Integrating Sustainability into Decision-Making at OWASA

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Orange Water and Sewer Authority

Sustainability Manager

OWASA

A public, non-profit agency providing water, sewer and reclaimed water services to the Carrboro-Chapel Hill Community.

Key Facts

- Provide drinking water, wastewater and reclaimed water services for 80,000 people in the towns of Chapel Hill and Carrboro and the University
- Annual revenues ~$39 million
- ~130 funded staff positions
- University is OWASA's largest customer (about 22% of drinking water sales)
- More than 400 miles of water lines and more than 300 miles of wastewater collection lines

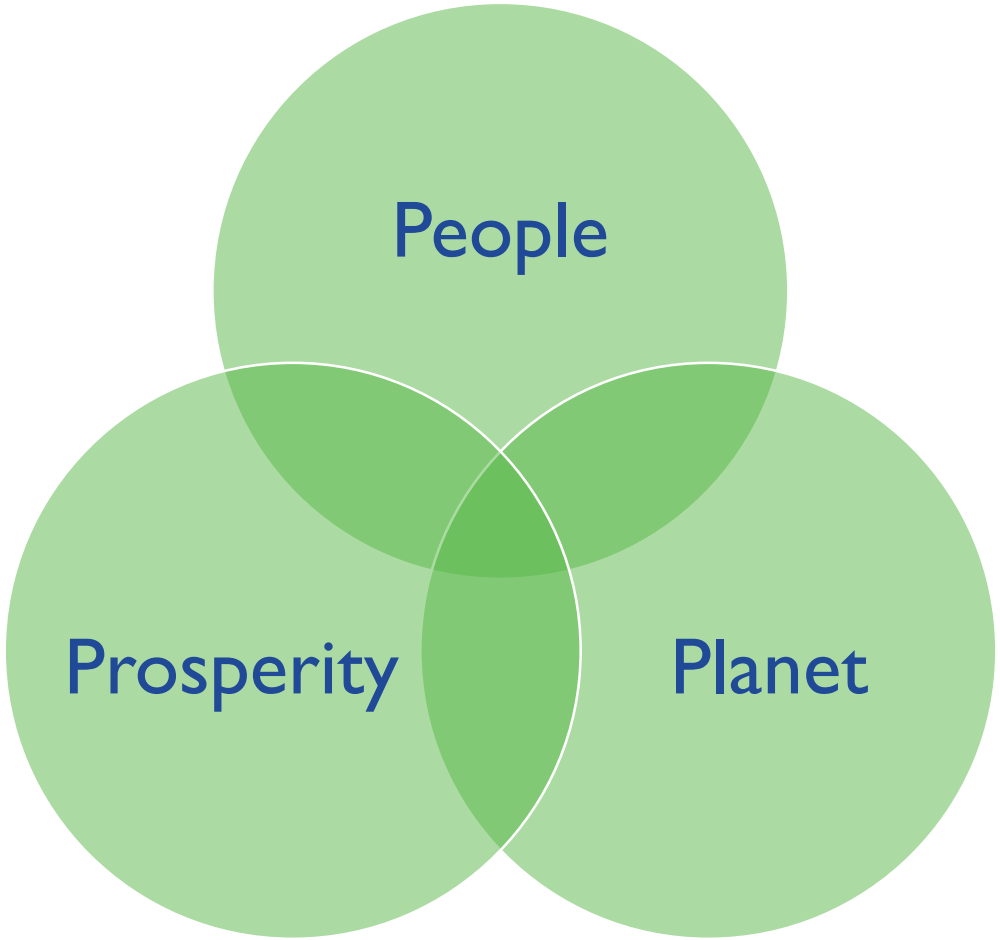
sustainability

[s*uh*-stey-n*uh*-**bil**-i-tee]
noun

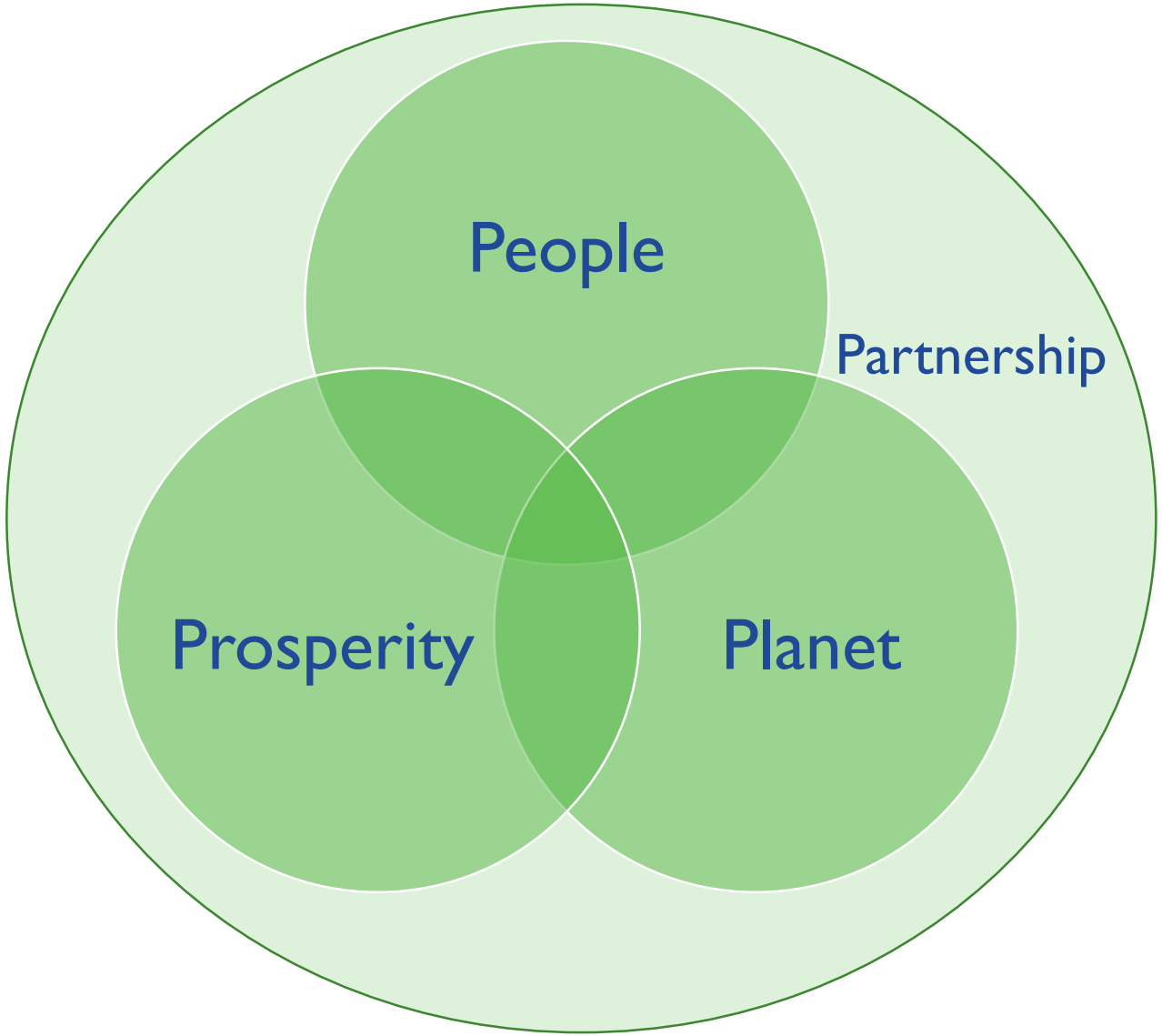
1. *A hippy dippy cosmic cupcake term loosely applied to just about everything…. (Urban Dictionary)*
2. *The ability to be maintained at a certain level (Oxford Dictionary)*
3. *Meeting the needs of the present without compromising the ability of future generations to meet their needs (United Nations)*


THE NORTH FACE

Sustainability Principles



Sustainability Principles



Sustainability-Minded Decision Making

- Programmatic Design and Implementation
  - >Energy Management Program
- Operational Decisions
  - > Biosolids Management
- Capital Projects
  - > Reclaimed Water System
- Long-Term Plans
  - >Long-Range Water Supply Plan

Energy Management Goals

- Reduce use of purchased electricity by 35% by the end of Calendar Year 2022 compared to the Calendar Year 2010 baseline
- Reduce use of purchased natural gas by 5% by 2020
- Beneficially use all WWTP biogas, provided the preferred strategy is projected to have a positive payback within the expected useful life of the required equipment

Pursued through strategic Energy Management Program

Evaluation Criteria for Energy Projects

- Financially Responsible (High level)
- Realistic/Implementable
- Operational Impacts
- Energy/Carbon Reduction Potential
- Coordinates with Other Projects
- Community Impacts

