



Pump Station Optimization - The Portland Water Bureau's Approach to Energy Management



Presentation Outline

- Framework
- System Overview
- Historical Power Use
- Pump Station Optimization
- Other Strategies

Framework

- Water & Wastewater Utilities Consume 3% of Energy in US
- 90 – 95% of Energy Consumed by Water Utilities is used by pumps
 - Raw Water Intake
 - Wells
 - Treatment Plants
 - Booster Pump Station

Portland Water Bureau Energy Management Charter, February 2010

VISION

The Portland Water Bureau provides excellent service to our customers and acts as the steward of the critical infrastructure and fiscal and natural resources entrusted to our care. We strive to purchase and generate electricity from renewable sources and are an energy efficiency leader among service agencies across the country.

GOALS

- To develop an organizational culture of energy (electricity and natural gas) awareness that seeks continuous efficiency improvements.
- To educate and empower energy efficiency and environmental responsibility in a manner which promotes quality and safety.
- To explore and promote the development of renewable energy projects where practical.
- To contribute to advancing goals in the City of Portland and Multnomah County Climate Action Plan.

OBJECTIVES

Using a variety of methods the Portland Water Bureau shall work to accomplish the following objectives:

- Establish a bureau-wide energy use and generation baseline.
- Track and evaluate energy use in facilities including, but not limited to treatment facilities, pump stations, tanks and buildings.
- Update facilities, where appropriate, using the most current equipment and modifying operating procedures to make them as efficient as possible.
- Educate employees about the current status of energy use and future potential energy savings and generation.

We believe our goals can be obtained by implementing the above mentioned objectives. Thank you for your participation and contributions to make this a success.



