A 21\textsuperscript{st} Century Vision of Solids Management

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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 (NH₄⁺)
  – nitrate nitrogen (NO₃⁻)

\{ \text{Inorganic forms} \}
Phosphorus (P)

• Found in body wastes, food residues, fertilizers, detergents
  – primary & secondary orthophosphates (H$_2$PO$_4^-$ and 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
- Commingle 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

- 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