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Water Fountains and Spray Features:

Efficient Design and Operation

SEATTLE PARKS AND RECREATION

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Water Fountains and Spray Features

- Many Configurations
  - Fountains (Decorative and Play)
  - Interactive spray features
  - Wading Pools

- Definition:
  - For our purposes, an outdoor ornamental or recreational water-containing structure designed for aesthetic enjoyment or recreational activity.
    - We'll refer to them all under the umbrella of "water features"

Issues and Concerns

- All consume water
- Typically fall outside of code-related consumption
- Often metered along with other uses
- Sometime difficult to measure the need/benefit
  - Recreation and aesthetics
- Potential costs
  - Initial construction
  - Water
  - Electricity (pumping)
  - Filtration equipment
  - Recirculation equipment
  - Purification equipment
  - Wastewater
  - Reuse equipment
  - Maintenance

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Operational Cost Examples

Annual Water Feature and Fountain Costs

S = includes wastewater fees
Bold = recirculating

Site	Average Gallons	2009 Cost	
Ballard Commons	1,277,023	*$ 15,331*	
Cal Anderson	1,564,068	$ 8,009	
John C Little	471,988	$ 8,500	S
Judkins	552,772	$ 9,940	S
MLK Fountain	136,884	$ 2,465	S
Pigott Corridor	1,947,044	*$ 23,375*	
Pratt	1,165,945	*$ 13,998*	
Waterfront fountain	712,470	*$ 8,553*	
Westlake	1,198,296	$ 20,522	S

Water Feature Designs

- Different types of design
  - Single Pass (Pass-through): Lower capital cost, higher water cost, lower maintenance
    - Drain to sewer or
    - Infiltration into ground
  - Recirculating: Higher capital cost, lower water cost, energy costs, higher maintenance
    - Reduces water consumption
    - Can be unhygienic if no water treatment – often not allowed today
  - Recirculating with filtration: Much higher capital cost, lower water cost, higher energy cost, much higher maintenance
    - Typical of many new water features
    - Often driven/required by health codes

Water Feature Operation: Inflows

- Make-up (potable) water
  - Health department rules create likely restrictions for using reuse (grey) water
- Rain/precipitation

Water Feature Operation: Outflows

- Evaporation
- Leaks in feature and mechanical equipment
  - Known and unknown
- Splashout/oversplash
- Filtration/Backwashing
- Walk away (on people/swimsuits)
- Unintended operations
  - Stuck make-up water valve
  - Open drain
  - Excessive backwashing
  - Shutoff button broken “on” (play features)

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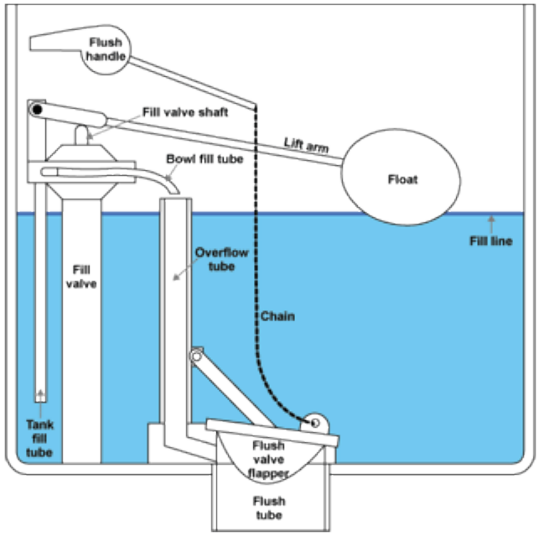
Keys to Reducing Consumption

- Early discussions between utility and customer
- Good design
- Lifecycle costing
- Water filtration and recirculation
- Individual water metering
- Real-time monitoring of operations
- Reuse or infiltration of backwash
- Minimize energy pumping



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Early Discussions Between Utility and Customer

- Conservation should be essential to the design
- Focus on the intended use and “need”
  - Define the “need” and satisfaction: flow rate? user experience? visibility?
- Have a dialogue about intended function and anticipated water use
- Discussion of equipment options and operational concerns
  - Utility, customer and designer should consider all potential consumption of equipment
  - If incentives are an option, determining a baseline is difficult

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Good Design

- Larger sprays to minimize evaporation
- Large area beyond fountain to capture water and overspray
  - Be aware of the impact of wind and ground contours
- Durable equipment to reduce likelihood of uncontrolled water losses
- Consider liners for fountains and expose piping when possible

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Lifecycle Costing

- Consider a realistic timeframe for equipment operational life
- Identify the capital, operations and maintenance costs
  - Factor in future increases in maintenance and utility costs
    - $ figure can be placed on other attributes beyond direct savings (e.g. water efficiency)
- High water and/or wastewater costs and environmental responsibility can drive recirculation
  - Recirc is the likely eventual future for most water features

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Water Filtration and Recirculation

- Driven by environmental and financial concerns
- Often a necessity for health codes and/or desired flow rates
  - Flow rates of fountains and many spraygrounds drive recirculation
    - Can flow hundreds of GPM
    - Recirculating spraygrounds can still lose 50-80% of water input
- Recirculation alone does not “solve” water use issues
  - Potential for uncontrolled water use remains…and possibly increases
  - Significant ongoing water use for evaporation, backwash, and “walk away”

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Individual Water Metering

- Water features often function as a black box of water use
  - Metering often tied to a park (irrigation), a building, or other uses
- Metering can help quantify costs
  - Can result in consideration of creative conservation options
    - Lower wading pool water levels or reduced operational hours, etc.
  - Can drive decision to convert to recirculation with existing water features

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Real Time Monitoring of Operations

- Particularly relevant with recirculating water features
  - Or features with high make-up water flow rates
- Monitoring of operations via a phone or computer network (telemetry)
- Water features have a high likelihood of uncontrolled water make-up
  - Think of a leaking toilet on steroids
  - Telemetry can be used to shut down a system
- **Telemetry can pay for itself in one avoided incident**

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Reuse or Infiltration of Backwash

- Consider alternatives to fill/drain
- Infiltration or reuse of “waste” water
  - Swales
  - Irrigation
  - Toilet flushing
    - Cost is a barrier to reuse systems (lifecycle costing)
- There may be a limit to how much water can be reused or infiltrated
  - An irrigation system may not need all available water
  - Infiltration area may not be large enough

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Minimize Energy Pumping

- Consider variable frequency drives (VFDs) to adjust flow to need
- Potential to shut off operations during evening hours or when “need” isn’t there
  - Ensure enough storage capacity to store all water coming back during down times

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WMPs: Worst Management Practices

- Don’t allow sufficient storage capacity for shutdowns
- Don’t individually meter fountains
  - No direct measurement of volume – remain clueless about water use
- Don’t install wye strainers before the solenoid/make-up water shutoff
  - Debris can clog solenoid, causing continual leaking
- Set the make-up water float/level near the discharge pipe
  - Make-up water may never shut off
- Backwash filters on time intervals rather than pressure differentiation
  - Doesn’t optimize use of water before discharge

- Don’t limit operational hours
  - Can result in excessive energy use, evaporation, and potential problems
- Don’t consider potential uses for water leaving the system
  - Reuse for irrigation, etc.
  - Infiltration (may be only economic savings – wastewater)

Summary

- Fountains and water features have a wide range of operational costs and issues
- Minimizing water use starts with identifying the “need”, collaboration with local water utilities, and good design
- Recirculation can minimize water costs but at the expense of increased capital costs and maintenance
- Individual metering and real-time monitoring can minimize operational costs and save water
- ALL water features need regular maintenance and attention to minimize water use.

Thank you

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