David Shaff, Administrator

Edward Campbell, Director, Resource Protection and Planning

David Hasson, Director, Finance and Support

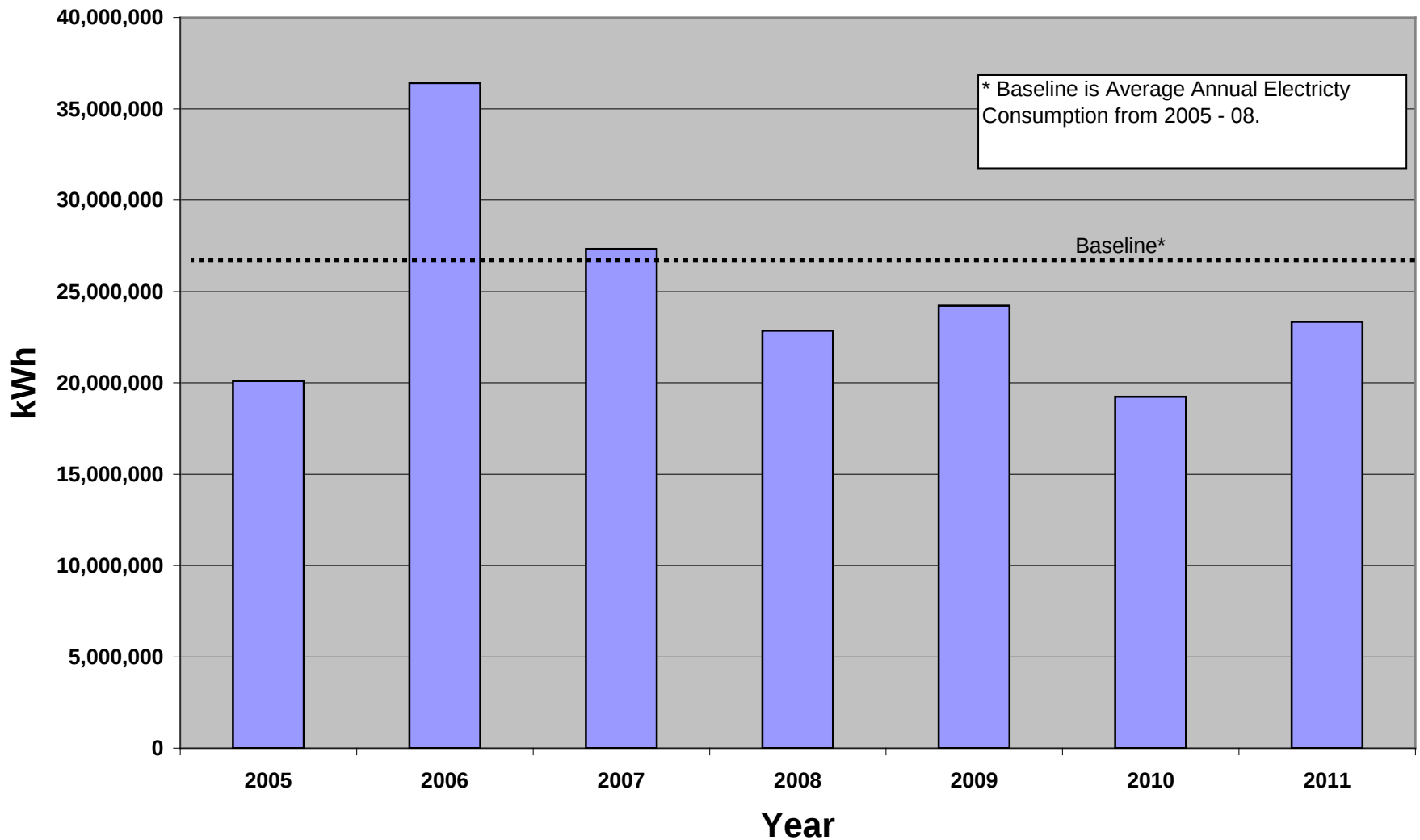
Kathy Koch, Director, Customer Service

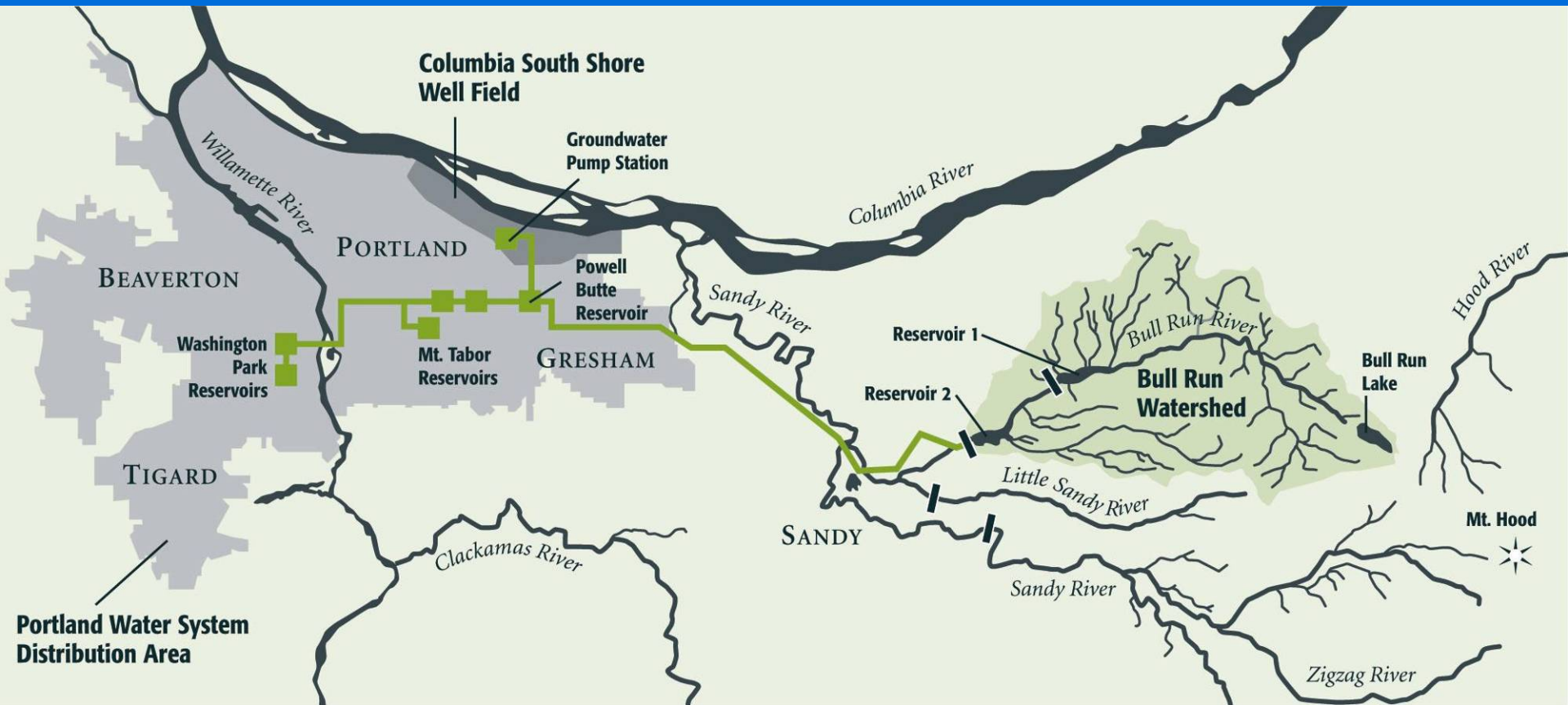
Kelly Mulholland, Director, Maintenance and Construction

