

This presentation premiered at WaterSmart Innovations

watersmartinnovations.com



**Alternate On-Site
Sources of Water –
The New Green Build
Buzz & Much More**

**Presented at WaterSmart Innovations
2009**

October 7, 2009

Las Vegas, Nevada

by

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Water Management, Inc.**

**The Green
Bandwagon is
Starting**

LEED 2009 & Alternate Sources of Water

**Use of alternate on-site
sources of water is
recognized as one way of
accomplishing these
goals.**

LEED EB 09

14 water points out of 110 total

Water Efficiency			14	Points
Y	Prereq 1	Minimum Indoor Plumbing Fixture and Fitting Efficiency		Required
	Credit 1.1	Water Performance Measurement: Whole building metering	1	
	Credit 1.2	Water Performance Measurement: Submetering	1	
	Credit 2	Additional Indoor Plumbing Fixture and Fitting Efficiency	1 to 5	
	Credit 2.1	10% Reduction	1	
	Credit 2.2	20% Reduction	3	
	Credit 2.3	30% Reduction	5	
	Credit 3	Water Efficient Landscaping	1 to 5	
	Credit 3.1	50% Reduction	1	
	Credit 3.2	75% Reduction	3	
	Credit 3.3	100% Reduction	5	
	Credit 4.1	Cooling Tower Water Management: Chemical Management	1	
	Credit 4.2	Cooling Tower Water Management: Non-Potable Water Source Use	1	

Yes ? No

LEED NC 2009

10 water points out of 100 total

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Water Efficiency	10	Points
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<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Prereq 1	Water Use Reduction, 20% Reduction	Required
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Credit 1.1	Water Efficient Landscaping, Reduce by 50%	2
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Credit 1.2	Water Efficient Landscaping, No Potable Use or No Irrigation	2
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Credit 2	Innovative Wastewater Technologies	2
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Credit 3.1	Water Use Reduction, 30% Reduction	2
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Credit 3.2	Water Use Reduction, 40% Reduction	2

LEED 3.0 ?

Green Build Initiative

- **Project Management – 100 points**
- **Site = 120 points (including 28 for irrigation)**
- **Energy – 300 points**
- **Water – 130 points**
- **Resource and Materials – 145 points**
- **Emissions and Storage of Hazardous materials – 45 points**
- **Indoor Air Quality - 160**

GBI Water Points

• Plumbing	46
• Cooling Towers	18
• Boilers	4
• Food Svc.	12
• Med./Lab	11
• Laundry	10
• Water Features	4
• Water Treatment	5
• Alternate Sources	14
• Metering	6
	<hr/>
	TOTAL 130

*Add 28 points for irrigation in sites for
a total of 158 water points out of
1000 total*

Green Globes Points

Replacement of Potable Water Use with Alternate Sources of Water

Points	Percent of Potable Water Replaced With On Site Sources
2 points	15%-25%
4 points	26%-35%
6 points	36%-45%
8 points	46%-55%
10 points	56%-65%
14 points	Over 60%

