

REU2016 and Select REU1999 Algorithms for Occupancy vs. Consumption

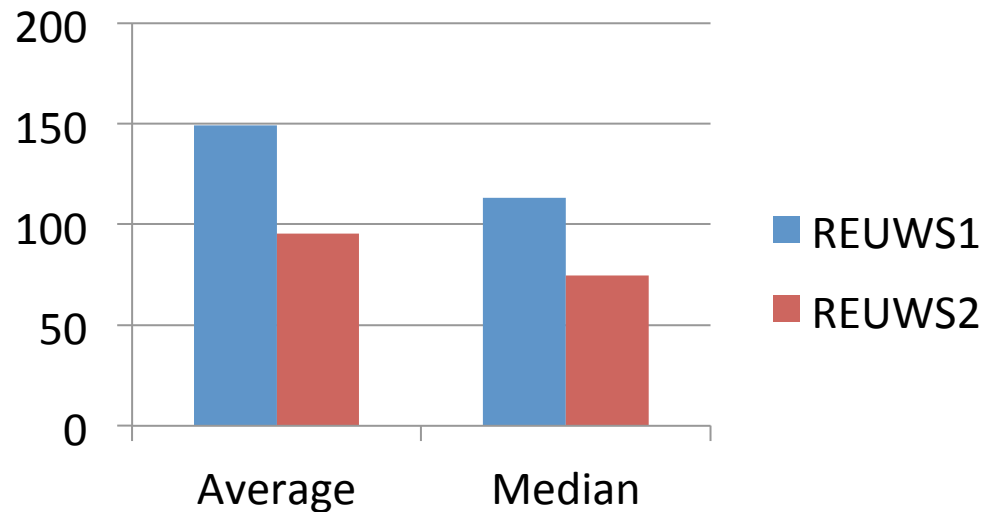
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Armstrong and Lauren Adabie with
the support of the Water Foundation

Study Sites (for data logging)

REUWS1	REUWS2
Boulder, CO	Fort Collins, CO
Denver, CO	Denver, CO
Cambridge/Waterloo, ON	Peel, ON
Eugene, OR	Cambridge/Waterloo, ON
Las Virgenes, CA	Scottsdale, AZ
Lompoc, CA	San Antonio, TX
Phoenix, AZ	Clayton Count, GA
Scottsdale/Tempe, AZ	Toho, FL
San Diego, CA	Tacoma, WA
Seattle, WA	
Tampa, FL	
Walnut Valley, CA	

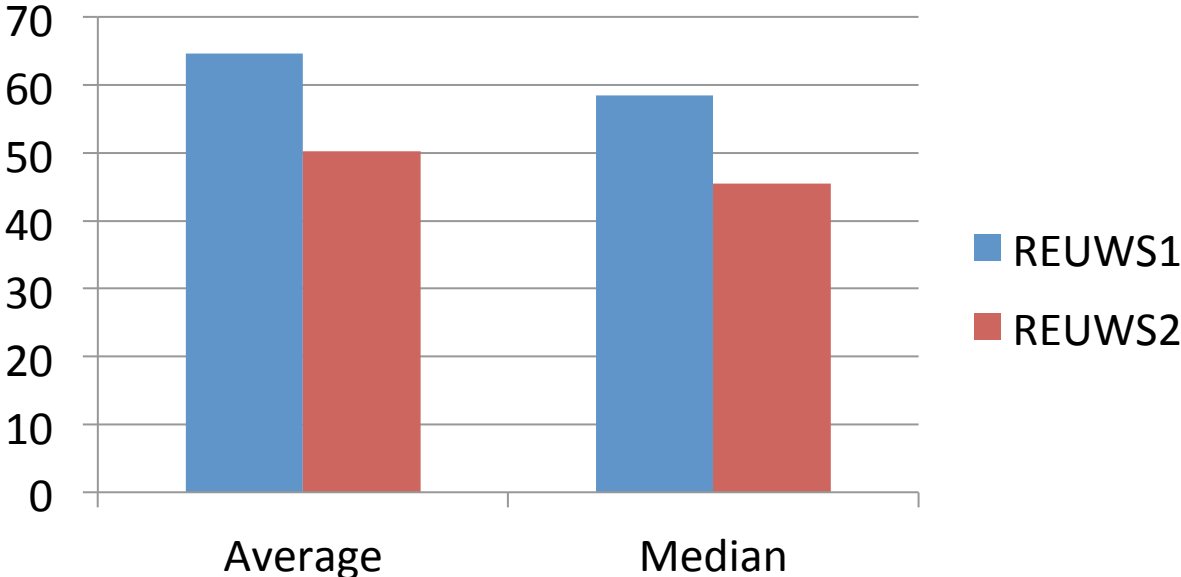
Annual Use (Indoor + Outdoor)

Annual Household Water Use	REUWS1	REUWS2
Average (kgal), N=838	149	95.5 (36% decrease)
Median (kgal)	113	74.7

