



Residential Water Conservation:



Can linear regression help solve the problem of over-consumption?

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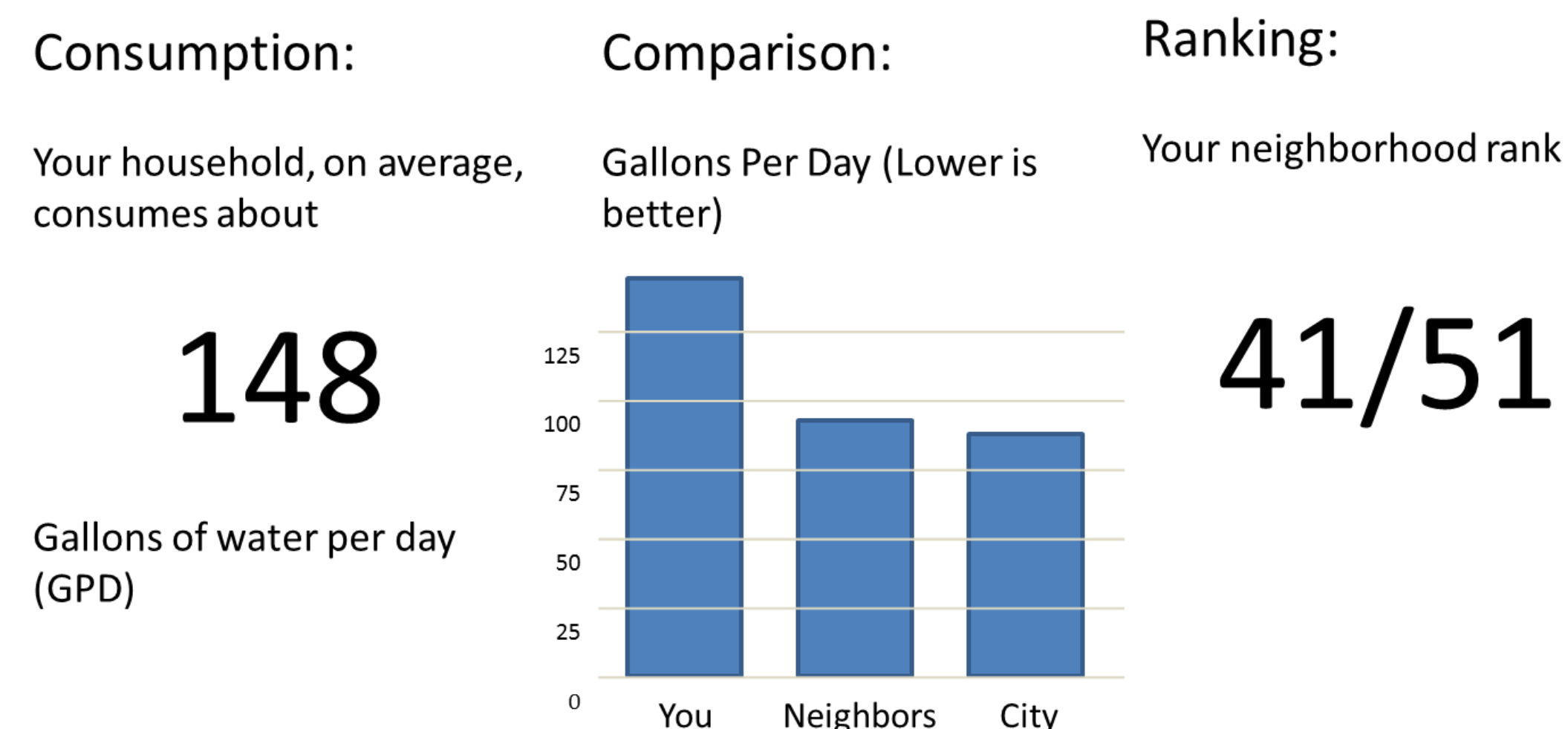
Problem

- Climate change and freshwater crisis
- Invisible infrastructure and the illusion of unlimited supply
- Low cost despite supply insecurity
- Summer 2012: widespread droughts