Evaluation Criteria for Energy Projects

- Financially Responsible (High level)
  - Likely a good use of public funds
  - Financial viability of similar projects in similar organizations and circumstances
  - Opportunities for outside funding/financing
- Realistic/Implementable
- Operational Impacts
- Energy/Carbon Reduction Potential
- Coordinates with Other Projects
- Community Impacts

Evaluation Criteria for Energy Projects

- Financially Responsible (High level)
- Realistic/Implementable
  - Degree to which strategy has been proven at a scale relevant to our operation
  - Organizational capacity to undertake and manage the project
  - Reasonable amount of staff time to implement
  - Legal
  - Meets regulatory requirements
- Operational Impacts
- Energy/Carbon Reduction Potential
- Coordinates with Other Projects
- Community Impacts

Evaluation Criteria for Energy Projects

- Financially Responsible (High level)
- Realistic/Implementable
- Operational Impacts
  - Consistent with how OWASA wants to operate
  - Degree to which strategy helps to resolve an existing or expected problem
  - Impact on safety, comfort, and productivity
- Energy/Carbon Reduction Potential
- Coordinates with Other Projects
- Community Impacts

Evaluation Criteria for Energy Projects

- Financially Responsible (High level)
- Realistic/Implementable
- Operational Impacts
- Energy/Carbon Reduction Potential
  - Potential to reduce OWASA's energy use
  - Potential to reduce OWASA's carbon emissions
- Coordinates with Other Projects
- Community Impacts

Evaluation Criteria for Energy Projects

- Financially Responsible (High level)
- Realistic/Implementable
- Operational Impacts
- Energy/Carbon Reduction Potential
- Coordinates with Other Projects
  - Interdependency with other project(s) increases potential to save energy (e.g. upgrade to HVAC system and building envelope)
  - Potential to take advantage of economies of scale to save money and/or staff time
- Community Impacts

Evaluation Criteria for Energy Projects

- Financially Responsible (High level)
- Realistic/Implementable
- Operational Impacts
- Energy/Carbon Reduction Potential
- Coordinates with Other Projects
- Community Impacts
  - Stakeholder enthusiasm
  - Coordinates with community initiatives

Applying the Evaluation Criteria

- Energy Team discussed each project against criteria
- Recommend to:
  - **Implement**
  - **Study**
  - **Defer until upgrade**
  - **Defer indefinitely**

	Energy Strategy	Financially Responsible (High level)	Realistic/ Implementable	Operational Impacts	Energy/Carbo Poter
				the working day that are considered "off-peak"	
4	Pump and Motor Asset Management Program	Early payback expected based on experience of others	Yes, but is technically involved and includes multifaceted effort	Could help identify pumps and motors that need to be replaced before they fail Will help inform performance-based maintenance program	Significant potent motors account energy use a
5	Heating, Ventilation, and Air Conditioning Assessment: Operational Changes and Minor Controls	Minor up-front costs Quick payback expected	Yes	Improved occupant comfort and health	Energy and natu potential:
6	Finished Water Pump Use Optimization	Modest cost for a study expected to be offset by cost savings from improved optimization	Yes	Use of right pump for right flow condition can reduce pump wear and tear Better control of pump start/stop operations Will be important to avoid large flow changes in the plant	Potential to reduce of the energy used pump
7	Heating, Ventilation, and Air Conditioning Assessment: Equipment Replacement	In instances of aging equipment or quick payback	Yes	Improved occupant comfort and health	Energy and natu poten
8	Optimize WWTP Filter Backwash	Modest cost for monitoring and control system	Potentially	Increased effort for monitoring	Could provide 50 energy use for denitrificati Modest ener
9	System-Wide Energy Model	Likely a high-cost study	Potentially	Would provide a theoretical baseline for future decision-making	No direct energy sa for setting re
10	Power Supply Optimization	Modest cost of study could identify cost of upgrade	Involved study; strategy may have limited benefits to OWASA	Reduction in power quality could negatively impact VFDs and other equipment	Anticipated lim opportunity
11	Real-Time Nitrification Control System	Modest up-front investment: We already have about 75% of the monitoring equipment Controls will require back-up	Potentially	Would enable changes to operational strategies Potential to improve plant performance Automation requires calibration and over-sight	Potential to reduc WWTP by about 5-1 reductions ma

Business Case Evaluation or Implementation?

Projects and strategies where energy management is a secondary objective will be proposed in annual budget or implemented.

