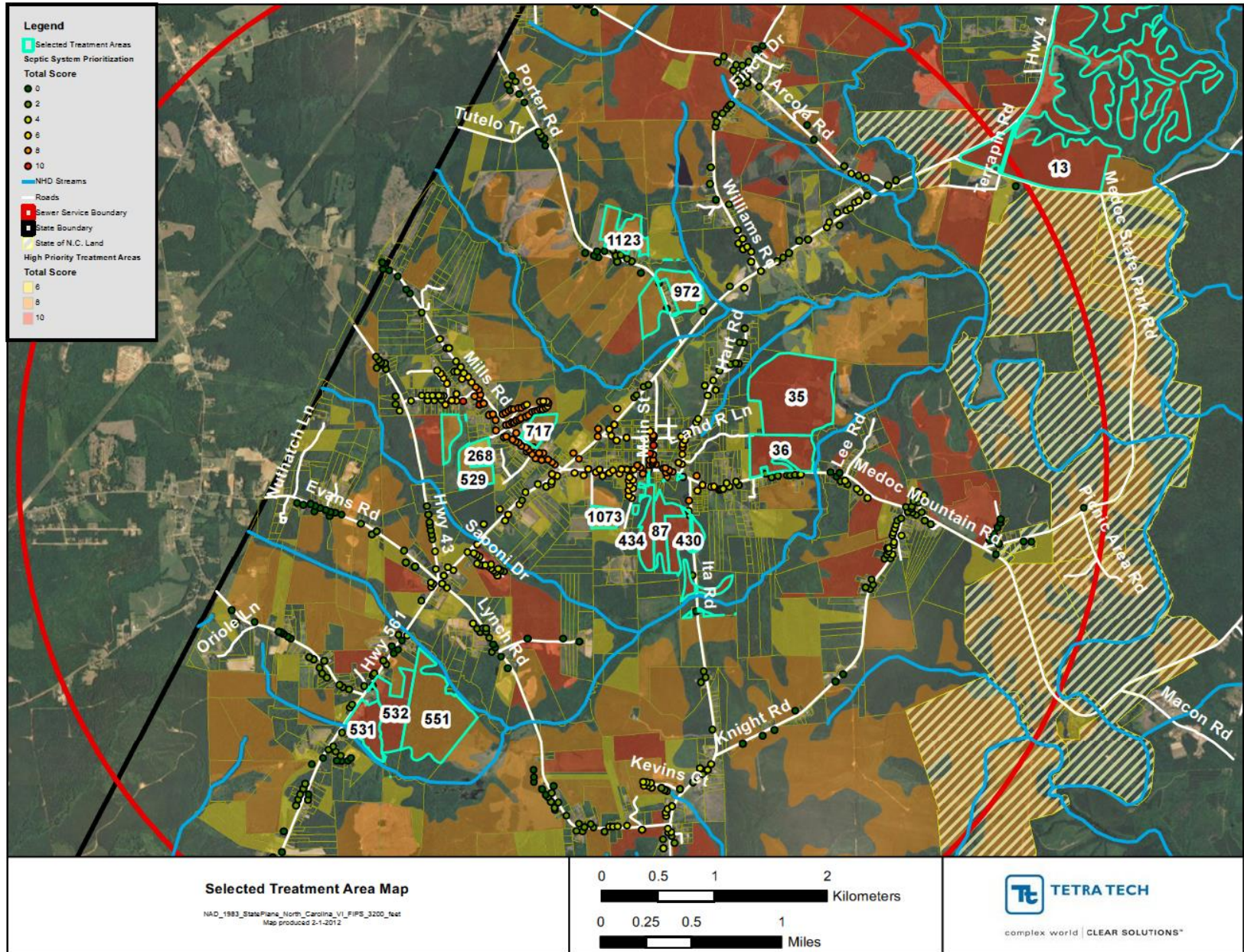


# Maryland Plan for Chesapeake Bay TMDL

- Statewide plan for reducing nutrients from existing decentralized systems
  - Loading analysis
  - Reduction analysis
- Tied into State smart growth objectives
  - Onsite upgrades
  - Clustering
  - Sewering



