Water Conservation at DiaSorin Inc.

By: Yohanes Agustinus

MnTAP Advisor: Michael Jost

Site Supervisor: Kelly Gilliland

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Company Background

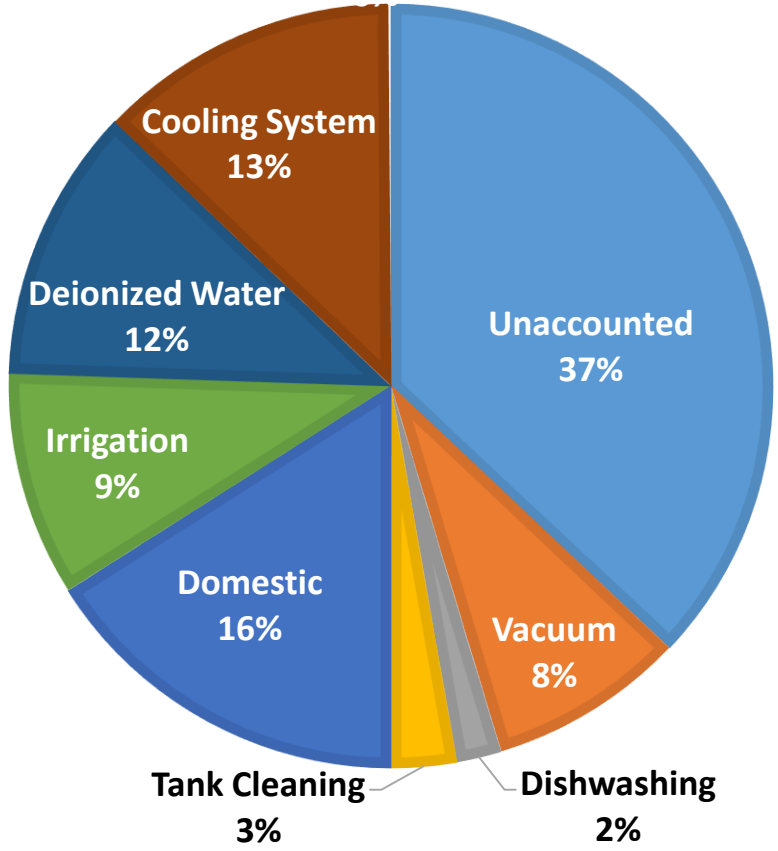
- **DiaSorin Inc. is located in Stillwater, MN**
  - Headquartered in Italy
  - Produces diagnostic kits for ZIKA virus, Vitamin D deficiency, specialty assays
- **260 employees**

Incentives for MnTAP Assistance

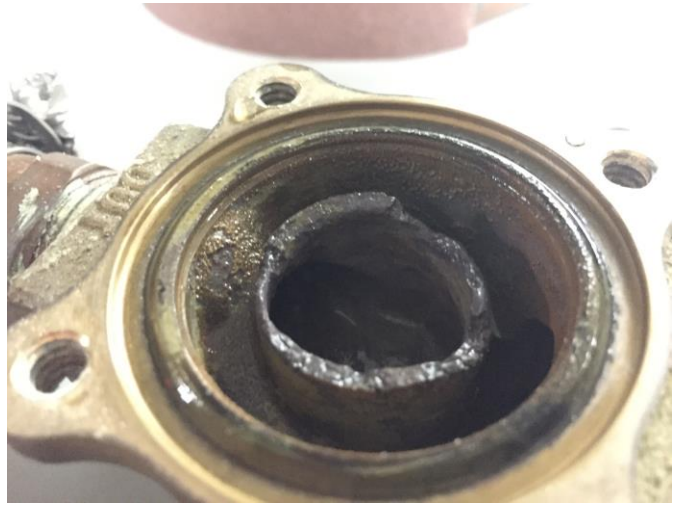
- **Close to Sewer Access Charge (SAC) Unit Limit**
  - 74 units
  - Potential for reassessment; ~ $2,500 per SAC unit
- **“Missing water”**
  - More than 3 million gallons per year (GPY) of water unaccounted
  - Difficult to reduce water usage
- **DiaSorin’s Goals**
  - Reduce water consumption, realize savings
  - Avoid SAC unit increase