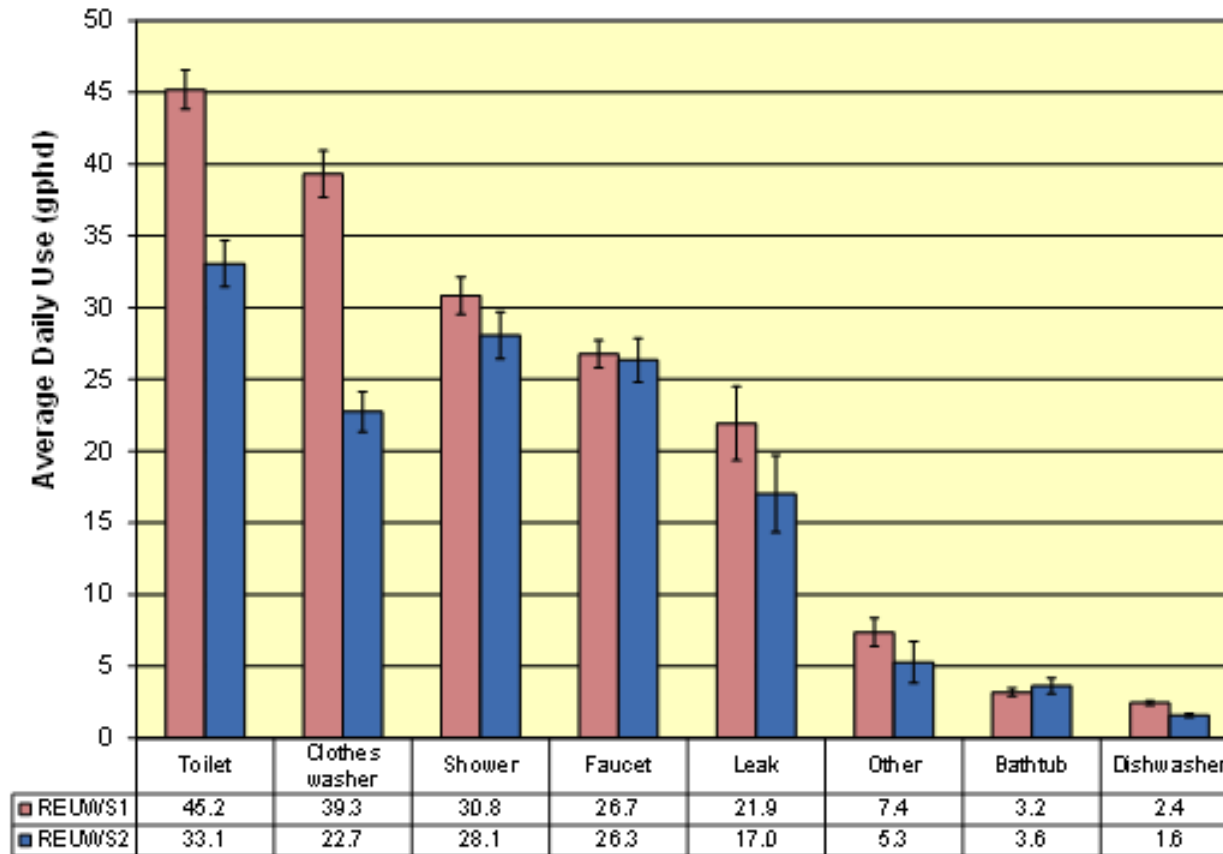


Indoor Use

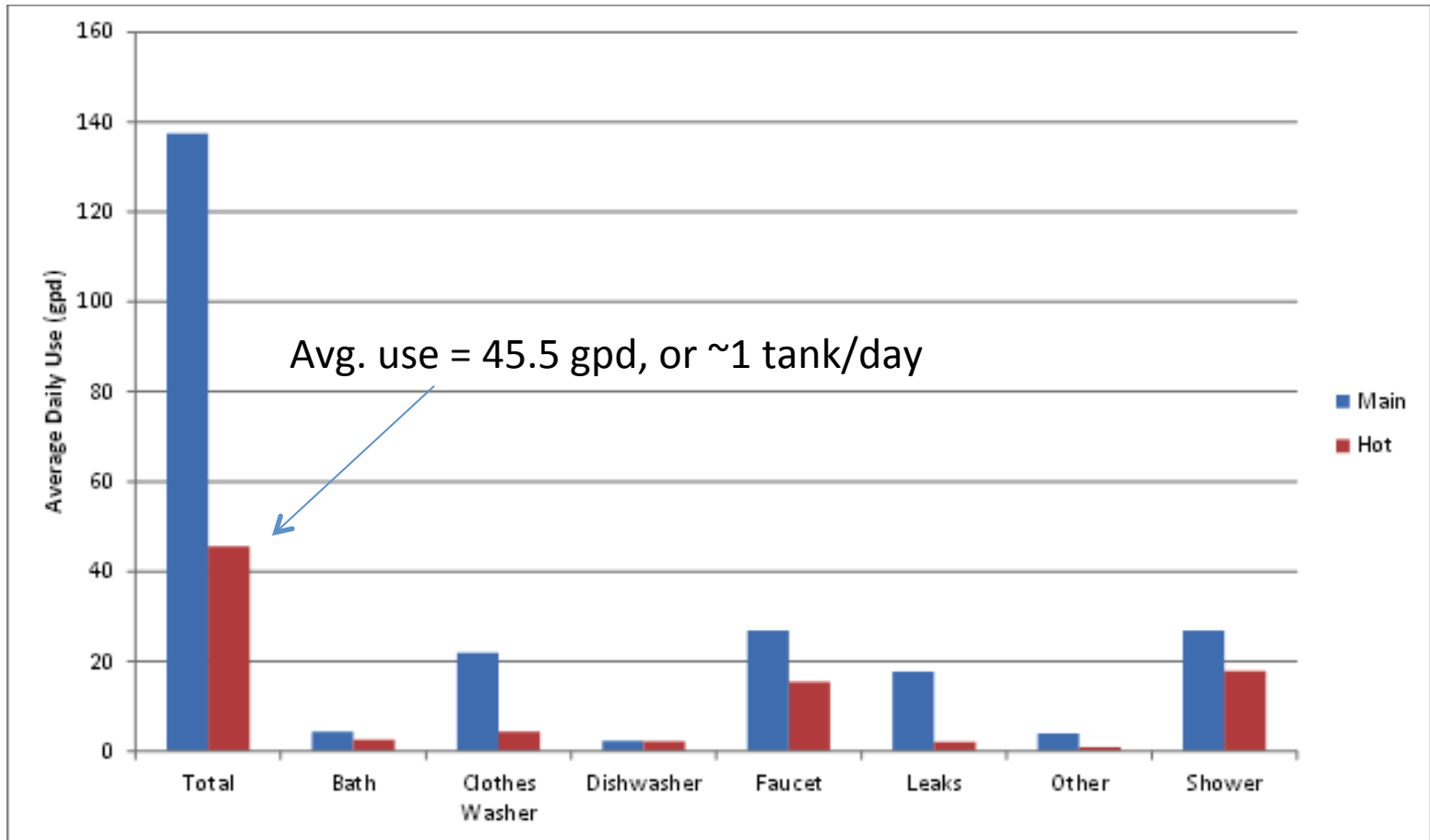
Annual Indoor Use	REUWS1	REUWS2
Average (kgal/hh)	64.6	50.2 (22% decrease)
Median (kgal/hh)	58.4	45.53



Changes in indoor end uses:

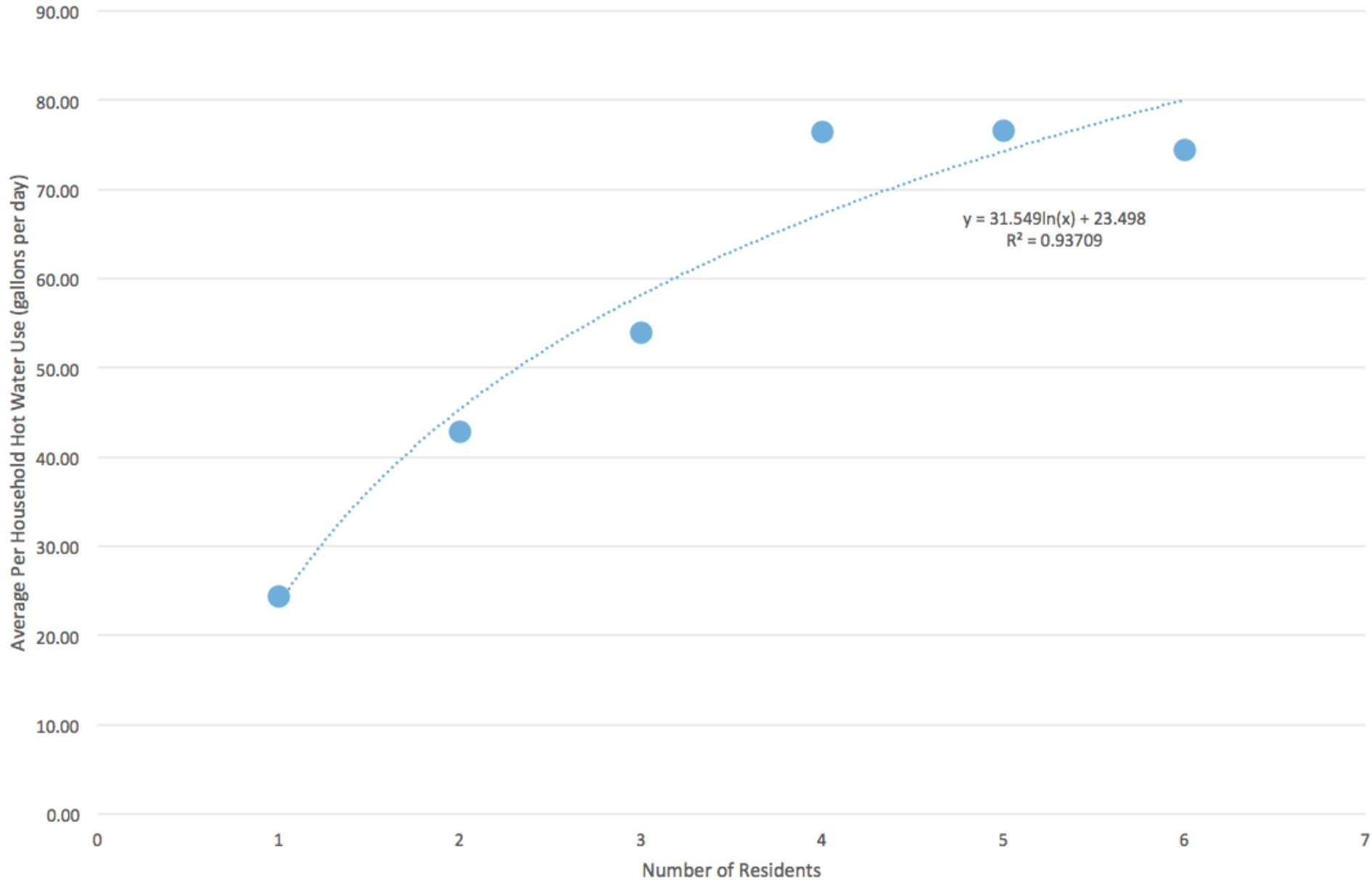


Hot water use (faucets and showers are main users).

