The Gray Area of Graywater

Water Reuse Workshop
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Overview

• Background
• Graywater Issues
  • Water Rights
  • Graywater Vs. Conservation
  • Graywater Economics
  • Safety and Health
• Developing a Graywater Policy
• Summary
My Purpose Today

• Water supply development and long term planning
• Statewide planning and policy
• Observations about the benefits and drawbacks of graywater

A Layman's Perspective
Colorado Springs Water System

- Serves roughly 450,000 people over 195 square miles
  - About 81,000 ac-ft/year
  - 26.4 billion gallons/year
  - 4.6 hours at Niagara Falls
  - 1 cent per 2 gallons

- Infrastructure crosses
  - Three river basins
  - Nine counties
  - Over 150 Miles

- Sources
  - Local ~ 20%
  - Transbasin ~ 65%
  - Arkansas River ~ 15%
How The System Works

2. **Mountain Collection System**: Collects water from Pacific Storms & snow.
3. **Lift Station**: Transfers water from storage to customers.
4. **Force Main**: Transfers water to customers.
5. **Customers**: Buildings connected to the water system.
7. **Force Main**: Transfers water to customers.
8. **Customers**: Buildings connected to the water system.
9. **Terminal Storage**: Stores water for distribution.
10. **Transmission Pipeline**: Transfers water from storage to customers.
11. **Distribution System**: Distributes water to customers.
12. **Regulatory Storage**: Stores water for regulatory compliance.
13. **Storage**: Stores water for distribution.
14. **Water Treatment Plant**: Treats water for distribution.
15. **Land Application**: Disposes of sludge.
16. **Sludge Disposal**: Disposes of sludge.
17. **Waste Water Collection System**: Collects waste water.
18. **Exchange**: Exchanges water with other systems.
19. **Discharge to Stream System**: Discharges water to the stream system.
Graywater

• Definition of Graywater
  • “...wastewater from sources other than toilets, urinals, kitchen sinks, non-laundry utility sinks, and dishwashers collected within a residential, commercial, or industrial building that meets the requirements, prohibitions, and standards adopted by the State of Colorado and the El Paso County Board of Health for subsequent use.”
Graywater Issues

- Water Rights
- Graywater vs. Conservation
- Graywater Economics
- Safety and Health
Water Rights

• Allocation method - based on time and use
• All the water was spoken for 100 years ago
  • True for the East Slope - still some unclaimed water on the West Slope
• Now reallocating among competing uses
• Different water types have different rules
• Inter-connected river system
Water Rights

• Graywater is small scale reuse
  • Reuse of certain water rights is legal, others not

• Graywater reuse may not be metered or tracked
  • Conflicts with “dominion and control”

• Graywater may change consumption pattern and return flow pattern
  • Depends on characteristics of second use
Water Rights

• Some policy relief for Colorado municipalities
  • State Engineer’s policy statement defines graywater as a “municipal use”
  • Assumes de minimis impact

• Recent Legislation - H.B. 13-1044
  • Authorizes graywater reuse in Colorado
  • Sets out minimum statewide requirements, standards and prohibitions
  • Calls for the development of safety and health regulations
Graywater vs. Conservation

• Graywater is often considered conservation
• Does graywater actually reduce water use?
  • Graywater does not necessarily reduce water use
  • Graywater is simply an alternative way to route water
• Challenge to shift thinking on water use
  • Stop thinking about reduced delivery, start thinking about reduced consumption
• Use Vs. Consumption
  • Use = delivery, diversions, or draw
  • Consumption = water removed (lost) from the system
  • Return flows a key component
Graywater vs. Conservation

• Shift to a system view - not user view

• User view
  • Graywater reduces delivery (water bill) - apparent savings

• System view
  • Graywater reduces delivery to one user - demand
  • Graywater also reduces return flow from that user - supply
  • Simply reduces the amount of throughput
  • No change in amount of water consumed
  • No increase of water available overall
Graywater vs. Supply

• Conflict with Reuse Supply
  • Potable and nonpotable reuse depends on return flows
  • Graywater use = lower return flow = less water to reuse
  • Net system effect negligible
    • Lower demand offset by lower supply from return flows

• Perception that graywater directly translates to water available for others to use
  • Statewide Roundtable discussions
  • Local Vs. Basin Scale

• Do you want to really save water - or just reduce your bill?
Local vs. Basin Scale

• On the local level, graywater can increase the amount of demand met by a given supply

• However, on a larger scale ..... perhaps not
  • In an over appropriated system, downstream users rely on upstream return flows for their supply
    • Arkansas River – Estimated that water is used 7 times by state line

• Graywater reuse does not increase supply to the basin, just reallocates supply
Basin Boundary

