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Effects of Water Conservation on Wastewater Treatment Costs and Discharge Permitting

City of Woodland Case Study

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Erler & Kalinowski, Inc.

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Outline of Presentation

- Purpose of Evaluation
- Background information on the City of Woodland
- Overview of Salt Issues in California
- Residential Indoor Water Use Conservation Trends
- Salinity Control Options Available to the City
- Modeling of Water Conservation and Effects on Wastewater Quality
- Expected Effluent Salinity Concentrations from Water Conservation and Salinity Controls

Woodland Master Plan

- **Study conducted to support the Woodland Wastewater Master Plan**
- **EKI was a subconsultant to NexGen Utility Management**
- **Goal of study:**
  - Estimate the effects of conservation on future salt concentrations in residential wastewater,
  - Evaluate the need for future programs to comply with wastewater discharge requirements,
  - Estimate the magnitude and timing of such programs,

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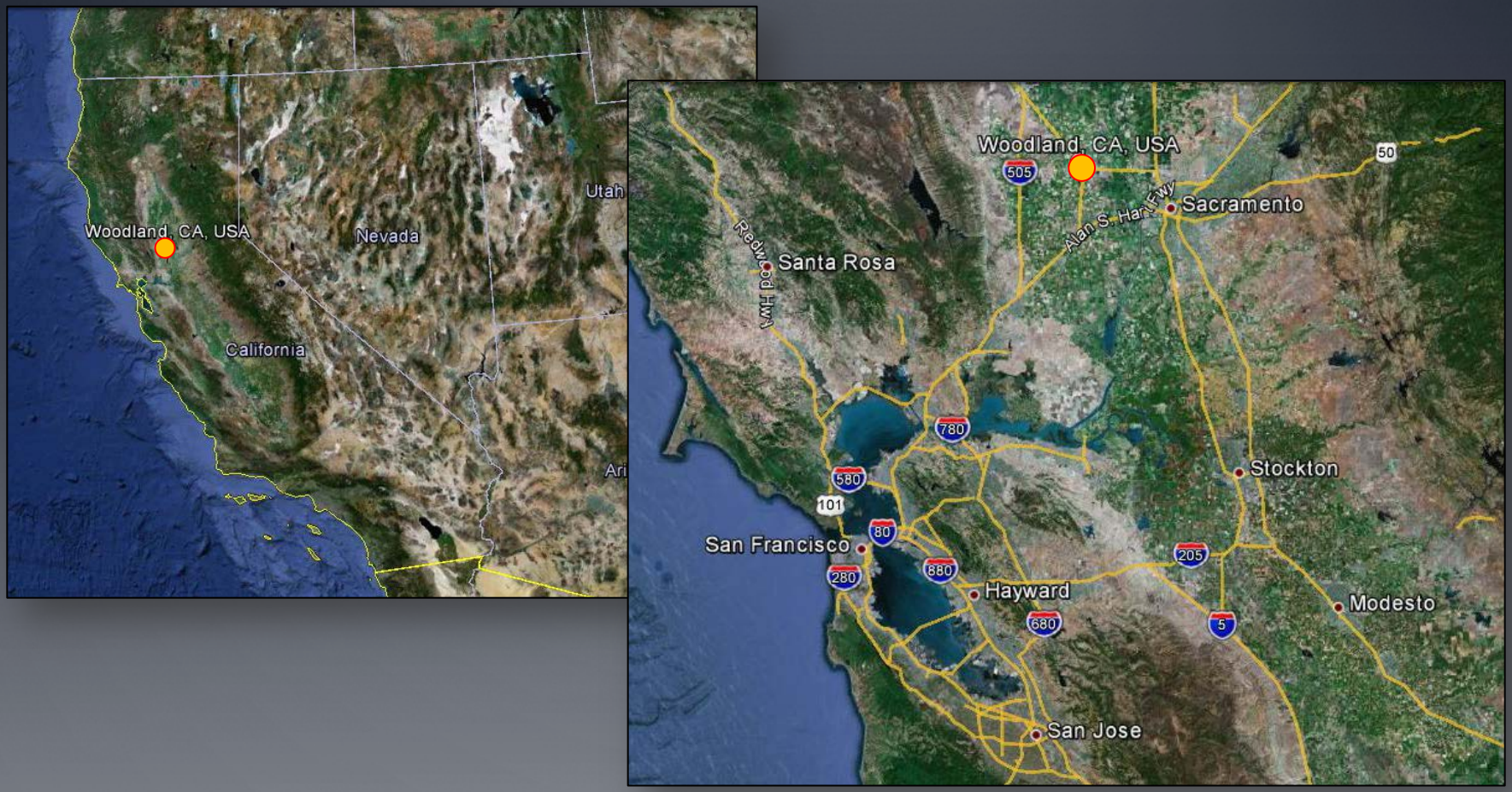
Woodland, CA



Source: Google Earth

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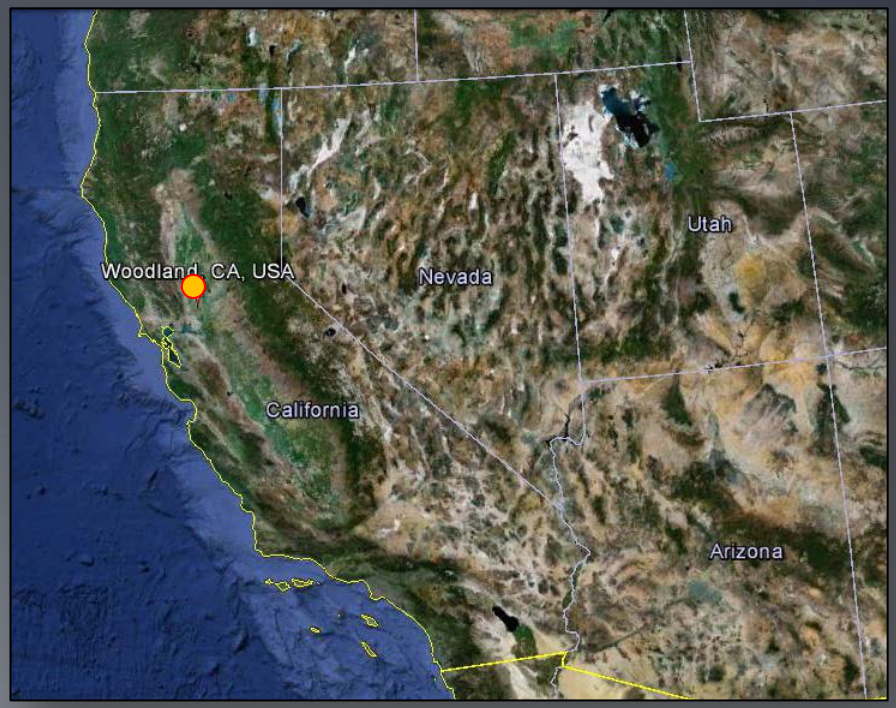
Woodland, CA