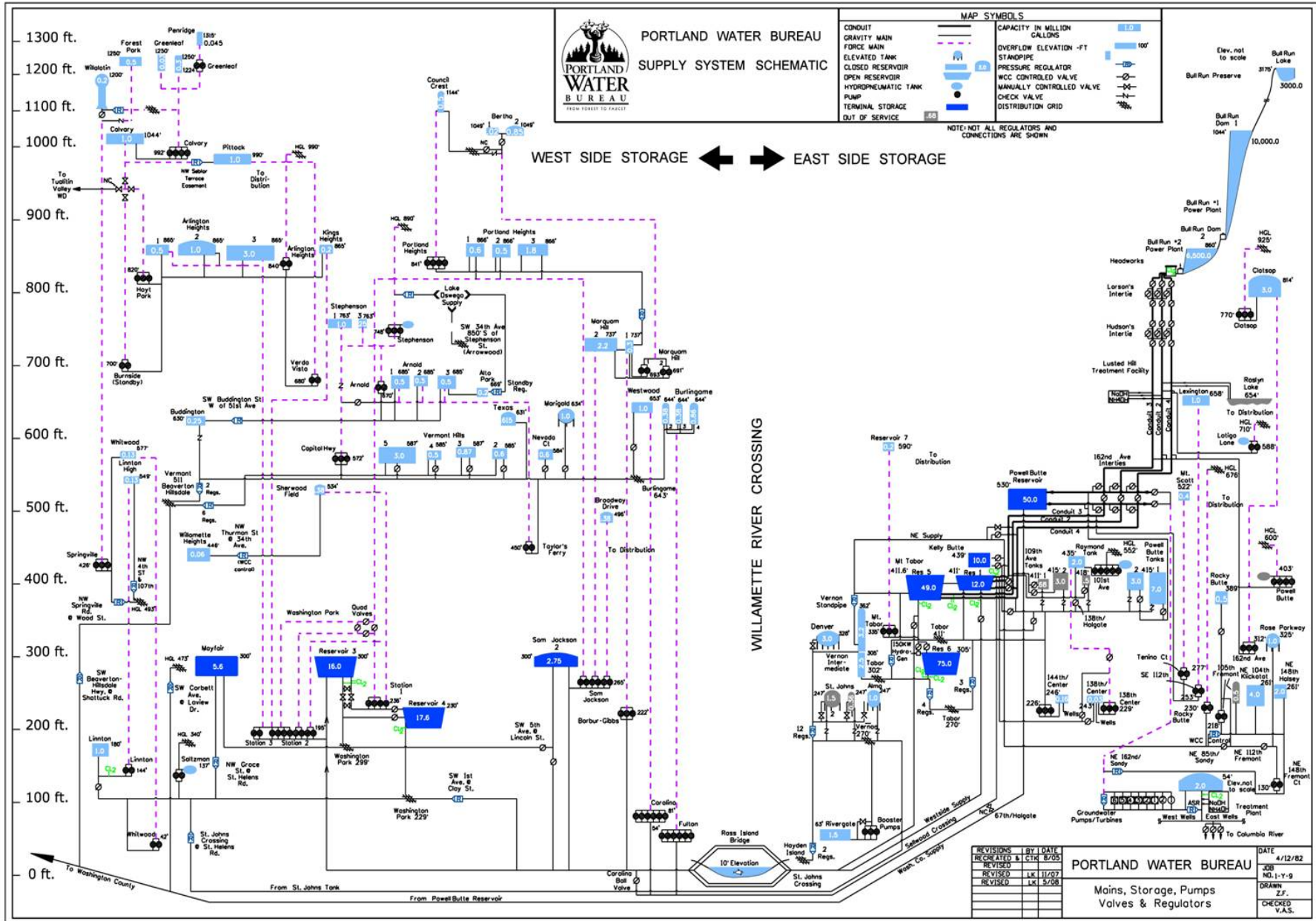
Michael Stuhf, Director, Engineering

Chris Wanner, Director, Operations

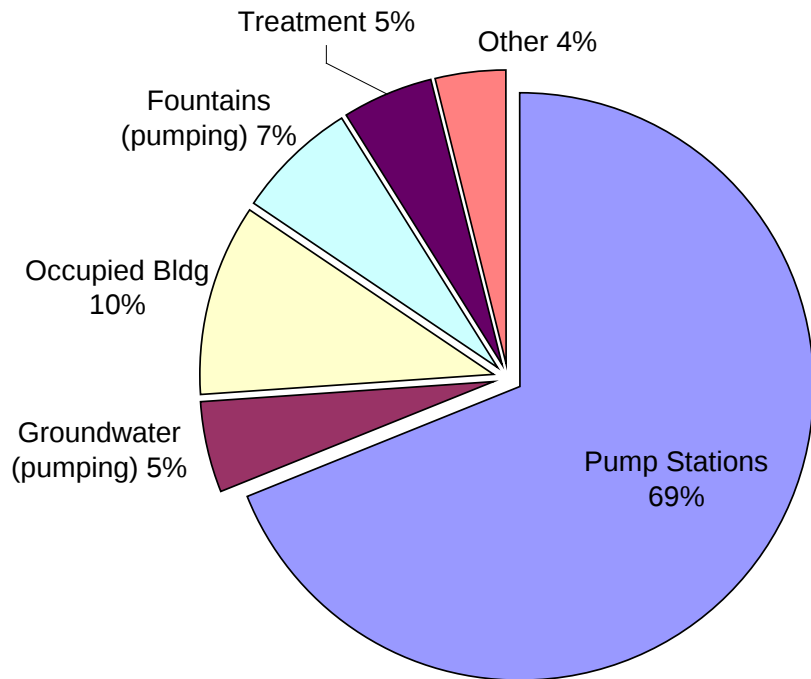
Total Annual Water Bureau Electricity Use for All Facilities





