This presentation premiered at WaterSmart Innovations

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Incorporating Water Conservation Into Water Demand Projections

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Erler & Kalinowski, Inc.

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Why Predict Water Demands?

- **Realistically estimate demand in light of supply pressures**
  - Adequacy of supply to meet demand
  - Planning for potential water restrictions
  - Determine need and opportunity for water conservation projects
  - Support capital improvement projects
  - Revenue projections

Source: http://commons.wikimedia.org/wiki/File:Crystal_ball.jpg

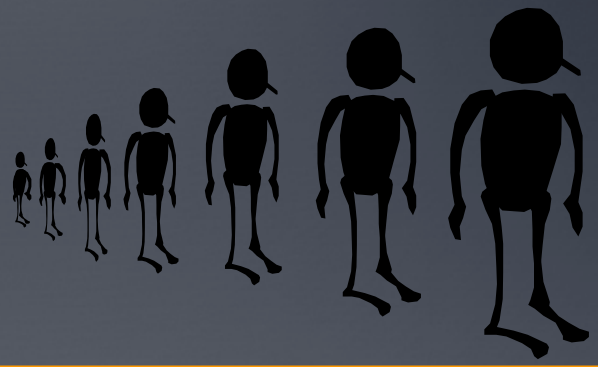
Why Predict Water Demands?

- **California Regulatory Requirements**
  - Urban Water Management Planning Act
    - Must project system's water demand and supplies over 20-year period, in 5-year increments
    - Eligibility for state water management grants and loans
  - SB-610 Water Supply Assessments
    - Must project project's and system's water demands over 20-years period, in 5-year increments
    - Required for most CEQA EIR projects

Source: http://mgallolaw.com/gavel.jpg

Basic Approaches

- **Long-Term Demand:**
  - Population-based
  - Land Use-based



Step 1: Determine Baseline Water Use

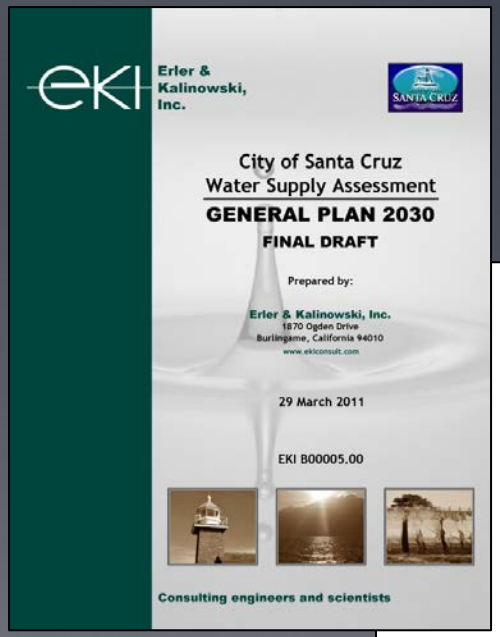
Step 2: Scale Up Baseline Water Use by Either Population Growth or Changes in Land Use

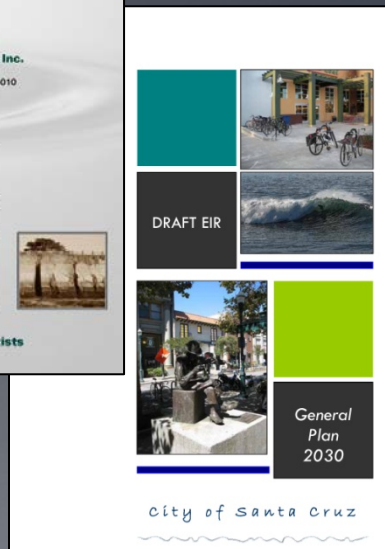
Challenges to Basic Approach

- **Understanding your system's baseline water use, which may be affected by:**
  - historical water use trends
  - recent policy changes
  - plumbing and building code changes
  - economic factors
  - weather patterns
  - behavioral changes
  - water service rates
  - water conservation programs

Case Study: City of Santa Cruz WSA

- **Water Supply Assessment ("WSA") done in close collaboration with the City**
- **Support EIR for General Plan 2030 Update**
- **City opted to prepare a WSA for water supply planning purposes**
- **Very limited water supply**





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City of Santa Cruz Water Service Area

- **Central Coast of California, approximately 75 miles south of San Francisco**
- **Approximately 30 square miles**
- **Serves approx. 90,000 people**

Source: City of Santa Cruz, *Draft Environmental Impact Report, City of Santa Cruz General Plan 2030,* September 2011.

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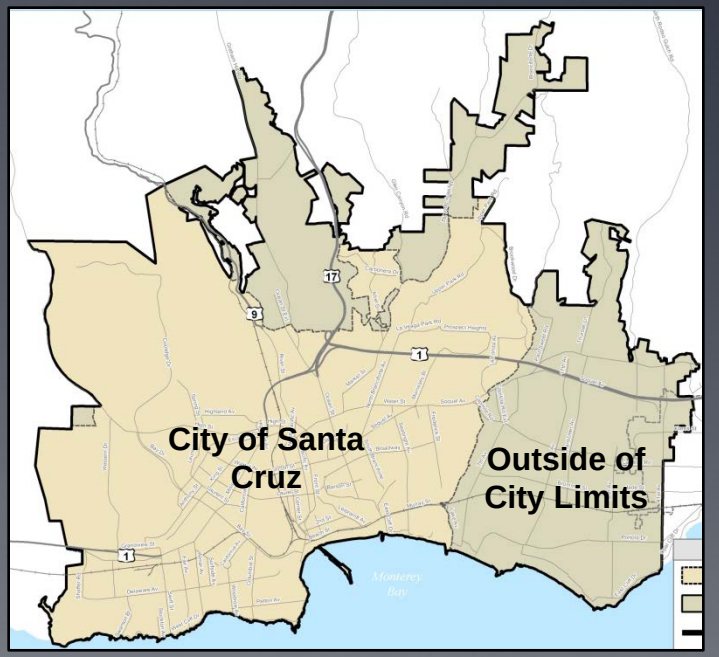
City of Santa Cruz Water Service Area

- **Is largely built out**
- **Very limited water supply**
- **Has a conservation-oriented population**
- **Active water conservation program since 2000**



Source: EKI, *City of Santa Cruz Water Supply Assessment, General Plan 2030,* 29 March 2011.