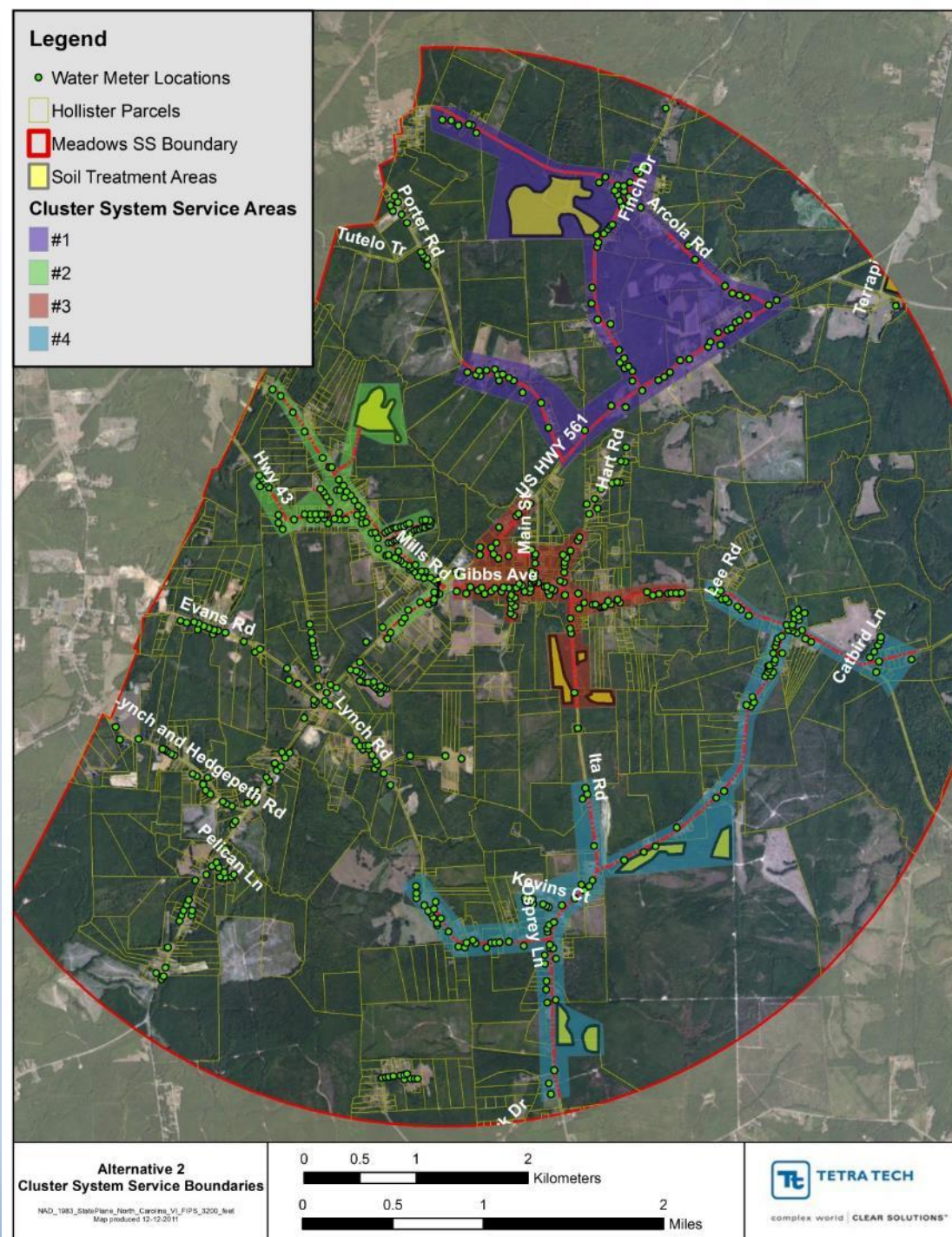
# Planning: Meadows Sewer District





# Meadows Sewer District: *Multiple Cluster Option*

- Cost effective
  - Sewer connection...  
\$22K/home
  - Single cluster...  
\$12.8K/home
  - **Multi-cluster...  
\$8.8K/home**
  - Smaller clusters...?



# Planning: Town of Lake Santeetlah

## AREA 1:

LRM feels this area has the possibility for multiple offsite conventional septic repairs. This area is approximately 3.5 acres. If a large cluster, or community type system needed, LRM recommends using an Aerobic Subsurface Drip Irrigation System in this area to maximize the potential design flow/bedrooms that could be permitted in this area.

## AREA 2:

LRM feels this area has the possibility for multiple offsite conventional septic repairs. This area is approximately 5.6 acres. If a large cluster, or community type system needed, LRM recommends using an Aerobic Subsurface Drip Irrigation System in this area to maximize the potential design flow/bedrooms that could be permitted in this area.

