

# Assessing Urinal Performance and Efficiency Opportunities

## Seattle Field Survey and Testing Results

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# About the Saving Water Partnership

- 17 Seattle area utilities jointly fund water efficiency programs.
- They supply one million people.
- Yearly average consumption is 90 MGD.
- The Partnership is guided by the CPA - Conservation Potential Assessment, an analysis tool providing life-cycle cost evaluation of the conservation potential for specific, and/or in combination with a group of measures.

# Research Goals

- To inventory a representative sample of urinals in the joint service area to determine the distribution of the most common fixtures, age, condition, and other relevant characteristics.
- To examine the baseline performance characteristics of the existing urinal stock.
- To assess practicality and cost-effectiveness of alternative strategies to significantly reduce water consumption and maintain flush effectiveness in urinal fixtures found throughout the SWP.

# Application of Research Results

- Use research findings to design a cost-effective urinal efficiency program to upgrade existing urinals.
- Use field measurements to better estimate savings potential and actual cost.
- Refine previous estimates of regional savings potential for urinal upgrades.



# Research Objectives

- Determine baseline characteristics of the current stock of urinals by collecting type, age, condition and other important performance data.
- Determine urinal flush volume and flush effectiveness through field measurements.
- Interview commercial customers to identify maintenance practices, urinal performance history, and decision makers for a urinal retrofit program.
- Assess the practicality and cost-effectiveness of alternative strategies to reduce flush volume and maintain flush effectiveness.

# Survey Size

- The inventory was collected for 179 male restrooms in 137 buildings for a total of 341 urinals.
- Additional urinal characteristics were collected for total of 48 urinals at 20 sites.
- Flush volume and conductivity measurements were taken at 33 of these urinals.
- Five completed customer surveys were returned.

# Survey Size contd.

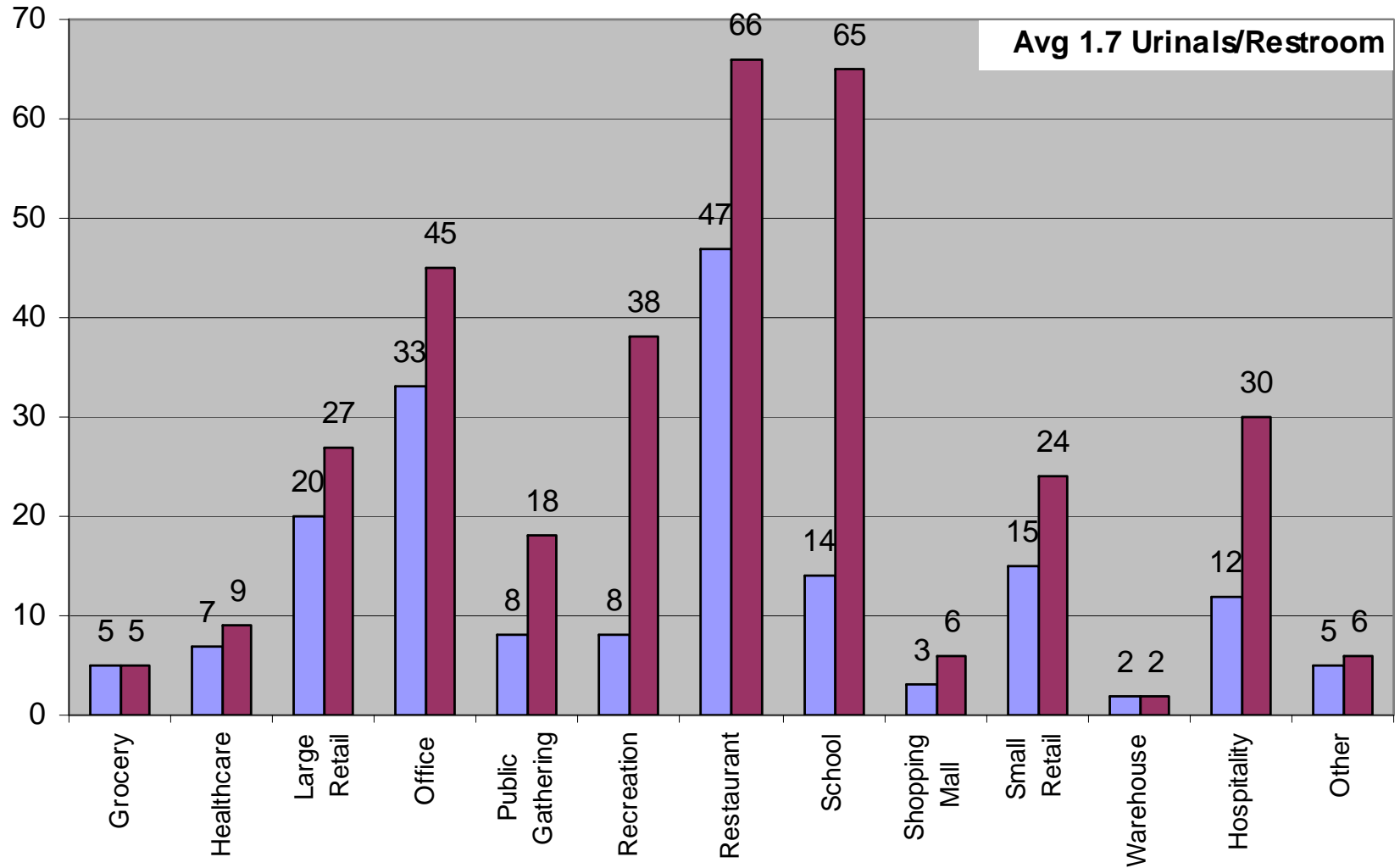
- Three efficiency options were tested:
  - Replacing existing urinals with 1/8th GPF High Efficiency Urinals (HEUs).
  - Replacing manual, exposed flush valves with adjustable pistons, with more efficient flush valves.
  - Replacing the diaphragms in the flush valves with lower flow diaphragms.
- Flush valves and diaphragms were tested for about 30 urinals; HEUs measurements and tests were conducted at 3 existing urinals.