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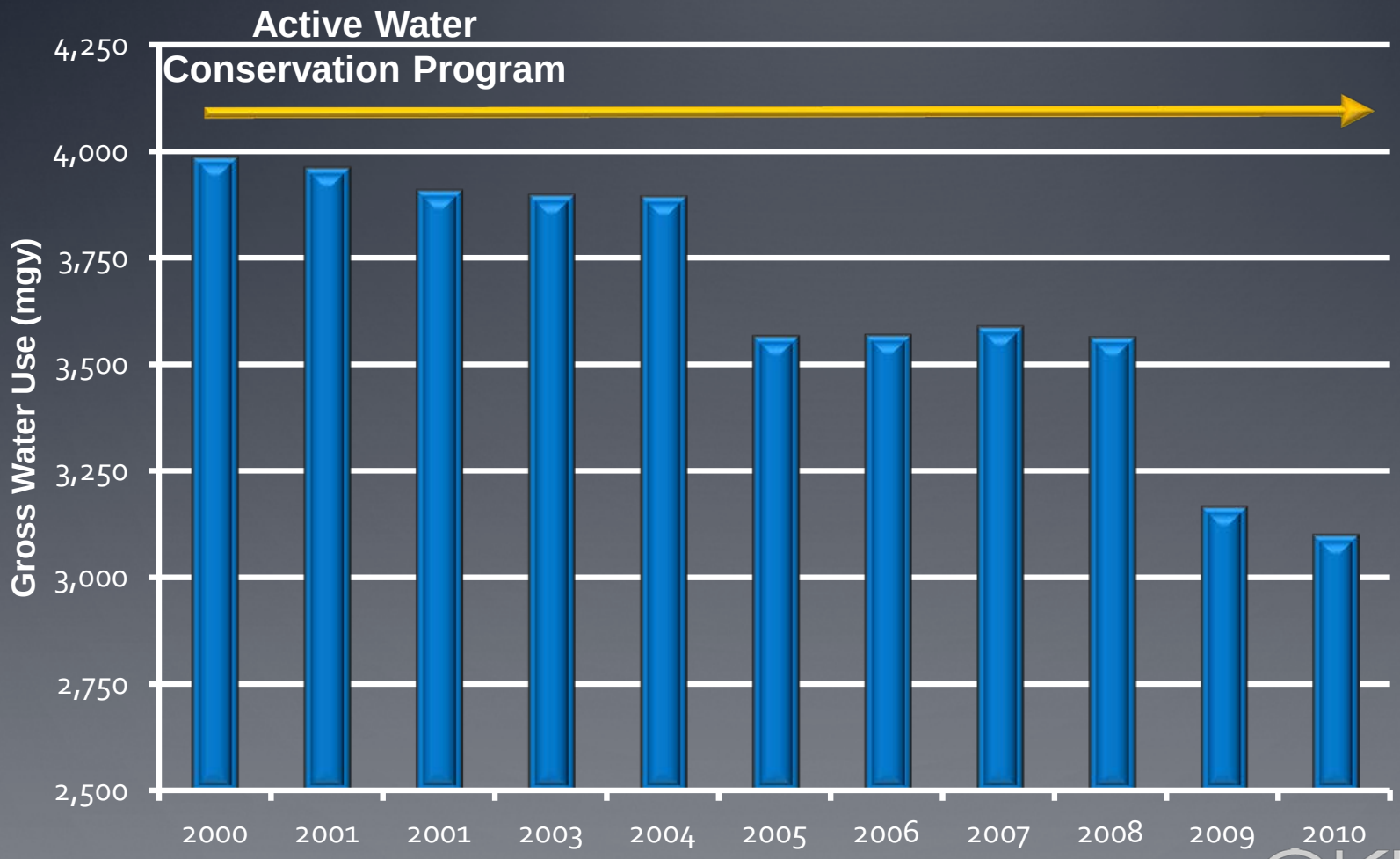
Santa Cruz Water Conservation Programs

- **Water Conservation Plan adopted in 2000**
  - Budget: ~$500K - $600k per year
  - Point of sale plumbing retrofit requirements (residential, commercial, and industrial buildings)
  - Plumbing fixture and appliance rebates
  - Residential water surveys
  - Water-smart gardening education program
  - Green business certification program
  - School education program
  - Water waste regulations

Gross Water Use 2000 - 2010



Source: City of Santa Cruz, *Draft Environmental Impact Report, City of Santa Cruz General Plan 2030,* September 2011.

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Water Service Rate Restructuring

- **Implemented over five years: 2004 – 2009**

BLOCK NO.	INSIDE CITY MONTHLY	OUTSIDE CITY BI-MONTHLY
Block 1: Essential Needs Units per billing period:	$ 1.57 1 to 4 units	$ 2.00 1 to 8 units
Block 2: Average Indoor Needs Units per billing period:	$ 4.00 5 to 9 units	$ 5.10 9 to 18 units
Block 3: Average Outdoor Needs Units per billing period:	$ 5.14 10 to 14 units	$ 6.55 19 to 28 units
Block 4: High Use (up to 200% of average use) Units per billing period:	$ 7.05 15 to 18 units	$ 8.98 29 to 36 units
Block 5: Inefficient Use Units per billing period:	$ 8.79 over 18 units	$11.21 over 36 units
Coast Irrigation:		$ 1.27
For All Other Customers:	$ 4.00	$ 5.10
Elevation Surcharge:	$ 0.20	$ 0.20

Current water rates (effective 1/1/2011)

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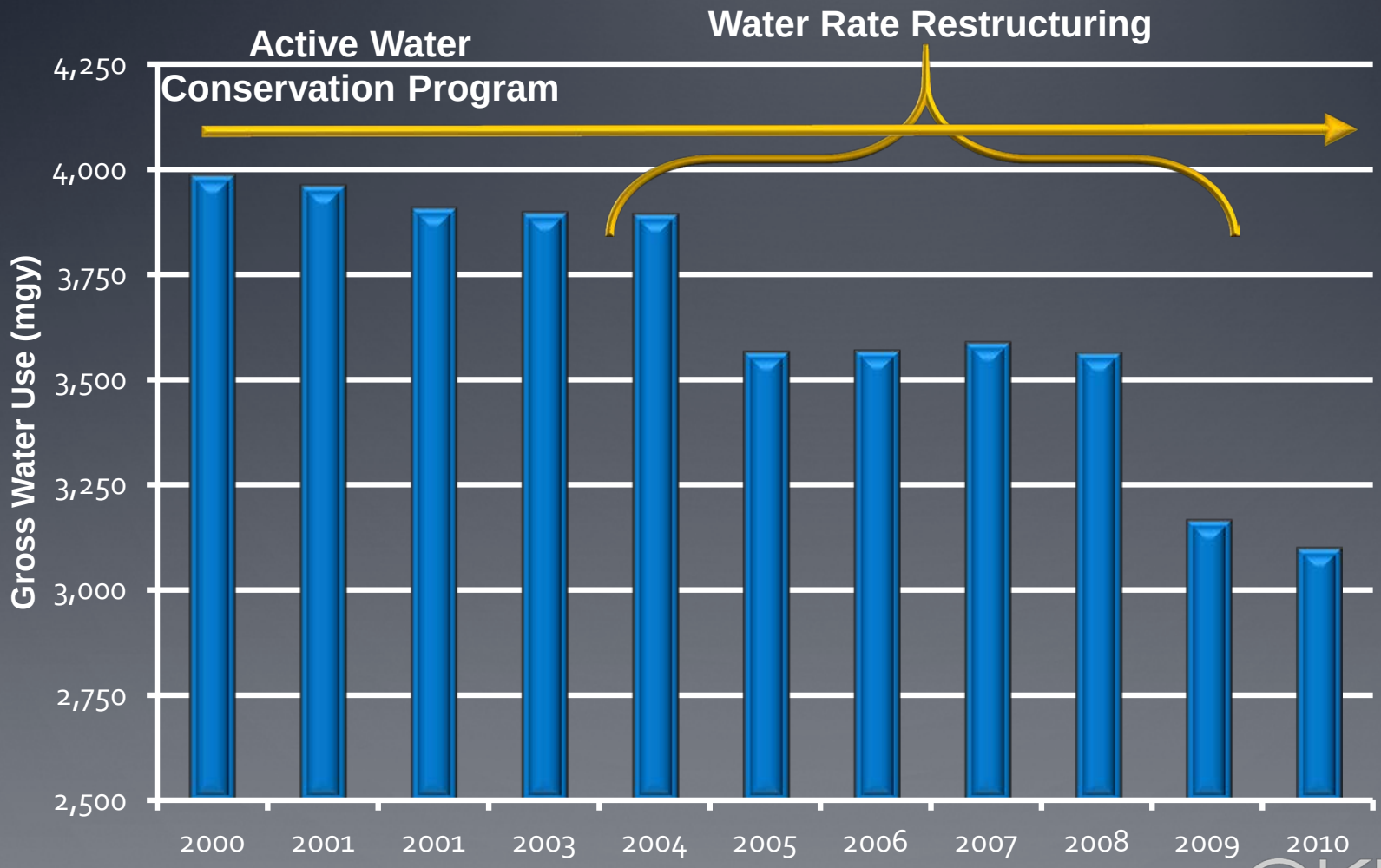
Gross Water Use 2000 - 2010



Source: City of Santa Cruz, *Draft Environmental Impact Report, City of Santa Cruz General Plan 2030,* September 2011.