## MAP KEY

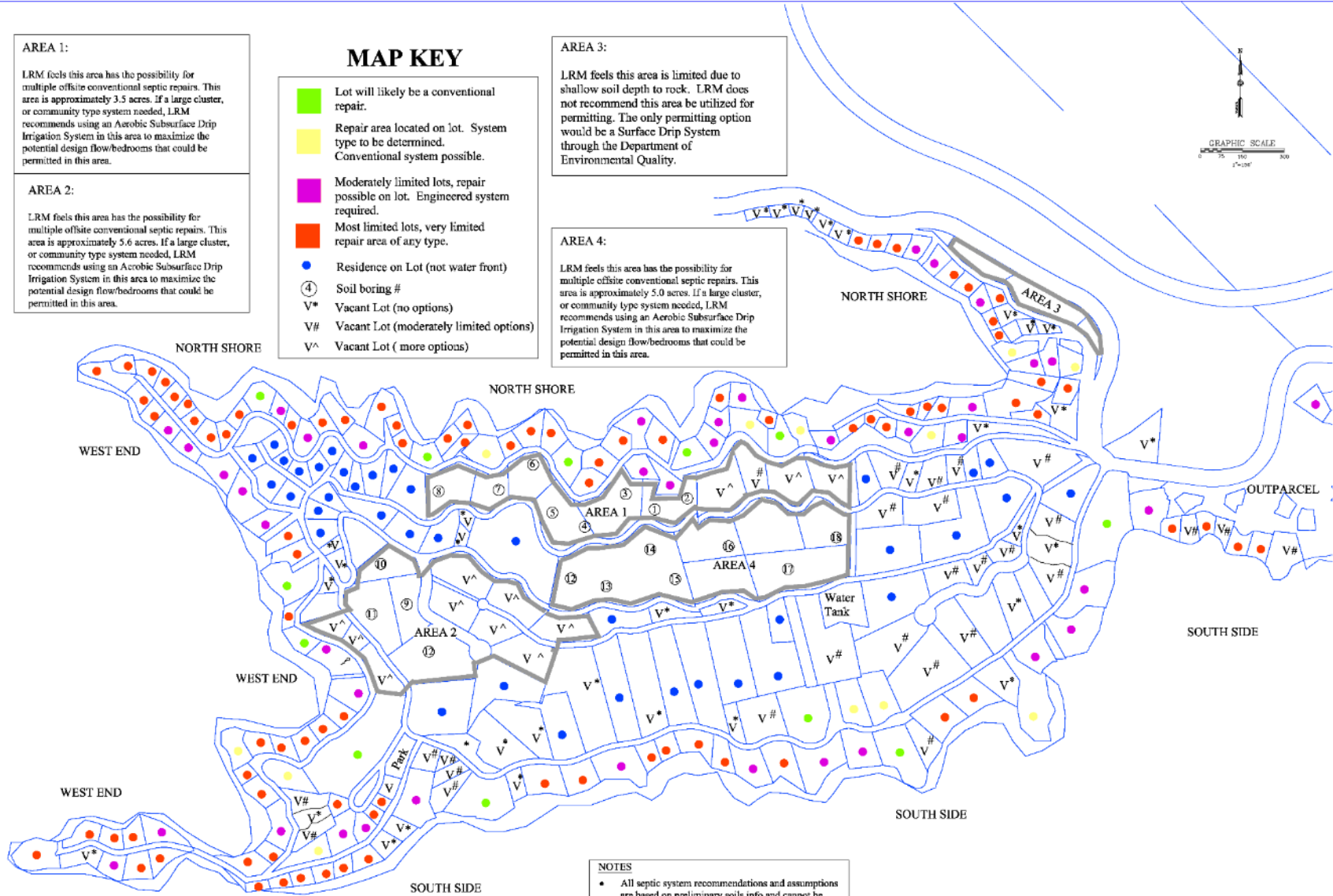
- Lot will likely be a conventional repair.
- Repair area located on lot. System type to be determined. Conventional system possible.
- Moderately limited lots, repair possible on lot. Engineered system required.
- Most limited lots, very limited repair area of any type.
- Residence on Lot (not water front)
- Soil boring #
- V\* Vacant Lot (no options)
- V# Vacant Lot (moderately limited options)
- V^ Vacant Lot ( more options)

## AREA 3:

LRM feels this area is limited due to shallow soil depth to rock. LRM does not recommend this area be utilized for permitting. The only permitting option would be a Surface Drip System through the Department of Environmental Quality.

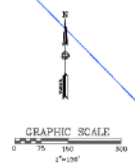
## AREA 4:

LRM feels this area has the possibility for multiple offsite conventional septic repairs. This area is approximately 5.0 acres. If a large cluster, or community type system needed, LRM recommends using an Aerobic Subsurface Drip Irrigation System in this area to maximize the potential design flow/bedrooms that could be permitted in this area.