# Urinal Distribution by Building Type

Urinal Distribution by Building Type

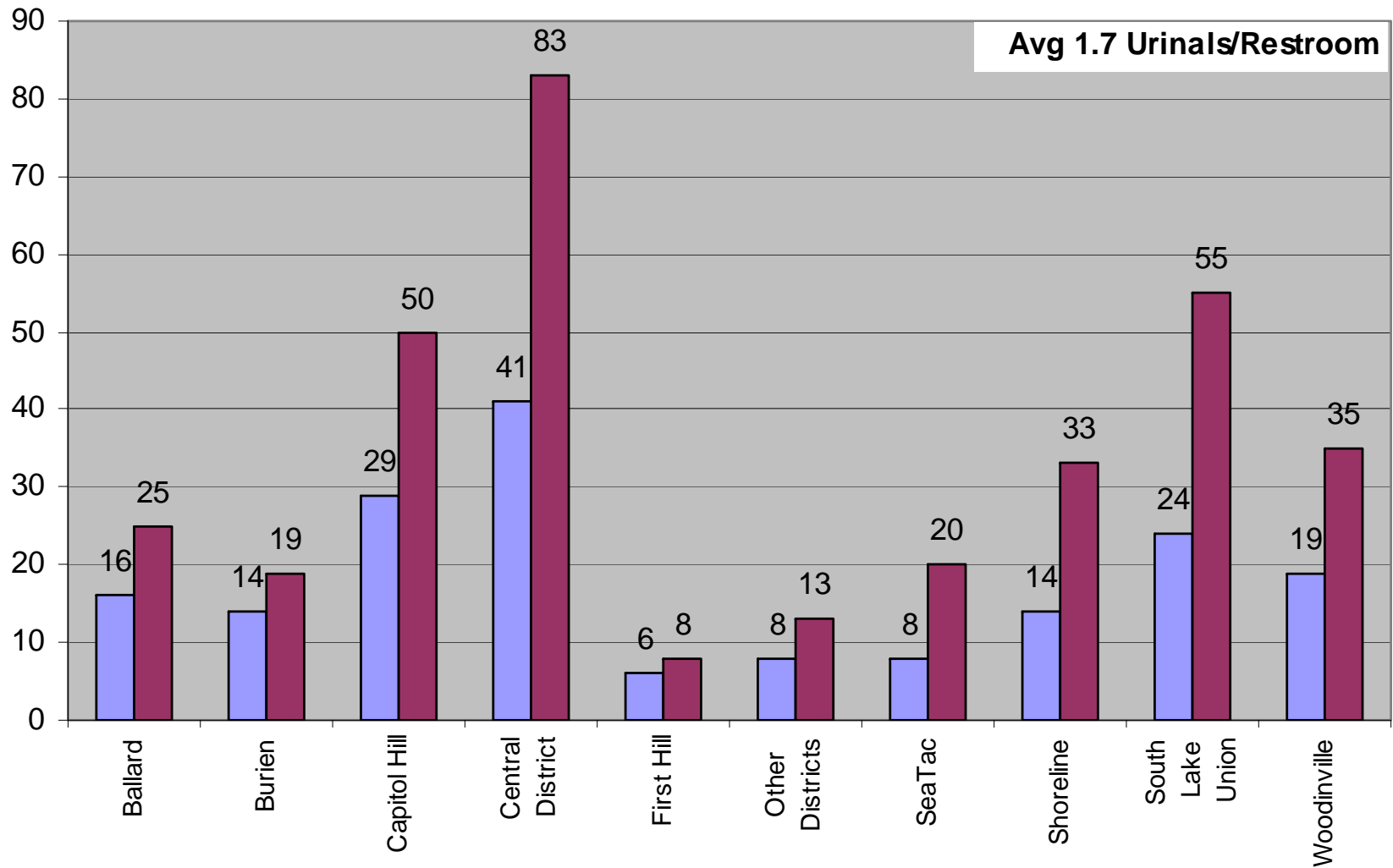
Restroom Count Urinal Count