- Central valley town 20 miles NW of Sacramento
- 55,000 residents, dry Industries (Warehousing)
- Groundwater wells used for potable supplies
- Served by tertiary WWTP, discharge to local irrigation canal
- Current wastewater flows are around 5.5 Mgal/d
- No water meters



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Salt Issues in California

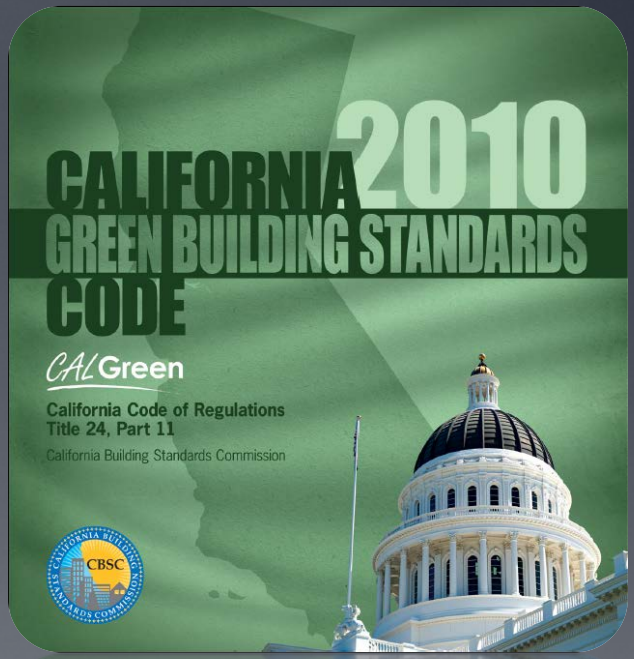
- Accumulating salts can reduce productivity or ruin agricultural lands.
- In parts of the Central Valley there are inadequate or no salt outlets and salt accumulates.
- Communities are spending increasing amounts of money to comply with water quality discharge standards designed to limit salinity.
- CV-SALTS (Central Valley Salinity Alternatives for Long-Term Sustainability) is a strategic initiative to address salinity and includes regulators and stakeholders.
- Debate goes as far as to whether to pursue so-called "in-valley" or "out-of-valley" solutions.

Why Discuss Woodland?

- Salty Groundwater = Very Salty Wastewater.
- Over half the City uses self regenerating water softeners. Over 120 tons of salt per month.
- City's 2003 WWTP NPDES Permit required City to start looking at salinity reduction.
- Over 87% of the service connections are residential.
- Pursuing a new surface water (Sacramento River) supply project with Davis to reduce wastewater effluent salinity.
- $300+ million project. Water rates will go from one of the lowest to one of the highest in the valley.
- Installing water meters with tiered billing rates

Residential Indoor Water Use

- Recent plumbing code changes in California → more water efficient fixtures
- National standards and changing technology → USEPA WaterSense Specifications
- Recent studies provided significant new information regarding residential end uses of water
  - Existing homes in California
  - Standard Homes - Constructed after 2001
  - New, High-Efficiency Homes



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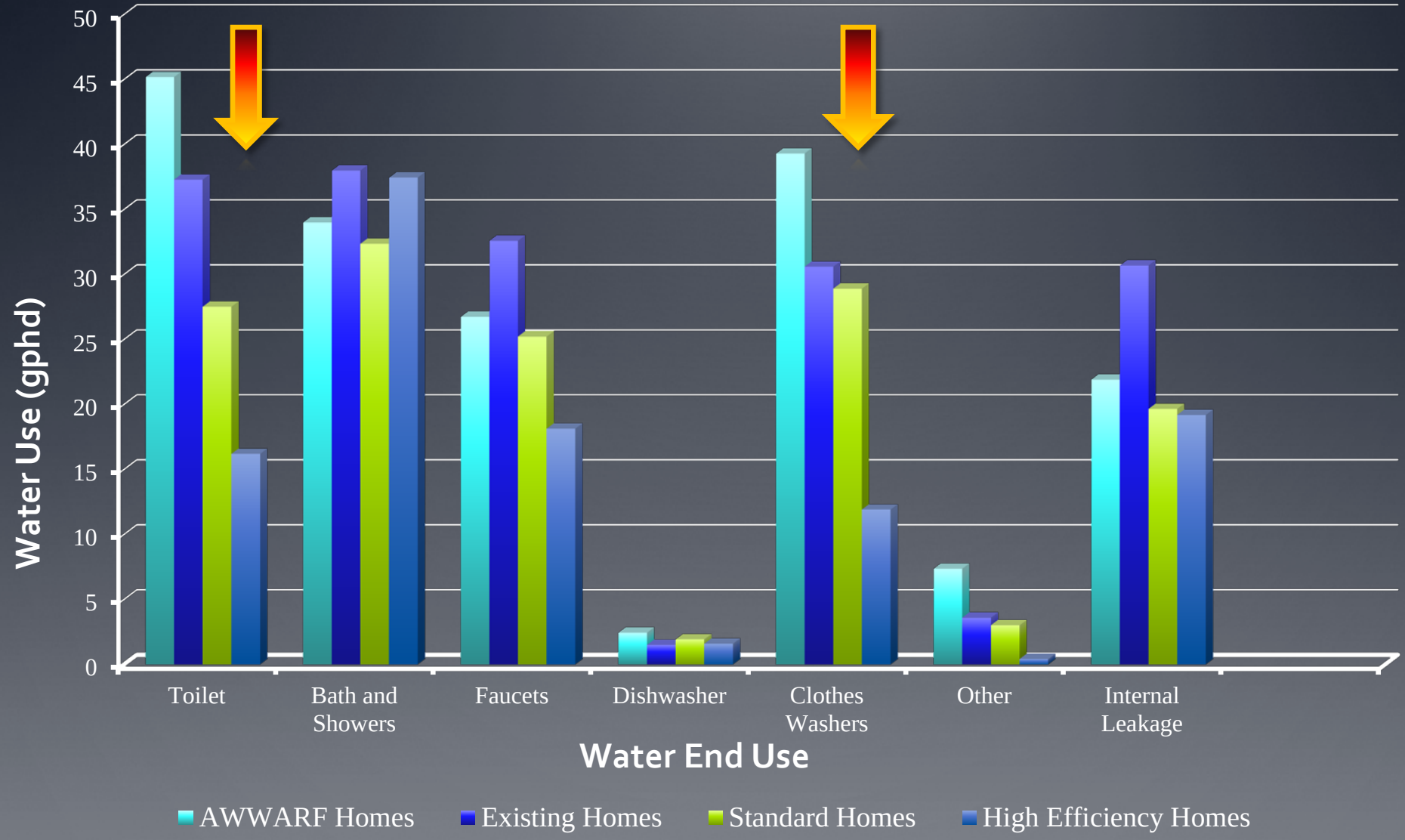
Comparison of Average Daily Water Use from Various Data Sources



