

# A 21<sup>st</sup> Century Vision of Solids Management

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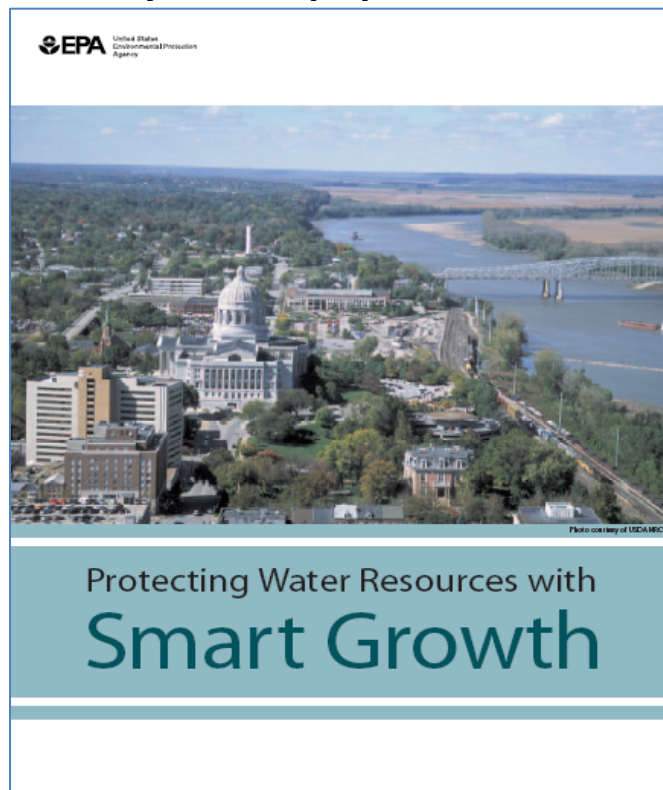
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# History

- Basis of Rule is Protection of Water Resources
- Onsite Vs. Central Collection and Treatment
- Public Health and Water Quality
- Rural vs. Urban
- Rural, Sub-Urban, and Urban Centers
- Water/Energy Management
- Solids Management
  - Wastewater
  - stormwater

# EPA Support

**USEPA to Congress “Adequately managed decentralized wastewater treatment systems are a cost effective and long-term option for meeting public health and water quality goals, particularly in less populated areas.”**



Reuse is a critical element in EPA, state and local strategies

# Water Resources

- Valuable asset for communities and industries
- Safe and adequate supply essential for life and industrial production/processing
- Tool for growth management and industrial development
  - Potable supply
  - Recreation
  - Aesthetics
- Recycled through water cycle
- Aggressive steps may be necessary to manage future supplies

# 5 pillars of Sustainability Require

- Sound, robust, reliable technology
- Competent, well trained operators
- Sustainable management entity
- Rules and regulations which enable and encourage
- Publics who support and encourage

# Pillar 1 – Sound Technology

- Treatment
  - Septic tank
  - Suspended media
  - Fixed media
  - disinfection
- Dispersal
  - Gravity
    - Conventional/gravel
    - Alternative media/design
  - Pressure
    - LPP
    - Drip/spray

# Pillar 2 – Competent Personnel

- Some technologies complex and require competent operators
- Operators require training on treatment and dispersal technology
- Management entity personnel require training
- Licensure/certification ?

# Training institutions/organizations

- CIDWT
- Industry
- State agencies and Universities
- NOWRA
- NAWT
- NEHA
- NC Septic Tank Association



# Pillar 3 - Management entities

- EPA Management Guidelines
- Sustainable entity required as part of infrastructure
- Resource allocation, scheduling, asset management
- Public or private

# Pillar 4 – Rules and regs

- USEPA mandate?
- State mandate !
  - Most rules for soil based, subsurface systems responsibility of state health agency
  - Reuse systems of water quality agency
- Local ordinance

# Pillar 5 – Informed Public

- Everything must be somewhere
- Residuals generated in all systems
  - Wastewater systems are a process with 2 products
    - Cleaner water
    - Nutrient and energy rich residuals or solids
- Solids
  - Management options dictated in rule
  - Your Challenge: recover value inherent in these materials

# Residuals

- EVERY System Generates Residuals
- Materials from wastewater systems are regulated
- Quality (Regulated Metals, VAR, Pathogens, Nutrients)
  - PSRP
  - PFRP
  - EQ

# Management Options (by Rule)

- Land fill
- Incineration and incineration with energy recovery
- Composting/heating/drying and distribution and marketing
- Direct land application

# Septage and Residuals Regulations

- Title 40 CFR Part 503 (Federal/EPA)
- Title 40 CFR part 257 (Federal/EPA)
- State Rules:
  - 15A NCAC 13B 0.800 (septage)
  - 15 A NCAC 02T 1100 (biosolids)
- County and Local Ordinances

# Solids

- Primary sludge and secondary sludge
- Organic and inorganic materials
- Solids removal is a major goal of wastewater treatment
- Solid fraction contains pathogens, nutrients, metals, and organic matter