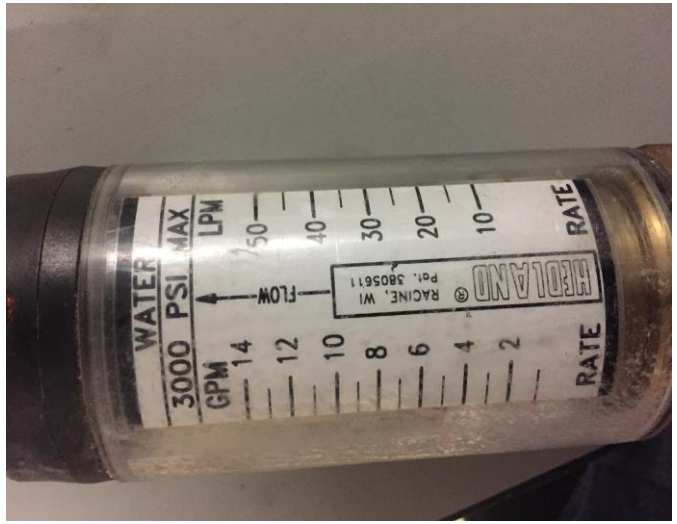
Project Overview

- **Goal: 95% of water balance closed, reduce water usage by 10%**
  - Took on an energy conservation aspect
- **Current water intake: ~ 8,500,000 GPY**
- **Sanitary sewer outflow: ~ 6,400,000 GPY**
- **Project was divided into 2 phases (for maximum impact)**
  - Phase 1: Identify all water usage sources
  - Phase 2: Identify possible water reduction opportunities