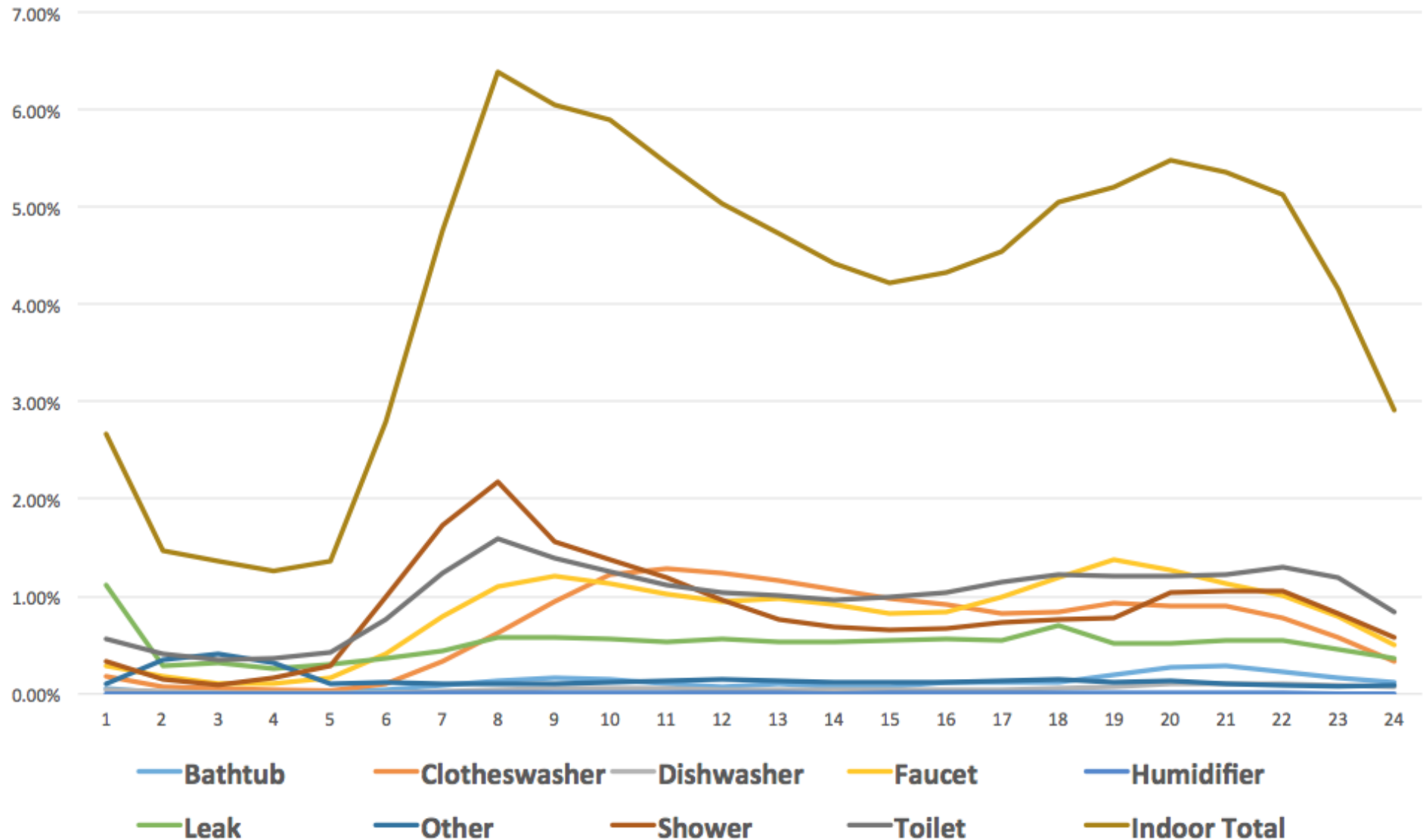


REU2015 Whole House DHW Use

Household Size vs. Hot Water Use

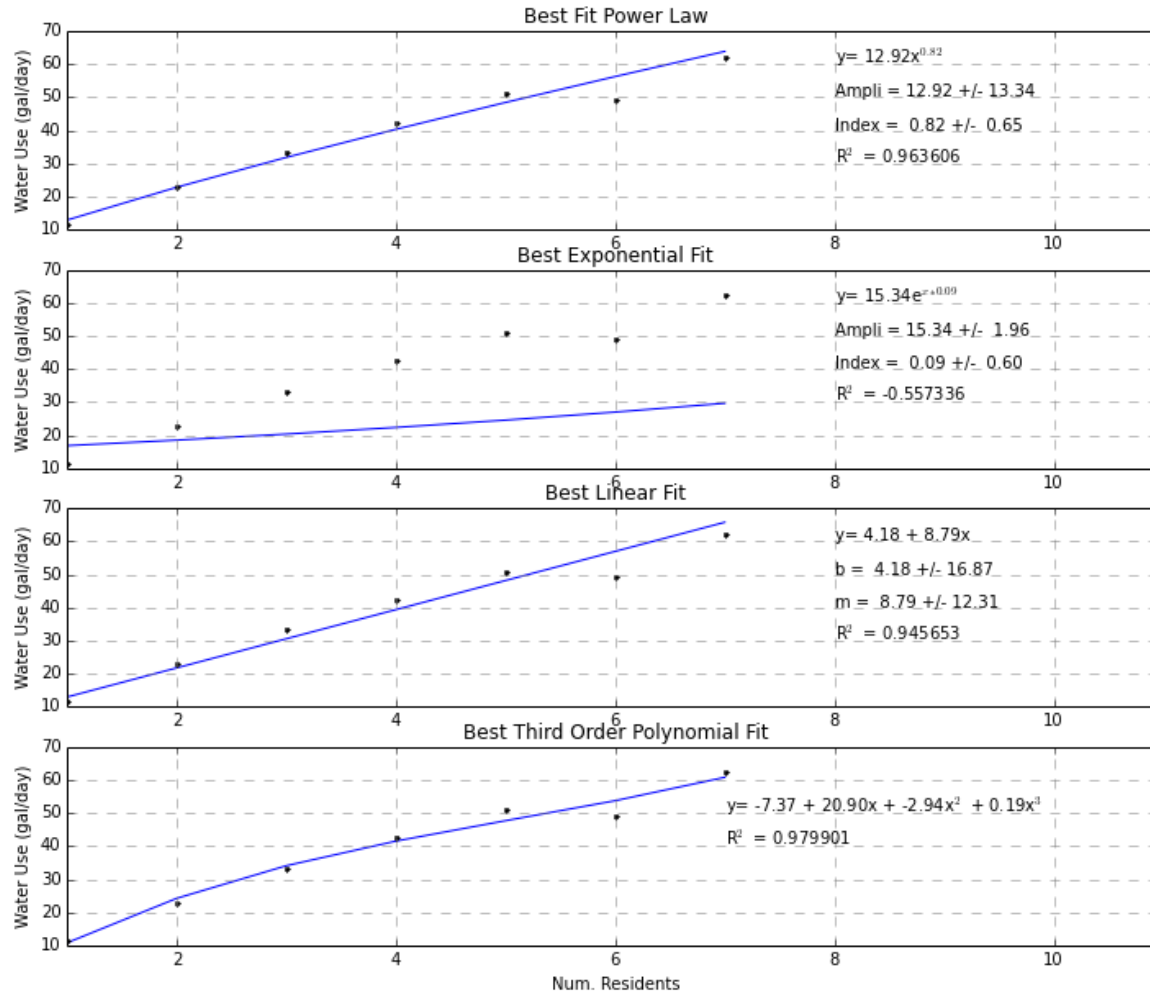


24 Hour Total Water Demand for Each Fixture (Blended Hot and Cold) (Residential End Uses of Water, 2015)

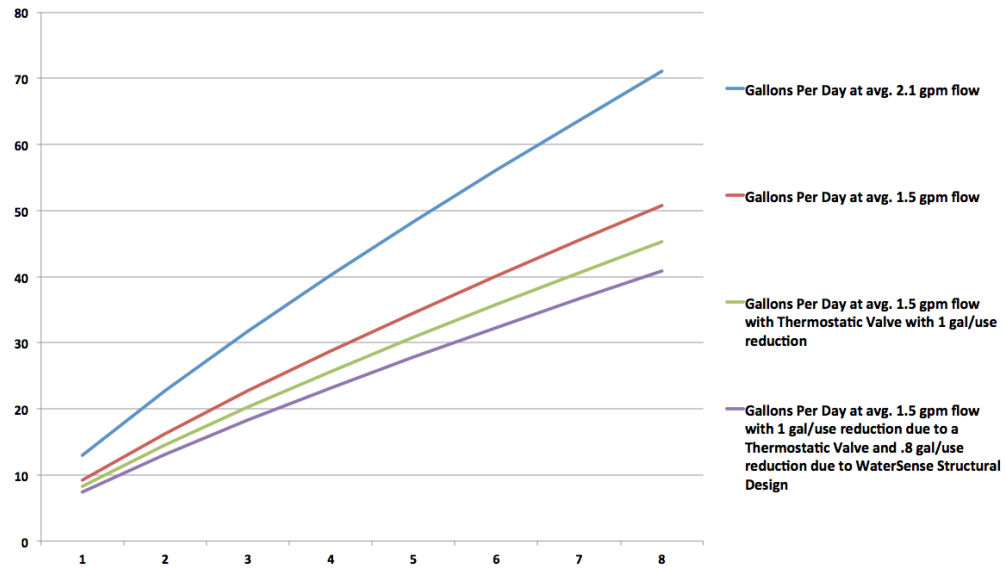


Showers-2015

Power Fit



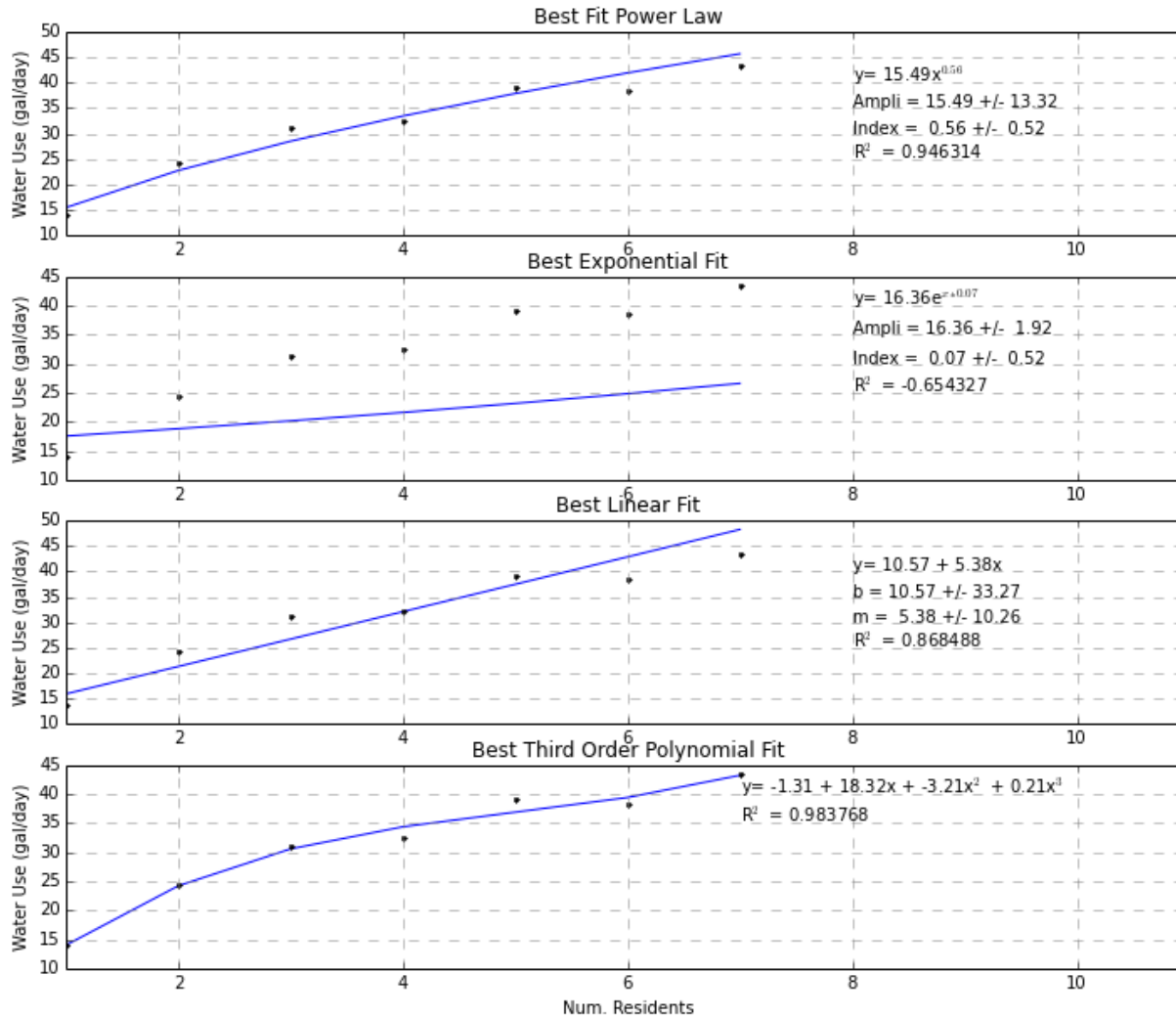
How to Use This Data in Modeling



Occupancy	1	2	3	4	5	6	7	8
Gallons Per Day at avg. 2.1 gpm flow	13	23	32	40	48	56	64	71
Gallons Per Day at avg. 1.5 gpm flow	9	16	23	29	35	40	46	51
Gallons Per Day at avg. 1.5 gpm flow with Thermostatic Valve with 1 gal/use reduction	8	15	20	26	31	36	41	45
Gallons Per Day at avg. 1.5 gpm flow with 1 gal/use reduction due to a Thermostatic Valve and .8 gal/use reduction due to WaterSense Structural Design	7	13	18	23	28	32	37	41