IAPMO

Green Technical Committee

- **Uniform Plumbing Code**
- **Uniform Mechanical Code**

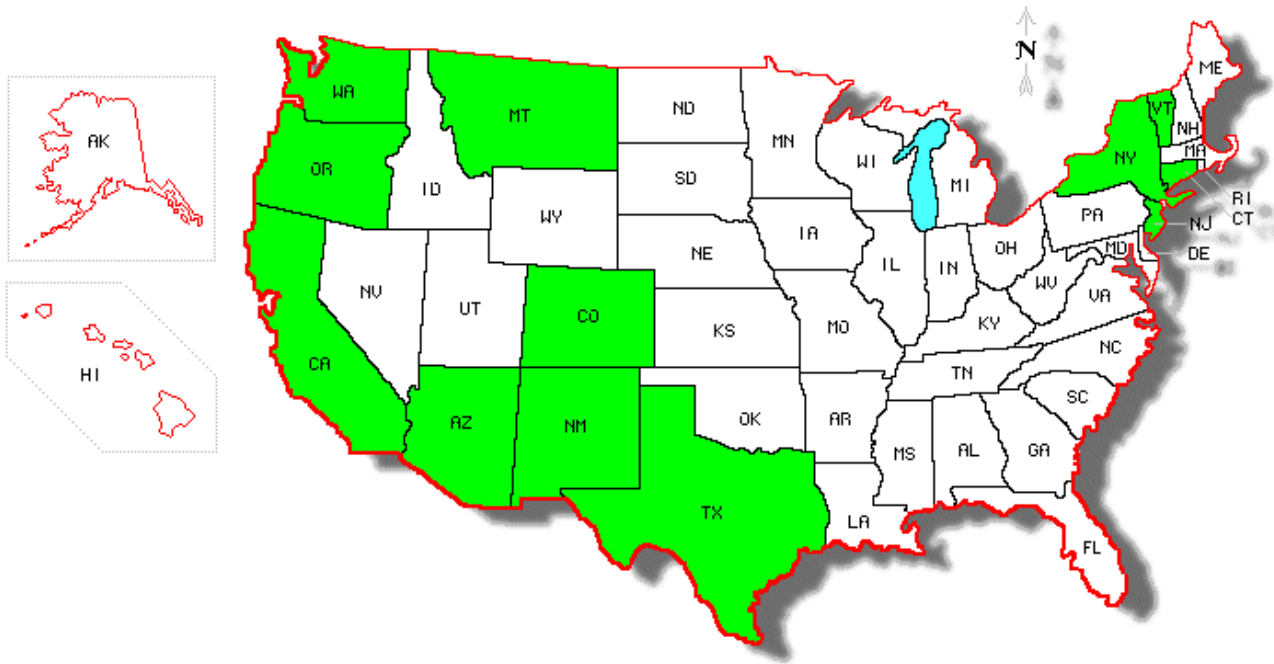
Types of Alternate Sources in IAPMO Green Supplement

- **Gray Water (Untreated)**
- **Rainwater**
- **Municipal Reclaimed Water**
- **Other On-Site Sources (Treated to meet needed)**

ICC just starting

States with some form of Gray Water Rules

● - States with Rules



Alternate On-Site Sources of Water

- Rainwater harvesting
- Stormwater harvesting
- Air conditioner condensate
- Swimming pool filter backwash water
- Cooling tower blowdown
- Reverse osmosis (RO) and nanofiltration (NF) reject water
- Gray water
- On-site treated wastewater systems
- Foundation drain water
- Others??????

Matching Source to Use

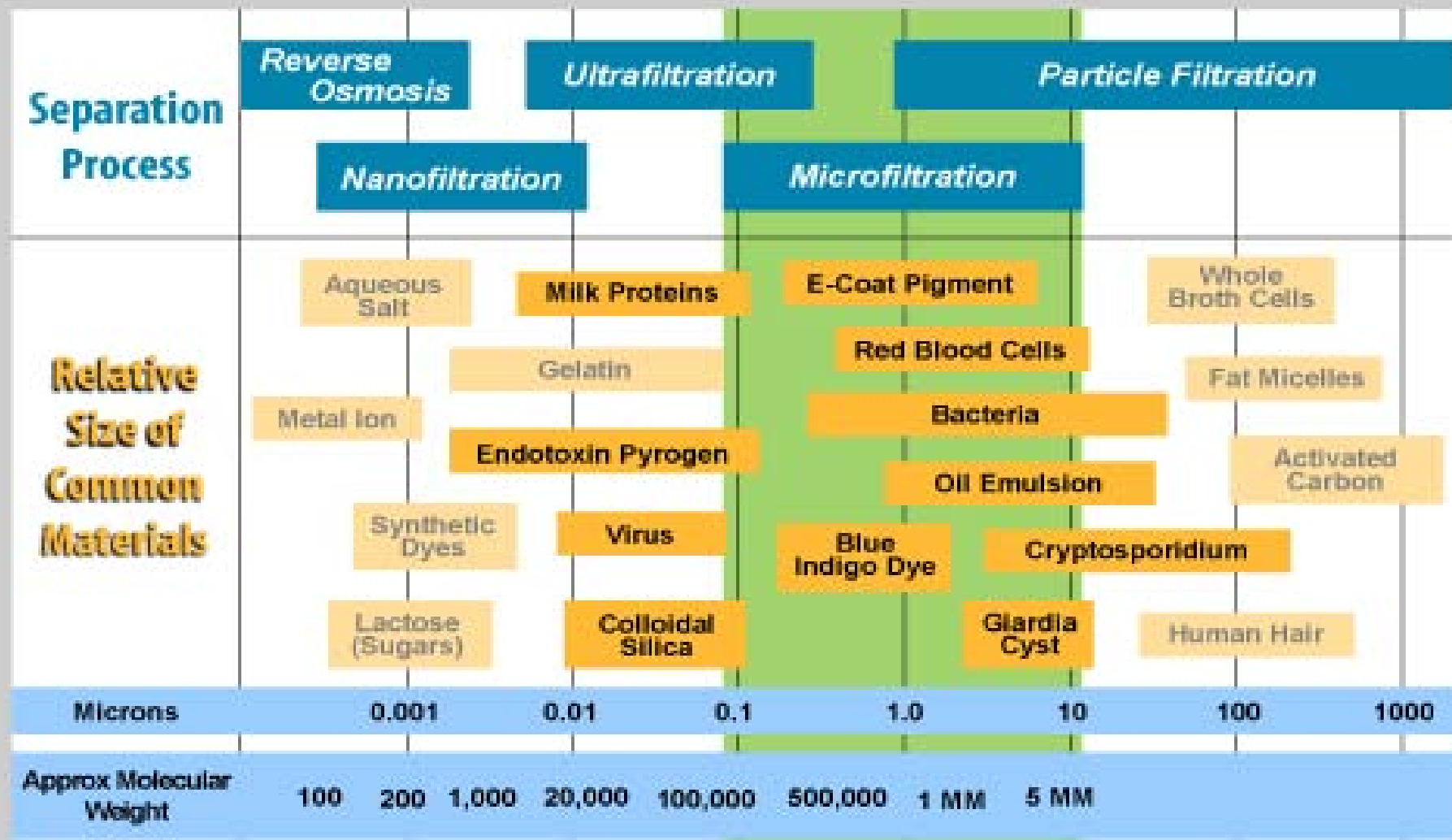
- **The Quality of the source must be acceptable for use.**
- **Treatment may be required**
- **The quantity of the source must be quantified.**