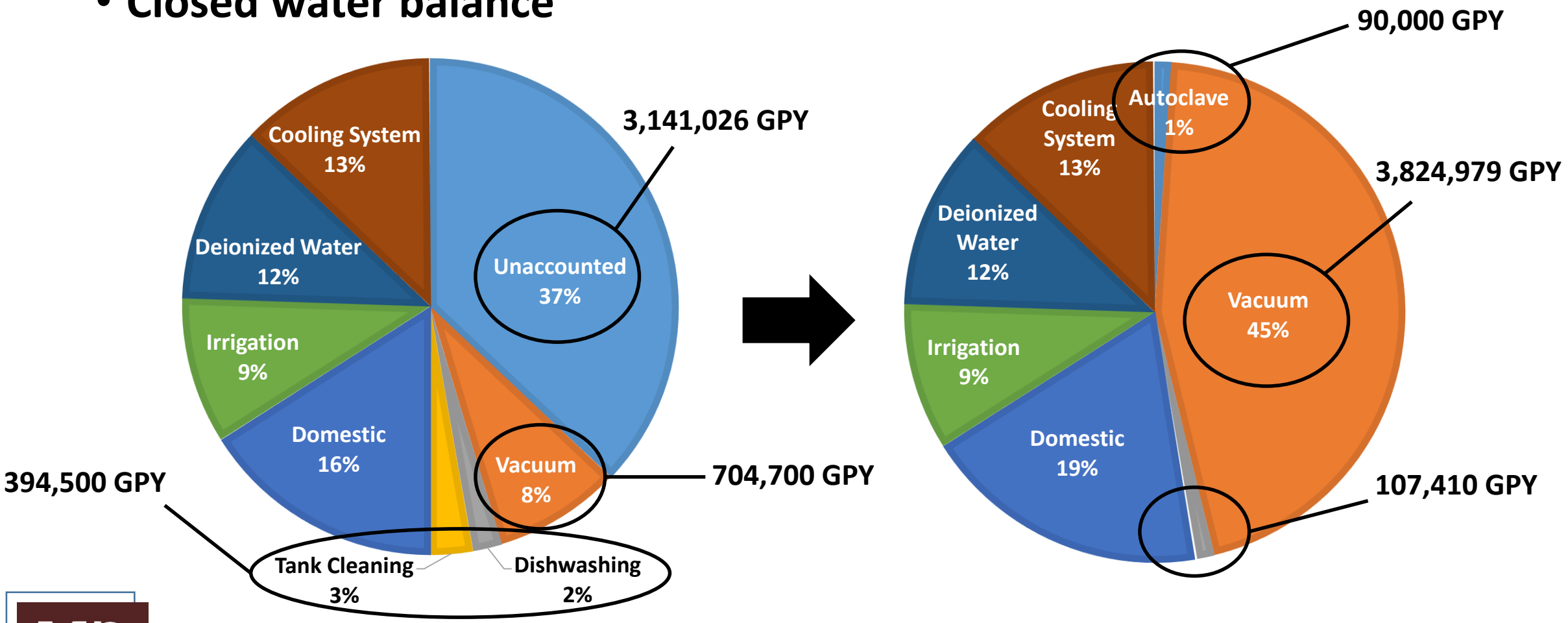
Findings: Phase 1





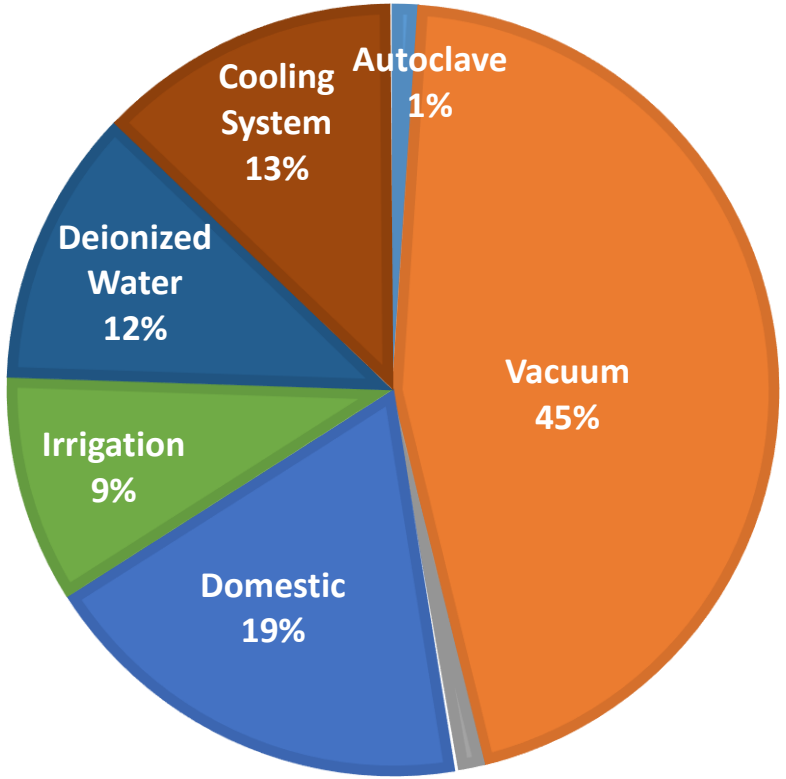
Findings: Phase 1

- Closed water balance



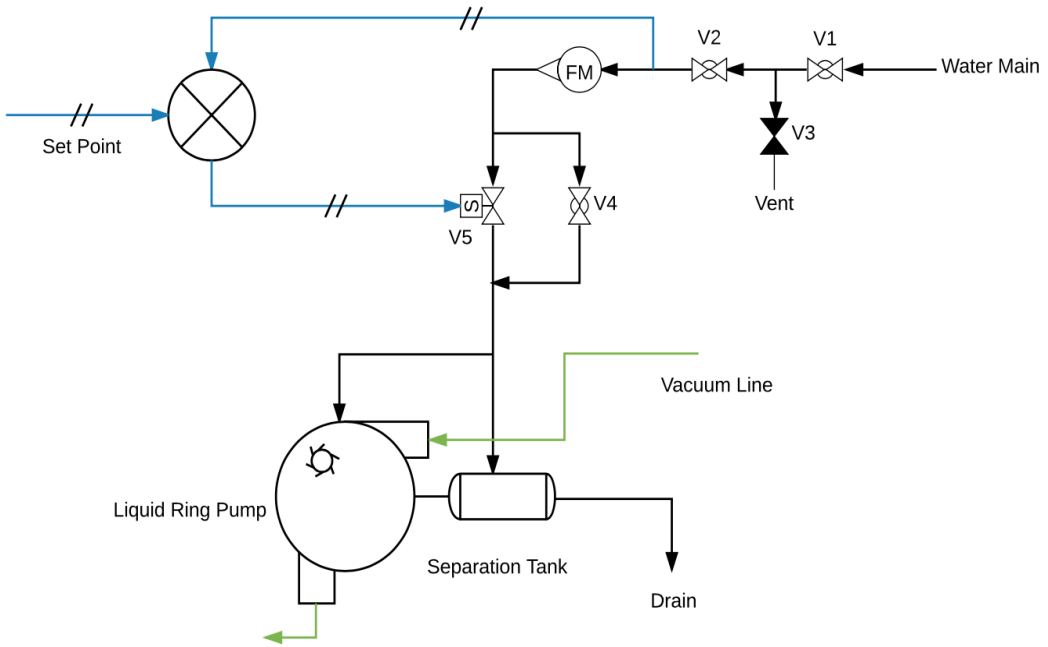
Findings: Phase 2

- **Concentrated on hard-hitters (4 areas):**
  - Vacuum pump (operates 15 hours/day)
  - Reverse osmosis (RO) reject
  - Domestic water consumption
  - Irrigation
- **Water softness issues in hot water loop**