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2008 Economic Downturn

- **Decreased commercial and industrial activities**
- **People opting to use less water to save money**
- **Behavioral pattern changes**

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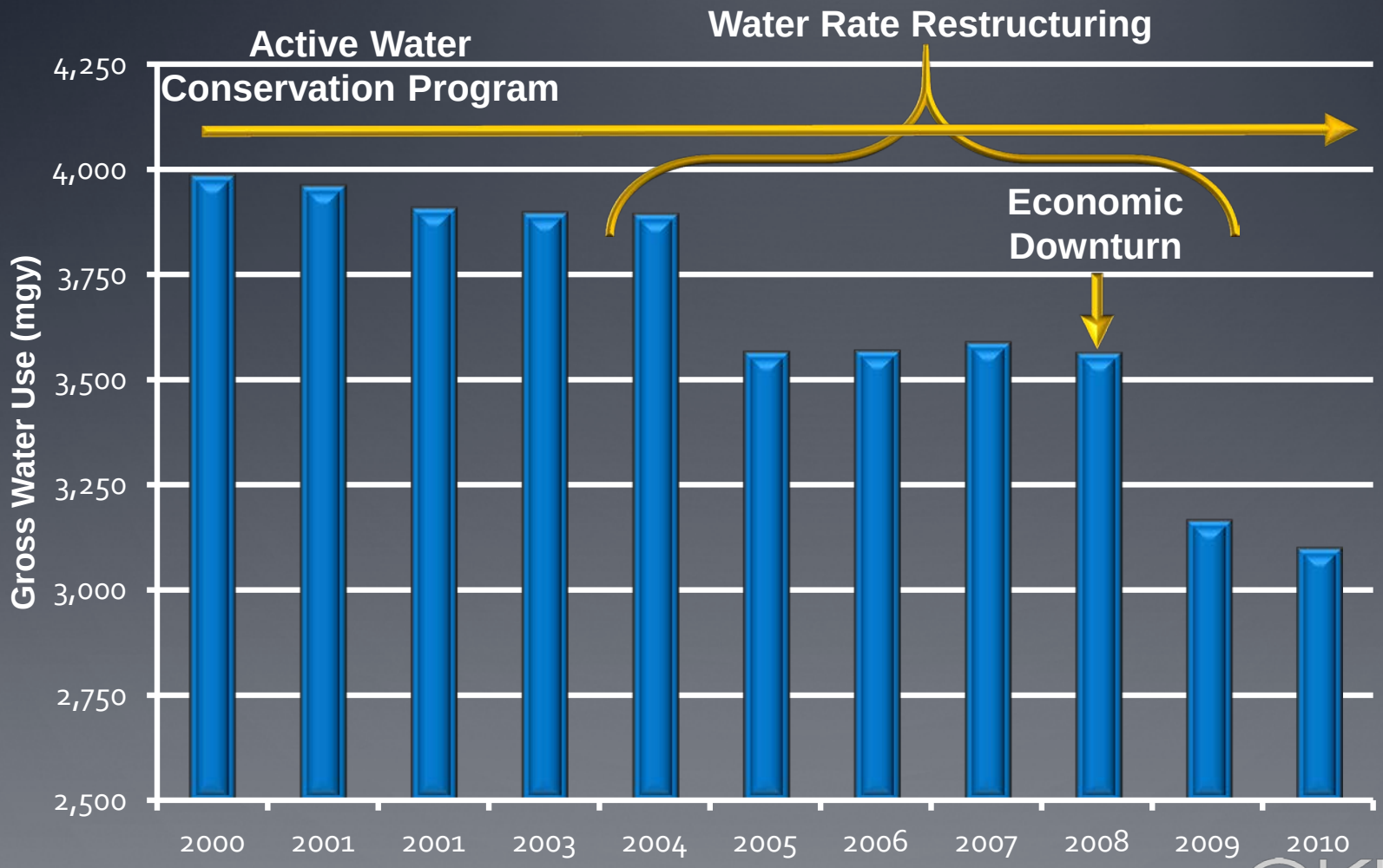
Gross Water Use 2000 - 2010



Source: City of Santa Cruz, *Draft Environmental Impact Report, City of Santa Cruz General Plan 2030,* September 2011.

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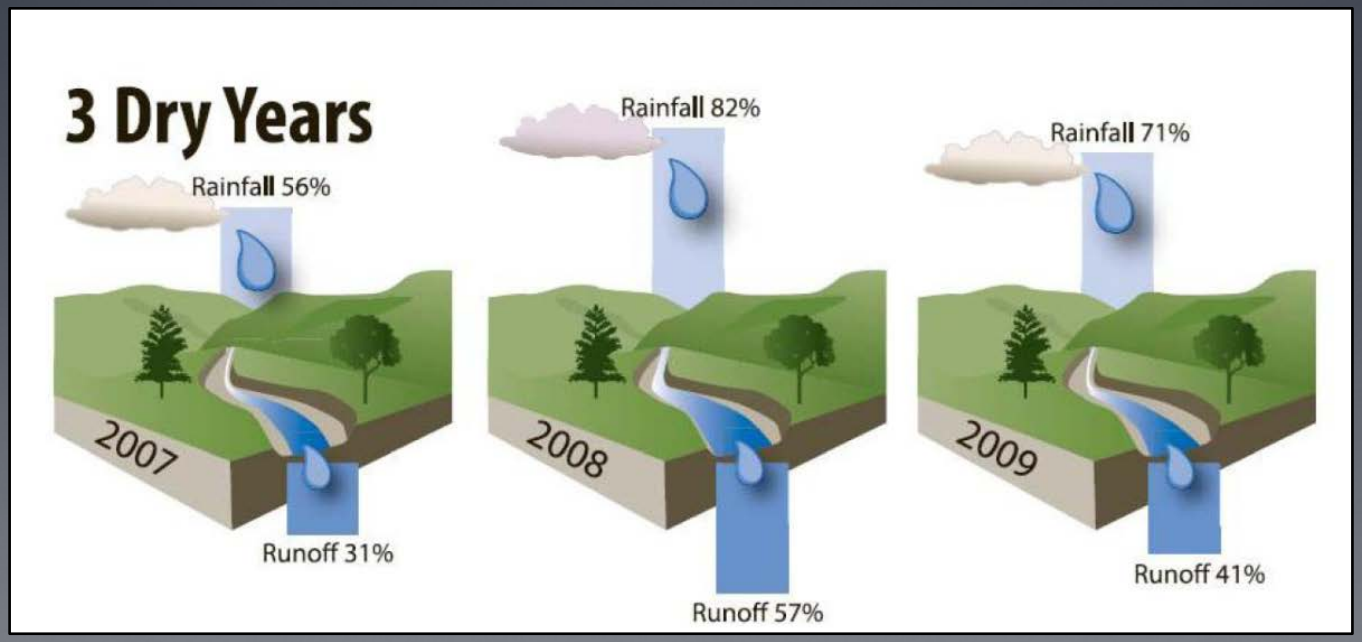
Prolonged Regional Drought

- **Drought: 2007 through 2009**
- **Water restrictions imposed in 2009**



Source: City of Santa Cruz, *The 2009 Water Shortage, An Evaluation of Water Management Strategies, Actions, and Results,* December 2010.