Basic Water Chemistry

- Dissolved Salts
- Alkalinity, pH, Bicarbonate, etc.
- Hardness
- Iron and Manganese
- Organics
- Particulates
- Silica
- Biological Specie

Types of Treatment

- **Filtration of particulates and smaller particles**
- **Removal of cations and anions**
- **Removal of organic matter**
- **Softening**
- **Disinfection**
- **Special treatment**



Note: 1 micron (micrometer) = 4 x 10⁻⁵ inches = 1 x 10⁴ Angstrom units

© 2004 - Koch Membrane Systems

**Table 1. - Water Quality Consideration for
Alternate On-site Sources of Water**

Possible Sources	Water Quality Considerations					
	Sediment	(TDS)	Hardness	Organic (BOD)	Pathogens (A)	Other considerations
Rainwater	1-2	1	1	1	1	<i>None</i>
Storm water	3	?	1	2	2	<i>Pesticides & fertilizers</i>
Air conditioner condensate	1	1	1	1	2	<i>May contain cooper when coil cleaned</i>
Pool filter backwash	3	2	2	1	2	<i>Pool treatment chemicals</i>
Cooling tower blowdown	2	3+	3	2	2	<i>Cooling tower treatment chemicals</i>
RO & NF reject water	1	3+	3	1	1	<i>High salt content</i>
Gray water	3	2	2	3	3	<i>Detergents and bleach</i>
On-site wastewater treatment	3	2	2	3+	3+	<i>Human waste</i>
Foundation Drain Water	1	>	?	2	2	<i>Similar to stormwater</i>

The use pass-through (once-through) cooling water is also a possible source of on-site water, but should be discouraged because of its huge potential to waste water, but it does provide a very clean source of water. For that reason, it is not included in this list.

- 1.Low level of concern
- 2.Medium level and may need additional treatment depending on end use
- 3.High concentrations are possible and additional treatment likely
- ? Dependent on local conditions
- (A) All water used inside for toilet flushing and other uses should be disinfected.