- **Chiller/exhaust also looked at (more energy-side)**



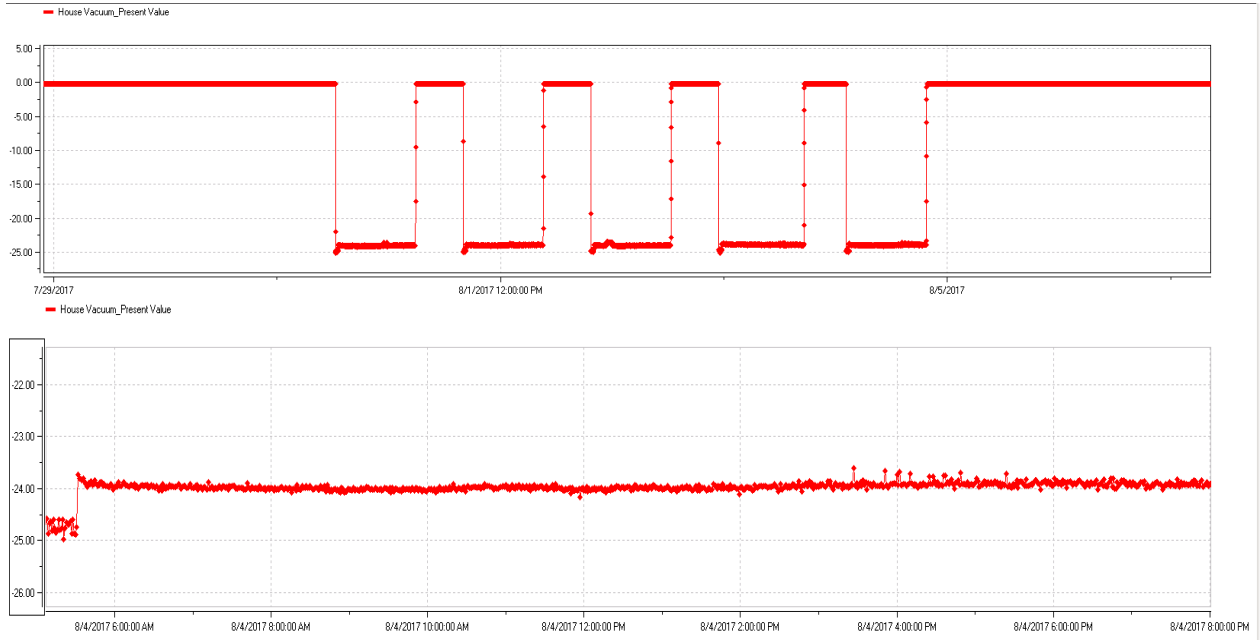
1. Vacuum Pump

- **Partial recirculation cooling system**
- **Eliminated leak**
  - 889,800 GPY (10% of total water consumption)
  - $6,200 annual savings
  - $240 implementation costs
- **Dialed down flow rate from 12.2 GPM to 2.8 GPM**
  - 2.2 million GPY (27% of total water consumption)
  - $15,400 annual savings
  - $300 implementation costs