# Urinal Distribution by Business District

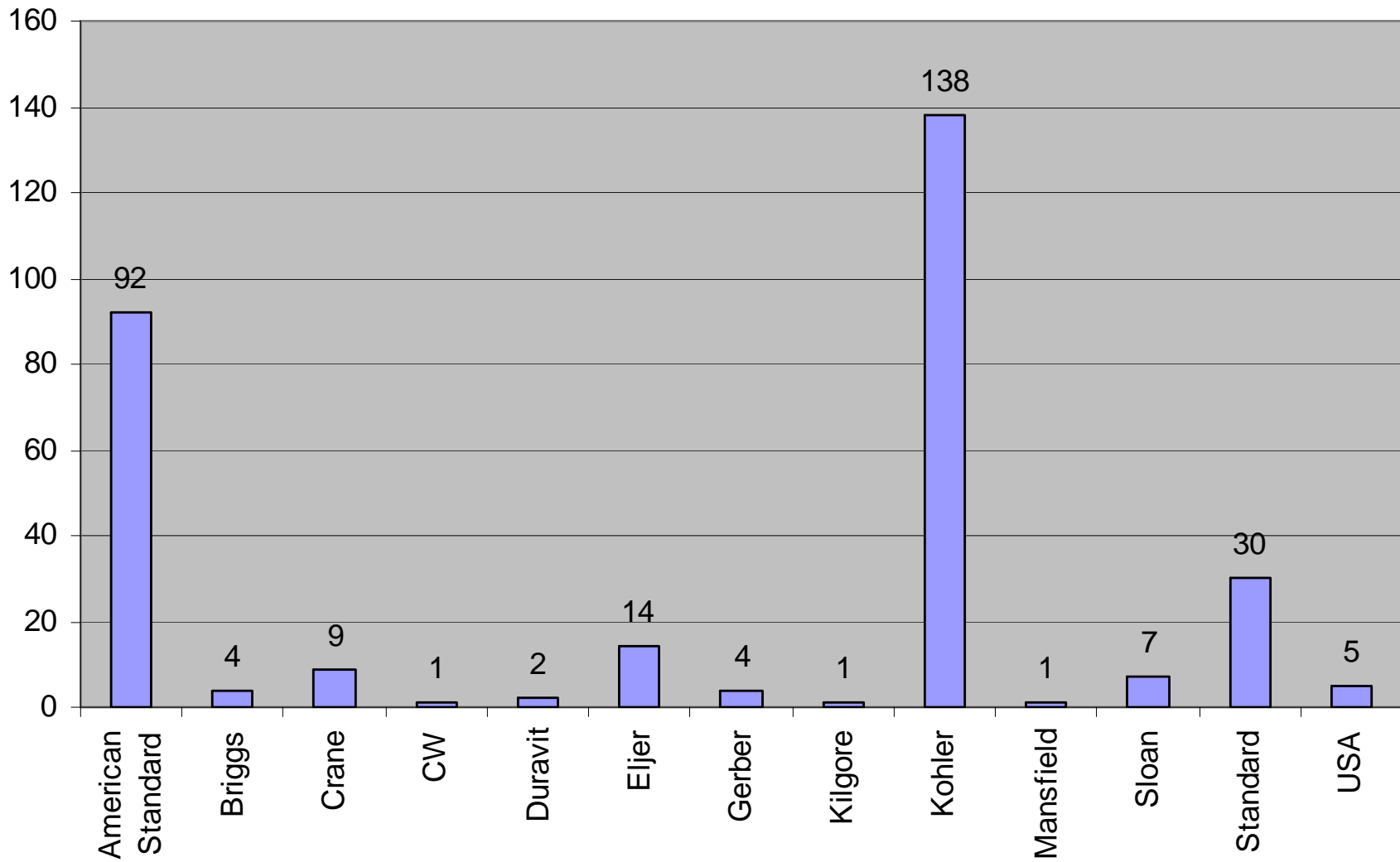
Urinal Distribution by Business District