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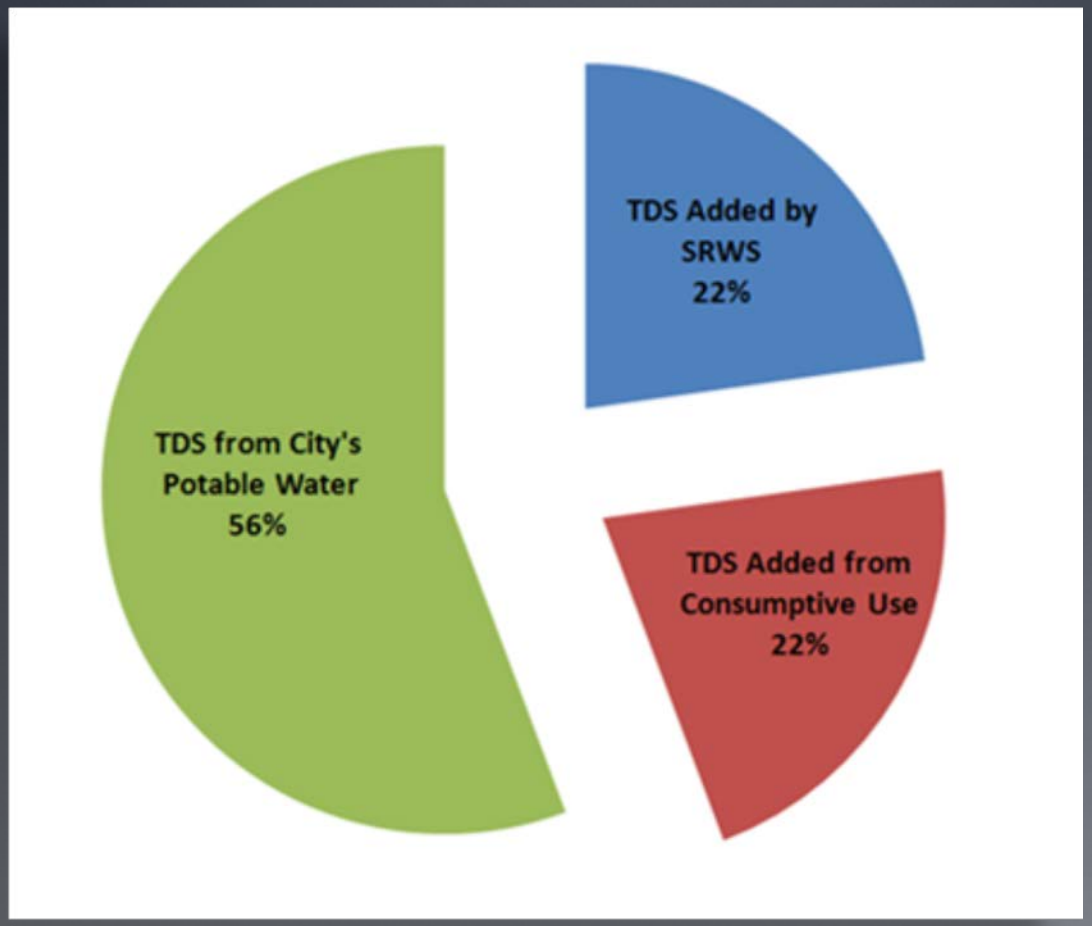
Woodland Wastewater TDS of 1000 mg/L



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Regulatory Context- NPDES Permit

- Narrative salinity objectives in 2009 NPDES Permit

Parameter	Agricultural WQ Goal[1]	Secondary MCL[3]	Effluent	
			Avg	Max
EC (µmhos/cm)	700[2]	900, 1600, 2200	1562	1844
TDS (mg/L)	450[2]	500, 1000, 1500	1042	1256
Boron (µg/L)	700	N/A	2540	3400
Sulfate (mg/L)	N/A	250, 500, 600	N/A	N/A
Chloride (mg/L)	106[2]	250, 500, 600	N/A	N/A

- Narrative objectives allowed by RWQCB because of City's progress on transition to a surface water supply.
- 2014 NPDES permit renewal likely to have final effluent limits

Salinity Source Controls

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Salinity Controls- AB 1366

- AB 1366 allows cities to significantly restrict use of water softeners if affecting wastewater quality.
- City of Dixon used AB 1366 for its softener rebate program. About half of city's SRWS (about 500 units) replaced/ removed in last 2 years.
- Where were the canisters being recharged? Woodland.
- Concern that AB 1366 just moves one city's salt to a nearby city.
- Additionally, if canisters are being recharged within the city, there is no net benefit to the implementation of AB 1366

Salinity Controls- AB 1366

- May require regulation of water softener companies as Significant Industrial Users ("SIUs") per the USEPA Pre-Treatment Program.
- Pre-Treatment program would establish salt effluent limits for SIUs.
- How does water get softened if onsite regeneration is banned and off-site regeneration is regulated as an SIU?