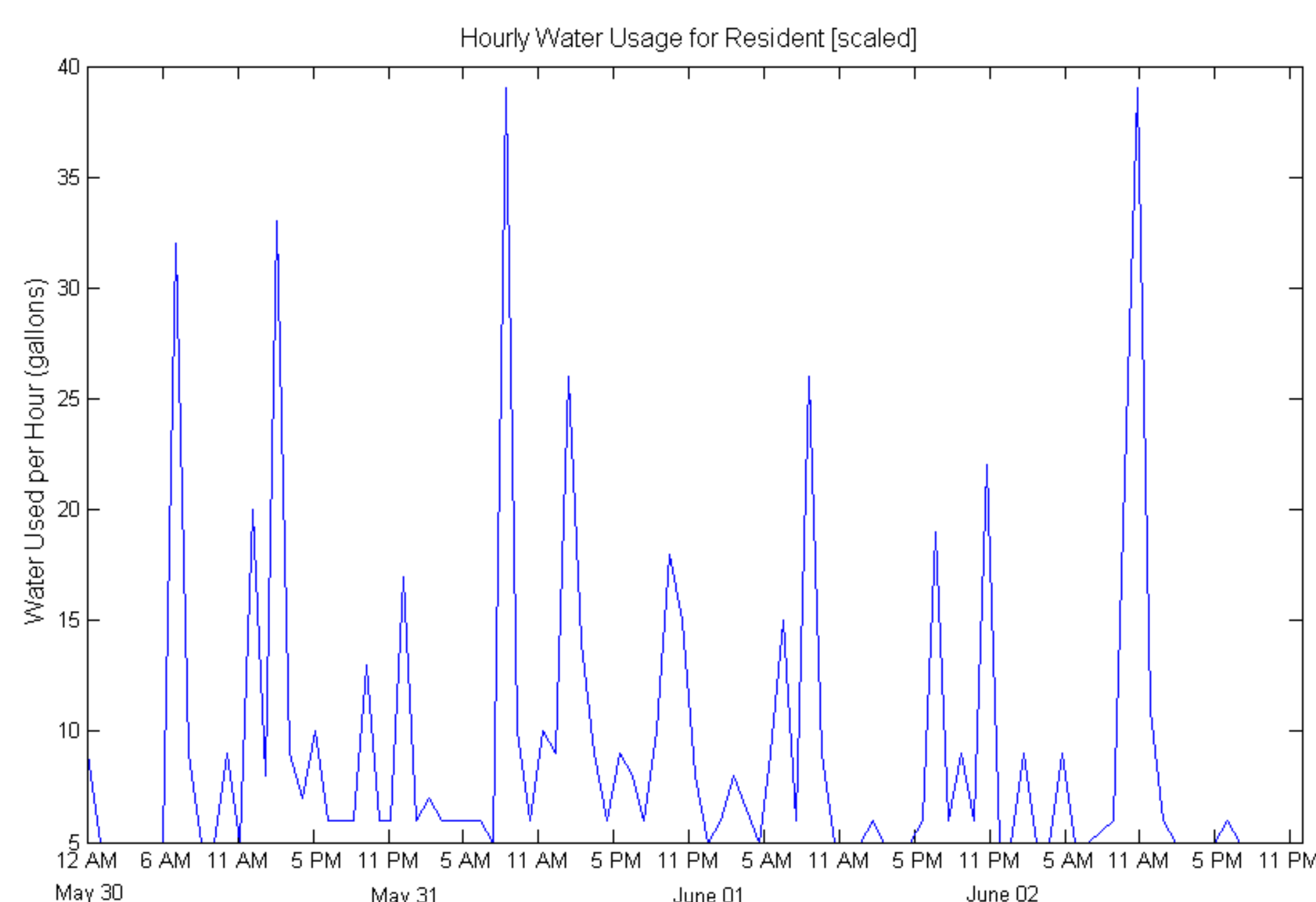
H₂Oscore User Interface

- Provides residents with dashboard regarding consumption trends
- Aims to make users aware of their own habits
- Encourages conservation