Restroom Count    Urinal Count



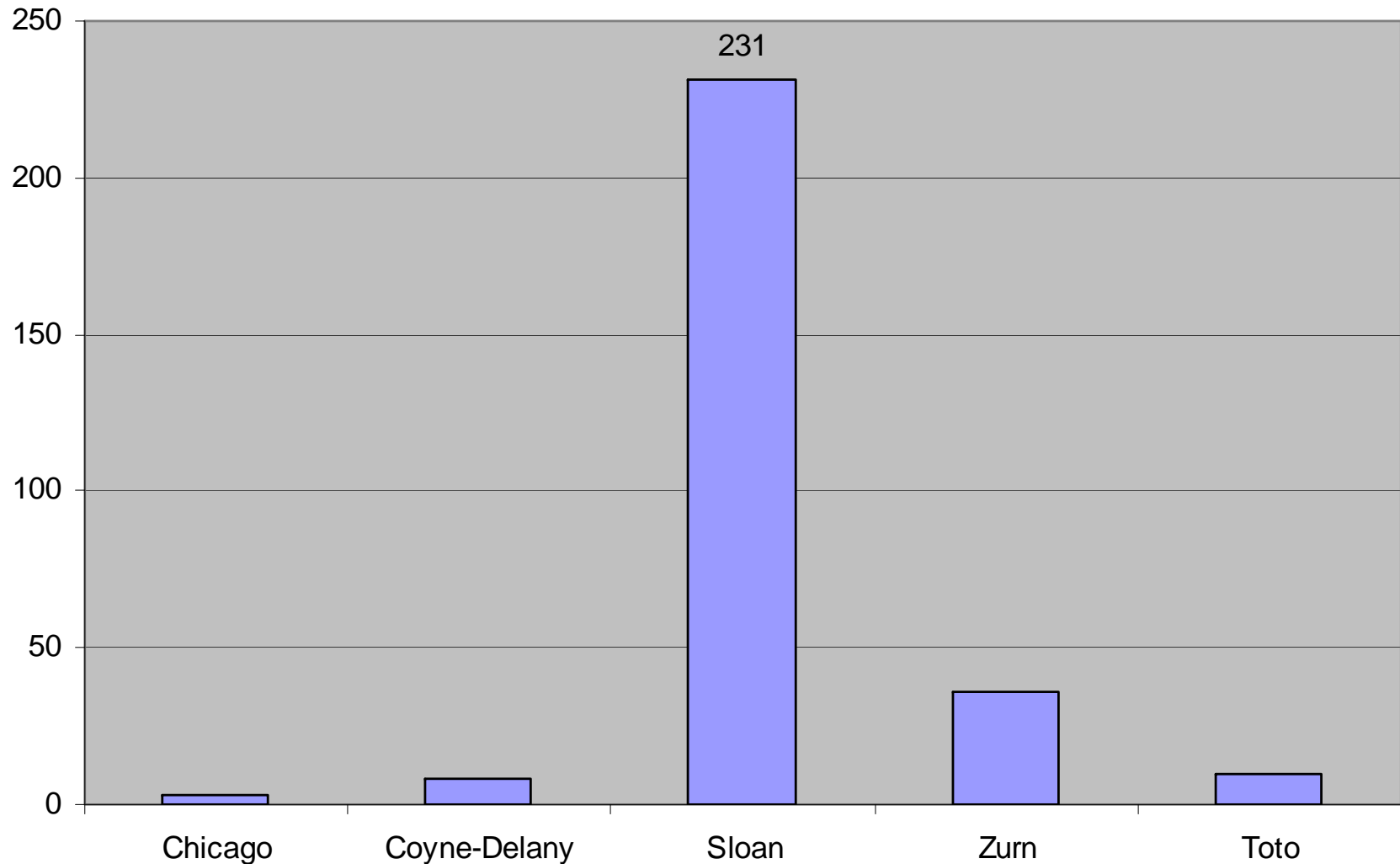
# Urinal and Flush Valve Characteristics