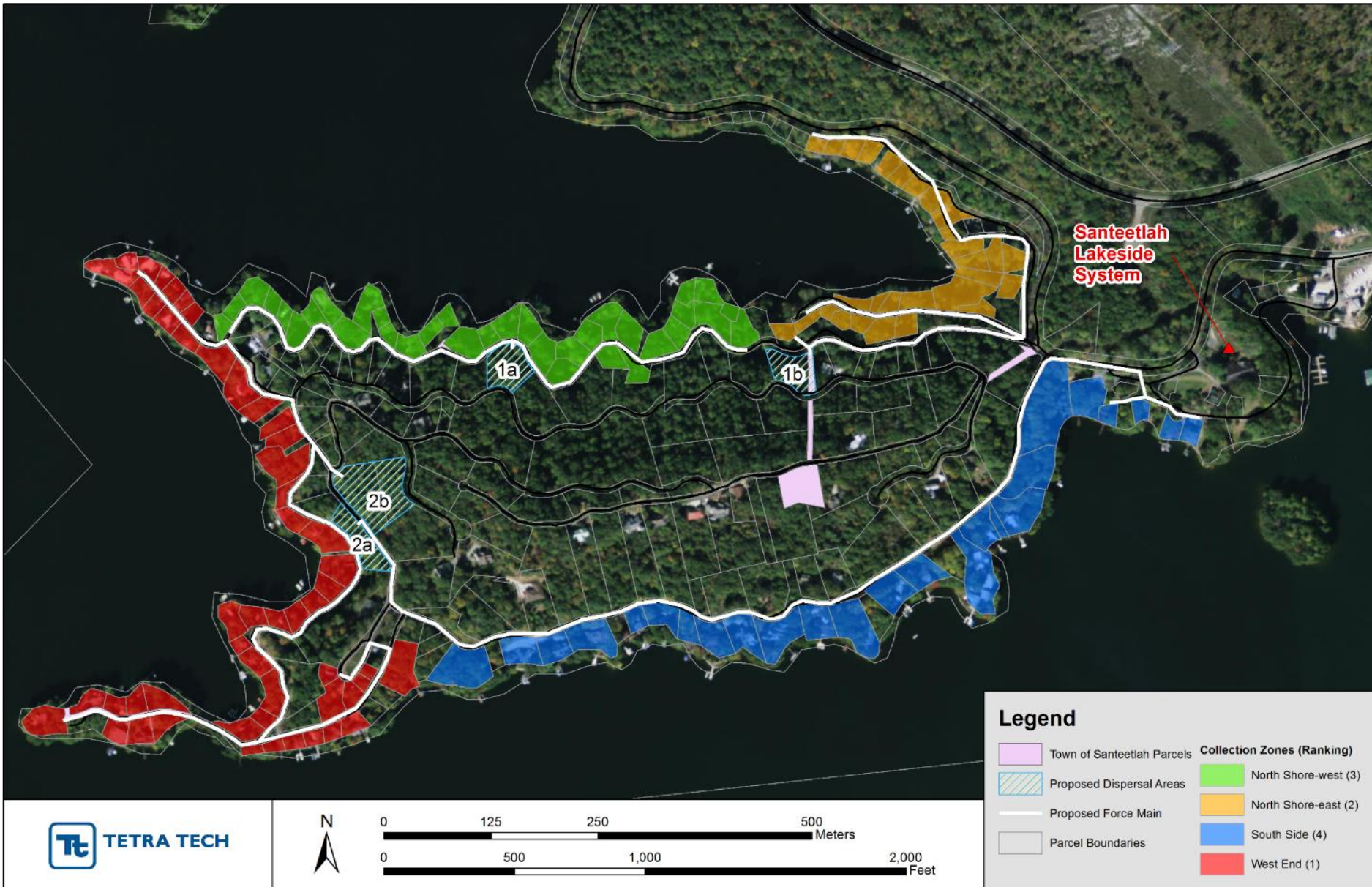
**NOTES**

- All septic system recommendations and assumptions are based on preliminary soils info and cannot be guaranteed without a Licensed Soil Scientist (LSS) permit level soils evaluation.