Woodland – Davis Water Supply Project

- **Expectation is that better quality potable water will significantly improve wastewater effluent:**
  - Groundwater TDS = 500 mg/L
  - Sacramento River TDS = 100 mg/L
- **Easier to phase out SRWS due to better source water quality water.**
- **Wastewater salinity might drop by half its current values.**

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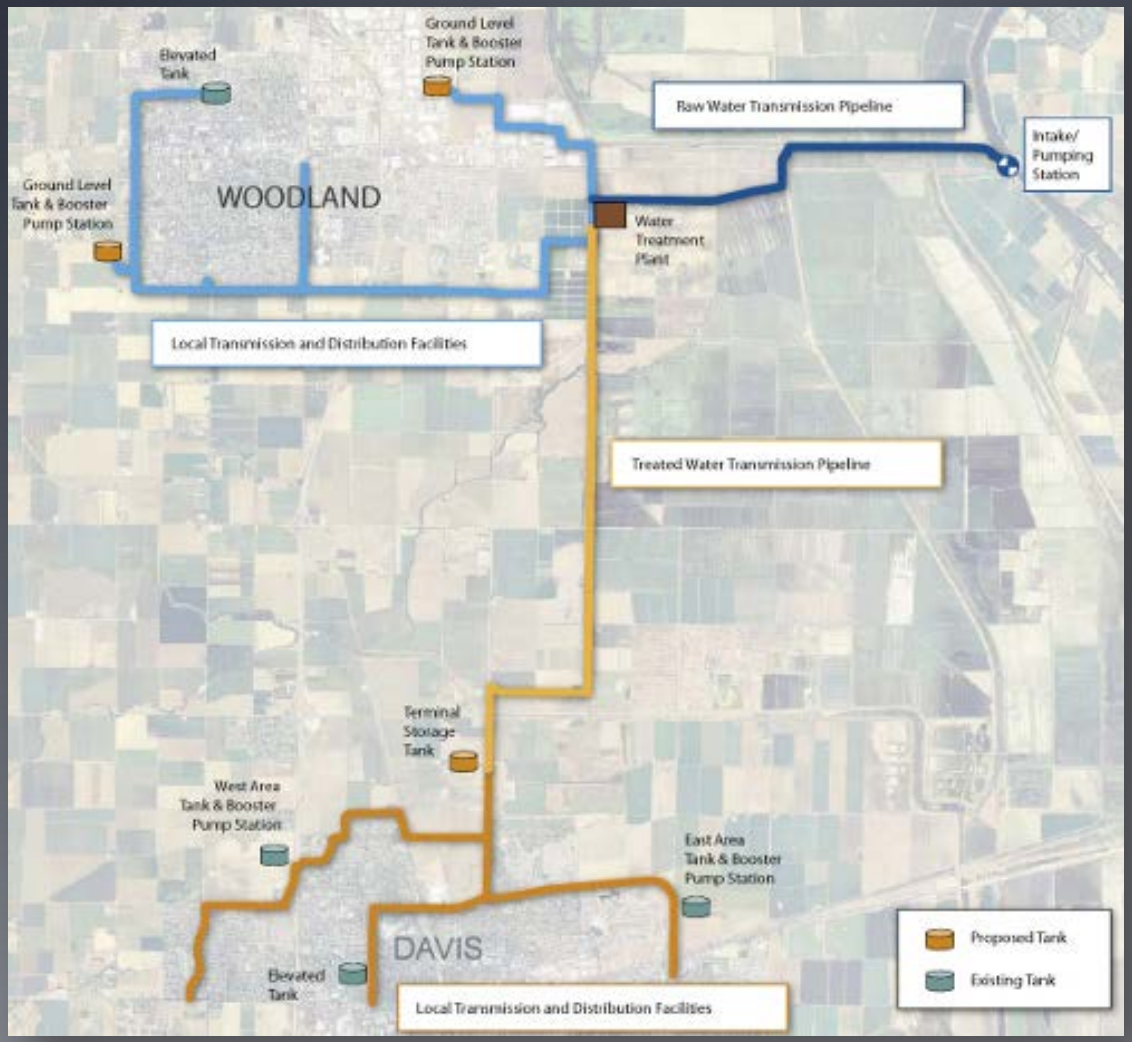
Woodland- Davis Water Supply Project



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Collision between Water Conservation and Wastewater?

- **To support new water treatment plant, Woodland will:**
  - Install meters on all accounts,
  - Implement tiered rate structure, and
  - Triple water rates in the near future.
- **New CalGreen plumbing standards will further reduce indoor water use.**
- **SB7 requires a statewide reduction of 20% gross, per-capita water use by 2020.**
- **Pending effluent limits for EC/TDS in next NPDES permit.**

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What Does the City Need to Determine?

- What to do now to address salinity in the future.
- Is conversion to surface water enough?
- How strongly does AB 1366 need to be implemented in the City, if at all?
- Do water softener companies need to be regulated as SIUs?
- What public backlash will occur as part of these efforts?