Distribution of Urinals by Manufacturer

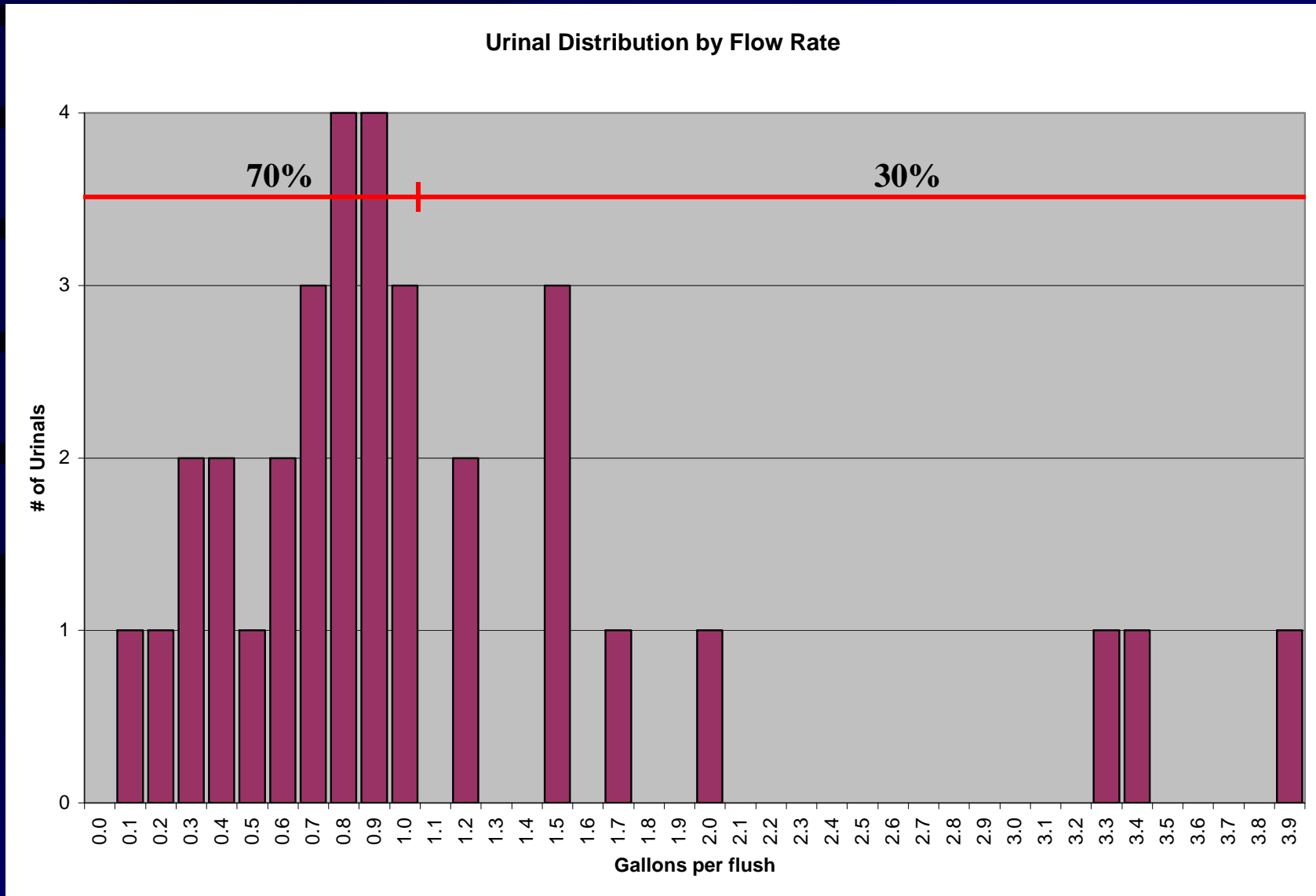


# Urinal and Flush Valve Characteristics

Distribution of Flush Valves by Manufacturer



# Urinal and Flush Valve Characteristics



# Urinal and Flush Valve Characteristics

Urinal Data	#	%
<b>Urinal Location</b>		
Public	34	70.8%
Private	14	29.2%
<b>Urinal Mount</b>		
Wall-back outlet	46	95.8%
Wall-bottom outlet	2	4.2%
<b>Urinal Style</b>		
Washdown	12	25.0%
Siphon-jet	25	52.1%
Blowout-ext	11	22.9%
<b>Flush Valve Type</b>		
Diaphragm	42	87.5%
Unknown	3	6.3%
Piston	3	6.3%
<b>Flush Valve Activation</b>		
Manual	36	75.0%
Sensor	12	25.0%
<b>Urinal Condition</b>		
Good	42	87.5%
Fair	4	8.3%
Poor	2	4.2%
<b>Flush Volume</b>		
Minimum	26	54.2%
Moderate	21	43.8%
Long	1	2.1%
<b>Vintage</b>		
Less than 35 years	42	87.5%
35 to 50 years	3	6.3%
More than 50 years	3	6.3%

Mounting Type	n	%
Concealed(in wall)	52	15.2%
Exposed	280	82.1%
Integral to fixture	0	0.0%
Waterless Urinals	9	2.6%
<b>Total</b>	<b>341</b>	<b>100.0%</b>