City Boundary

Outdoor Use 50

Outdoor Return Flow 5

Jr. Ag. Right 53 AF Met

City Diversion 95

Indoor Use 45

Indoor Return Flow 43

Available to "Gap" 0

Big River 200

10% Indoor Graywater Reuse
Conservation Calculator

Basin Boundary

City Boundary

Outdoor Use

50

Outdoor Return Flow

5

Jr. Ag. Right

53 AF Met

Indoor Use

50

Indoor Return Flow

43

City Diversion 95 45

200

Available to "Gap"

0

Big River

10% Outdoor Graywater Reuse

105

153

100

Nonpotable Reuse Philosophy

Water is water is water

Supply

Potable Systems

Nonpotable Systems

Demand

Graywater Systems
Graywater Economics

• Individual user point of view
  • Graywater reduces water delivery and water bill
  • May cost some money upfront to install and some for O&M

• Utility point of view
  • Water rates set to recover costs
  • Vast majority of costs are fixed - same regardless of amount of water delivered
    • Water is an infrastructure intensive industry
  • Graywater reduces throughput - and sales
  • Graywater will drive up water rates (per unit cost)
    • Fixed costs spread out over lower units sold
  • Some marginal savings on variable costs (pumping)
  • Some long term benefits from capacity life / delayed projects
Safety and Health

• Graywater - vigilante reuse, or responsible water management?

• Safety and health concerns and risks
  • Individual user level - viruses, bacteria, etc.
  • System level - cross connection concerns

• Need for some level of regulation
  • State, county, and local regulations/jurisdictions
  • International Plumbing Code
  • Industry/product standards
  • BMPs

• Need for education and acceptance by public
Developing a Graywater Policy

• Why develop a policy?
  • Demonstrates responsible water management
  • National trends
  • Customer driven

• Challenges to policy development
  • Water rights questions
  • City Code prohibitions
  • Measurement / billing / revenue issues
  • Lack of Utility standards
  • Lack of County regulations / permitting process
  • Lack of State regulatory guidance
How we met the challenges

• Water rights questions
  • Colorado Springs has a portfolio of reusable water
  • State Engineer’s Policy Statement issued in response to statewide questions

• City Code prohibitions
  • Code states water is sold on a license basis for one use only
    • Protect water supply for nonpotable reuse and reuse by exchange
  • Developed reuse guidelines defining what constitutes a single use, and what constitutes a second use
  • Process to charge minimal fee for “second use”
    • Use pre-existing “Augmentation Tariff Rate”
    • Based on selling water only, no recovery of infrastructure costs
    • Made graywater reuse a paid water service, thus honoring code
How we met the challenges

• CSU’s Draft Policy defined a three tier graywater reuse structure based on reuse guidelines and volume
  • Tier I - de minimis graywater reuse
    • No permanent installation of plumbing
    • Hand carry, small volumes
  • Tier II - substantial graywater reuse defined as a single use
    • Larger, permanent installations
    • Reused for the same basic purpose as initial use, i.e. indoor sanitary use, industrial process water reused in the same process
    • No payment to Utility
  • Tier III - substantial graywater reuse defined as a second use
    • Larger, permanent installations
    • Reused for a different purpose than the initial use, i.e. outdoor irrigation, cooling towers, etc.
    • Minimal payment to Utility (about 1/10 of potable rate)

Latest Draft of Reg. 86 precludes this option!
How we met the challenges

• **Measurement / billing / revenue issues**
  • Process established by reuse guidelines and tiered structure, incorporated into normal billing system
  • Offset a portion of “lost revenues” - absorb the rest

• **Lack of Utility standards**
  • TBD - will address at a future date, now handled ad hoc
  • Unclear where standards, plan review, and inspection roles will reside
How we met the challenges

• Lack of County regulations / permitting process and State regulatory guidance
  • Passage of H.B. 13-1044
  • In the middle of a Statewide Rulemaking Process
    • Draft Regulation 86 has been circulated
    • Comments have been submitted
  • Subsequent Development of County/Local rules and regs
  • We are actively involved in development of rules and regs
Implementation

• Currently on the third major revision of the draft policy - continue to refine

• Adoption of Policy by ordinance or resolution
  • Required by H.B. 13-1044
  • Colorado Springs City Council - 2015

• Development of Utility standards
  • Revise standards to incorporate and guide installations

• Incorporation of County regulations / permitting process and State regulatory guidance
  • Regional Building Code
  • County permit process
Summary

• Graywater reuse is an important aspect of sustainable water development
• Sustainability conflicts and challenges exist
• An honest evaluation of the big picture is necessary
• Successful policy development must consider and address many issues
• In the end, community values will decide