Modeled Impacts of Water Conservation and Source Control to Wastewater

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AWE Model

- **Alliance for Water Efficiency ("AWE") Water Conservation Tracking Tool, Version 2.0**
- **Tool designed for planning and tracking urban water conservation programs**
  - Well documented and transparent model
  - Highly flexible and customizable
  - Forecasts water demand over time
  - Disaggregates water savings between program-related savings and plumbing code-related savings
- **Many, literature-based assumptions.**

Key Model Parameters

- **Woodland-specific data, where available.**
  - UWMP
  - California Department of Finance
  - American Community Survey – U.S. Census
- **Constant per-capita mass of TDS added to wastewater through consumption.**
- **Utilized wastewater flow data from strictly residential areas to estimate per-capita and dwelling unit indoor demands.**

Key Model Assumptions

- **How to evaluate the effect of water meter installation?**
- **Many studies conducted regarding reduction in total water use associated with installation of water meters.**
- **None consider the coincident effects of:**
  - Meter installation,
  - Tiered rate structures, and
  - Tripling of water rates to fund surface water project.

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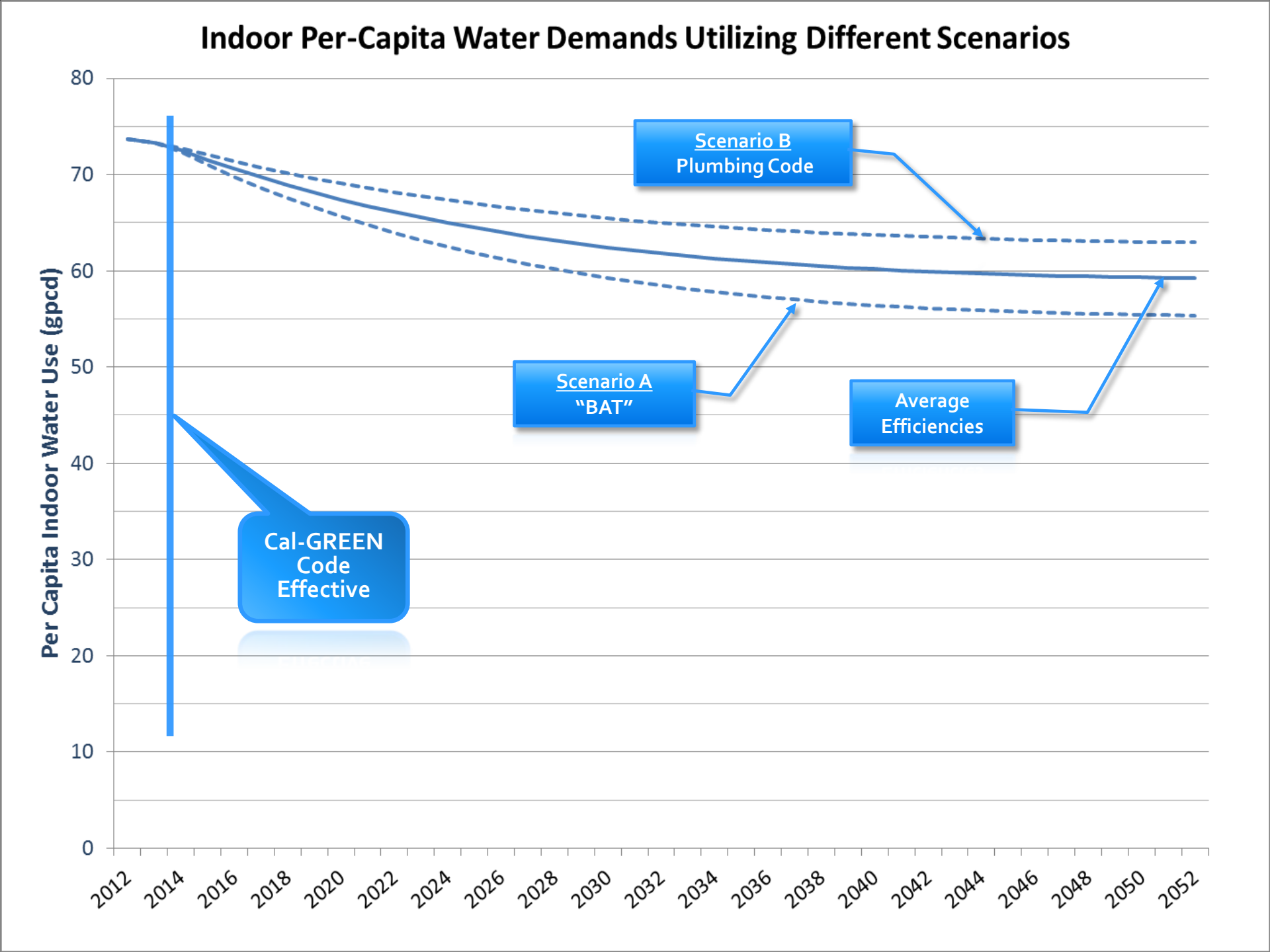
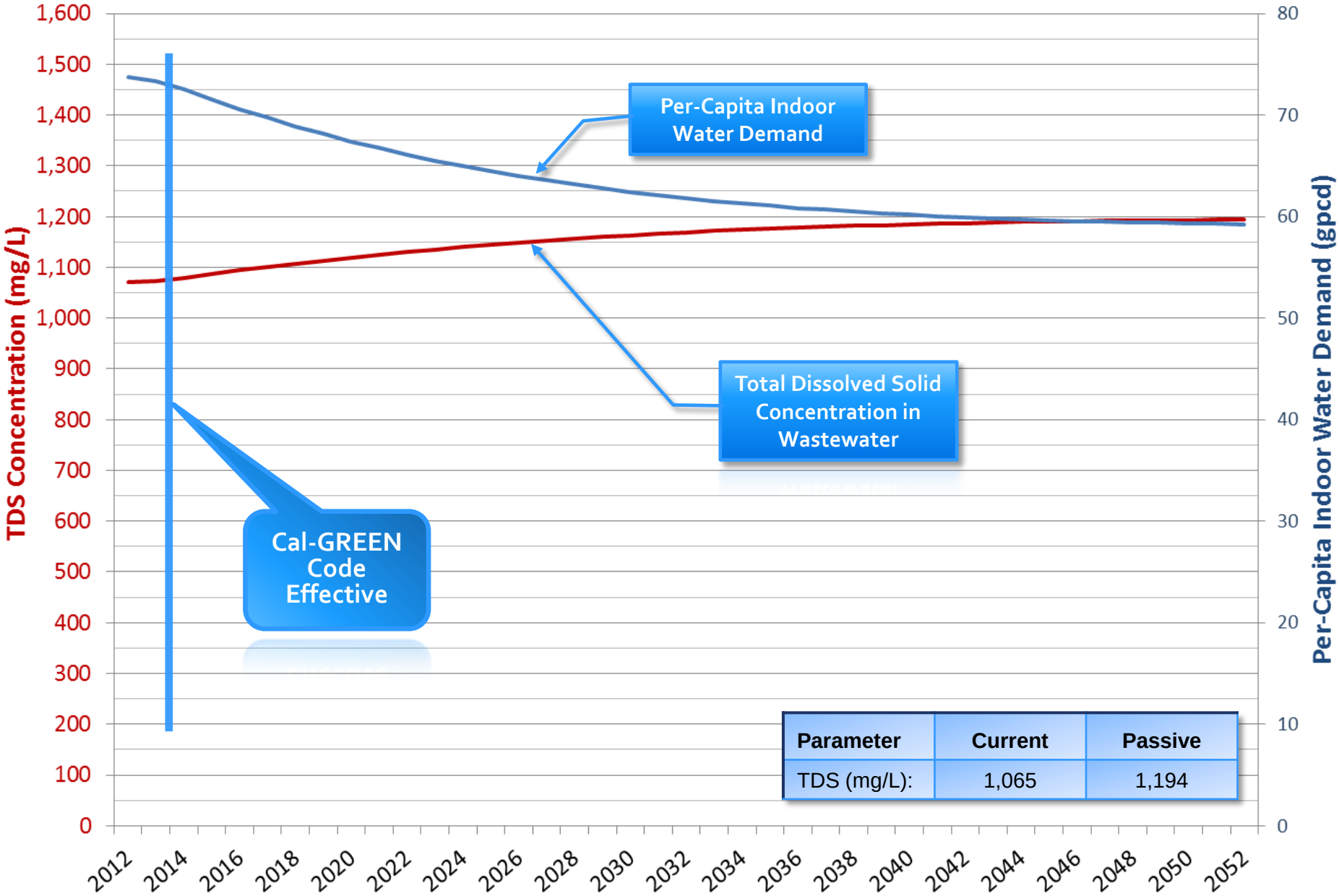
Key Model Assumptions