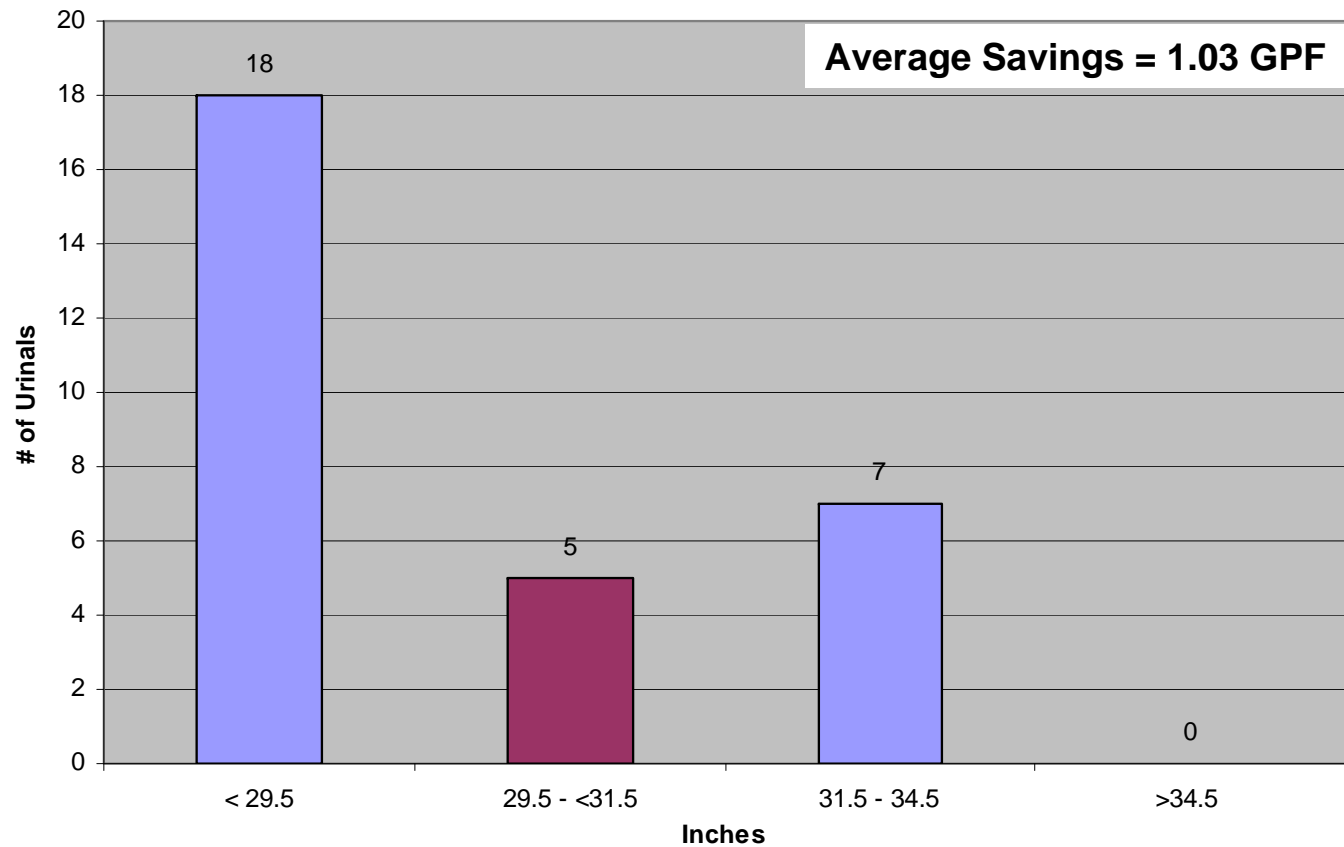
- 25% flush valves are sensor activated – not eligible for a flush valve retrofit, but can have a diaphragm retrofit.
- 25% of the concealed mountings were still accessible for flush valve and diaphragm replacement.

# Observations

- Maintenance staff use stop valves to minimize actual flush volume. Many older urinals already operate at low flush volume.
- Old urinals with single filter diaphragms flush at less than nominal flush volume even with the stop valve fully open.
- Dual filter diaphragms provide better immediate savings and more consistent long term savings.
- Urinal use is >100/day in public buildings and 11-50/day in private buildings.
- Most facilities are interested in a urinal retrofit program.

# Urinal Efficiency Options – 1/8<sup>th</sup> GPF HEU

Urinal Count by Distance from Bolt to Supply



- HEUs can be replaced when distance between bolt and supply heights is 31.5” to 34.5” – 23% of sample. Future models will fit in 29.5” – 40% of sample.