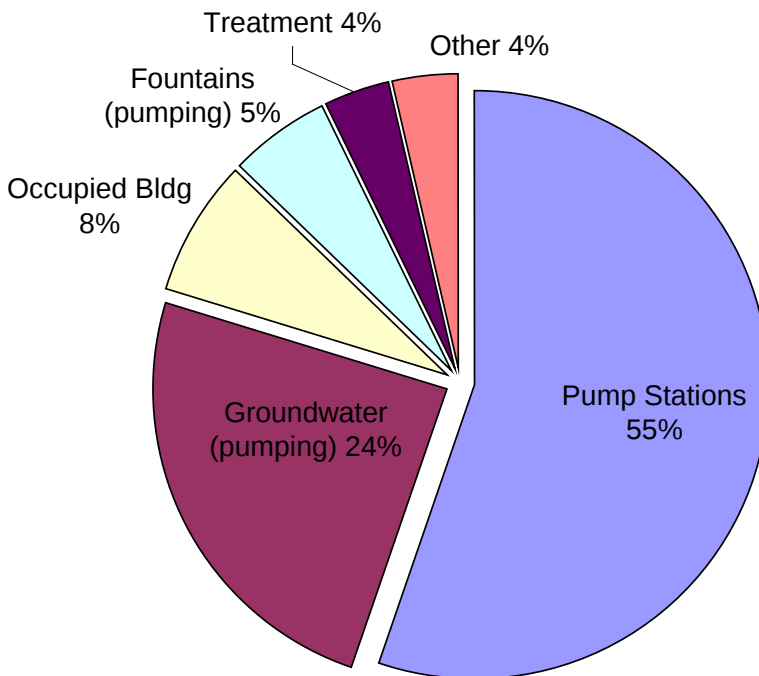


2010 Water Bureau Electricity Use by Sector (kWh)

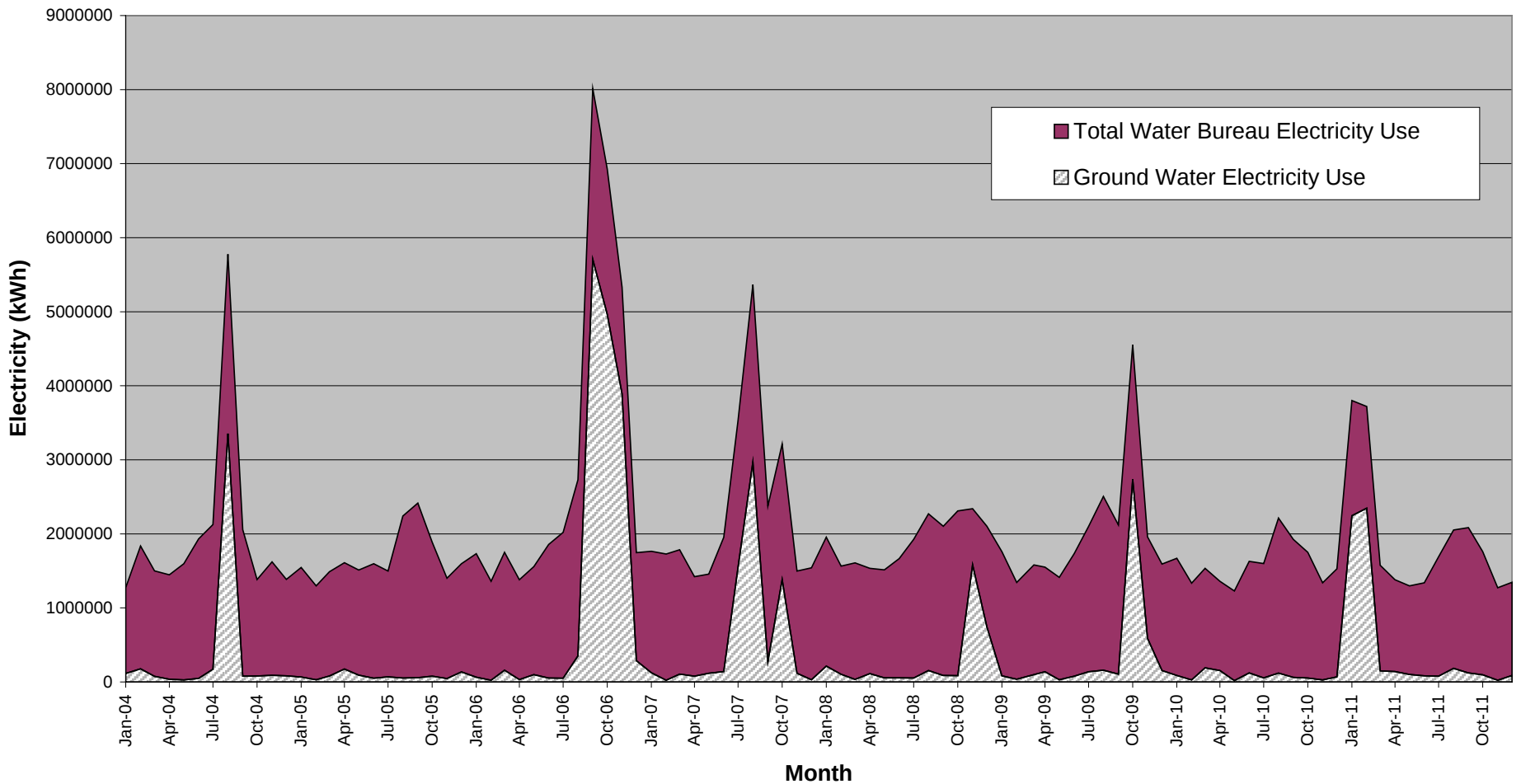


Electricity Consumption

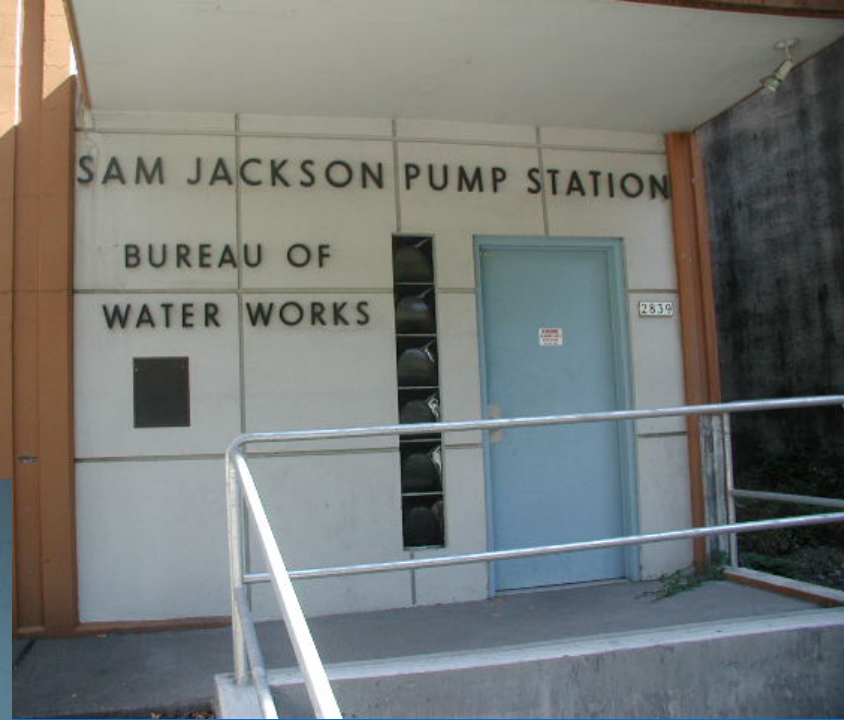
2011 Water Bureau Electricity Use by Sector (kWh)



Monthly Electricity Use for Water Bureau Facilities

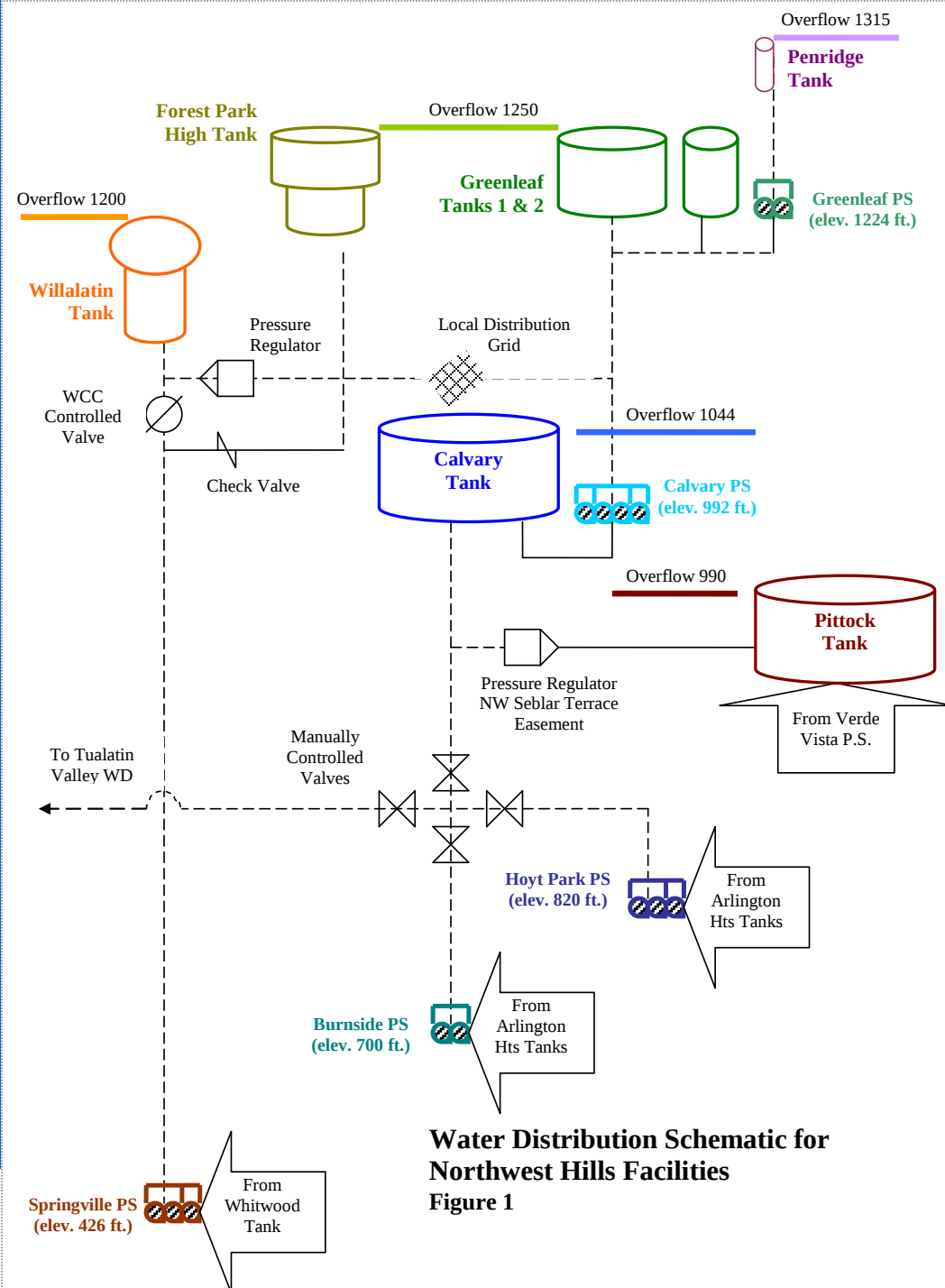


Pump Stations



Challenges

- Pump and Motor Efficiency
- Weather affects demand for water



PWB Strategy

- Focus 7 Largest Pump Station
- PS Improvements
 - Pumping Efficiency Optimization
 - Pump/Motor Replacement
 - Weatherization
- Pump Station By-Passing
 - Is there a way to get water to customers without pumping?