- **Used AWE Model default value (could be low) for indoor savings associated with water meters.**
- **City will sponsor intensive rebate program to help offset the cost impacts. So, it was assumed that:**
  - All water savings during meter installation attributed to meter savings value from the Model
  - Lag between installation effect and achieving water savings
  - Incremental effect of active rebate programs starts after water meter installation effects end
  - Utilized standard AWE Model values and appliance replacement rates for passive conservation.


Indoor Per-Capita Water Demands Utilizing Different Scenarios
Per Capita Indoor Water Use (gpcd)
80
70
60
50
40
30
20
10
0
2012
2014
2016
2018
2020
2022
2024
2026
2028
2030
2032
2034
2036
2038
2040
2042
2044
2046
2048
2050
2052
Scenario B
Plumbing Code
Scenario A
"BAT"
Average
Efficiencies
Cal-GREEN
Code
Effective

Estimated Per-Capita Indoor Demand and TDS Concentration

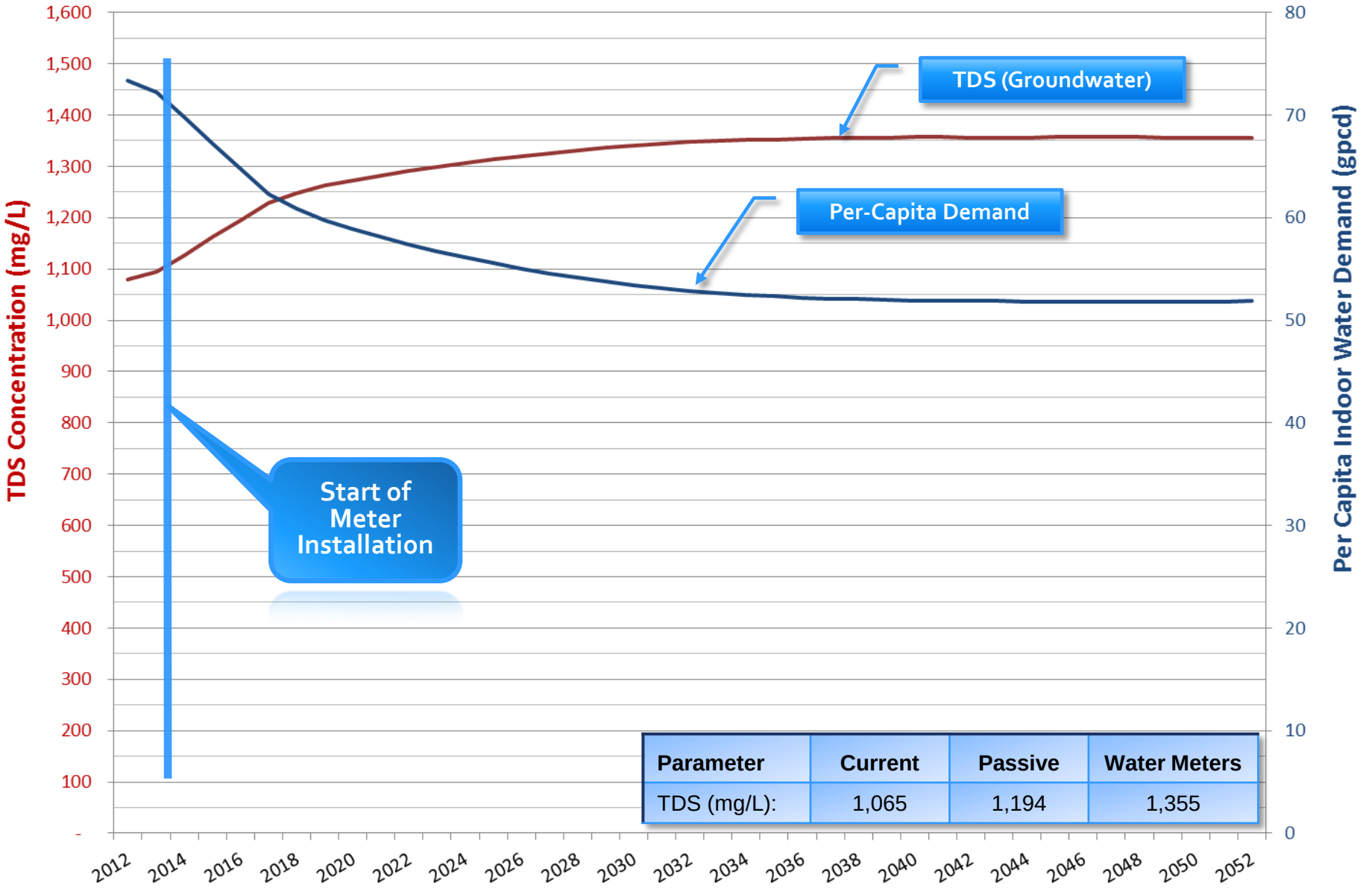
Passive Conservation



Parameter	Current	Passive
TDS (mg/L):	1,065	1,194

Estimated Per-Capita Indoor Demand and TDS Concentration

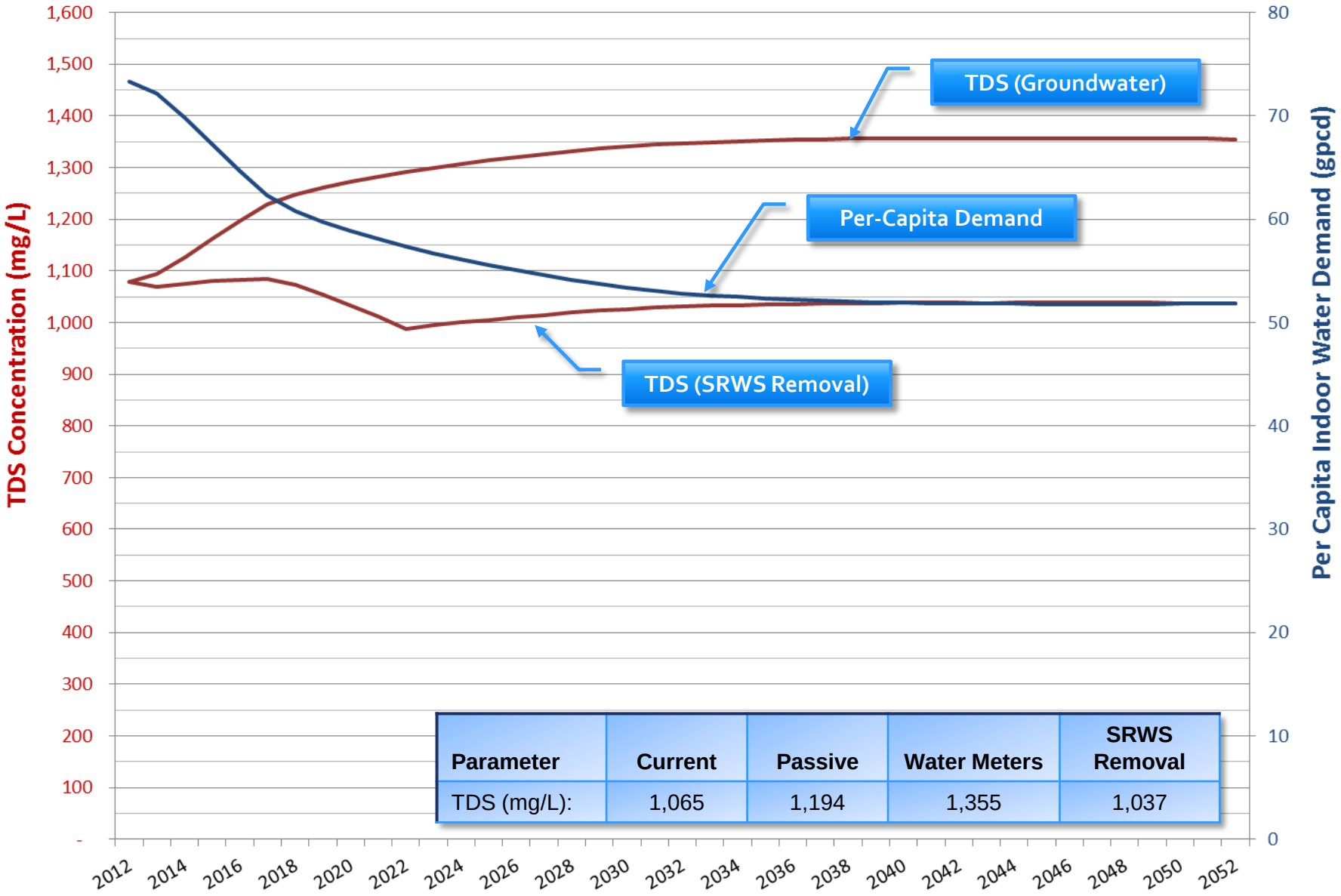
Passive Conservation plus Water Meters



Parameter	Current	Passive	Water Meters