# Important Characteristics

- pH
  - Acid/Base
  - Typical Range 6.6 – 7.6
- Solids
  - Range from 2 or 3 % in liquid to 30 or 40 % in dry product
  - VSR critical measure
- Nutrients
  - Plant availability
- Metals
  - Total and bioavailable
  - Some toxic



# Land Application and Beneficial Reuse

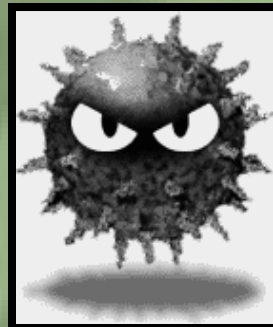
- Source of plant nutrients
- No adverse impact to environment
- Primary sludges/biological sludges
- Requirements:
  - Metal Levels (40 CFR 503)
  - Pathogen Reduction (PSRP or PFRP)
  - Vector Attraction Reduction

# Issues in Residuals' Future?

- Population and development
- Agriculture
  - markets, past experiences, stigma, certified organic
- County ordinances
- Nutrient concerns (CNMP) and TMDL
- State regulations, legislation(?)
- Lawsuits (New Hampshire)
- **SEPTAGE, Biosolids and ANIMAL WASTE all compete for land**
- National and local research

# Pathogens

- Disease-causing organisms
  - bacteria, viruses, parasites
- Comfortable in human digestive system
- Difficulty surviving in other environments

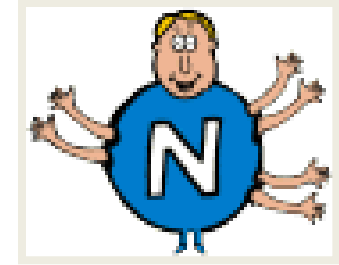


# Nutrients

- Essential for growth of living organisms
- Major nutrients
  - N, P, K
- Secondary nutrients
  - Mg, Ca, S
- Micronutrients
  - Cu, Zn, Mn, Mo, B



# Nitrogen



- Several forms found in wastewater and residuals
  - Behave differently in soil environment
  - Availability to plants differs
    - organic nitrogen
    - ammonium nitrogen ( $\text{NH}_4^+$ )
    - nitrate nitrogen ( $\text{NO}_3^-$ )
- } Inorganic forms

# Phosphorus (P)

- Found in body wastes, food residues, fertilizers, detergents
  - primary & secondary orthophosphates ( $\text{H}_2\text{PO}_4^-$  and  $\text{HPO}_4^{2-}$ ) - forms available to plants
  - P in soil often forms insoluble compounds
  - rarely mobile in soil, but can move with soil particles during erosion

# Rule Issues

- Including, but not limited to:
  - Class B residuals, nuisance issues (odor, truck traffic), site management (site registration), reporting, floodplains, setbacks, monitoring, health concerns (bio-aerosols, runoff), grazing, ground water, surface water
  - Class A residuals (fewer site permitting issues), ***nutrient management plans, and phosphorus***

# Site Registration

- Currently, land application sites are permitted and approved through a permit application process
- Site registration will enhance the regulation and management of receiver sites
- Site registrant/Site manager
- Site logs, site reporting of site loadings
- Facility plan will identify sites to be used
- Public notice of proposed approval of application (flow based, 50000 GPA+, notice)
- Licensed operators (continuing ed req in NC)



# Nutrient Management Plans

- Proposing requiring site CNMPs
- To be prepared:
  - In accordance with NRCS Code 590
  - By a person certified by NRCS in nutrient management planning
- Submitted with application for site registration
- Use the P-Index for each application zone (field)
- CNMPs will be required for CAFO/AFO, intent is to be consistent between the two rules
- Universities, NRCS and Industry represented on local TAC's

- Class B
  - Commonly used
  - Land based
  - Agricultural and silvicultural
  - Loading depends on crop uptake



# Class B Fecal Monitoring

- Concerns exist with the Class B, Alternative 1, fecal monitoring option
  - Current EPA requirement is to meet a 2 million MPN/CFU limit (7 samples, geometric mean)
  - Untreated sludges may meet or be close to meeting this limit
- Proposing that this option be met by meeting the 2 million limit AND by monitoring the raw influent solids and demonstrating a 2-log reduction in fecal levels between the influent (a 2-log reduction is the reduction necessary to demonstrate Class B equivalency of a process to the EPA Pathogen Equivalency Committee)

# Are all Class A residuals created equal?



Dry pellets

Compost



# Class A - PFRP

- Begin by identifying markets
- Fuel value – FOG and septage
- Compost
- PERMIT

# Fuel

- Dewater and address disposition of liquid
  - pH adjustment
  - Polymer addition
  - Dewatering time
- FOG/septage BTU content 6000 – 9000 BTU/lb
  - Stable
  - Nutrient value concentrated
- Fuel must be used without storage – odor
- In NC, Liquid to land application or POTW

# Fuel

- Green fuel – see DOE
- Add to waste to energy facility
- Supplants coal, wood, biomass
- Ash content low
  - Mostly organic carbon
  - Remember: incoming solids screened
  - Feed contains lime, beneficial for incineration

# Composting Option

- If no fuel need, compost
- Compost production requires TIME!!!
- Systems approach essential
- Compost can be sold



# Compost



- Compost
- In-vessel or windrow
- Comingle variety of materials
- Valuable end product
- Potential sale of compost
- TIME!!!