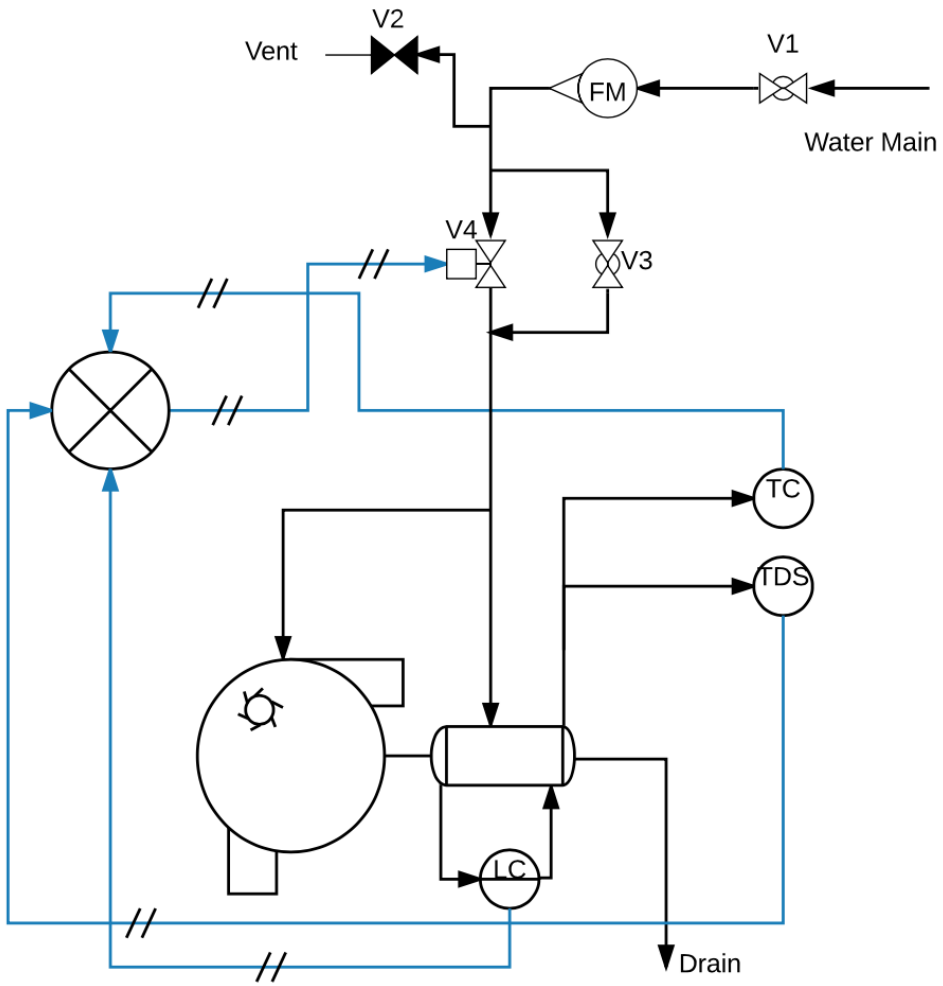
1. Vacuum Pump

- **On-demand vacuum**
  - Minimal usage based on historical trend
  - Reduce operating time of vacuum pump
  - 3 hours **vs** 15 hours per day
  - Costs:
    - $320 for 8 pressure gauges
    - $200 for 2 timers
    - 60 hours labor
  - Estimated savings:
    - Energy: 28,100 kWh
    - Water: 522,300 GPY
    - $5,200 annually



1. Vacuum Pump

- **Temperature-based controls**
  - Final polish; adjust with weather
- **Adjust vent position**
  - Automatic monitoring
  - Will adjust with seasonal changes
  - Ease of maintenance checks



2. RO Concentrate Water

- **~ 21% of water coming in to deionized water (DI) room is drained**
  - RO membranes part of the purification process in DI room
  - ~ 207,000 GPY
  - $1,500 potential annual savings

2. RO Concentrate Water

- **Irrigation**
  - 103,500 GPY (~ $730)
  - Seasonal, irrigation controls are far away
  - Can drain into pond for irrigation storage; cheaper plumbing
    - Further discussion on greywater reuse needed
    - No exposure exclusion
- **Toilet flushing**
  - 207,200 GPY ($1,500)
  - Extensive plumbing needed, in excess of $15,000

2. RO Concentrate Water

- **Hot water make-up**
  - 26,000 GPY (~ $180)
  - ~ $500 implementation costs, ~ 3 years payback
  - Studies on calcium carbonate film formation
    - Emphasize that this is clean water, there is DI rinse (meet those standards, are they necessary AND sufficient)

Characteristic	RO Concentrate	City Water
Hardness (ppm)	0	270
Alkalinity (ppm)	724	244
Total Dissolved Solids, TDS (ppm)	2,584	641