Pumping Efficiency Optimization



Pump Efficiency Test Locator by Site

[Close Form](#)[Print Screen](#)[Add Tests](#)[Requery](#)

ID 105

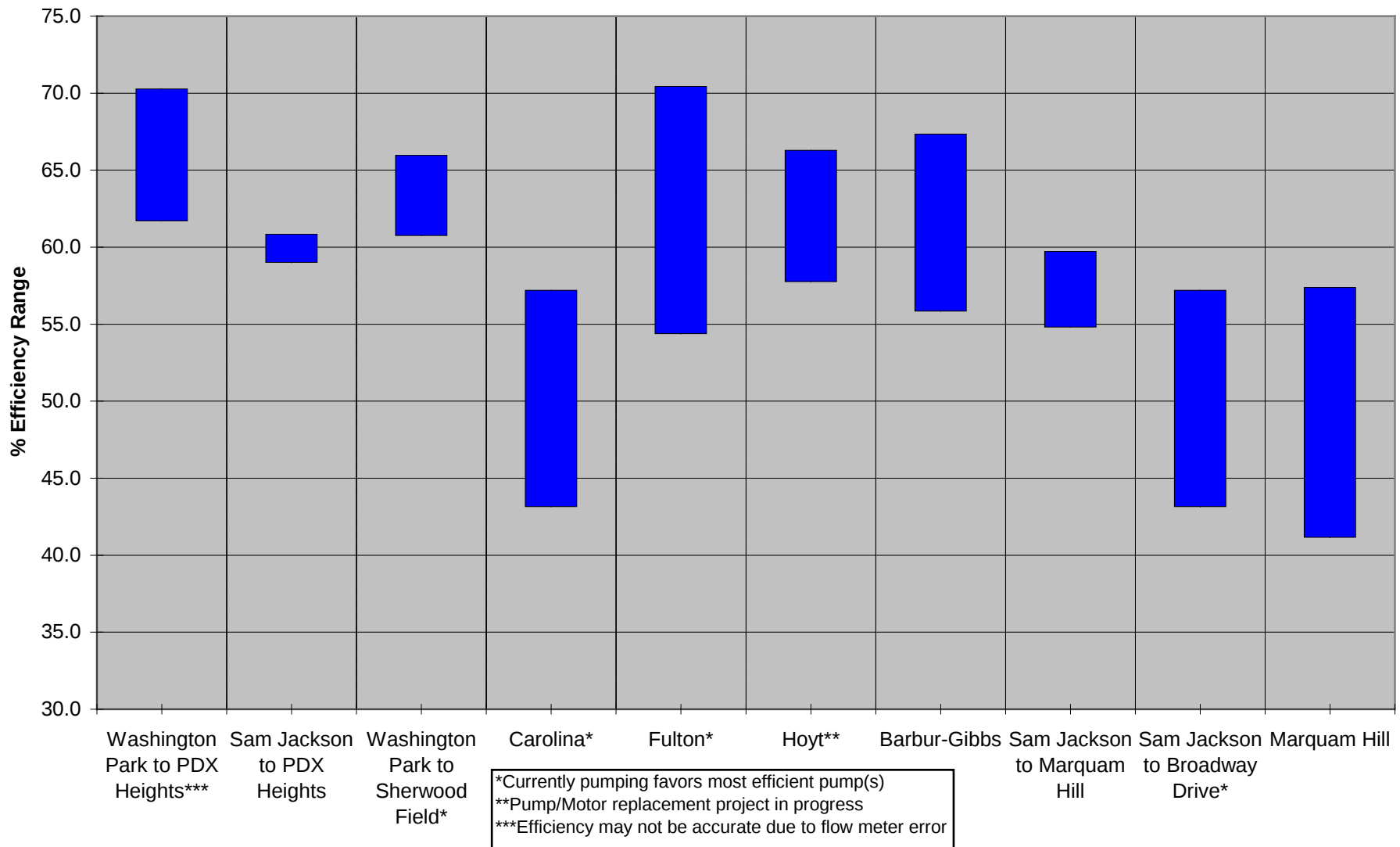
Select Site:**Sam Jackson**[View Old Form
\(All Tests by Pump\)](#)