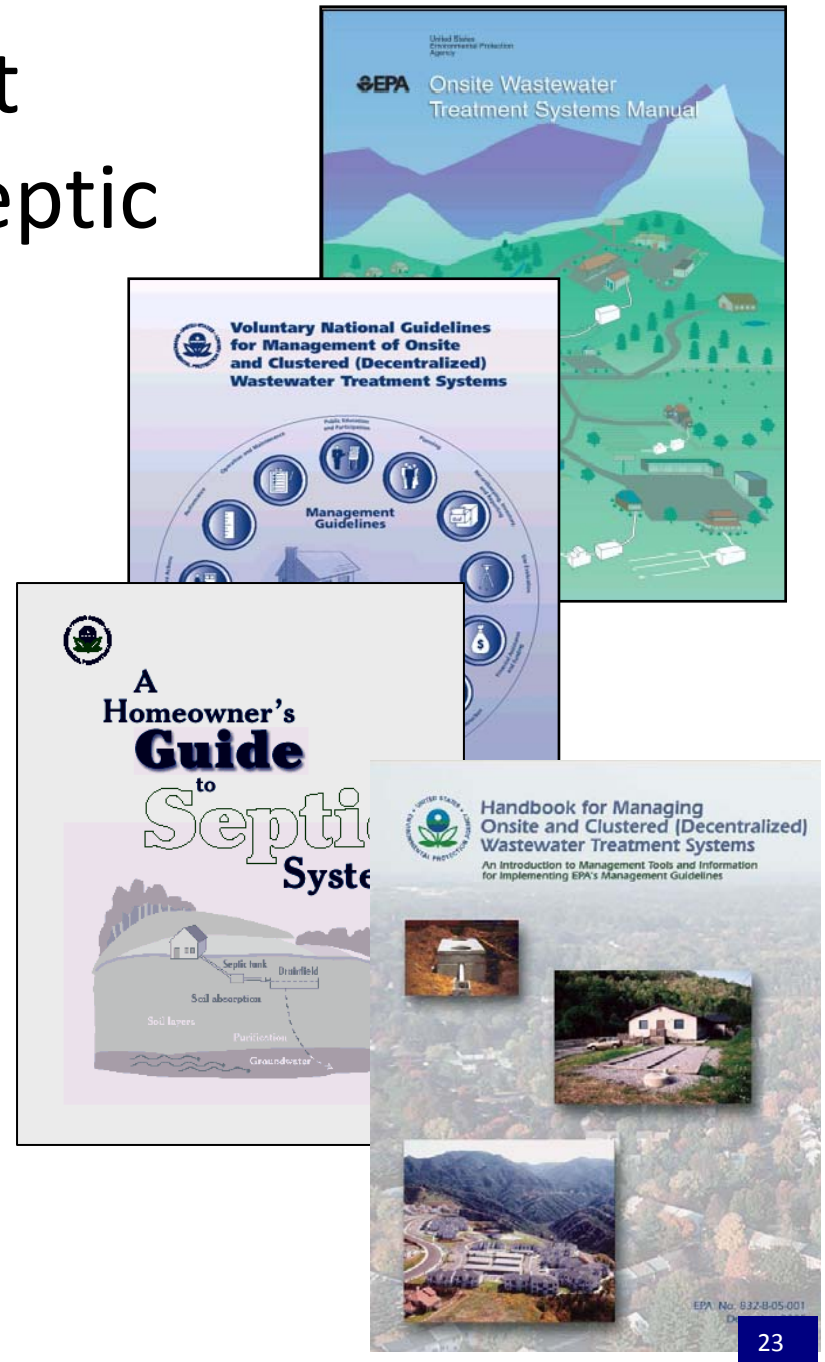
# NC Compost Demonstration Approvals

- 1) State policy to reduce, reuse and recycle
- 2) Streamlined application process
- 3) 12 month approvals (renewed for up to 24 months)
- 4) Requirements based on state Solid Waste Compost Rules (15A NCAC .1400)



# US EPA resources at [www.epa.gov/owm/septic](http://www.epa.gov/owm/septic)

- Design guidance
- Management guidelines
- Case studies
- Technology fact sheets
- State and local examples
- Research, demonstration projects, and other tools



# Commencement

- Sound science supports technology
- Competent personnel critical,
- sustainable management entity vital,
- rules and regulations supporting infrastructure vital
- Costs may be significant, but must be recovered as any sustainable infrastructure