	REVISIONS/SUBMISSIONS	Date
No.		
Prepared by: WJH MFT	Checked by: MFT WJH	Date: 5-10-16
<b>LAND RESOURCE MANAGEMENT</b> PO BOX 9251 ASPEN, NC 28805 828.231.1963 www.lrdm.com		
<b>TOWN OF LAKE SANTEEHLAH</b> ONSITE WASTEWATER (SEPTIC) PRELIMINARY ANALYSIS GRAHAM COUNTY NORTH CAROLINA		
Project No: 30877	Drawing Title: SS-1 PARCEL CLASSIFICATION MAP	

# Lake Santeetlah - Potential Cluster System Plan



# Distributed System Applications

- **Green Buildings/Sustainable Sites**
  - Integration into buildings/landscapes
  - Resource recovery and reuse
  - Education and recreation
- **Independent Communities**
  - Maintain fiscal control
  - Preserve community character
  - Underserved communities
- **Utility Optimization**
  - Managed distributed systems
  - Sewer mining
  - Satellite reuse
- [www.werf.org/distributedwater](http://www.werf.org/distributedwater)
  - Includes decision-support tool

Case Studies Listed by Type
<b>Green Building/Sustainable Sites (GB)</b>
<a href="#">Battery Park City, New York City (UO)</a>
<a href="#">Couran Cove Island Resort, Queensland, Australia (IC)</a>
<a href="#">Currumbin Ecovillage, Queensland, Australia (IC)</a>
<a href="#">Dockside Green, Victoria, British Columbia, Canada (UO)</a>
<a href="#">Philip Merrill Center, Annapolis, Maryland</a>
<a href="#">Sidwell Friends School, Washington, D.C.</a>
<a href="#">Workplace6 Recycled Water Factory, Sydney, Australia (UO)</a>
<b>Independent Communities (IC)</b>
<a href="#">Bethel Heights, Arkansas</a>
<a href="#">Gillette Stadium, Foxborough, Massachusetts (GB)</a>
<a href="#">Lake Elmo, Minnesota</a>
<a href="#">Piperton, Tennessee</a>
<a href="#">Warren, Vermont</a>
<a href="#">Weston Solar Aquatics, Weston, Massachusetts (GB)</a>
<a href="#">Wickford Village, Rhode Island</a>
<b>Utility Optimization (UO)</b>
<a href="#">LOTT Alliance, Lacey, Olympia, and Tumwater, Washington</a>
<a href="#">Loudoun Water, Loudoun County, Virginia (IC)</a>
<a href="#">Mobile Area Water and Sewer System, Mobile, Alabama</a>
<a href="#">Pennant Hills Golf Club, Sydney, Australia</a>
<a href="#">Sand Creek, Aurora, Colorado</a>
<a href="#">University of North Carolina at Chapel Hill, North Carolina (GB)</a>

# Distributed System Applications



- **MAWSS, Mobile Alabama**
  - Owns and operates two conventional and at least 12 decentralized wastewater facilities

- **Sydney Water**

- Privately-driven *sewer mining* project
- Treated water is used to irrigate 55 acres of greens, tees and fairways

- **Bethel Heights, Arkansas**

- Rapidly-growing population on septic systems
- City selected two cluster systems phased-in to meet increasing demand with growth

- **Dockside Green, Victoria, B.C.**

- On-site, closed-loop treatment provides *fit-for-purpose*, reclaimed water supply
  - Toilet flushing, landscape irrigation, green roof watering, and natural stream/pond