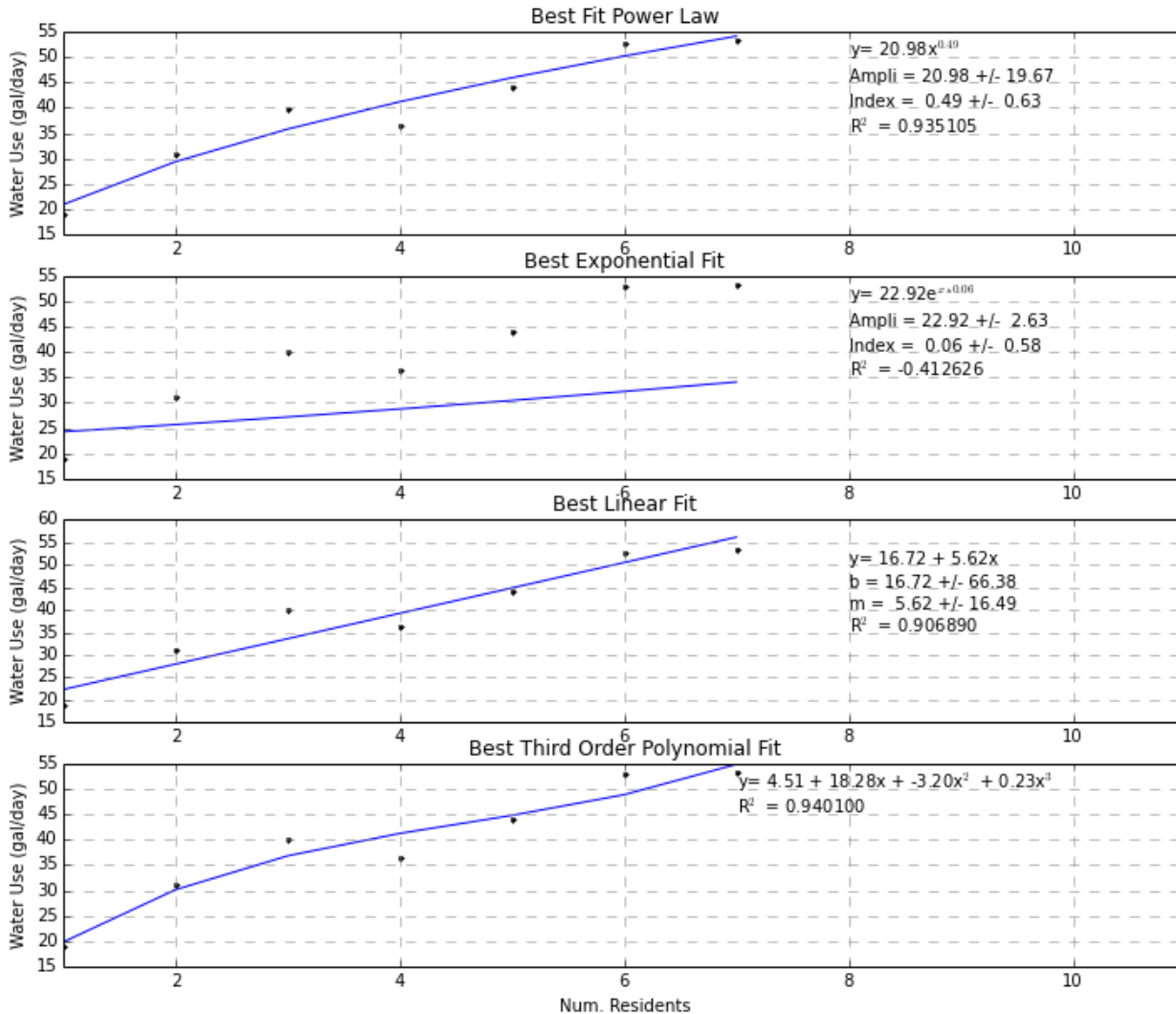
Faucets-2015

Power Fit



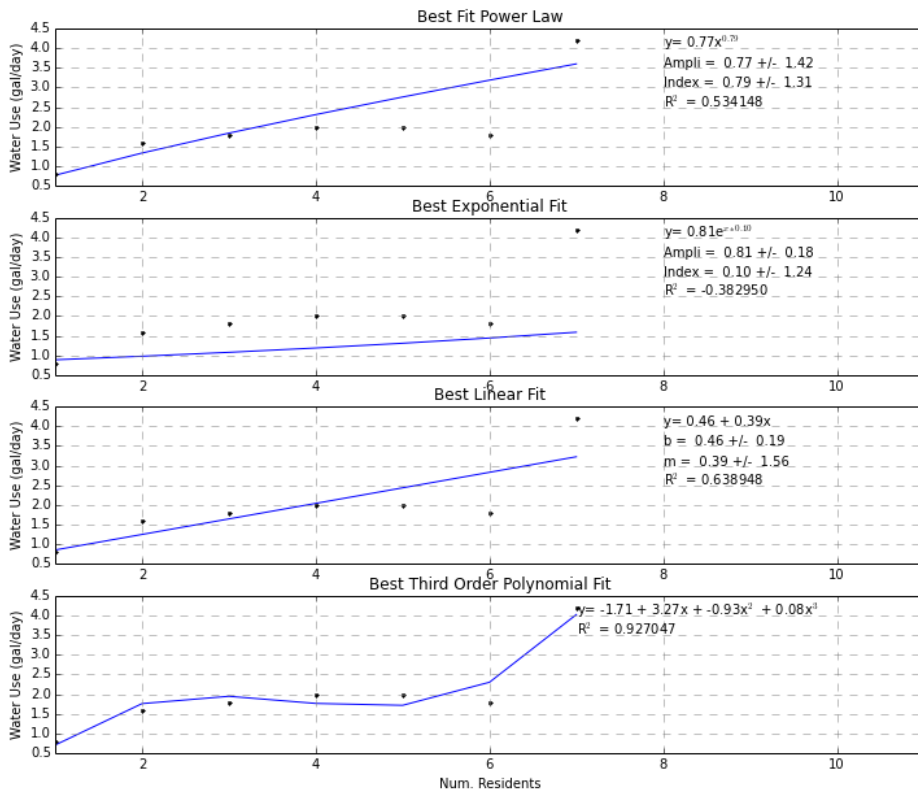
Toilets-2015

Power Fit

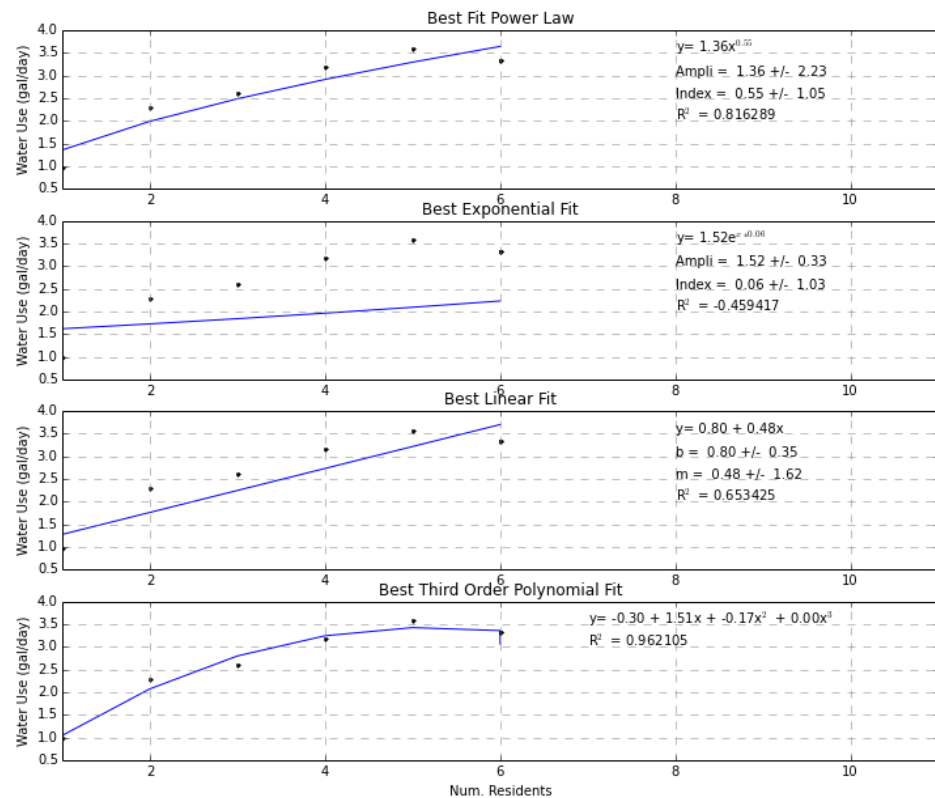


Dishwashers-2015 vs. 1999

Best Linear Fit