**Table 2. - Types of Treatment That May Be Employed
Depending on Intended End Use Quality Needs**

Possible Sources	Filtration	Sedimentation	Disinfection	Biological Treatment	Other Treatment Considerations
Rainwater	?	?	?		May be use for irrigation without additional treatment
Storm water	X	?	?	?	For non-potable use only
Air conditioner condensate			x		Segregate coil cleaning water
Pool filter backwash	X	?			May have high TDS and chlorine levels
Cooling tower blowdown	?	?	X		Consider TDS monitoring
RO & NF reject water					Consider TDS monitoring
Gray water	X	?	X	?	Biologically unstable for long periods of storage unless treated. Subsurface drip requires the least treatment.
On-site wastewater treatment	X	X	X	X	Biologically unstable for long periods of storage unless treated
Foundation Drain Water	?	?	?		May be hard if in alkaline soils

X - Treatment likely needed

? - Treatment depends on ultimate use

Quantifying Volume Available

- **Engineering Estimates**
- **Metering and Bucket and Stopwatch**
- **Sizing Storage vs. Use**

The Quality – Quantity Quandary

Process	Process Needs		Process Discharge	
	Volume	Quality	Volume	Quality
Cooling				
Wash/ Clean				
Process				
???? ↓				

Cost Considerations

- **The volume produced**
- **The timing of when the source is produced in relationship to the demand;**
- **The potential to combine multiple sources;**
- **Water quality;**
- **Type of treatment required;**
- **System cost and payback.**

Regulations, Codes & Incentives

- **Regulations & Code give credence**
- **Codes available are outdated**
- **Few States have any type of regulation**
- **Incentives do exist in States and local jurisdictions**

Rainwater & Stormwater

- **The most recognizable**
- **Thousands of years of history**
- **Reduces storm surges & pollution**
- **Reduces combined sewer overflows**

Rainwater Collection Rates

- **One inch of water = 0.623 gallons**
- **The surface it falls on will determine runoff**
 - **Wetting**
 - **Holdup**
- **You only catch rain when it rains**





**Rainwater
“guzzlers” at
Big Bend
State Park in
far West
Texas are
used to
provide
water for
wildlife.**



Stormwater

Proven Practices

- Include capture in on-site features, such as berms, swales, rain gardens, or terraces, and the use of soil as a water-storage medium jointly in the design of landscape and stormwater facilities.
- Require stormwater ponds to be established or enlarged to accommodate long-term storage for landscape irrigation and other uses.

Additional Methods

- Examine the potential of captured and stored stormwater along with other on-site sources of water.