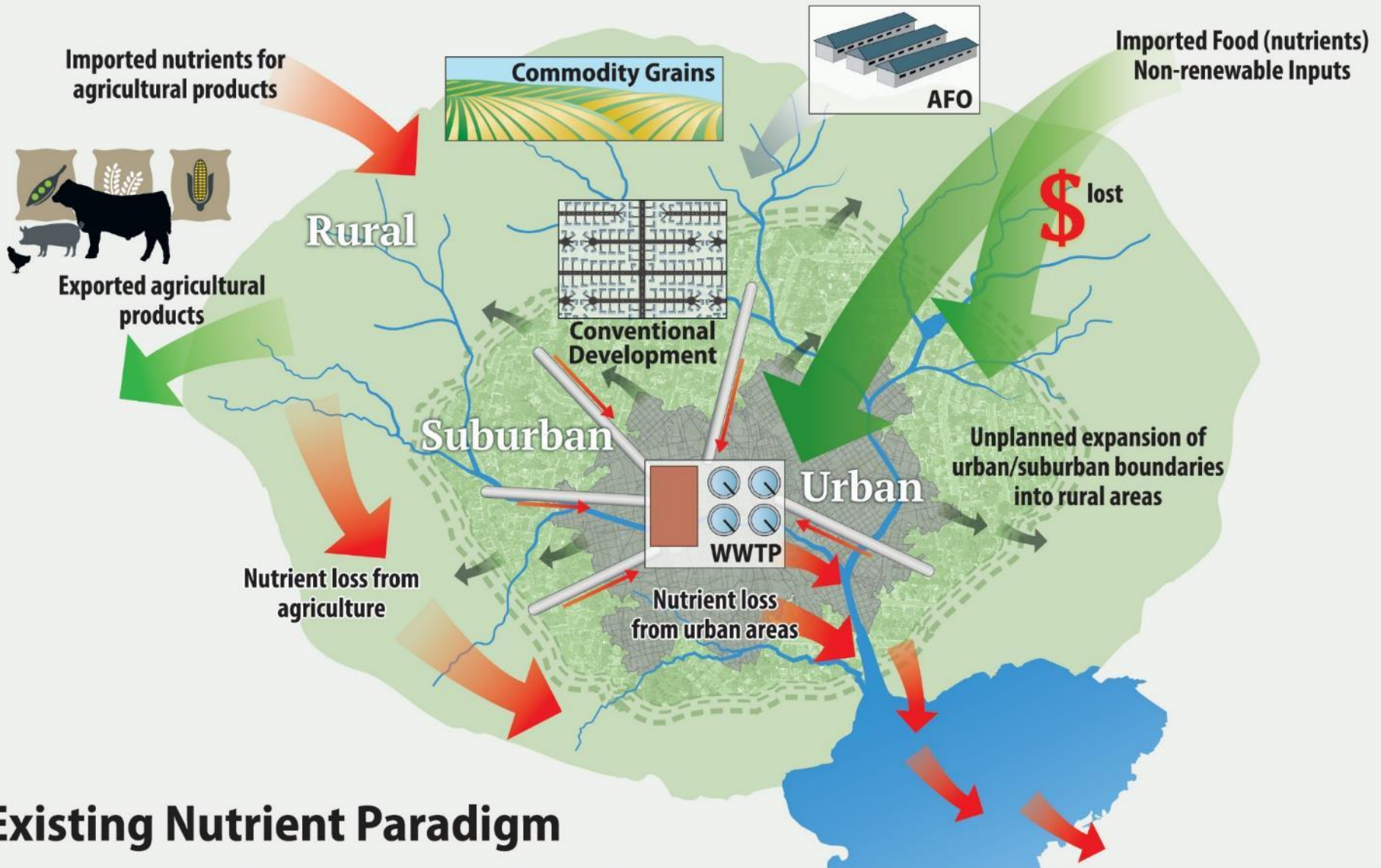


# Resources in Wastewater

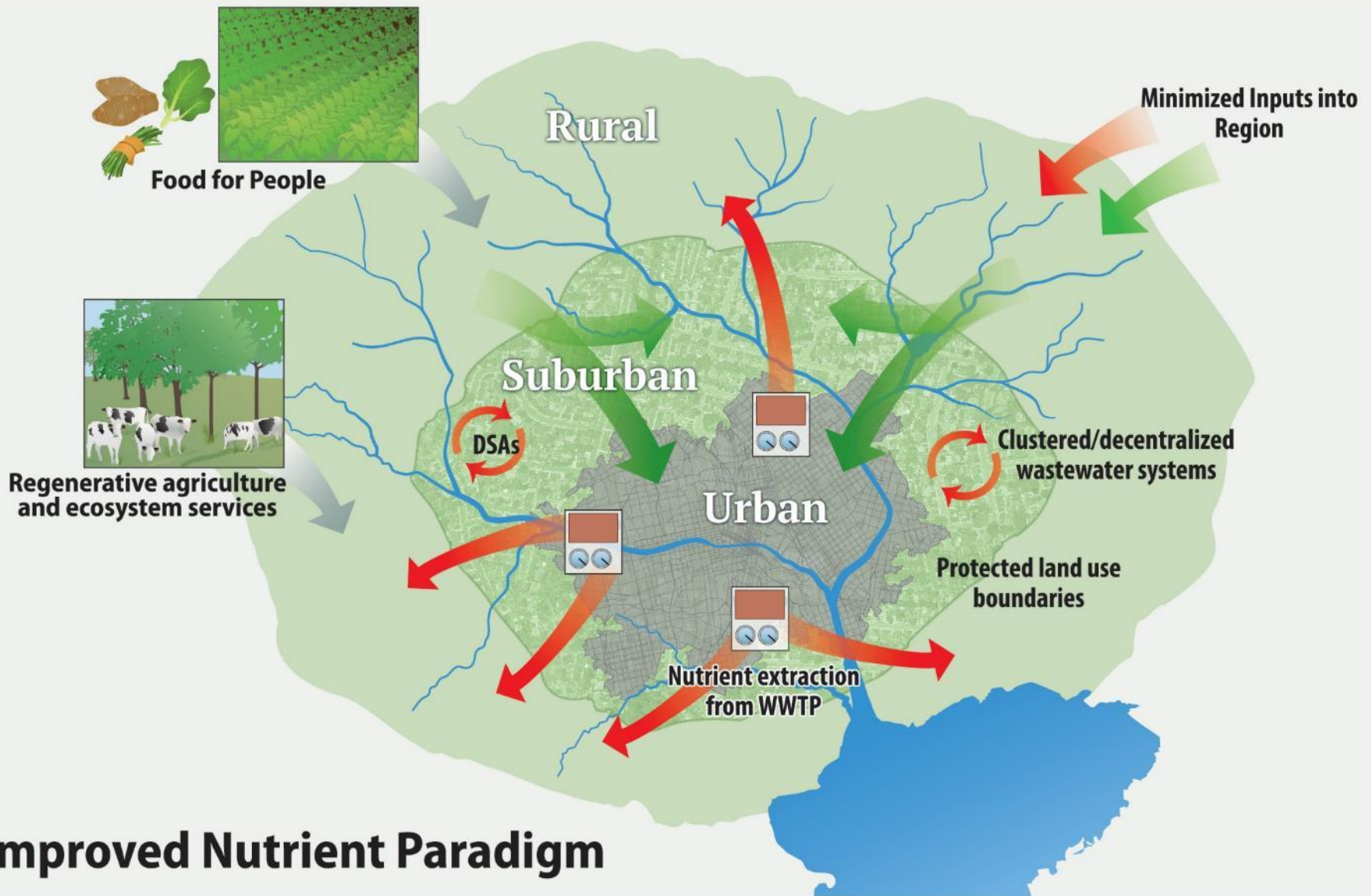
- Clean water
  - Landscape/agriculture irrigation
  - Flushing toilets
- Nutrients: nitrogen and phosphorus primarily
  - Fertilizer for landscape/agriculture
- Carbon/energy
  - Biogas for direct burning or electricity generation
  - Compost for soil amendment