Example: Cane Creek Pump Station Improvements

Projects and strategies that have a primary objective of achieving energy management goals will move to the next phase: business case evaluation.

Example: Rooftop solar panel installation

Business Case Evaluation

- Method: Life-cycle Cost Analysis
  - Threshold: Positive net present value
- Financial considerations (Compared against baseline)
  - Design and construction costs
  - Avoided cost of energy
  - Cost of operations and maintenance
  - Utility rebates and other incentives
  - Analyze project with and without applying a social cost of carbon as a benefit (i.e. revenue) in the business case
- Community engagement important for those projects whose business case is "made" by incorporating a social cost for carbon
- Clean energy projects that surpass the business case threshold will be prioritized in OWASA's Capital Improvement Program or proposed in our annual Operating Budget

Energy Management Program Achievements

40%
reduction in greenhouse gas emissions*

29% reduction in electricity use*
41% reduction in natural gas use*

Investment in Cost-Effective Energy Efficiency Projects

Energy-Minded Decision Making

Operations and Maintenance

Capital Projects

Biogas-to-Boiler Restoration

Over **$400,000** annual savings purchase of electricity and natural gas purchases*

Since 2010 Baseline

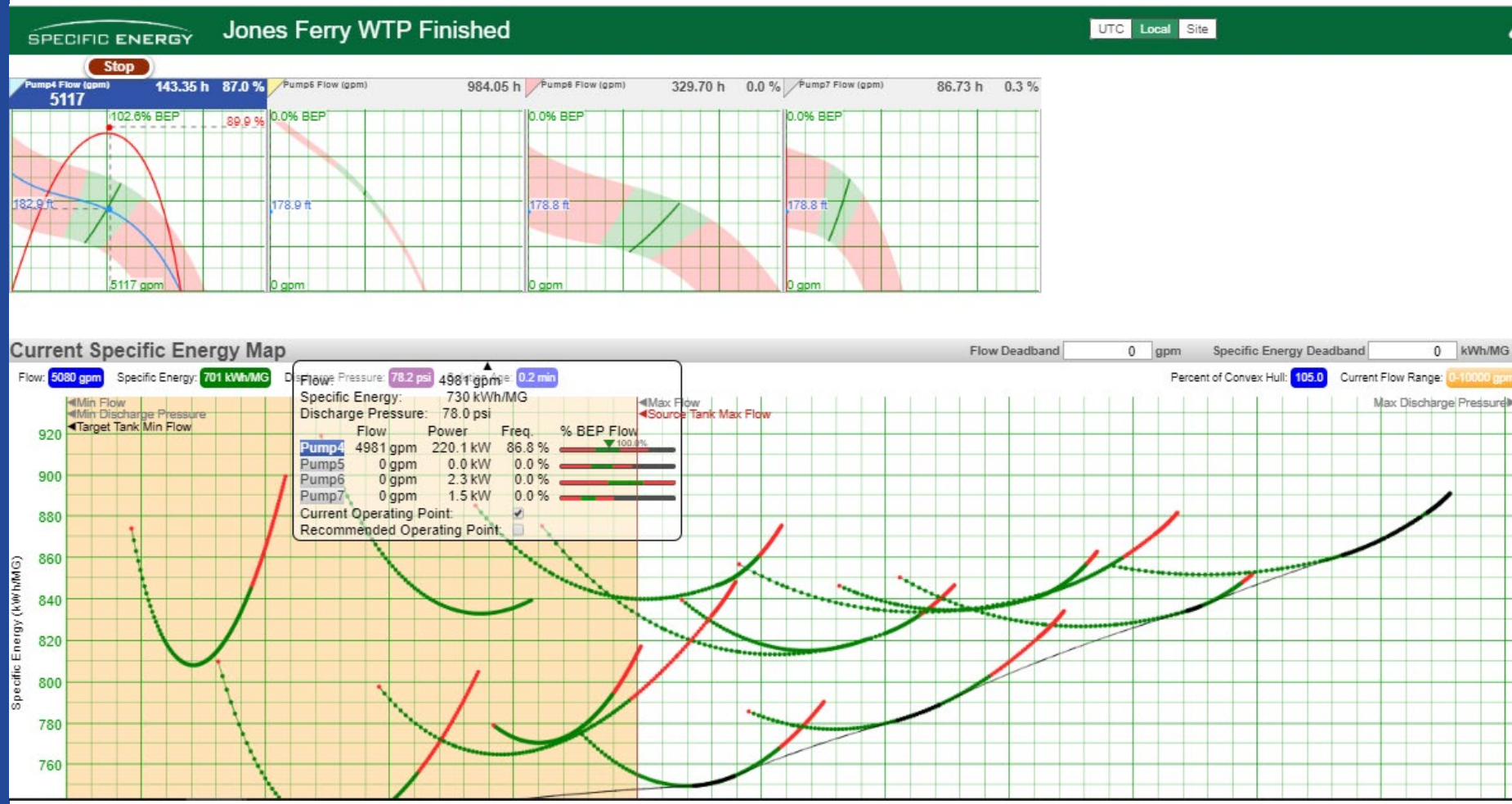
KPI Metric

SCADA

Energy Dashboard

Specific Energy Dashboard

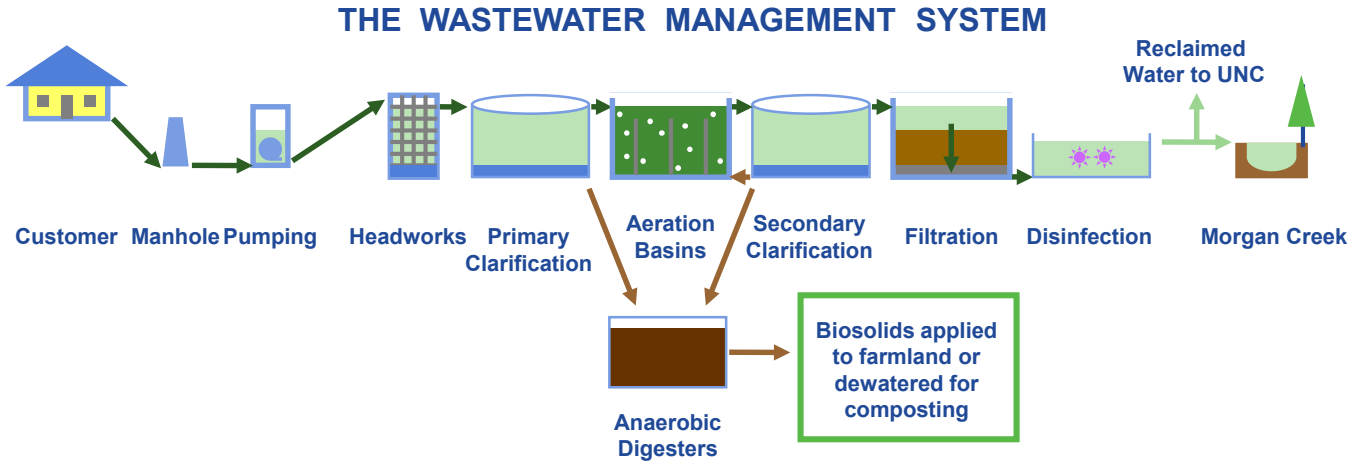
Embedding Energy into Daily Decision-Making



Recycling Biosolids


Liquid biosolids are applied on local farms


Dewatered biosolids are composted for reuse



"Triple Bottom Line" Evaluation for Biosolids Management

Social Performance

- Safety of employees and public
- Compliance with public health standards
- Odor, dust, noise, etc.
- Effect on farmers
- Effect on employees

Environmental Performance

- Compliance with environmental standards
- Reliable removal of biosolids from WWTP
- Energy use and greenhouse gas emissions
- Beneficially recycle 100% of biosolids

Financial Performance

- Relative life-cycle costs
- Proven and reliable strategy at our scale
- Flexible and adaptive to changing conditions
- Cost-effective, balanced program

“Shades of Green”

Relative comparison of performance to each other (only applicable to the objective for that row)