Pump Efficiency Tests

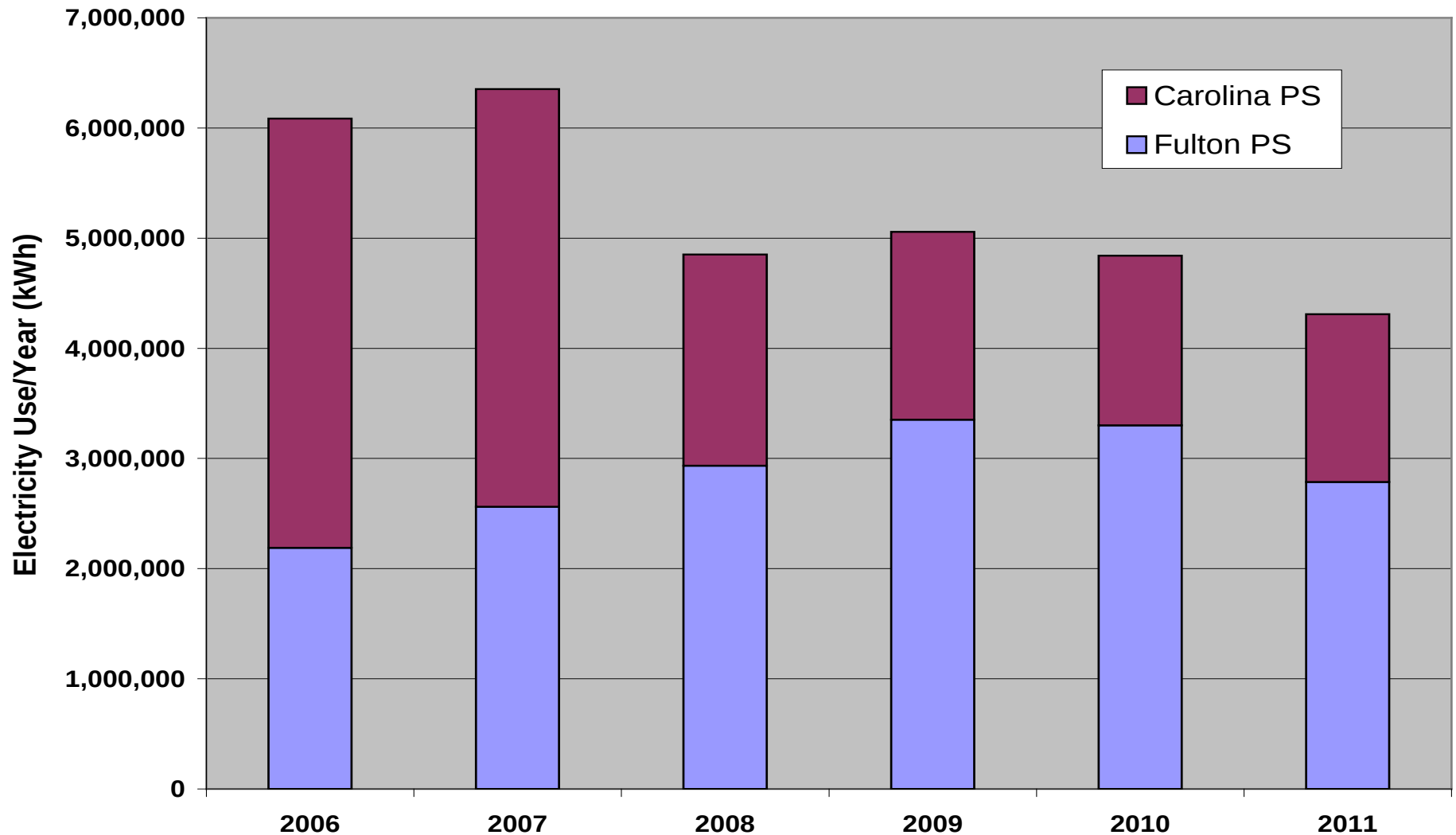
Date Observed	Pump List	Calculated Efficiency (g/kWh)	Test #	Bad Test?	
5/11/2009	Pump(s): 206	945	397	☐	View/Edit
5/11/2009	Pump(s): 206	951	396	☐	View/Edit
5/11/2009	Pump(s): 206	947	395	☐	View/Edit
5/7/2009	Pump(s): 205	675	401	☐	View/Edit
5/7/2009	Pump(s): 205	678	400	☐	View/Edit
5/7/2009	Pump(s): 205	682	399	☐	View/Edit
5/7/2009	Pump(s): 205	688	398	☐	View/Edit
5/5/2009	Pump(s): 205	684	404	☐	View/Edit
5/5/2009	Pump(s): 205	690	403	☐	View/Edit
5/5/2009	Pump(s): 205	700	402	☐	View/Edit
5/5/2009	Pump(s): 205	680	405	☐	View/Edit
4/29/2009	Pump(s): 206	886	391	☐	View/Edit
4/29/2009	Pump(s): 206	888	390	☐	View/Edit
4/29/2009	Pump(s): 206	890	389	☐	View/Edit
4/25/2009	Pump(s): 206	877	394	☐	View/Edit

[Operational Notes](#)[Set Points](#)

Efficiency Range of Pumps at Top 7 Pump Stations



Energy savings by favoring more efficient Pump / Pump Station



Hoyt Pump Replacement

Form 420C
Incentive Offer - Custom
Business Energy Solutions—Production Efficiency



Program Use Only	
Project ID	PE3519
Currently Self-Directing	No
Eligible to Self-Direct	No

Participant Information

Participant Name	City of Portland				
Contact Name	Peter Nierengarten		Title	Engineer	
Mailing Address	1120 SW 5th Ave #609		City	Portland	State OR Zip 97204
Telephone	(503) 823-7507	Cell Phone		Fax	(503) 823-6015
Email	peter.nierengarten@portlandoregon.gov			Website	

Project and Facility Information

Project Name	Hoyt Pump Station Improvement		Facility County	Multnomah	
Site Address	4025 SW Fairview Blvd		City	Portland	State OR Zip 97221

Section 1: Measure Summary and Incentive Offer (to be completed by PMC)

A technical analysis study, incorporated and made a part of this agreement by this reference, was performed for Participant's site by Portland Water Bureau, and is dated 10/1/2010. Based on our review of this information, we have identified the following energy efficiency measures (Measures) as potentially eligible to receive Energy Trust incentive funds.

Measure	Estimated Gas Savings	Estimated Electric Savings	Estimated Cost of Measure	Estimated Incentive Amount
New 100 HP Pump	0	75,229 kWh	\$ 41,448	\$ 20,724
Totals		Therms 75,229 kWh	\$ 41,448	\$ 20,724

Estimated incentives have been calculated in accordance with current program requirements and incentive levels. The actual incentive amount paid to Participant may be different than the estimated amounts listed in this application depending on the actual Measures installed and final costs; however, the maximum amount Energy Trust will ever be required to pay under this agreement is limited to the estimated amounts as set forth above.

DEADLINE FOR PARTICIPANT TO ACCEPT THIS OFFER. Details of this program, including incentive levels and availability, are subject to change. Unless Energy Trust receives this completed and signed Form 420C: Incentive Application and Agreement from Participant by 11/30/2010, Energy Trust's offer to reserve the estimated incentive amounts above for the Measures will expire and shall be void. Applications will be processed on a first-come, first-served basis.

Reviewed by	Walt Minkeski Production Efficiency Technical Manager	Signature	Walt Minkeski, P.E.	Date	10/20/10
-------------	--	-----------	---------------------	------	----------

- 10% efficiency gain
- Project cost = \$41,500
- Electric Utility Provider incentive covered 50% of project construction cost, through state of Oregon program (ETO).



PS Weatherization

- Poor Insulation
- Air Leaks
- Electric Resistant Heat = up to 5,000kWh/month
- Goal
 - Prevent freezing
 - Reduce humidity
 - Comfortable work zone?
- Strategies
 - Reduced temperature (freeze protection)
 - Programmable thermostats
 - Weather-stripping
 - Louver and vent covers
 - Winterize/Summerize Checklist



Winterize Facility Checklist

When performing your Winterize work order for a remote facility place check mark in box next to each item to confirm that it was completed. If an item does not apply to a particular site please make note next to that item. Add other any appropriate checklist items in blank lines below.

- ☐ Close manual louvers
- ☐ Place covers over louvers
- ☐ Set heater thermostat to 55 deg
- ☐ Close ceiling vents
- ☐ Clean photocells on exterior lighting

Summerize Facility Checklist

(Place check mark in box next to each item to confirm that it was completed. If an item does not apply to a particular site please make note next to that item. Add other any appropriate checklist items in blank lines below.)