# Urinal Efficiency Options – 1/8<sup>th</sup> GPF HEU

## *Advantages*

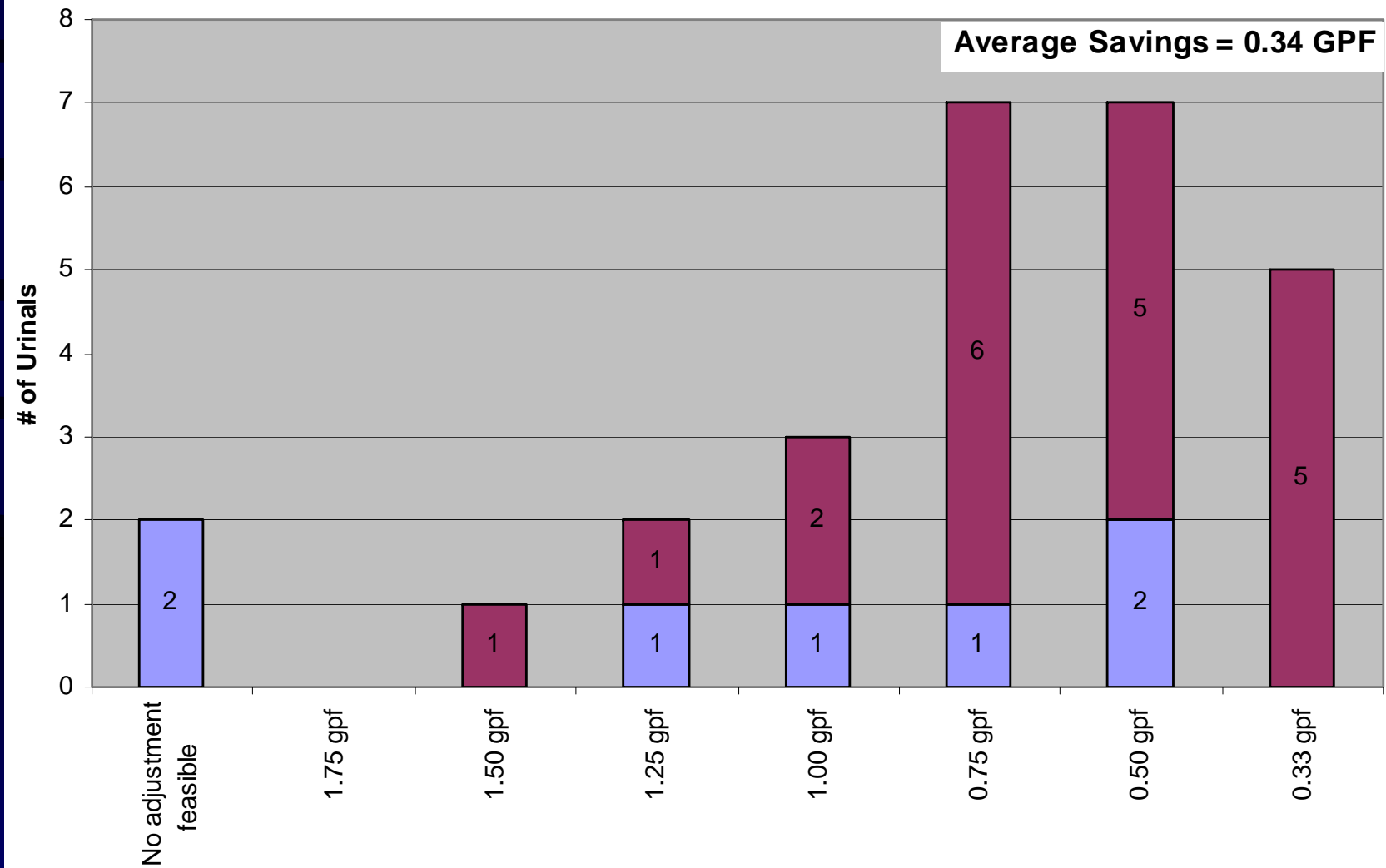
- Longest expected measure life (20+ years).
- Greatest water savings per urinal.
- Guaranteed savings as the flush valves cannot be replaced with higher flow systems.
- Good customer acceptance.
- Market transformation value.

## *Disadvantages*

- Highest cost per urinal.
- Applicable to a portion of the market for which the new units can fit into the existing plumbing.
- Potential liabilities involved with a direct install option or requires customer to arrange installation.

# Savings from Flush Valve Replacement

Urinal Distribution After Flush Valve Replacement



# Urinal Efficiency Options – Flush Valve Replacement

## *Advantages*

- Good Measure Life (15+ years)
- Moderate equipment cost.
- Relatively quick to install and to set to optimum efficiency
- Ability to zero in to whatever GPF that provides maximum efficiency, down to a minimum of 0.32 GPF.