Cistern is framework of plastic modules



**Using Landscape
as a
Rain/Storm Water
Harvesting System**



Shape land to hold water

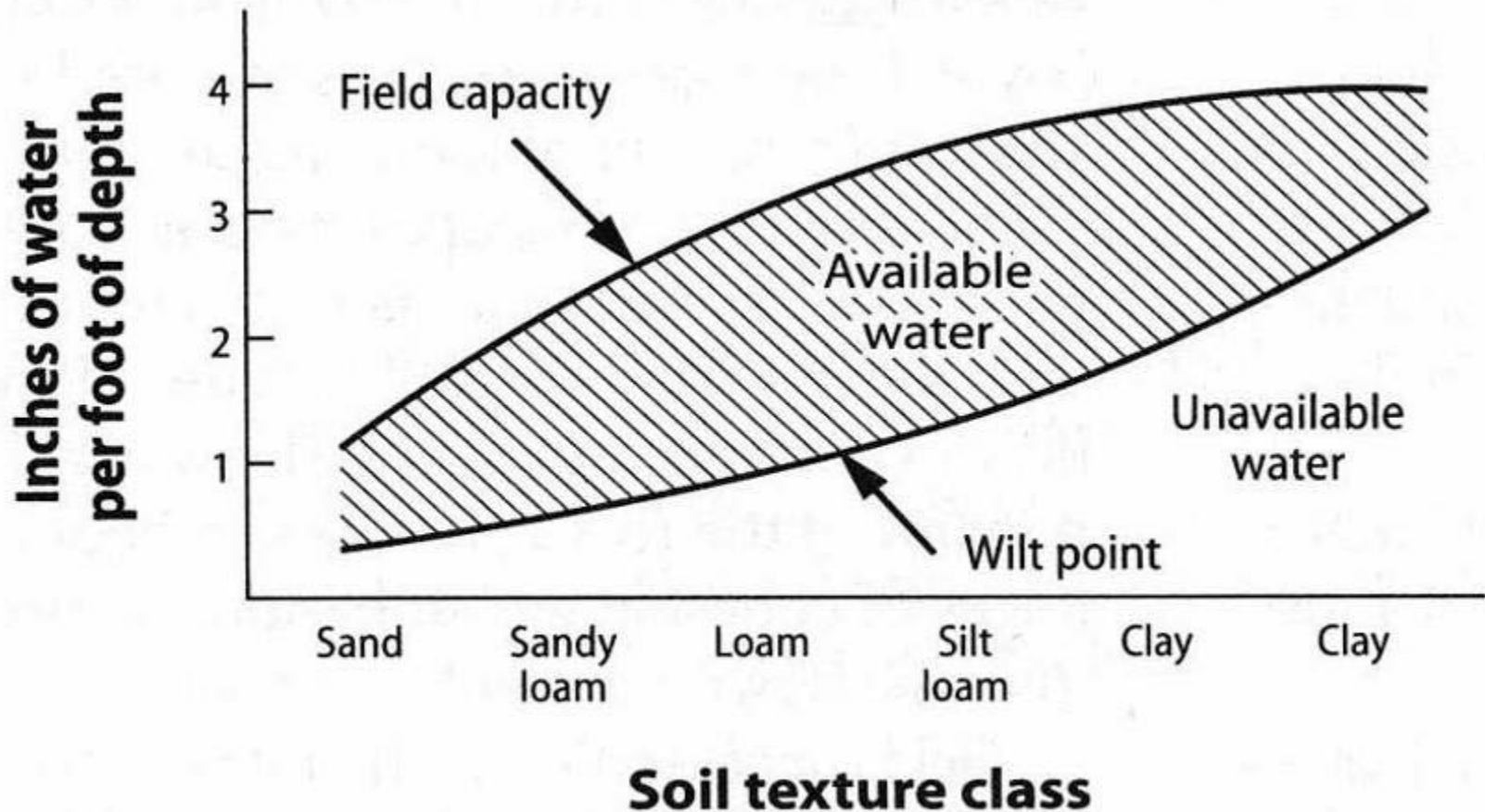


Landscape Design Concepts

- Soil preparation and depth
- Shape land to hold water
- Chose appropriate plant material
- Proper irrigation system design
- Capture on-site sources of water
- Symbiosis between landscape and stormwater control
- ***KEEP IT WHERE IT FALLS***