TABLE 2. RELATIVE COMPARISON OF BIOSOLIDS MANAGEMENT OPTIONS AGAINST EVALUATION CRITERIA

	EVALUATION CRITERIA		MANAGEMENT OPTIONS INVOLVING LIQUID BIOSOLIDS			MANAGEMENT OPTIONS NOT INVOLVING LAND APPLICATION OF LIQUID BIOSOLIDS			
			BASELINE (Existing Program) 50% Cake to McGill; 50% Liquid to Farmland	75% Liquid to Farms by Contractor; 25% Cake to McGill by OVASA	75% Liquid to Farms by OVASA with Seasonal Contractor; 25% Cake to McGill by OVASA	100% Cake to McGill	100% Cake to Farmland by OVASA	100% Cake to Farmland by Contractor	100% Cake to Thermal Drying at WWRF; Transport by OVASA
SOCIAL PERFORMANCE	Safety of employees and public		Moderate total miles for transport	Higher miles for transport	Higher miles for transport	Lower miles for transport	Lower miles for transport	Lower miles for transport	Lower miles for transport
	Compliance with public health standards		Moderate risk of non-compliance; moderate risk of spills and improper application	Higher risk due to potential for spill, improper application, containment challenges, and indirect control	Higher risk due to potential for spill, improper application, and containment challenges	Lower risk of non-compliance; lower spill risk; no risk of improper application	Lower risk of non-compliance due to lower spill risk and cake product; higher risk of improper application	Lower risk of non-compliance due to lower spill risk and cake product; higher risk of improper application; higher risk due to indirect control	Lower risk of non-compliance; lower spill risk; no risk of improper application
	Odor, dust, noise, etc.		Moderate risk for nuisance levels of odor, dust, noise, etc.	Moderate risk of odor; higher risk of dust and noise due to more transport loads	Moderate risk of odor; higher risk of dust and noise due to more transport loads	Lower risk of odor, noise, and dust - McGill is in industrial area; cake loading not expected to be major odor source; fewer transport loads	Moderate risk of odor, noise and dust; cake storage may result in some odor; more transport loads may result in more noise and dust	Moderate risk of odor, noise and dust; cake storage may result in some odor; more transport loads may result in more noise and dust	Lower risk of odor, noise, and dust - cake loading not expected to be major odor source; fewer transport loads
	Effect on farmers		Moderate fertilizer and soil conditioning benefits to farmers	Higher fertilizer and soil conditioning benefits to farmers	Higher fertilizer and soil conditioning benefits to farmers	No benefit to local farmers (they have all supplemental fertilizer and soil conditioning benefits)	Lower benefits to farmers; reduced nutrient value by 50% compared to Baseline	Lower benefits to farmers; reduced nutrient value by 50% compared to Baseline	No benefit to local farmers (they have all supplemental fertilizer and soil conditioning benefits)
	Effect on employees (program staff and managers)		Existing program staff maintained; program management somewhat complicated due to coordination of land application program	One staff position eliminated; program management slightly less complex as contractor coordinates land application activities	Existing program staff maintained and new staff added; program management more complex for greater land application	One staff position eliminated; program management and regulatory compliance made considerably easier	Existing staff retained and new staff added; program management more complex due to new procedures, equipment, etc.	One staff position eliminated; program management requirements similar; contractor coordinates land application activities	One staff position eliminated; program management and regulatory compliance made considerably easier
ENVIRONMENTAL PERFORMANCE	Compliance with environmental standards		Moderate risks of spills and improper application; moderate operation risk with filtrate treatment	Higher risk of spills and improper application; contractor oversight required	Higher risk of spills and improper application	Lower spill risk; higher operational challenge associated with filtrate treatment	Lower spill risk; higher risk of improper application; higher operational challenge associated with filtrate treatment	Lower spill risk; higher risk of improper application; higher operational challenge associated with filtrate treatment	Lower spill risk; higher operational challenge associated with filtrate treatment