Dashboard

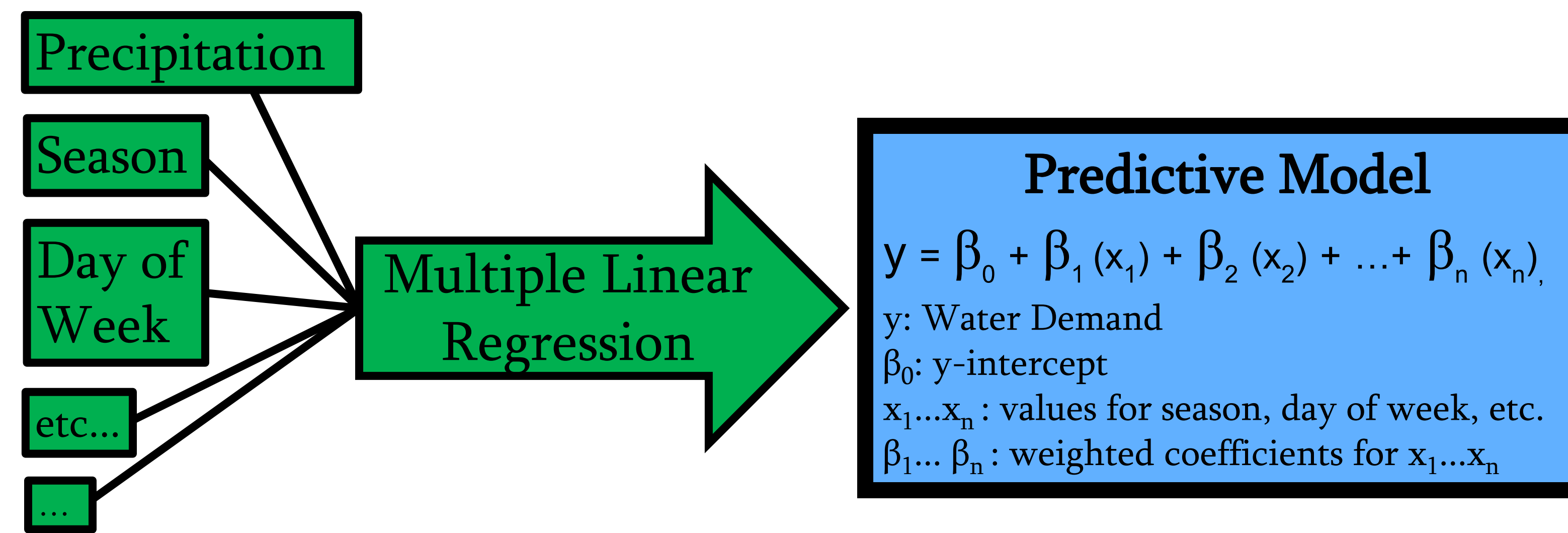


Water Tracker



- Provides residents with graphical representation of daily water usage

Multiple Linear Regression



Training Data

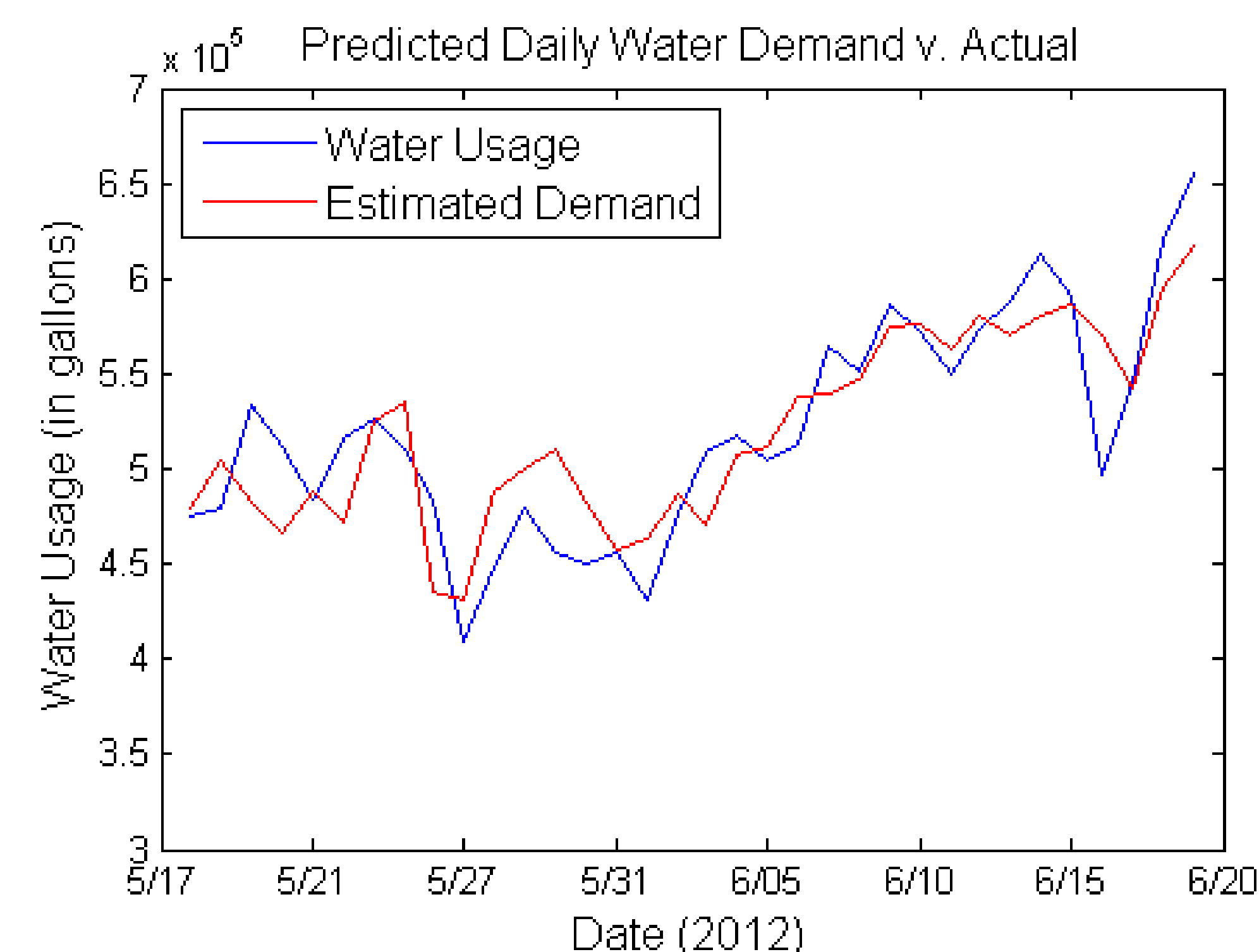
- Hourly usage data from Whitewater, WI
- Weather readings drawn from Bloomberg L.P.
- Limitations
 - Model trained with limited data (5/17/2012-6/19/2012)
 - Abnormal weather (high temperature, low precipitation)