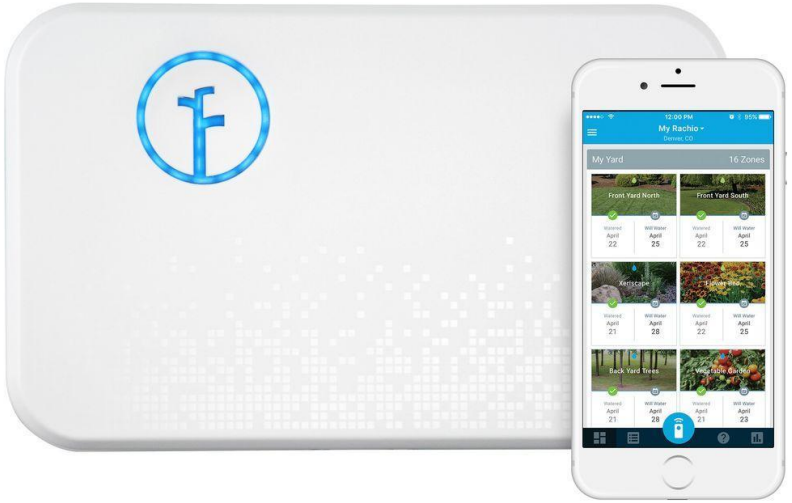
3. Domestic Consumption

- **Replace 1.6 gpf with 1.28 gpf toilets (35 pieces)**
  - Reduce water flushing by 20%, or ~ 48% of current domestic use
  - 747,500 GPY (~ 8% of overall water consumption)
  - ~ $5,200 annual savings
  - ~ $15,600 implementation costs
    - 70 hours for all toilet bowls
    - Change flush-o-meters ($150 each)
    - Change toilet bowls ($200 each)
  - ~ 3 years payback

Source: Home Depot

4. Irrigation

- **Current irrigation utilizes clock-based scheduling**
- **Switch to a smart controller**
  - Rachio Smart Sprinkler Controller, detects changes in weather patterns
  - Implementation costs: ~ $300
  - City of Woodbury pilots averaging more than 50% water savings
  - 403,800 GPY, payback period of 6 months (summer)



Source: Rachio

5. Hot Water Hardness Control

- **Problems with hardness in the hot water system**
  - Reaches 180 ppm over weekends
  - Wastes ~ 300 gal in purge every week or 15,600 GPY, also 0.5 man-hours
- **Faulty check valves identified as main issue**
  - Replace valves
  - Monitor hardness to anticipate issues
  - Eliminate mixing valves in toilets

6. Chiller/Exhaust Optimization

- **Reducing exhaust from fume hoods**
  - Currently there are several fume hoods that exhaust 24/7
  - There is also potential for exhaust to be left on
  - Better temperature and pressure regulation
  - May also save water in cooling system
- **Install timers to turn on exhaust**
- **Reconfigure when exhaust fans run**
  - Autoclave
  - ~ $1,000 purely from heat losses in winter
    - Factor in positive pressure regulation
  - 7 other exhaust points to optimize

Summary Table

Recommendations	Waste/Water/Energy Reductions Per Year	Implementation Cost	Net Savings Per Year	Payback Period	Status
Eliminate leak (vacuum)	889,800 gallons	$240	$6,200	0.5 months	Implemented
Reduce flow rate through vacuum pump	2,200,000 gallons	$300	$15,400	1 week	Implemented
On-demand vacuum pump	522,300 gallons 28,100 kWh	$3,400	$5,200	7.8 months	Implementing
Reuse RO concentrate as hot water make-up	26,000 gallons	$500	$180	3 years	Needs Further Analysis
Install ultra-low flush toilets	747,500 gallons	$15,600	$5,200	3 years	Recommended
Optimize irrigation	403,800 gallons	$300	$570	6.4 months	Recommended
Hot water hardness control	15,600 gallons	$1,800	$1,400	1.2 years	Implementing
Chiller/Exhaust optimization	<1,300 therms Water and Electrical	Needs Further Analysis	Needs Further Analysis	Needs Further Analysis	Needs Further Analysis
Total	**4,805,000 gallons (57%)** **28,100 kWh**	**$12,400**	**$32,900**	**N/A**	**N/A**

Next Steps

- In process of determining best course of action for RO reject
- Obtain detailed breakdown of DI water use
- Installation of timers for vacuum system and fume hoods
- Installation of faucets and new check valve in Building 3

Personal Benefits

- Communication and teamwork
- Learn about non-technical issues affecting design decisions
- Dealing with complex data
- Environmental regulations
- Exposure to new types of unit operations

Questions?