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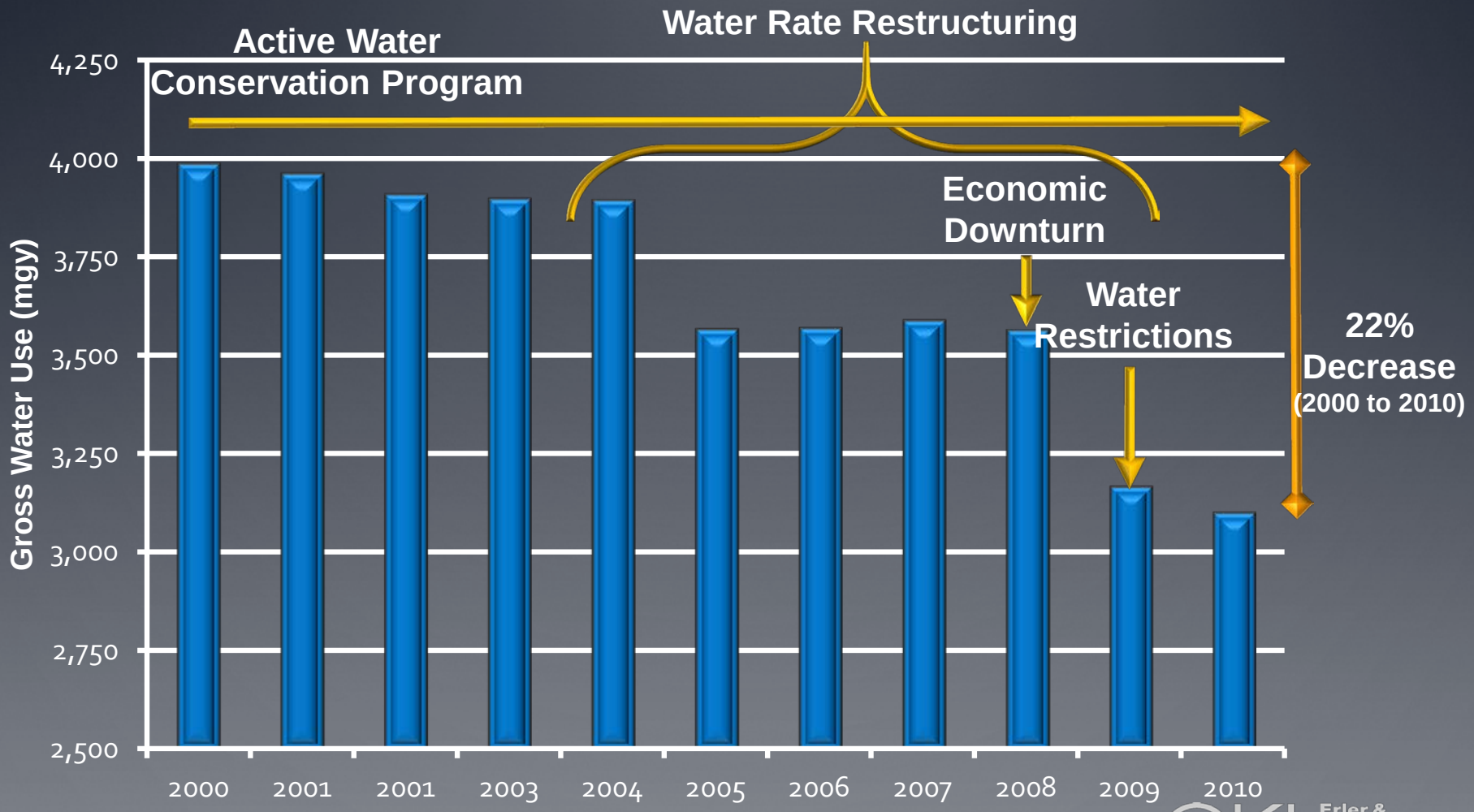
Gross Water Use 2000 - 2010



Source: City of Santa Cruz, *Draft Environmental Impact Report, City of Santa Cruz General Plan 2030,* September 2011.

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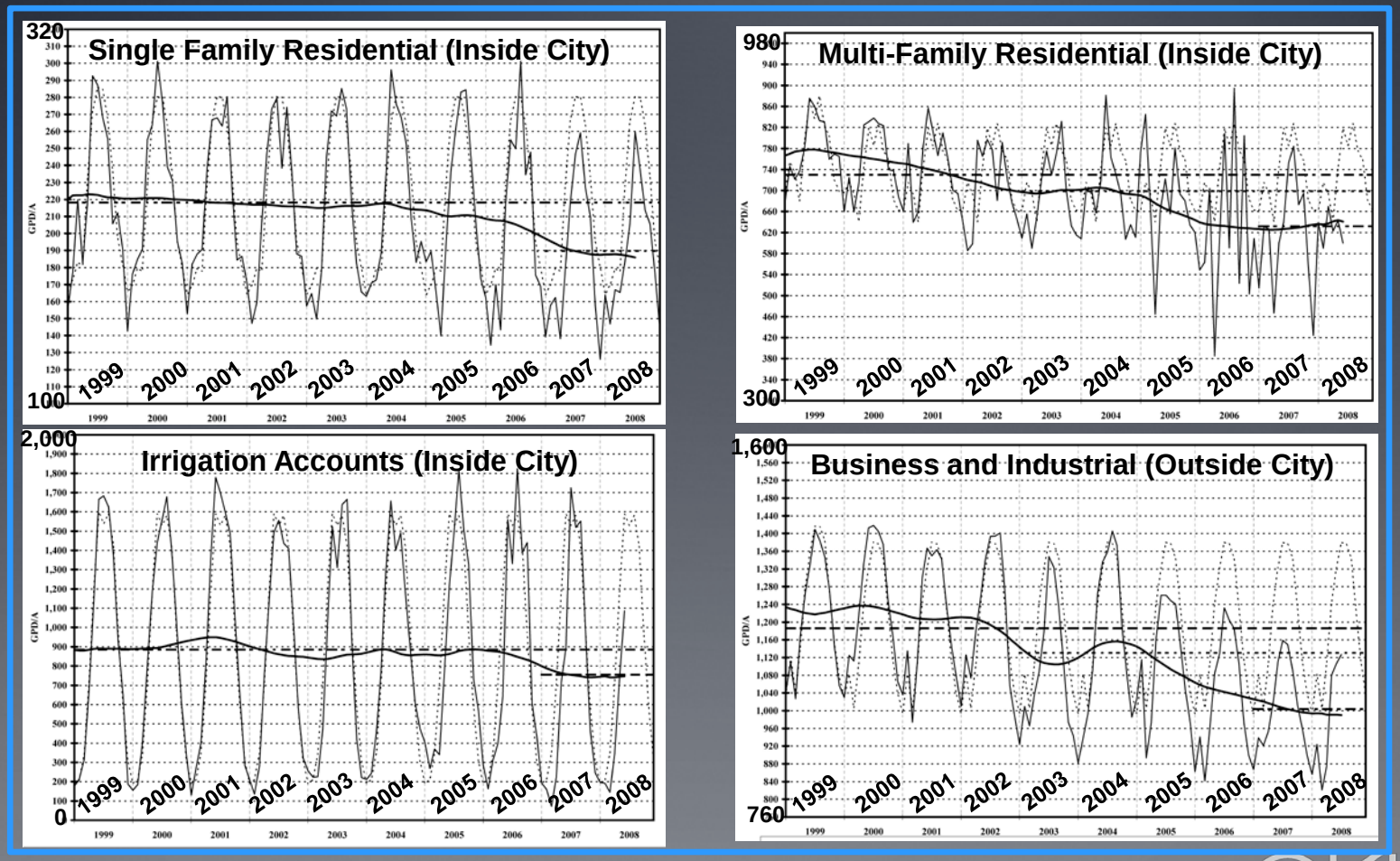
Understanding Baseline Water Use

- **The City maintains a model that tracks water demand by account type (inside and outside of the city limits)**
  - Weather normalized water use - based on seasonal index
  - Based on data dating back to 1983 for most consumer groups

Weather-Normalized Demand by Account Type



Additional account types are tracked by the City, not shown here. Source: *Provided by the City of Santa Cruz, October 2010.*