# An Unsustainable Model



# A Resilient Model



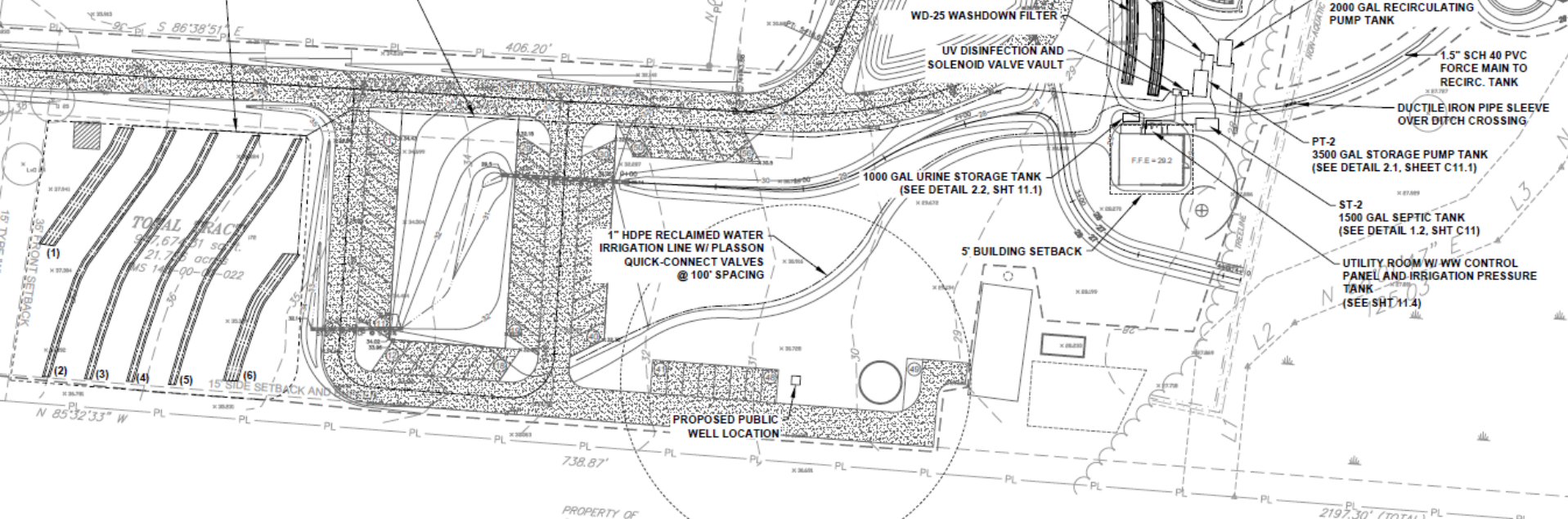


# Dragonfly EcoResort — Moncks Corner, SC



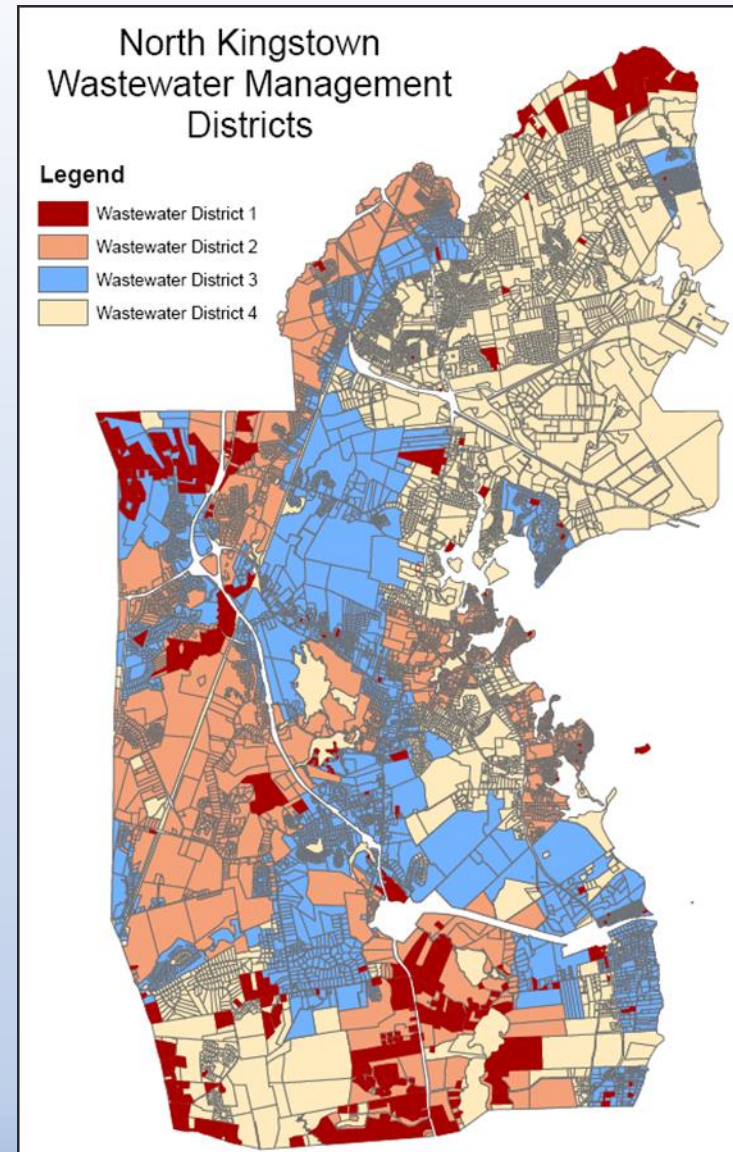
PROPOSED DRIP DISPERSAL ZONE  
W/ (6) DRIP IRRIGATION BEDS.  
1 LATERAL PER BED.  
TUBING 2' O.C.

(2) 1.5" SCH 40 PVC  
SUPPLY AND RETURN  
LINES FOR DRIP FIELD



# Paths Forward

- Status quo
  - Health Department continues permitting septic systems and privately owned and operated “cluster” systems *ad hoc*
  - Centralized sewer implemented over time
- Proactive wastewater management
  - **Inventory:** what do you have?
    - GIS data, permit data, field reconnaissance
  - **Prioritize** systems for improvement
    - Stakeholder goals and values
    - Indicators might include: proximity to water, soil characteristics, system age, etc.
  - **Manage:** intensity tied to risk
    - Onsite improvements, cluster systems, sewer
    - Implementation (design, installation, OM&M)
    - Capacity building



# Recommendations and Contact Information



- Recognize attributes of centralized and decentralized approaches
- Recognize importance of a distributed sewer architecture
- Consider water/sewer approaches when identifying development zones
- Avoid “leapfrog” development
- County-side wastewater scoping study

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