	Reliable removal of biosolids from WWTP		Moderate reliability; may be extended periods in which liquid biosolids cannot be land applied; risk of having land in program	Lower reliability; higher risk due to extended periods of inclement weather when land application is not possible; higher risk of having land in program	Lower reliability; higher risk due to extended periods of inclement weather when land application is not possible; higher risk of having land in program	Higher level of reliability depending on terms and conditions required by other party	Moderate reliability; farmers could drop out of program to seek alternative fertilizer sources; higher risk of having land in program	Moderate reliability; farmers could decide to drop out of program to seek alternative fertilizer sources; higher risk of having land in program	Higher level of reliability depending on terms and conditions required by other party
	Energy use and greenhouse gas emissions		Liquid program is fuel & GHG intensive for transport; dewatering is more energy & GHG intensive for WWTP operations	Higher fuel use and GHGs for transport; lower energy use and GHGs for treatment and N fertilizer replacement	Higher fuel use and GHGs for transport; lower energy use and GHGs for treatment and N fertilizer replacement	Lower fuel use and GHGs for transport; higher energy use and GHGs for filtrate treatment at WWTP and N fertilizer for farmers	Lower fuel use and GHGs for transport; higher energy use and GHGs for filtrate treatment at WWTP and N fertilizer for farmers	Lower fuel use and GHGs for transport; higher energy use and GHGs for WWTP and N fertilizer for farmers	Lower fuel use and GHGs for transport; higher energy use and GHGs for filtrate treatment at WWTP and for thermal drying, and for N fertilizer for farmers
	Beneficially recycle 100% of our biosolids		Achieve 100% beneficial use	Achieve 100% beneficial use	Achieve 100% beneficial use	Achieve 100% beneficial use	Achieve 100% beneficial use	Achieve 100% beneficial use	Achieve 100% beneficial use
FINANCIAL PERFORMANCE	Relative life-cycle costs		Higher life-cycle costs; higher O&M costs; higher capital costs	Lower life-cycle costs; moderate O&M costs; lower capital costs	Lower life-cycle costs; lower O&M costs; moderate capital costs	Lower life-cycle costs; lower O&M costs; moderate capital costs	Higher life-cycle costs; moderate O&M costs; higher capital costs	Higher life-cycle costs; higher O&M costs; higher capital costs	Higher life-cycle costs; higher O&M costs; moderate capital costs
	Proven and reliable strategy at our scale		Proven and reliable based on our experience to date	Higher risk of having land in program; contract land application is common practice	Higher risk of having land in program; contract land application is common practice	Higher reliability; more contingency options are available for dewatered biosolids than liquid; risk of having land in program not applicable	Less proven; inefficient at our scale due to lack of consolidated farmland, need for off-site covered storage; higher risk of having land in program	Less proven; inefficient at our scale due to lack of consolidated farmland, need for off-site covered storage; higher risk of having land in program	Technically more complex; more contingency options are available for dewatered biosolids than liquid; risk of having land in program not applicable
	Flexible and adaptable to changing conditions		Moderate flexibility since we maintain current management strategies; land availability and regulatory framework are risks to land application	Lower capital costs and maintain future options; land availability and regulatory framework are risks to land application	Lower capital costs and maintain future options; land availability and regulatory framework are risks to land application	Higher flexibility since alternative end management options will be available; no risks associated with land application	Less flexible and adaptable; cake storage facility and spreading equipment required; land availability and regulatory framework are risks to land application	Lower flexibility/adaptability; cake storage facility and spreading equipment required; land availability and regulatory framework are risks to land application	Higher flexibility since alternative end management options will be available; no risks associated with land application
	Cost-effective, balanced program		TO BE DETERMINED						