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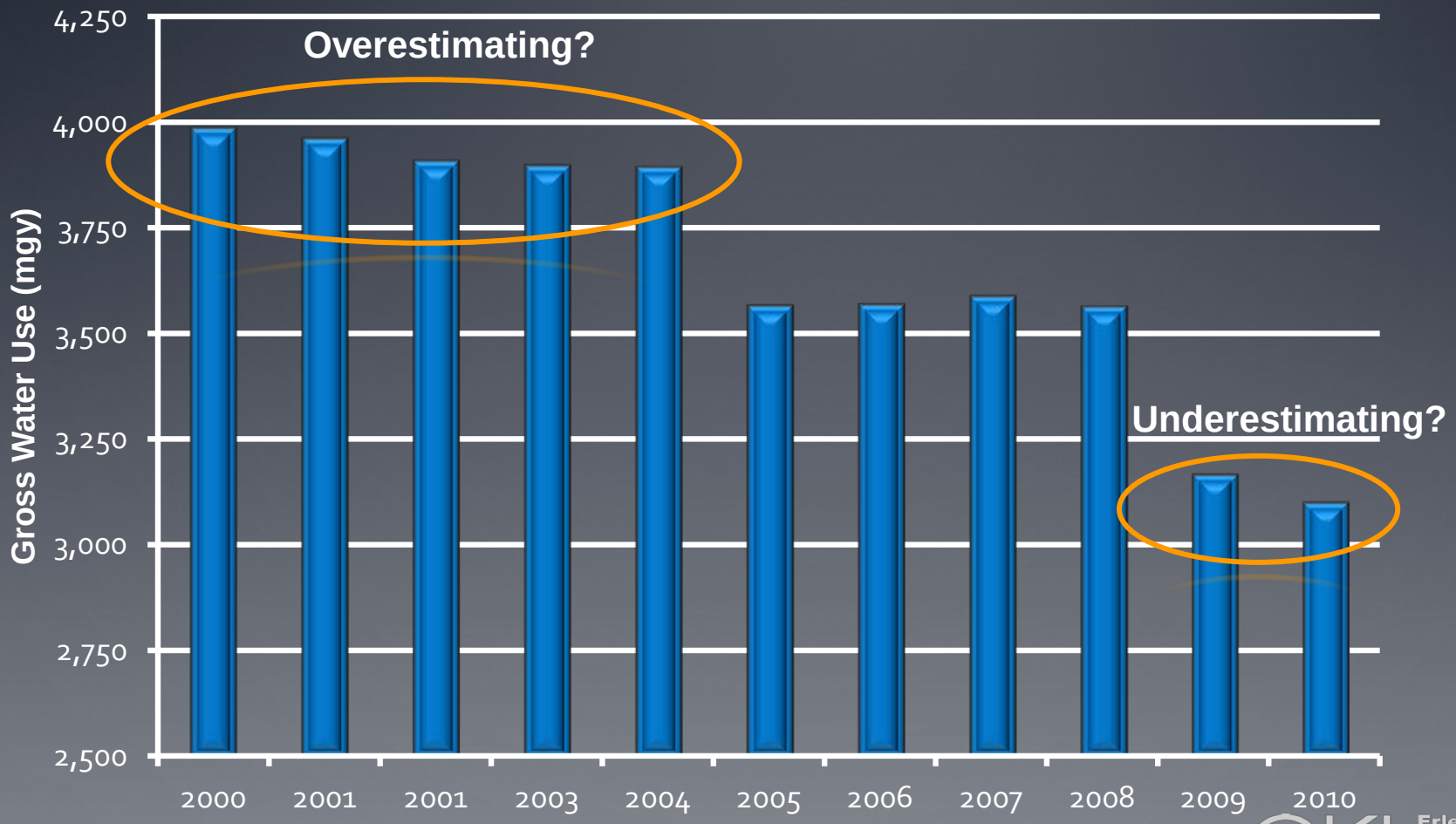
Understanding Baseline Water Use

- **Do not have enough information to discern:**
  - Degree to which each of these factors are affecting water use
  - Degree to which the effects are permanent

Gross Water Use 2000 - 2010



Source: City of Santa Cruz, *Draft Environmental Impact Report, City of Santa Cruz General Plan 2030,* September 2011.

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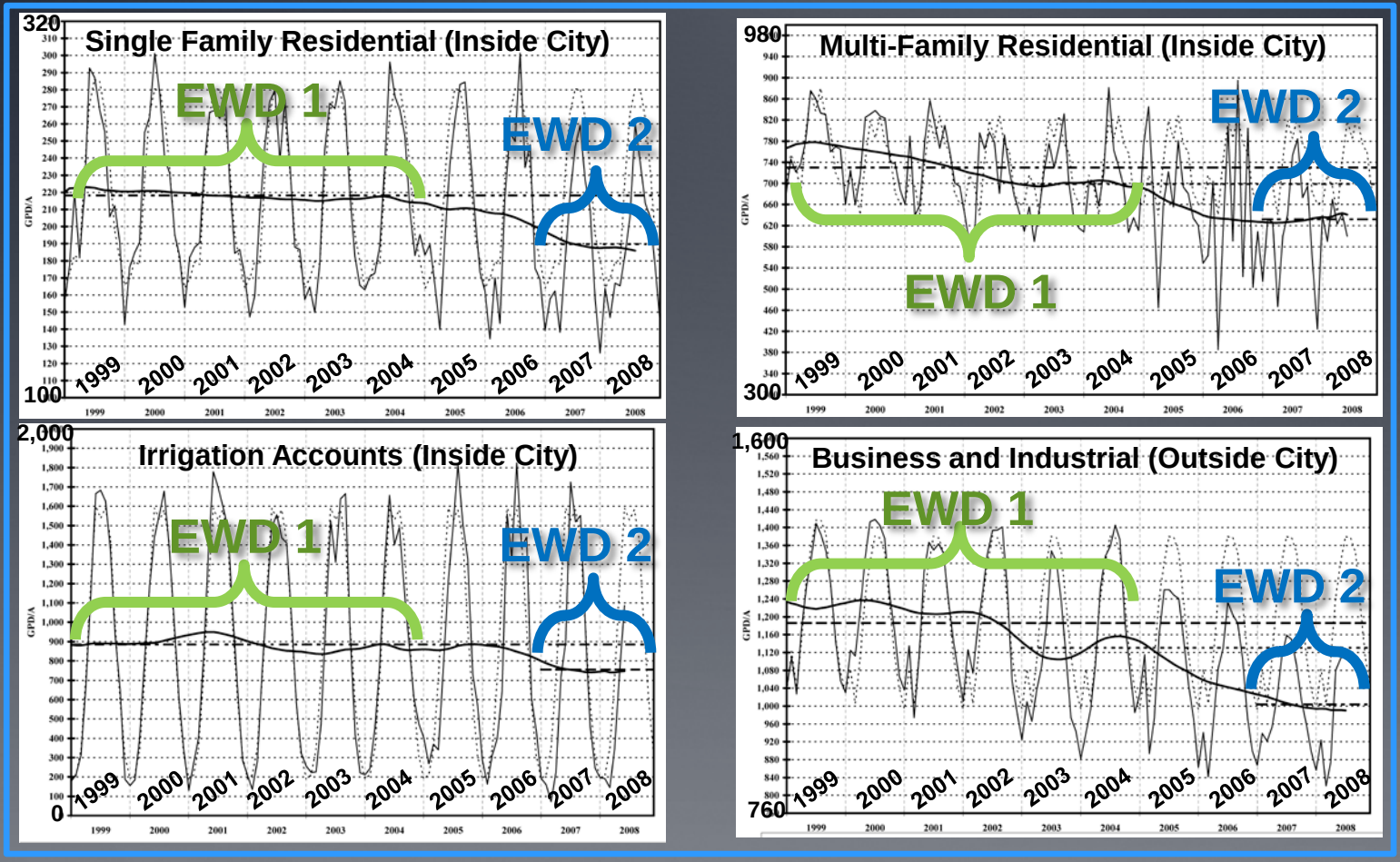
Choose **Two** Baselines

- **Existing Water Demand ("EWD") Estimate 1 – 1999 through 2004**
  - Extended period of stable water use before the onset of the economic downturn, drought conditions, and water billing rate increases
- **EWD Estimate 2 – 2007 through 2008**
  - Reflects water usage incorporating 3 water use depressors, prior to water restrictions

