Water Supply and Reuse Strategies in the Southeastern United States

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Overview of Presentation

- Definition of Water Reuse
- Water Reclamation Options
- Importance of Water Reuse & Applications
- Three Case Studies
- Water Quality Requirements & Treatment Technologies
- Water Reuse Drivers
- Economics of Water Reuse
- Permitting Considerations
- Feasibility Study Guidelines

What is Water Reuse?

- Use of reclaimed wastewater to meet non-potable needs
- High-level treatment of domestic wastewater (reclaimed water)
- Effluent previously considered a waste product requiring disposal – instead reuse for a beneficial purpose

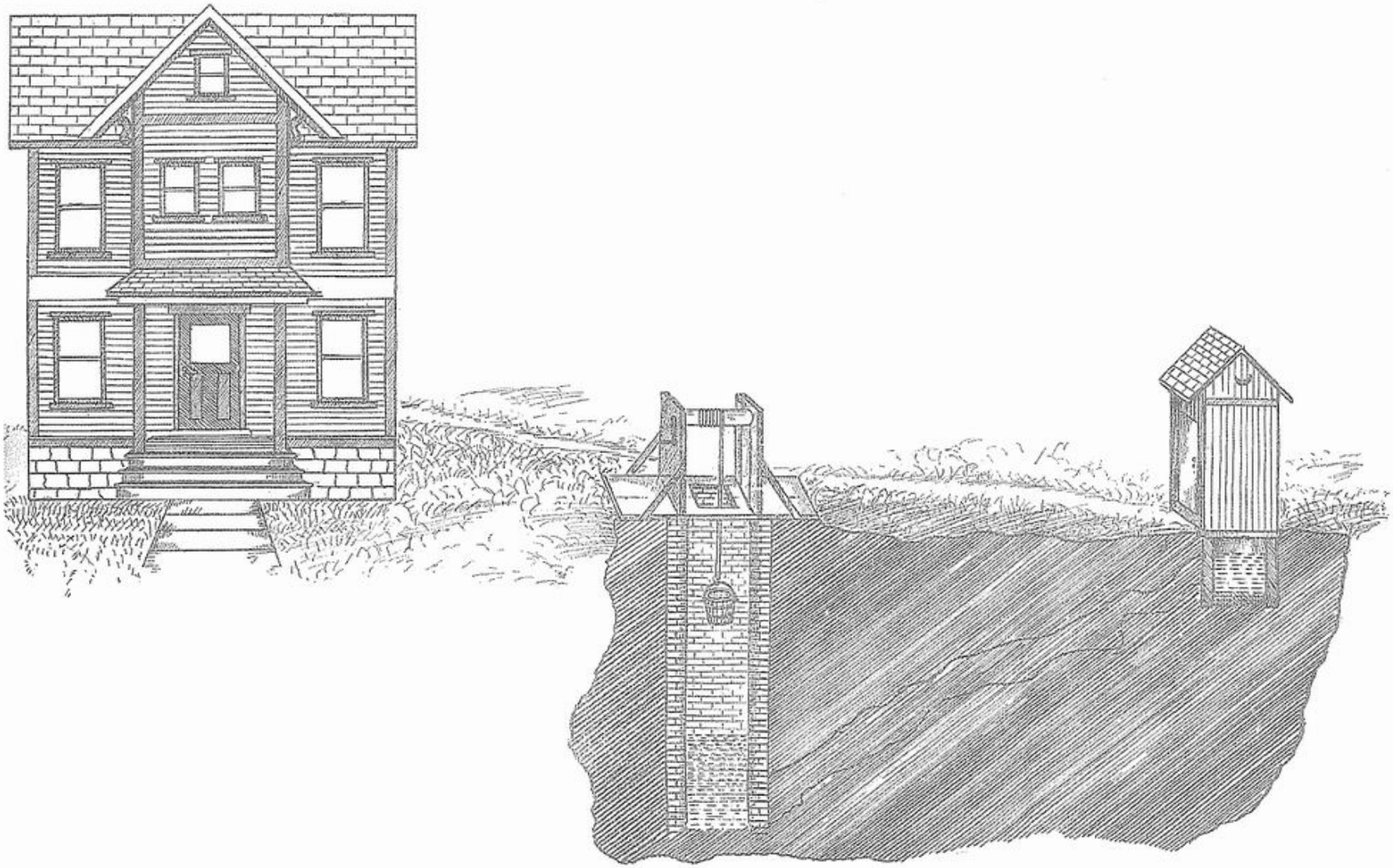
Wastewater Reclamation Options

- Conventional treatment and surface water discharge (NPDES)
- Treatment and rapid infiltration (RIB)
- High-level treatment and reuse
- Satellite reuse systems
- Individual homeowner septic tanks

Importance of Water Reuse

- Of all the earth's water, 97% is salt water located in oceans and seas
- Only 1% of the earth's water is available for drinking water
- The other 2% of the earth's water is frozen
- Each person uses 60 to 100 gallons of water a day at home
- 50% to 70% of household water is used for watering lawns and gardens
- 30% to 35% of O&M costs for wastewater treatment is energy

“Past Practices”



Where is Reclaimed Water Used?