Soil Preparation and Depth

6" to 8" of well amended soil



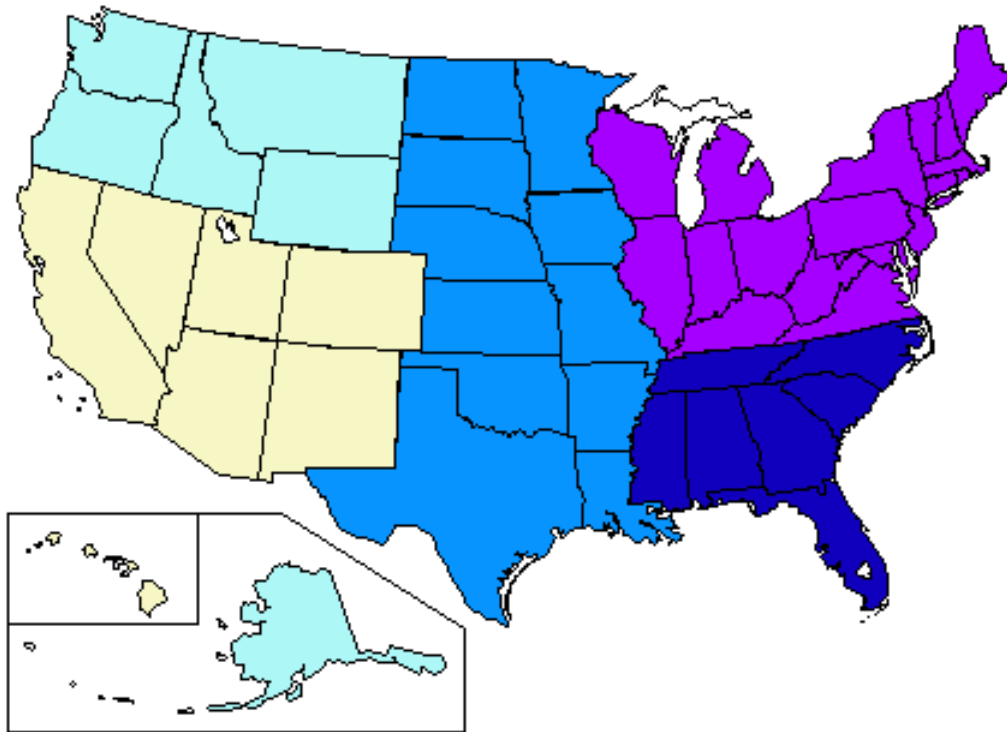
Sun Valley Watershed Management Plan

...but also



**Stormwater-capture BMPs
on
20 to 40%
of individual properties**

American Rainwater Catchment Systems Association



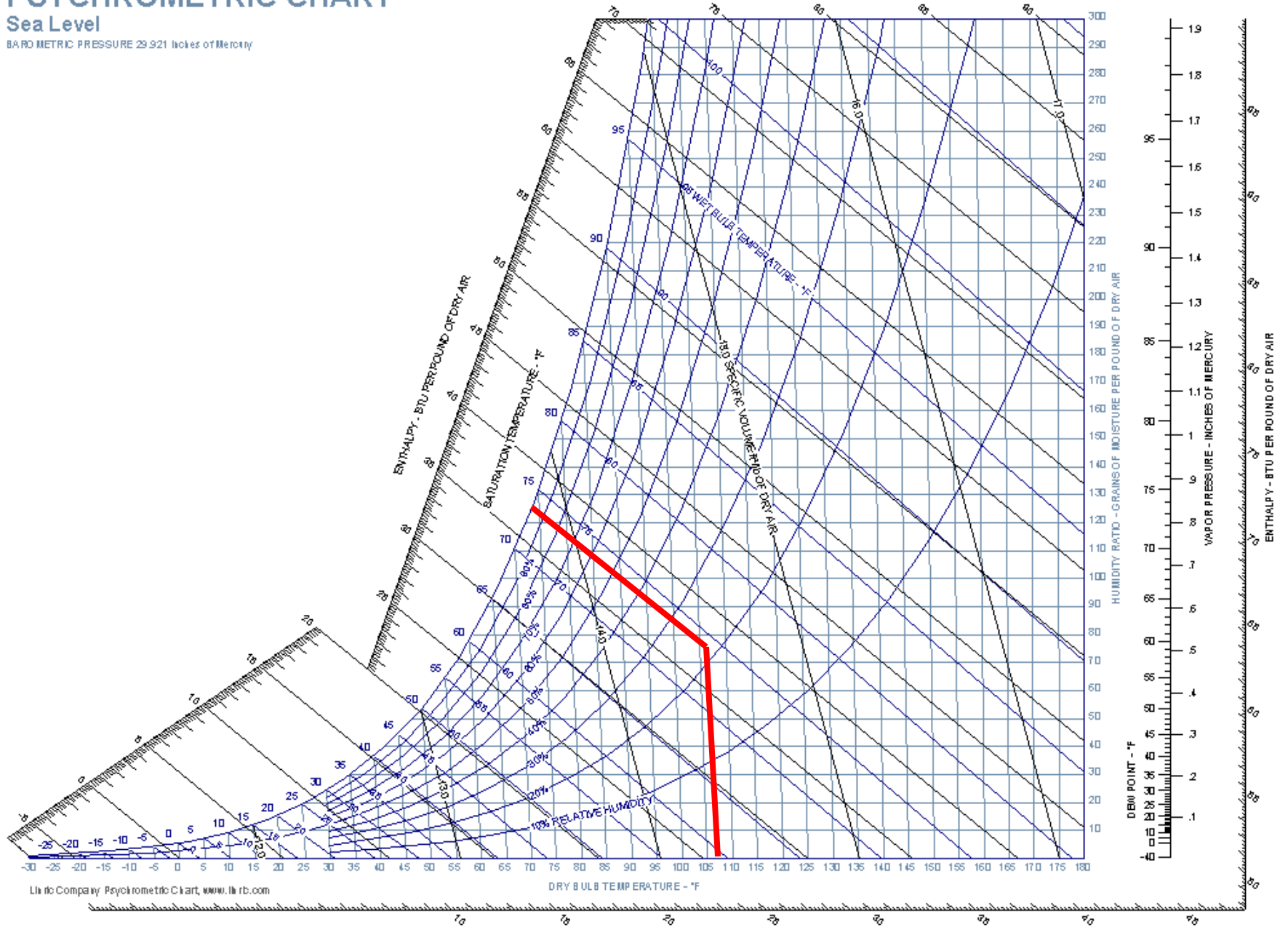