Weather-Normalized Demand by Account Type



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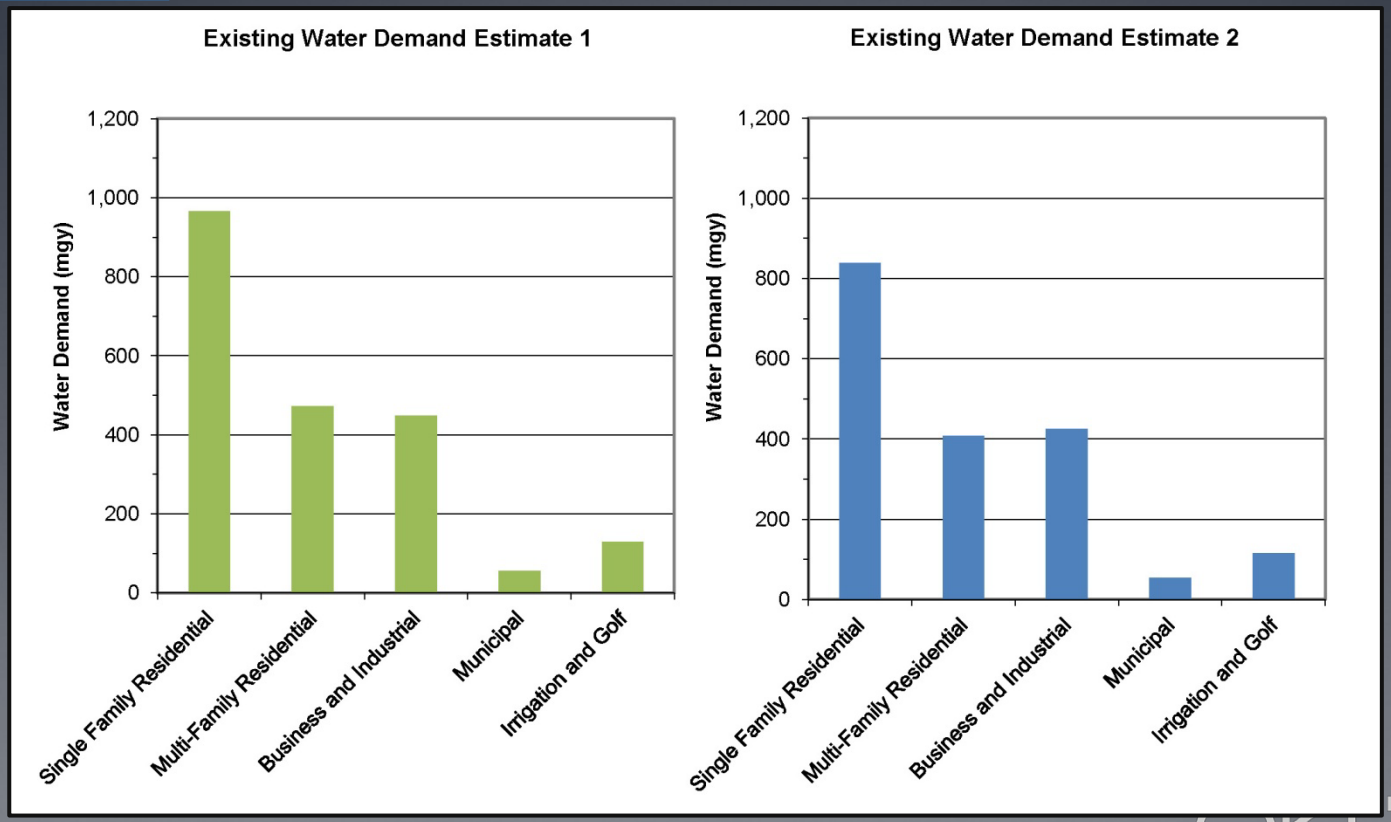
Project Increased Demand: Land Use

Calculate 2 Baseline Water Use Scenarios



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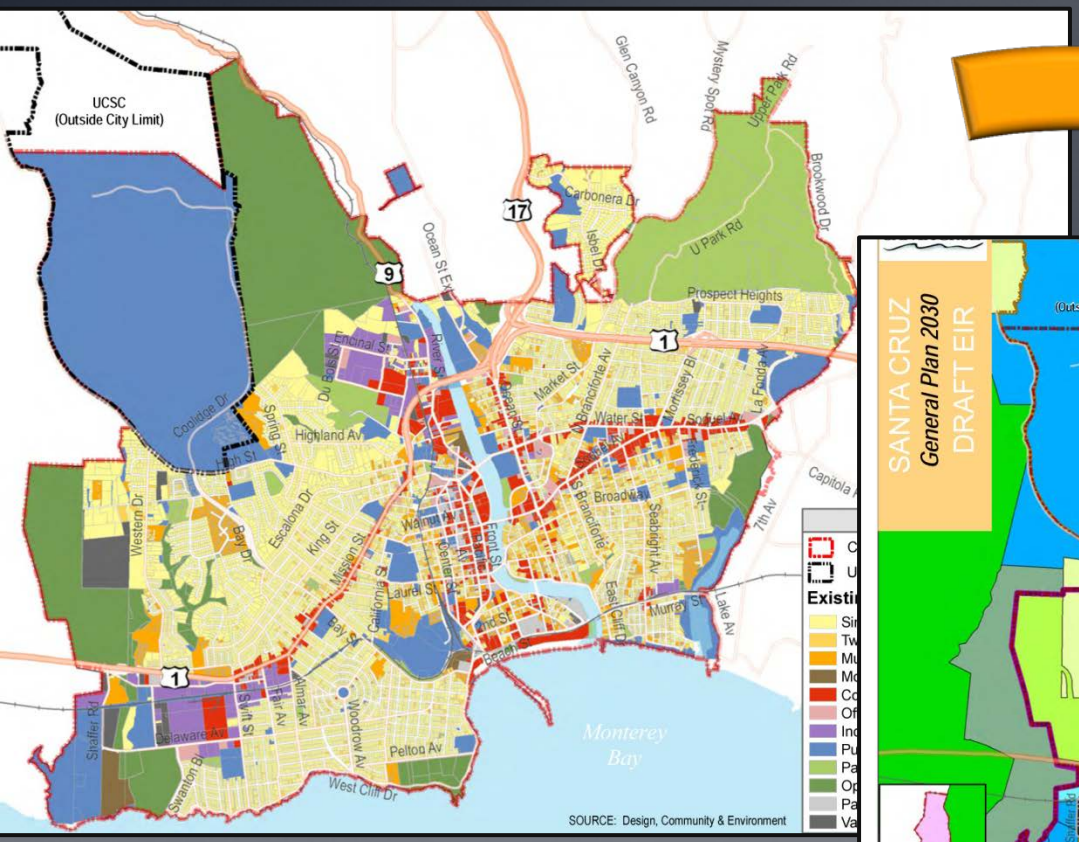
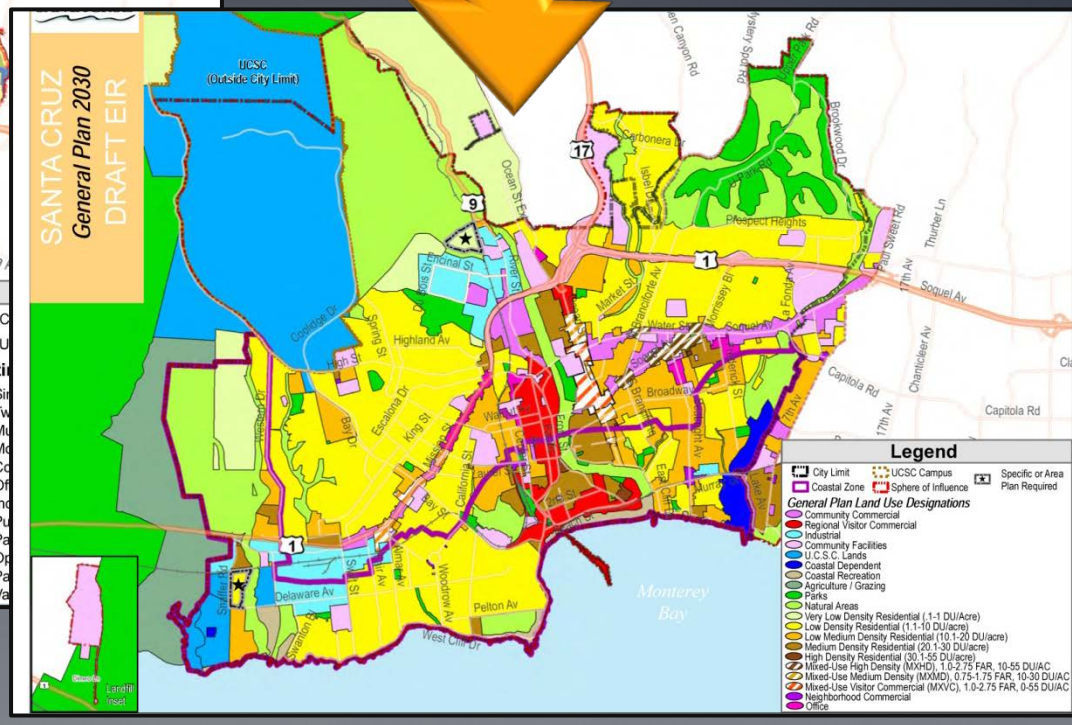
Project Increased Demand: Land Use