Findings

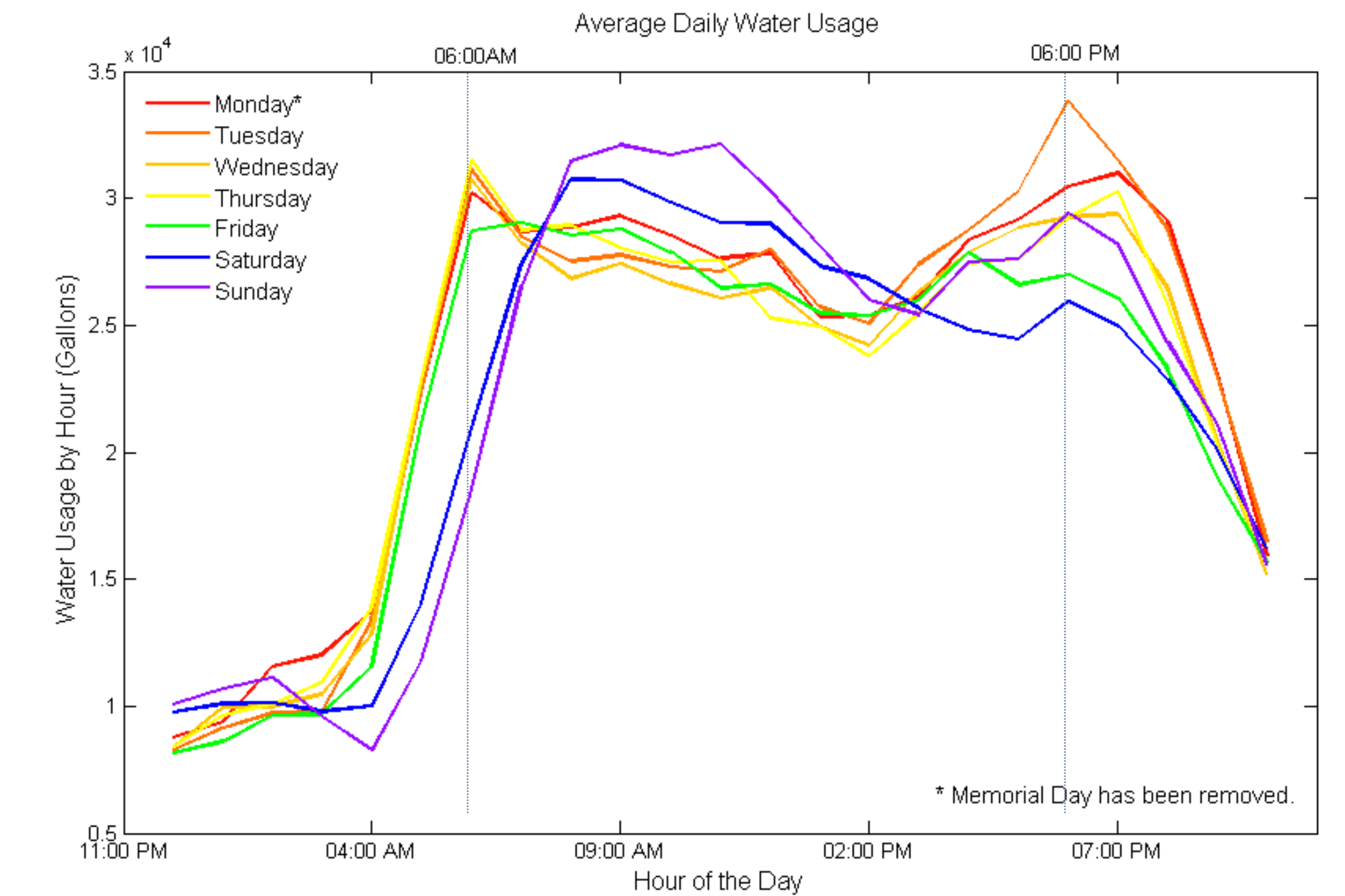
- Significant Factors: Date and Relative Humidity
- Other Potential Factors: Precipitation, Day of Week

Variable	T-Statistic	P-Value
β_0 Intercept	-7.537	2.62E-08
β_1 Date	7.539	2.61E-08
β_2 Relative Humidity	-4.632	7.05E-05
β_3 Weekday/Weekend	1.498	0.145
β_4 Precipitation (Past 5 Days)	-1.626	0.115

	4 Parameters	2 Parameters
R-Square	0.7312	0.7066
Adj. R-Square	0.6941	0.6773
RMSE	31988.07	32852.46
MAPE	0.3287%	0.3547%



The Hourly Profile



Applications

- Increase user awareness of consumption patterns
 - Encourage conservation efforts
- Identify biggest water users
 - Target new policies and solutions accordingly
- Forecast unusual days
 - Enact watering restrictions when projected demand exceeds sustainable supply
- Identify residents/businesses with low consumption
 - Learn from good practices

Future Work

- Identify seasonal/ long term trends
- Analyze changes in consumer behavior following H2Oscore launch
- Analyze accuracy of forecast with separate test data
- Train Additional Models
 - Hourly forecasting model
- Compare multiple cities

Resources

[1] J. Kindler and C.S. Russell, *Modeling Water Demands*. New York: Academic Press, 1984.
 [2] C. Barnett, *Blue Revolution: Unmaking America's Water Crisis*, Boston: Beacon Press, 2011.
 [3] Weather data for Whitewater, WI. May 15, 2012 – June 30, 2012, via Bloomberg L.P, accessed July 20, 2012