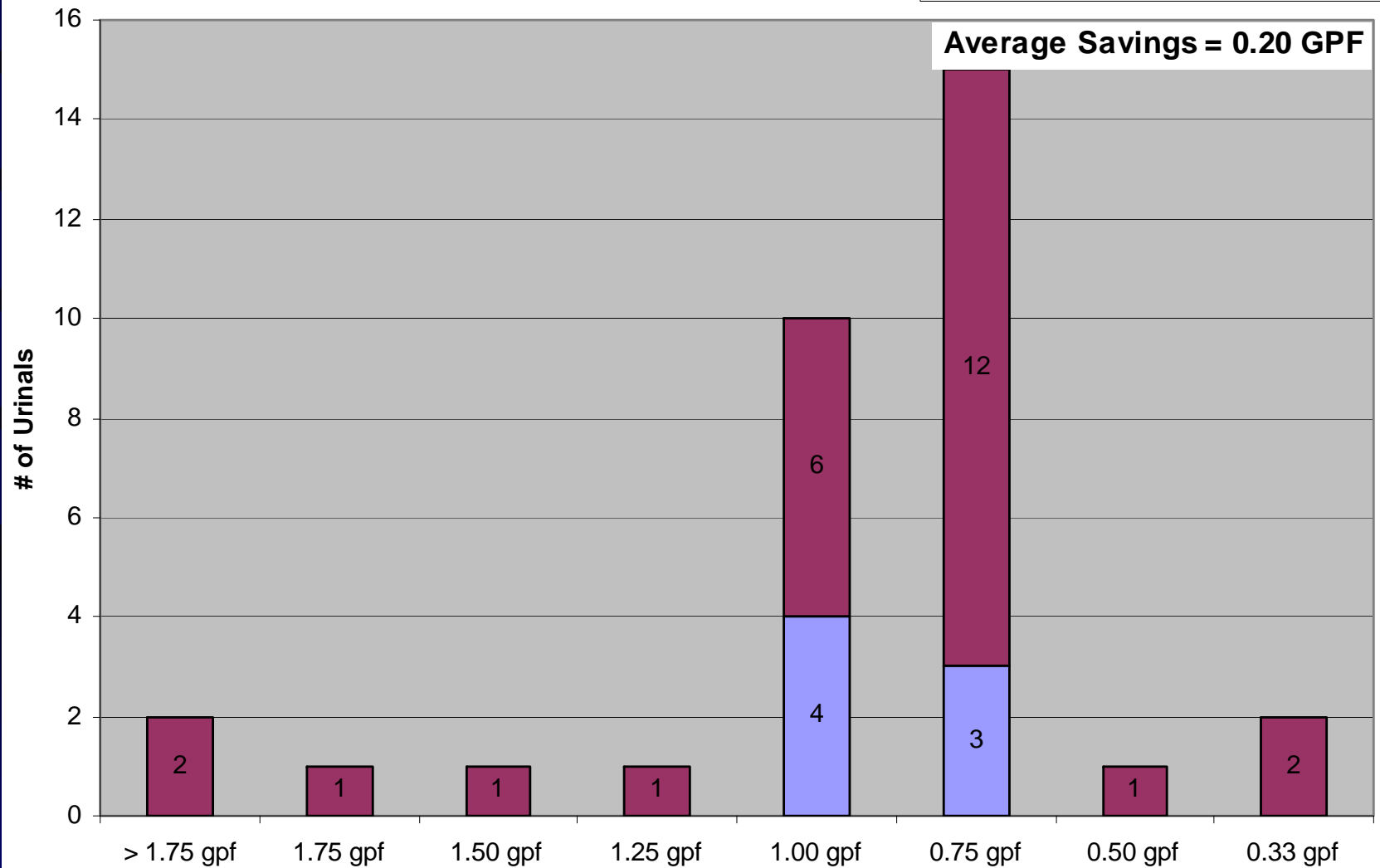
## *Disadvantages*

- Applicable to portion of the market with manual exposed flush valves and adjustable pistons.
- May increase water use in a small percentage of cases.
- May be user adjusted within limits.
- Piston technology unfamiliar to some.
- Facilities with maintenance contracts may refuse installation.
- Lower savings than HEUs.

# Savings from Diaphragm Replacement

Urinal Distribution After Diaphragm Replacement

■ Negative Savings ■ Postive Savings



# Urinal Efficiency Options – Diaphragm Replacement

## *Advantages*

- Lowest equipment cost.
- Good customer acceptance - no visible changes to equipment, use of familiar parts.

## *Disadvantages*

- Short measure life (2+ years).
- May increase water use in a small percentage of cases.
- May be replaced with higher flow diaphragms by maintenance staff.
- Need to test diaphragms of various ratings to get optimum GPF.
- Lower savings than HEU or new flush valve.

# Costs and Payback for Efficiency Options

Option	Efficiency Option Description	Avg Savings (gpf)	Market Share (%)	Equipment Costs (\$)	Labor Costs (\$)	Admin Costs (\$)	EUL (yrs)	\$/GPF Saved Levelized by Measure Life
A	New 1/8th gpf HEU	1.03	38%	\$ 545	\$ 300	\$ 80	20	\$ 45
B	New 0.6 gpf Flush Valves	0.34	72%	\$ 45	\$ 25	\$ 20	15	\$ 18
C	New 0.3 to 1.5 gpf Diaphragm	0.20	64%	\$ 25	\$ 25	\$ 20	2	\$ 175

- Equipment cost for the HEUs can be lowered through bulk pricing, more negotiation, and competitive pricing.
- Labor costs were computed at \$100/hour but can be reduced by negotiating volume plumber labor costs.
- Administrative costs calculated at 10% of other costs, but will vary with the selected program delivery method

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