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Project Increased Demand: Land Use

- **General Plan 2030 Proposed Buildout**
  - 3,350 residential units
  - 1,087,983 square feet of commercial development
  - 311 hotel rooms
  - 1,273,913 square feet of office space
  - 776,926 square feet of industrial development

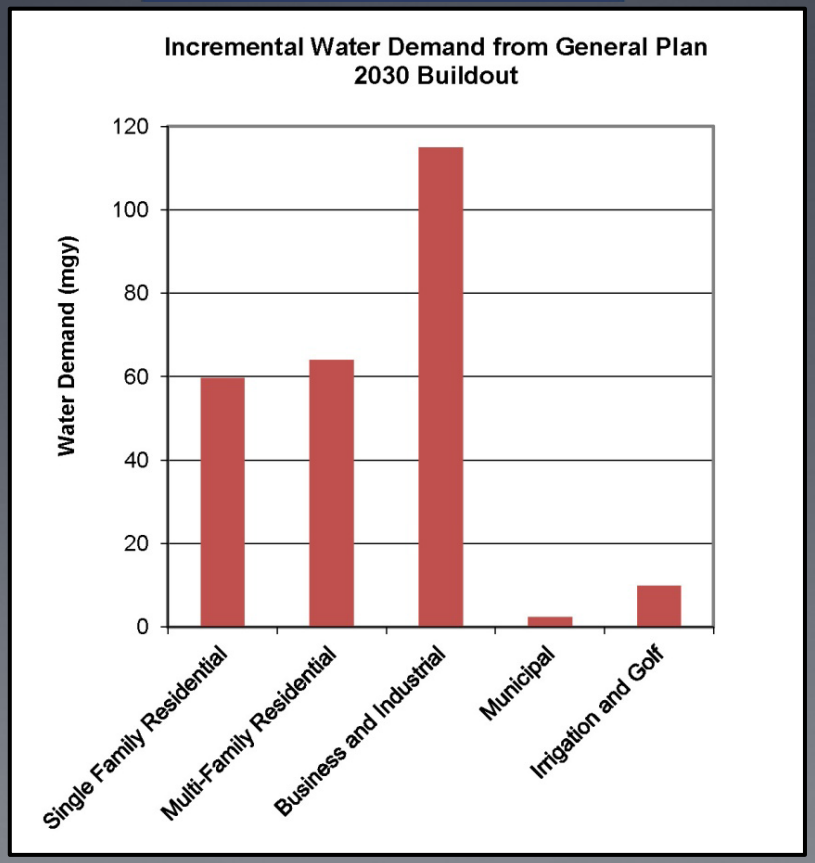
Project Increased Demand: Land Use

Calculate 2 Baseline Water Use Scenarios → **Determine water use factors**

Account Type	Water Factor
Single Family Residential	196 gpd/du
Multi-Family Residential	70 gpd/du
Business and Industrial	
Commercial	66 gpy/sq ft
Hotel	93 gpd/room
Office	18 gpy/sq ft
Industrial (light)	12 gpy/sq ft
Municipal	2 mgy
Irrigation and Golf	Relative to other development (+12%)

Project Increased Demand: Land Use

Calculate 2 Baseline Water Use Scenarios → **Determine water use factors** → **Apply water factors to General Plan Buildout Projection**



Source: EKI, *City of Santa Cruz Water Supply Assessment, General Plan 2030,* 29 March 2011.

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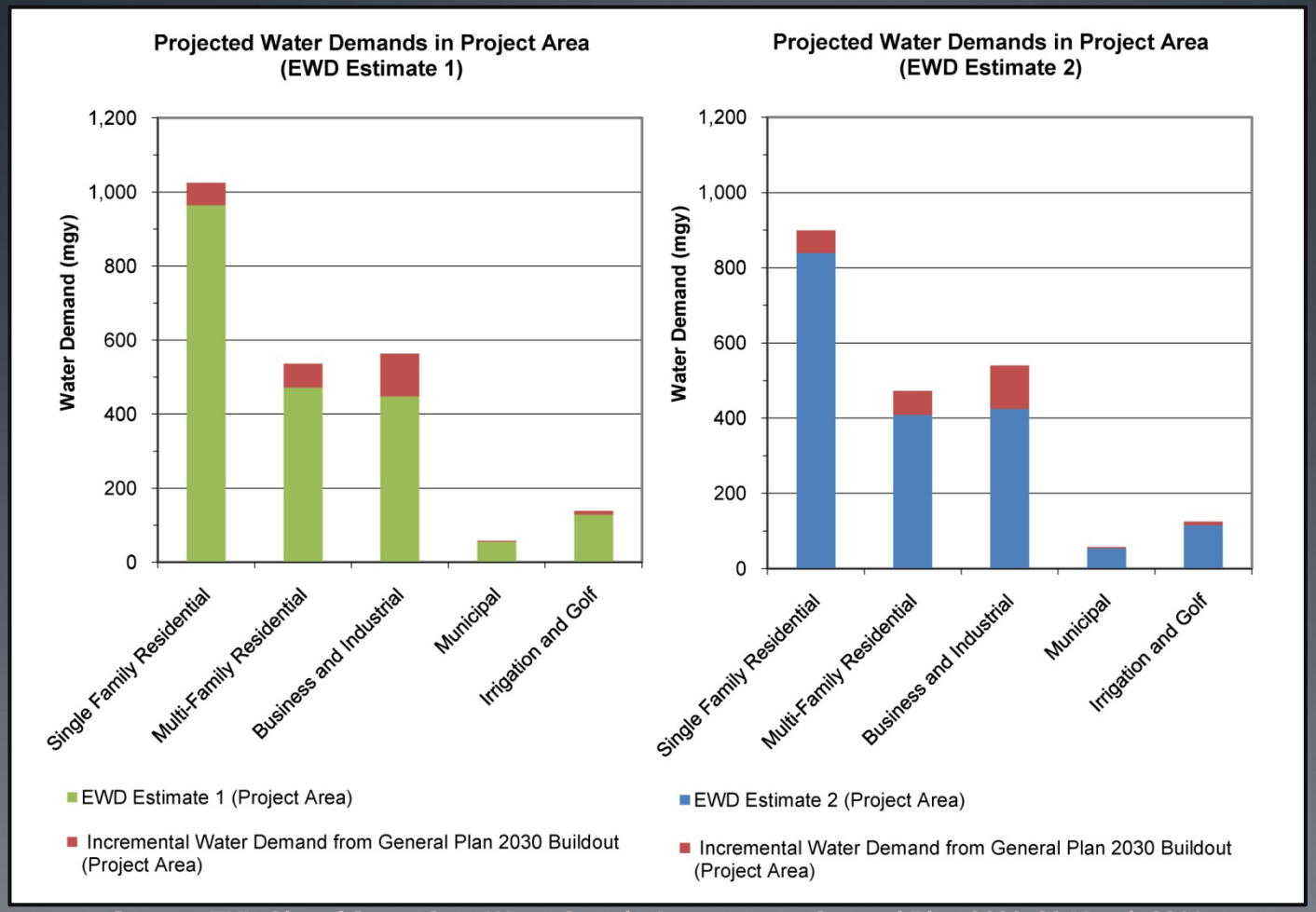
Estimated Water Demand at General Plan Buildout



Source: EKI, *City of Santa Cruz Water Supply Assessment, General Plan 2030,* 29 March 2011.