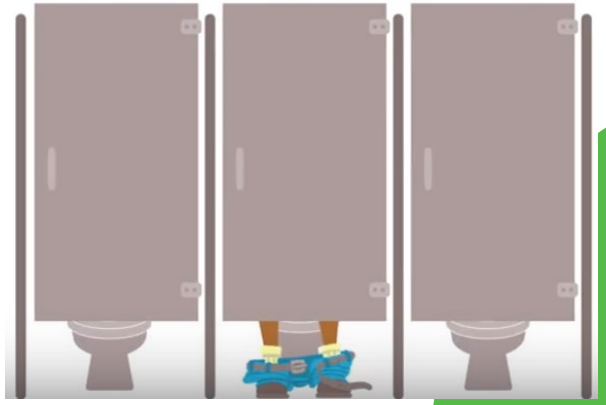
Relative comparison of performance to each other (only applicable to the objective for that row)

Key to Cell Shading:	UNACCEPTABLE	ACCEPTABLE	BETTER	BEST

Reclaimed Water System: Partnership with University of North Carolina

- For chiller plants to cool buildings
- Irrigation
- Flush toilets!

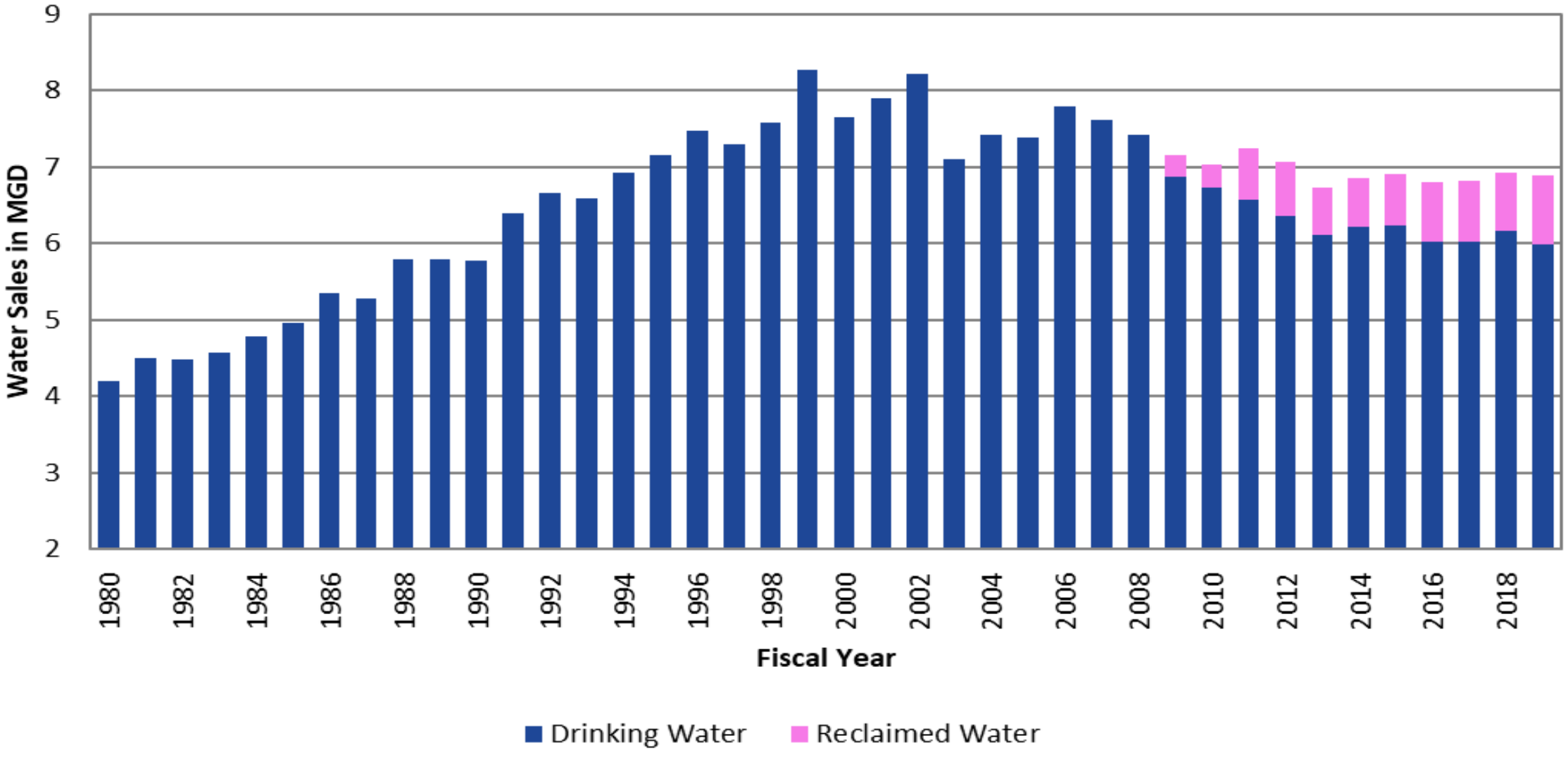
THE UNIVERSITY of NORTH CAROLINA at CHAPEL HILL



Reclaimed Water System

- Reduce community's risk to droughts
- Save drinking water for human use
- Reuse supply less vulnerable to drought
- Locally controlled source
- Reduce discharge of nutrients
- Sustainable management strategy
- Cost-effective water source

Annual Water Sales have been Stable Recently Despite Growth in Service Area



Financial Feasibility: The 4th "P" of Sustainability

- UNC Funding > $10,000,000 for Phase I
- $1.866 million CWMTF grant (North Carolina fund)
- $0.625 million EPA grant

- UNC expected positive ROI in 4 to 10 years
  - Water rates have increased annually
    - Currently $8.47/kgal May-Sept and $4.46/kgal Oct-Apr
    - Currently UNC pays $0.60/1,000 gallons + $24,000 base charge
  - ROI dependent on scenarios and demands served

Sustainability-Minded Decision Making

- Programmatic Design and Implementation
  - >Energy Management Program
- Operational Decisions
  - > Biosolids Management
- Capital Projects
  - > Reclaimed Water System
- Long-Term Plans
  - >Long-Range Water Supply Plan

Lessons Learned for Small Systems

- Compare decisions to the status quo
- Sustainability programs can save money, but that is not the only reason to pursue (You have to spend money to reach goals.)
- Draw a big fenceline: Partnerships can attract funding and broaden perspective
- Don't worry about quantifying every factor: Relative comparisons inform decision-making

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