- ☐ Open manual louvers
- ☐ Remove covers over louvers
- ☐ Turn off Heaters
- ☐ Open ceiling vents

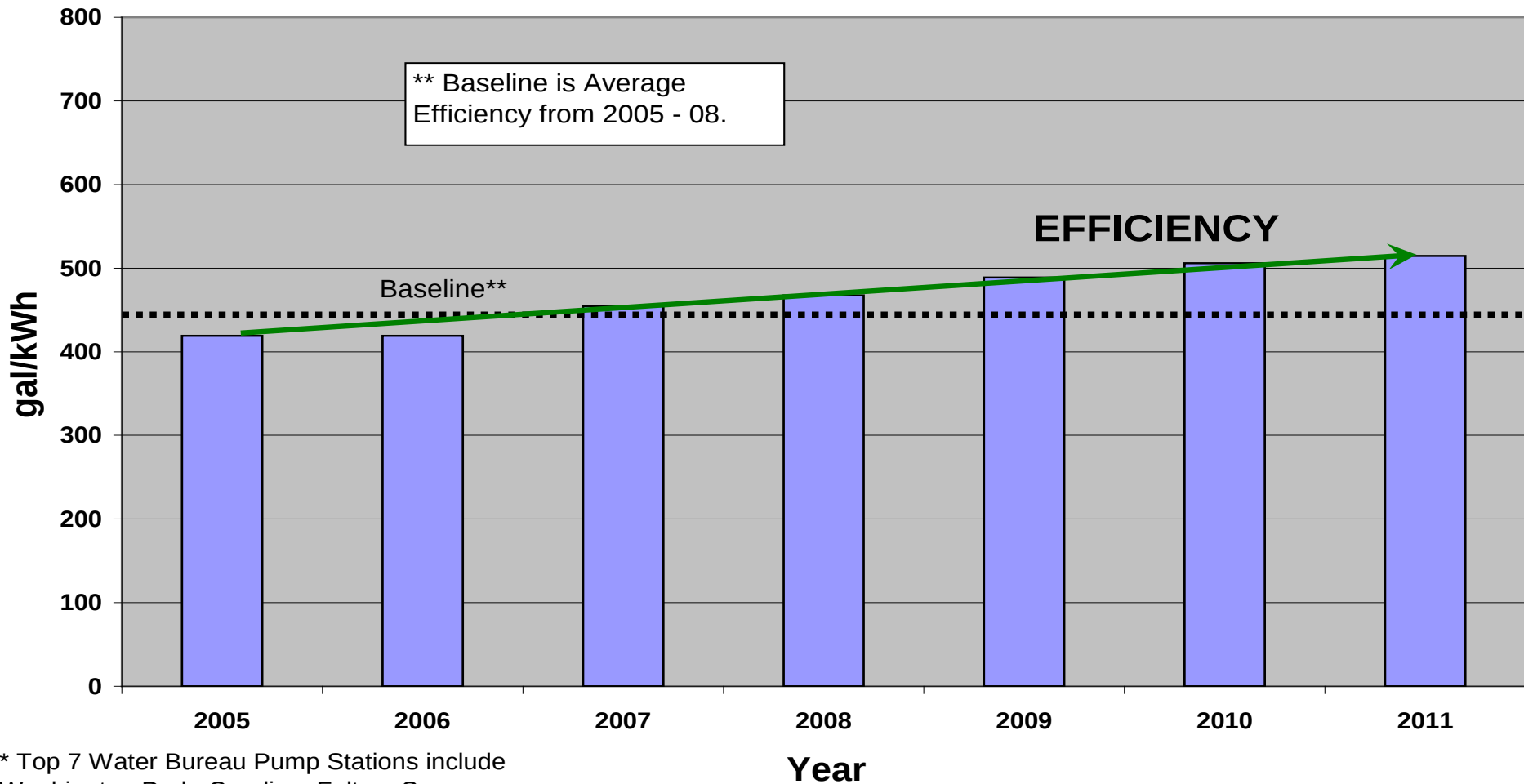
Results

- Groundwater contributed to increase in 2011

Type of Facility	2005 - 08 Baseline	2010	2011
Pump Stations	14,844,882	13,240,241	12,921,575
Groundwater	6,537,153	972,971	5,653,653
Occupied Bldg	2,159,840	2,006,680	1,809,685
Fountains	1,218,799	1,285,600	1,269,767
Treatment	896,601	993,520	856,190
Other	1,147,076	737,320	824,383
Total (kWh)	26,804,350	19,236,332	23,335,253

Energy Use by Sector

Efficiency at top 7 Water Bureau Pump Stations*

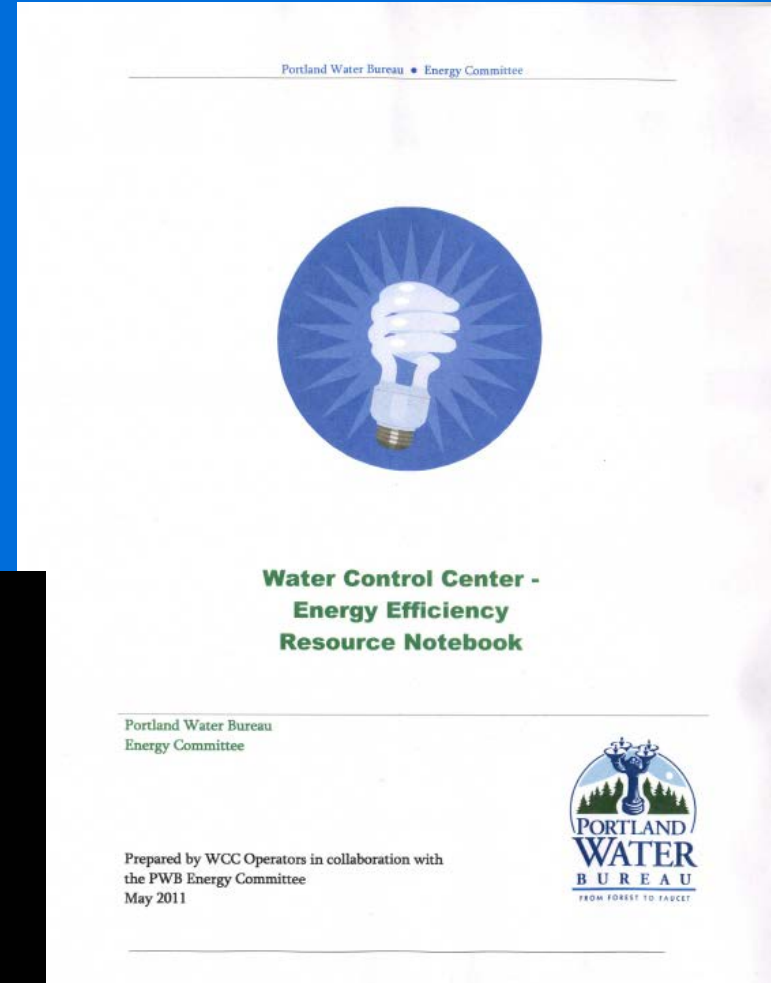


* Top 7 Water Bureau Pump Stations include Washington Park, Carolina, Fulton, Sam Jackson, Barbur-Gibbs, Hoyt & Calvary