- Landscape irrigation
- Power plant cooling
- Boiler makeup
- Toilet flushing
- Indirect potable reuse
- Wetlands augmentation
- Fire protection

Municipal Water Reuse

- Clarifier sprays
- Equipment wash down
- On-site irrigation
- Plant make-up water

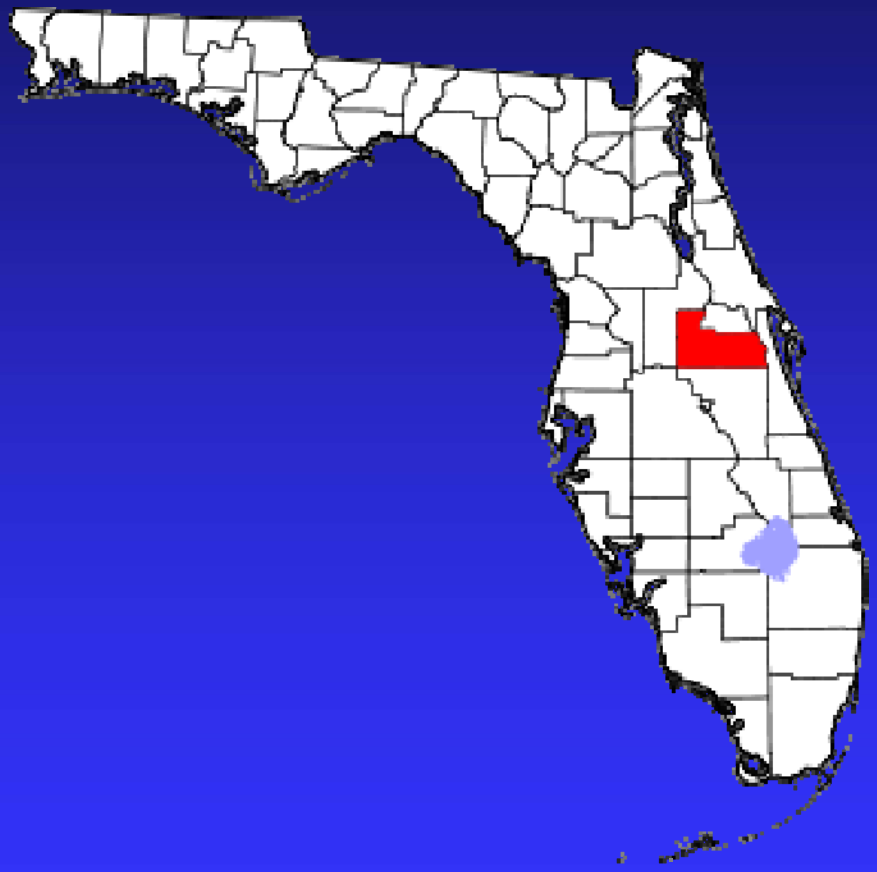
Satellite Reuse Systems

- Also known as scalping plants, sewer mining, etc.
- Located near point of use
- Usually involved membrane bioreactors (MBRs)
- Solids are returned to the sewer system
- Could lead to potential treatability problems at the wastewater treatment plant.

Three Water Reuse Case Studies

- Orange County, FL – Wetlands Augmentation
- Occoquan, VA – Indirect Potable Reuse
- Duke University, NC – Chilled Water Make-Up

Case Study – Orange County, FL



Constructed Wetlands

- Orange County Northwest Water Reclamation Facility
- Increased reclaimed water system capacity by 3.0 MGD
- Encompasses 70 wetted acres comprised of six interconnected cells
- Wetland plant species selected for further uptake of nutrients
- Provides groundwater recharge
- Overflow goes into Lake Marden

Constructed Wetlands, cont.