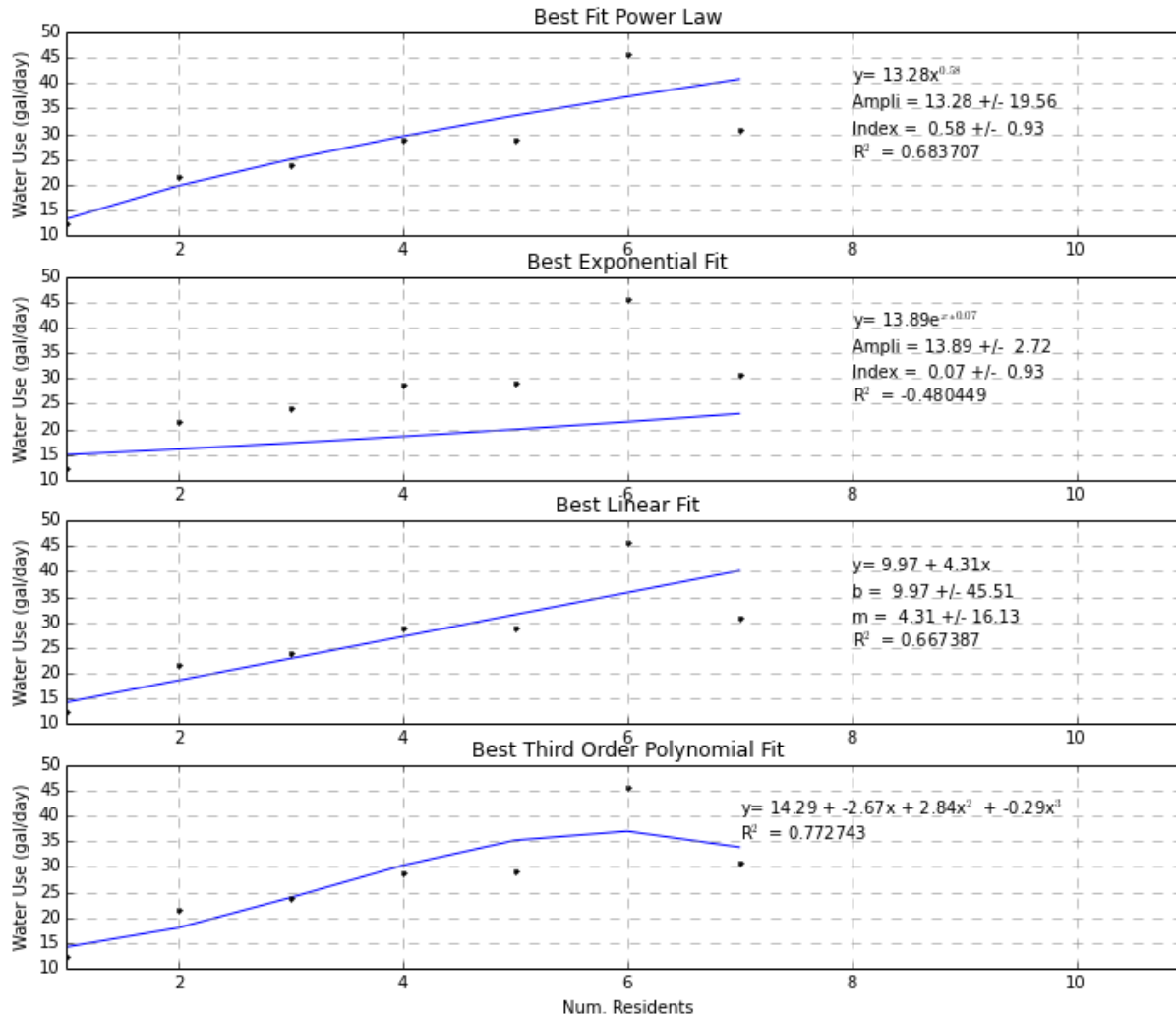
2015 Data



1999 Data

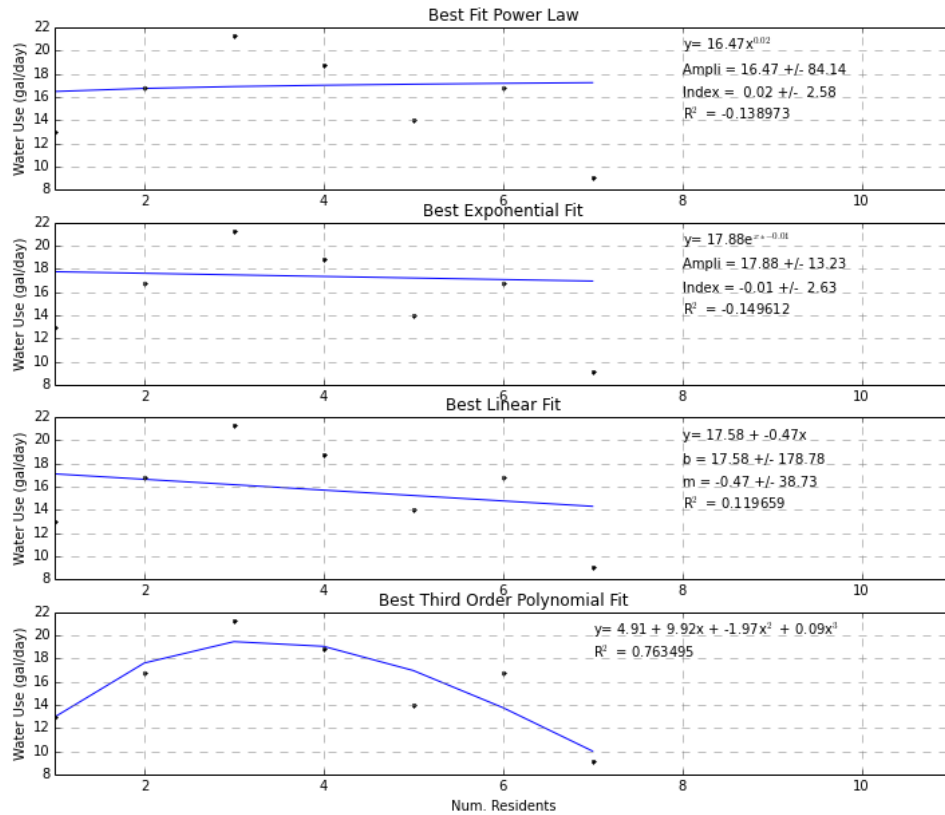
Clothes Washers-2015

Linear

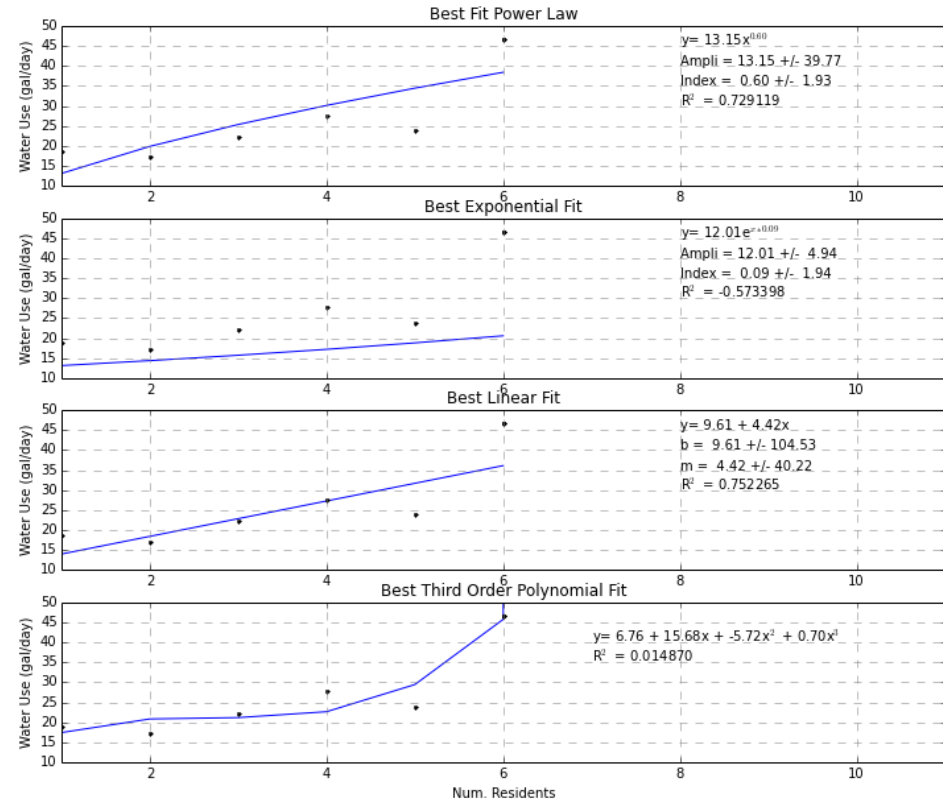


Leaks-2015 vs. 1999

Use an average amount per household, not occupancy. Boiler make-up water is included