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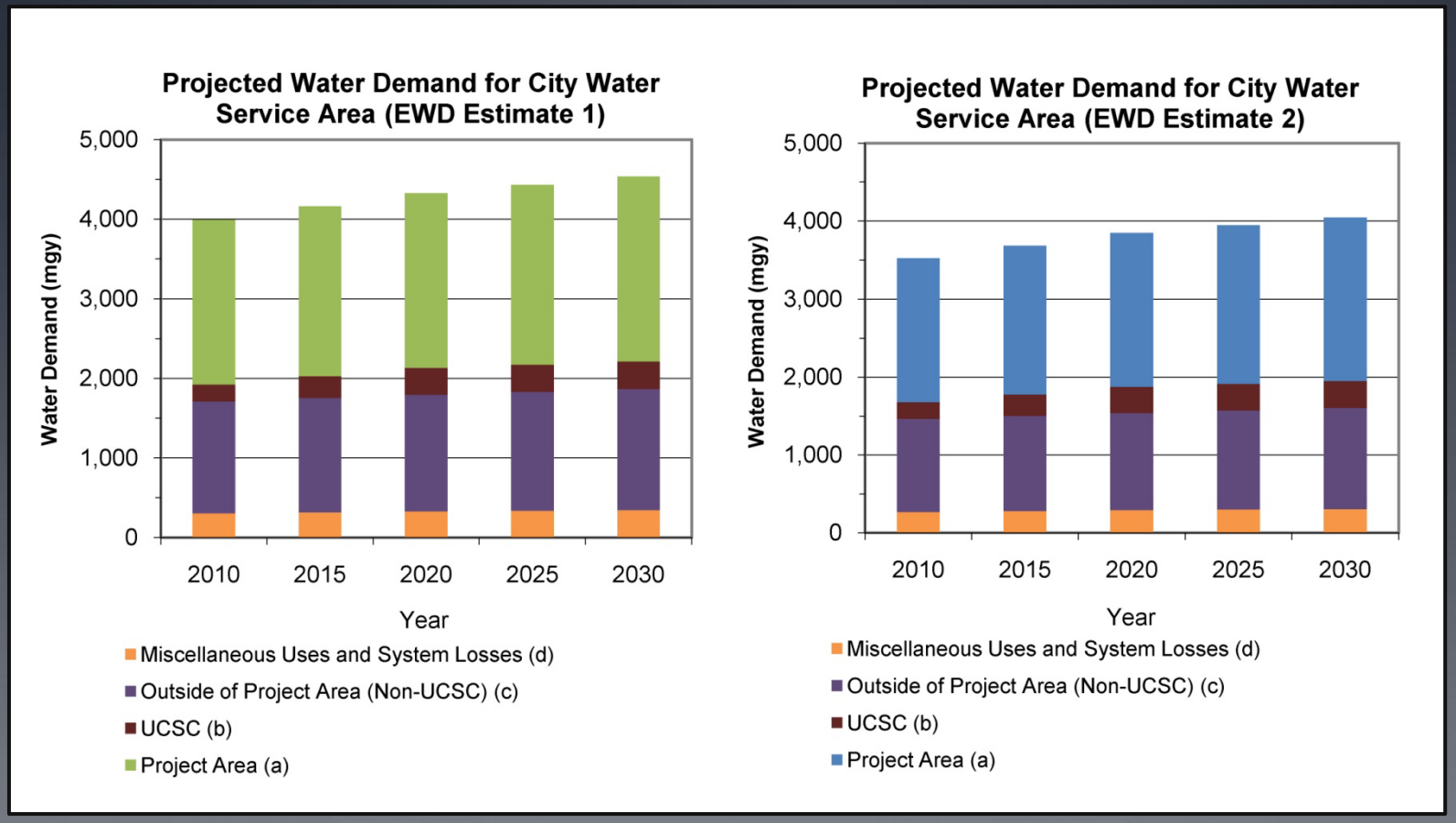
Projected Water Demand



Source: EKI, *City of Santa Cruz Water Supply Assessment, General Plan 2030,* 29 March 2011.

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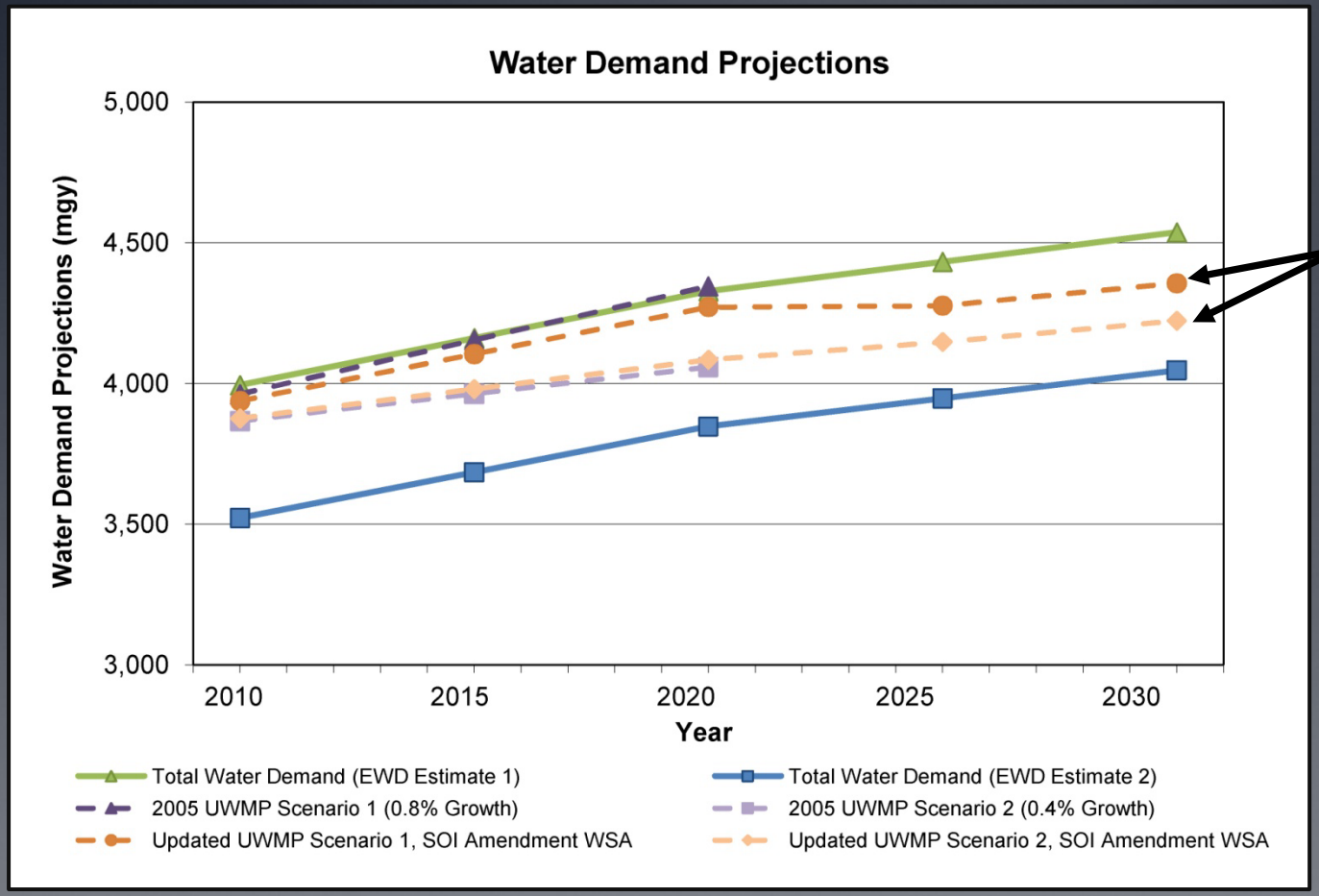
Comparison to Previous Demand Projections



Previous Population-Based Projections

Source: EKI, *City of Santa Cruz Water Supply Assessment, General Plan 2030,* 29 March 2011.

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Benefits to Projecting a Range of Potential Water Demand

- **Conservative for EIR purposes**
- **Reflects the high degree of uncertainty**
- **Inform risk-decisions on multi-million dollar capital improvement project**
- **Because of conservation program history, we assume a high degree of demand hardening and little opportunity for passive conservation savings**

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End-Use Modeling Approaches

- More sophisticated
- Account for passive conservation
- Incorporate demand hardening
- End-use models, evaluate conservation program potential
- Strength of model depends on data availability

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End-Use Modeling Approaches

- **Matt Zucca (EKI) will be discussing a recent application of end-use modeling to incorporate water conservation for a new planned development in California**
  - Thursday 11:15am - 11:45am: Water Demand Forecasting for a Sustainable Residential Development in California

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Thank you

Any Questions?

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