- Provides groundwater recharge
- Increased water level in Lake Marden
- Various species of birds, fish and mammals have begun to migrate to the lake

Case Study – Orange County, FL

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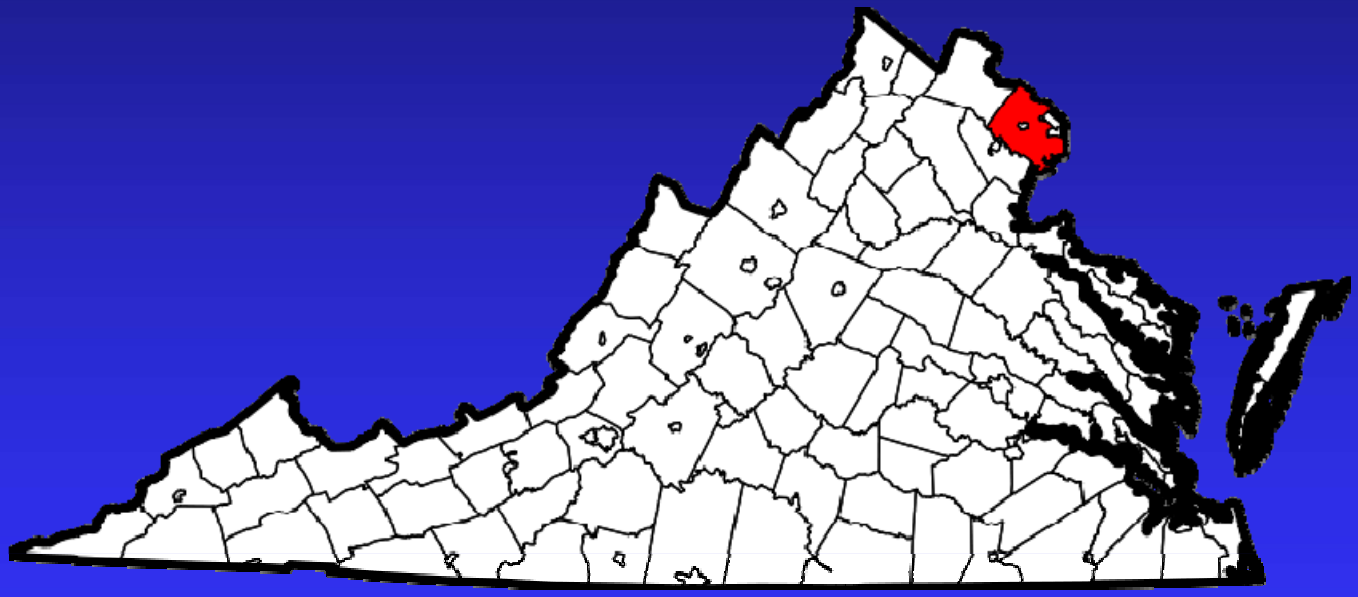
Case Study – Upper Occoquan Sewage Authority, Virginia



UOSA Reuse

- 54 million gallons per day facility
- Discharges into the Occoquan Reservoir
- Drinking water supply for 1 million people in Fairfax County
- Reclaimed water treatment includes filtration, activated carbon, and disinfection
- 10 mg/l COD, 1 mg/l TSS, 0.5 NTU, and 2 coliform/100 ml

UOSA Reuse, continued

- Effluent returned to the natural environment and mixed with other waters
- Additional treatment provided includes sedimentation, filtration and disinfection prior to potable water distribution
- Operating for over 20 years
- Indirect potable reuse

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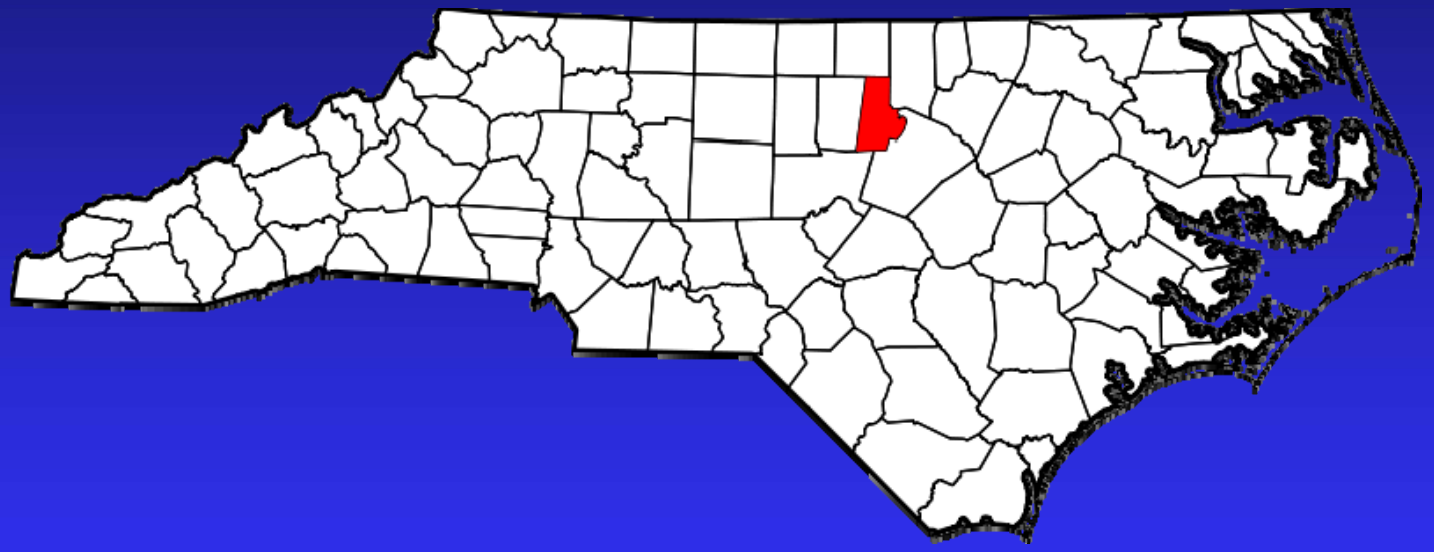
Case Study: Duke University, NC