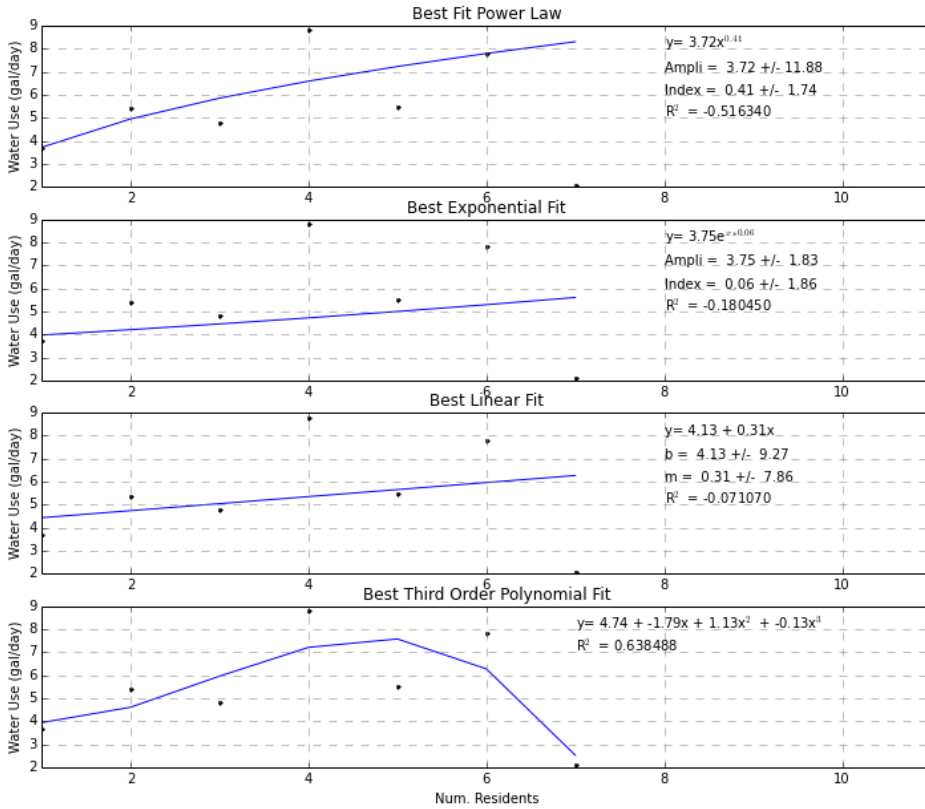
2015 Data



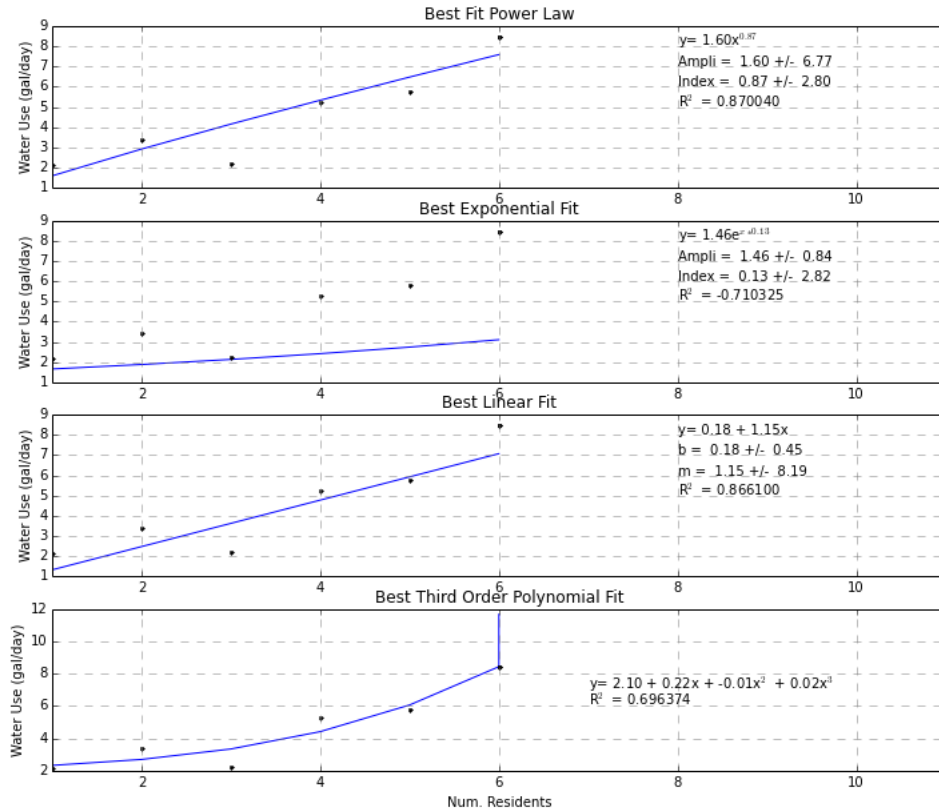
1999 Data

Other—2015 vs. 1999

Hot tubs, humidifiers: use an average per household like leaks



2015 Data



1999 Data