TDS (mg/L):	1,065	1,194	1,355

Estimated Per-Capita Indoor Demand and TDS Concentration

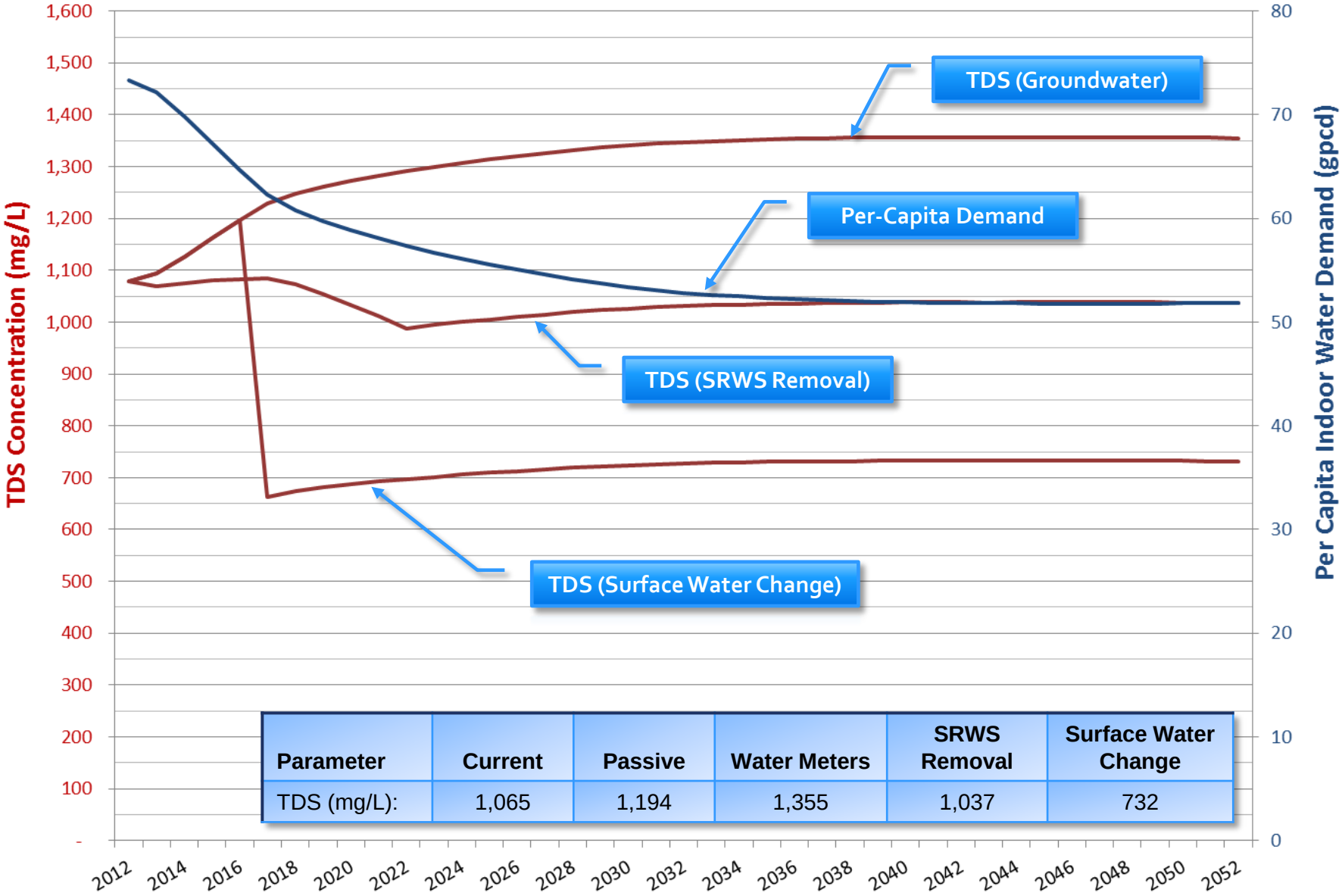
Removal of SRWS and Conversion to Surface Water



Parameter	Current	Passive	Water Meters	SRWS Removal
TDS (mg/L):	1,065	1,194	1,355	1,037

Estimated Per-Capita Indoor Demand and TDS Concentration

Removal of SRWS and Conversion to Surface Water



Parameter	Current	Passive	Water Meters	SRWS Removal	Surface Water Change
TDS (mg/L):	1,065	1,194	1,355	1,037	732

Is Surface Water Enough?

- The TDS concentration is still more than Agricultural Water Quality Goal (~730 vs. 450 mg/L).

Parameter	Agricultural WQ Goal[1]	Secondary MCL[3]	Effluent	
			Avg	Max
EC (µmhos/cm)	700[2]	900, 1600, 2200	1562	1844
TDS (mg/L)	450[2]	500, 1000, 1500	1042	1256
Boron (µg/L)	700	N/A	2540	3400
Sulfate (mg/L)	N/A	250, 500, 600	N/A	N/A
Chloride (mg/L)	106[2]	250, 500, 600	N/A	N/A

- In this case, the boron source is from groundwater.

Salinity Control Options for City

Activity	Status
New Water Supply Project	In design, on-line in 2017
Ordinance banning SRWS for new construction	Passed in 2007
Public Education	On-going
Control of Existing SRWS per AB 1366	Consider after Water Supply Project is online
Enforcement of specific dischargers per new Pretreatment Ordinance	Consider after Water Supply Project is online and 2013 NPDES Permit limits known.

Summary

- **Cost effectiveness of water conservation is not necessarily tied to the offset wastewater treatment, especially for communities:**
  - With high TDS source water and
  - Discharge to agricultural ditches, land, or other salt sensitive locations
- **AB1366 and the regulation of SRWS may be inadequate to reduce residential wastewater salinity even with the regulation of regeneration facilities as SIUs.**
- **Future wastewater and water conservation regulations will only make the situation more difficult.**

Thank you

Any Questions?

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References

1. AWE, 2011. Alliance for Water Efficiency Water Conservation Tracking Tool, Version 2.0, released August 2011.
2. DeOreo, William B., 2011. *California Single Family Water Use Efficiency Study*, dated 20 April 2011.
3. DeOreo, William B., 2011. *Water Efficiency Benchmarks for New Single-Family Homes - Final Report*, dated 24 March 2011.
4. Mayer, Peter and DeOreo, William, et al., 1999. *Residential End Uses of Water*. American Water Resources Association Research Foundation, 1999.