- 1.8 Million kWh/yr saved
- 830 Tons of Carbon Dioxide

Other Strategies

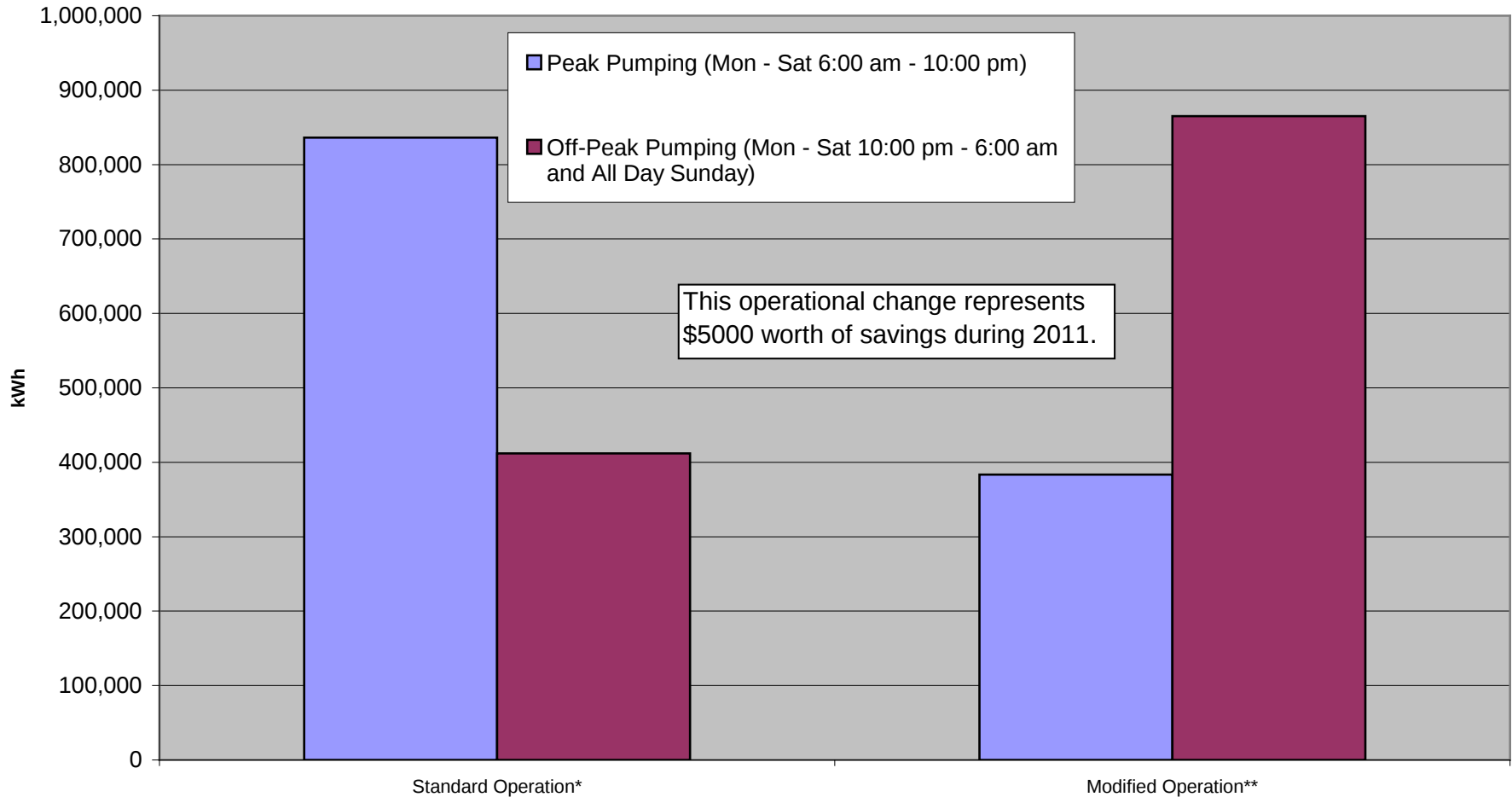
- Lighting Upgrades
- Employee Outreach
- Demand Shift



Demand Shift

Sam Jackson Pump Station - 2011 Peak vs. Off-Peak Pumping

Note: Electricity use at Sam Jackson Pump Station represents about 6% of total PWB electricity use.



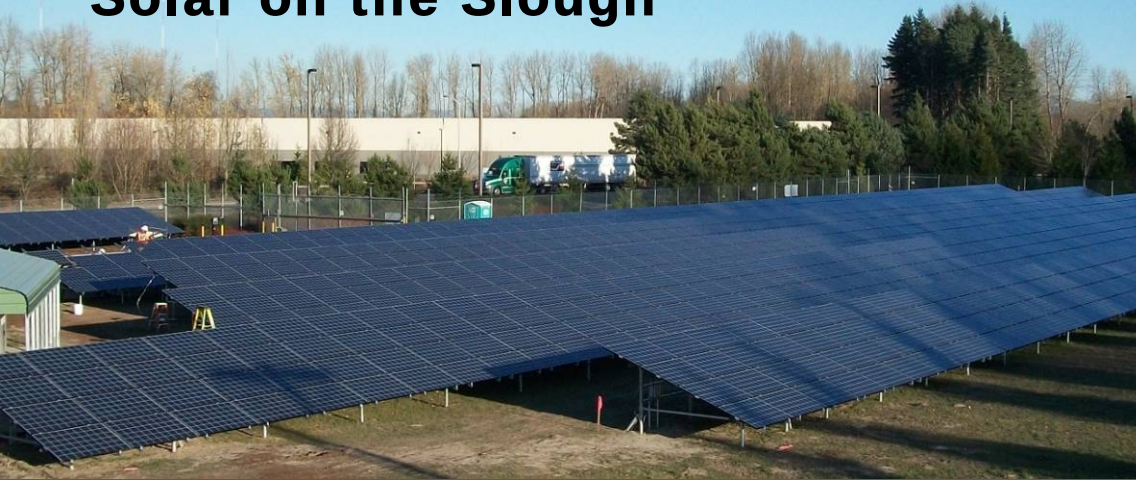
*Standard Operation was prior to Jan 2011, when pumps were operated approximately 2/3 of the time during peak period and 1/3 of the time during off-peak period.

**Modified Operation is after Jan 2011 when pumps were operated as much as possible during the off-peak period. Pumps may be operated during the peak period if tank levels are low or for other necessary operational purposes.

Renewable Energy



Solar on the Slough



Meter Shop Solar



Vernon-Micro Hydro Generator



Groundwater Treatment Bldg Solar

Questions?