Chilled Water System

- Woolpert provided site, building, and MEP design services
- 17,000-T chilled water plant, expandable to 36,000-T
- Sustainable design concepts include natural lighting, variable-speed drive equipment, and rainwater recovery

Chilled Water System, cont'd.

- Recirculation Water Usually 3.0 gpm/T
- Over 73 Million Gallons per Day for 27,000-T System
- Make-up Water Required to Replace Losses from Evaporation, Blow-down and Drift

Other Applications for Water Reuse

- Boiler water makeup – Pinellas County
- Golf course irrigation – Coastal NC/SC

Typical Water Quality Parameters Important for Municipal Reuse

- Tertiary quality effluent – filtered or equivalent
- Biochemical oxygen demand – a measure of the organic matter
- Total suspended solids – a measure of the particulate content
- Ammonia – due to breakdown of urea in the wastewater
- Coliform bacteria – a measure of the microbial content
- Turbidity – clarity of the water and an indication of the effectiveness of the filtration process
- Nutrients – typically include nitrogen and phosphorus

Treatment Technologies for Water Reuse

- Conventional biological treatment (BOD and TSS Removal)
- Biological or biological/chemical nutrient removal
- Filtration – conventional media or cloth disk
- High-level disinfection – usually ultraviolet
- Online turbidity monitoring
- Upset pond
- Membrane polishing if required by end use

Examples of Reuse Drivers

- Restrictions on groundwater withdrawals
- Stress on surface water supplies
- Population growth
- Phosphorus limits into lakes and rivers
- Limited assimilative capacity of receiving streams
- Elimination of NPDES wastewater discharges
- Limitations on inter-basin transfer
- Support industrial development
- Economics
- Energy considerations

Water Reuse Economics

- Reclaimed water – significantly less than the cost of potable water
- Often better quality water than raw surface or groundwater supplies (industrial reuse)
- Potential to minimize pumping and piping infrastructure

Water Reuse Economics

- Representative potable water rates (inside)
  - Greater Cincinnati Water Works: $2.62/kgal
  - City of Columbus: $2.87/kgal
  - Charlotte-Mecklenburg Utilities: $1.94/kgal
  - Orlando Utility Commission: $0.63/kgal
  - Gwinnett County: $4.11/kgal
  - City of Corona, CA: $2.42/kgal
- Potential loss of potable water sales
- Additional costs for reclaimed water treatment
- Storage and distribution costs

Permitting Considerations

- Most reuse systems are permitted at the state level
- Allow adequate time for regulatory review and applicant response
- Water reuse projects typically complex
- Each project is unique

Reuse Feasibility Study Guidelines

- Technical criteria
  - Signage
  - Treatment limits
  - Licensed operator
  - Storage
- Economic criteria
  - Customer base
  - Wastewater availability
  - Distribution system costs
  - Population projections
- Environmental criteria
  - Reduced aquifer withdrawals
  - Construction impacts (i.e. wetlands)

Water Conservation & Energy

- Energy/Water Nexus: The Interrelationship Between Water and Energy
- Water Treatment Techniques are Becoming More Energy Intensive and Less Chemical Intensive (i.e. UV, Ozone vs. Chlorine)
- Additional Energy is Required for Water Distribution
- A Reduction in Water Usage Results in a Commensurate Reduction in Energy Usage

“The Future of Reuse”

Questions and Answers

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