<http://www.arcsa-usa.org>

Using Air Conditioner Condensate

PSYCHROMETRIC CHART

Sea Level

BAROMETRIC PRESSURE 29.921 Inches of Mercury





Pools & Spas

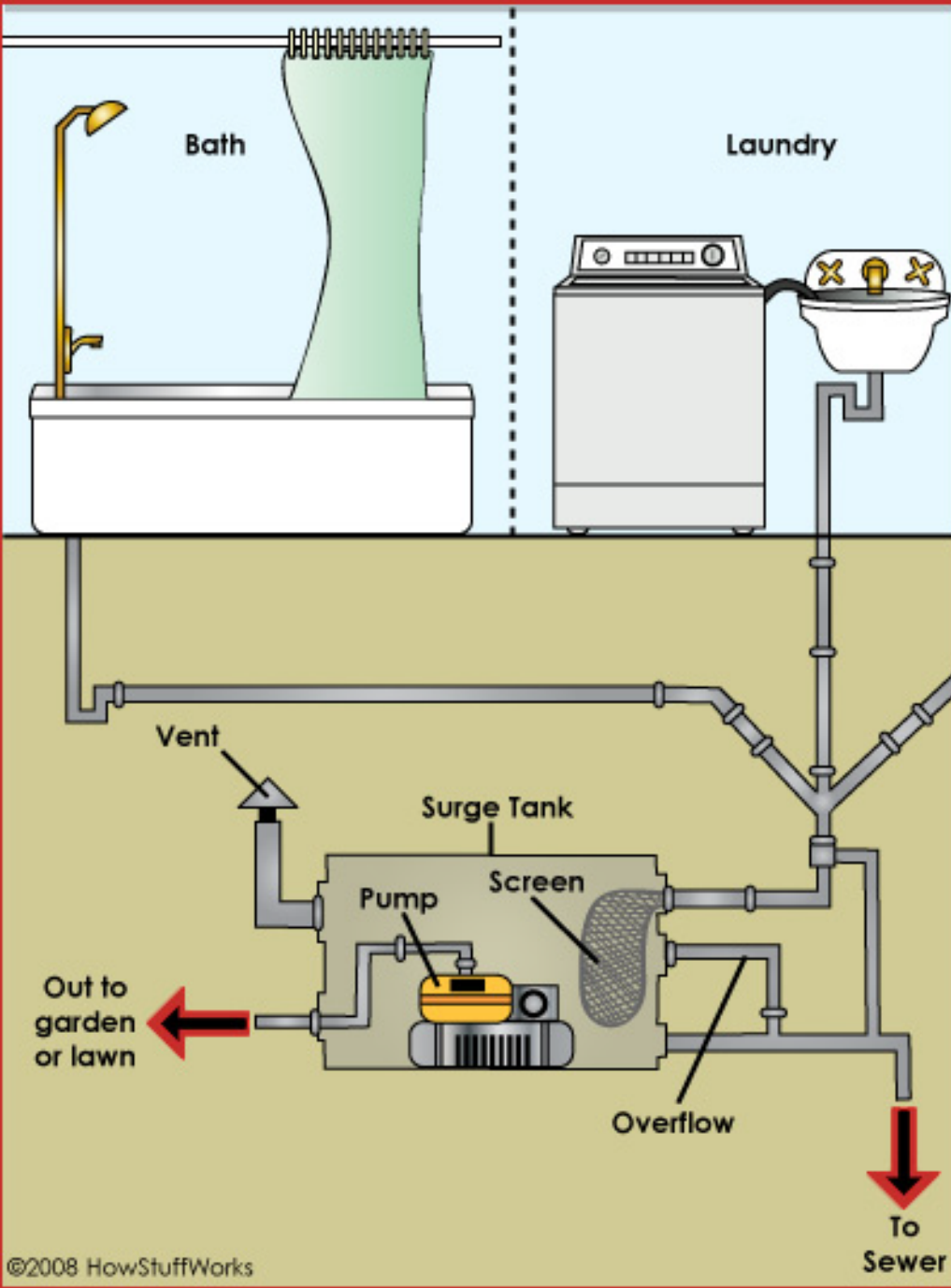
**Reuse of filter backwash at
City Pools
For landscape irrigation**

Foundation Drain Water



Some-
times
you
got'a-
get
down
and
dirty!

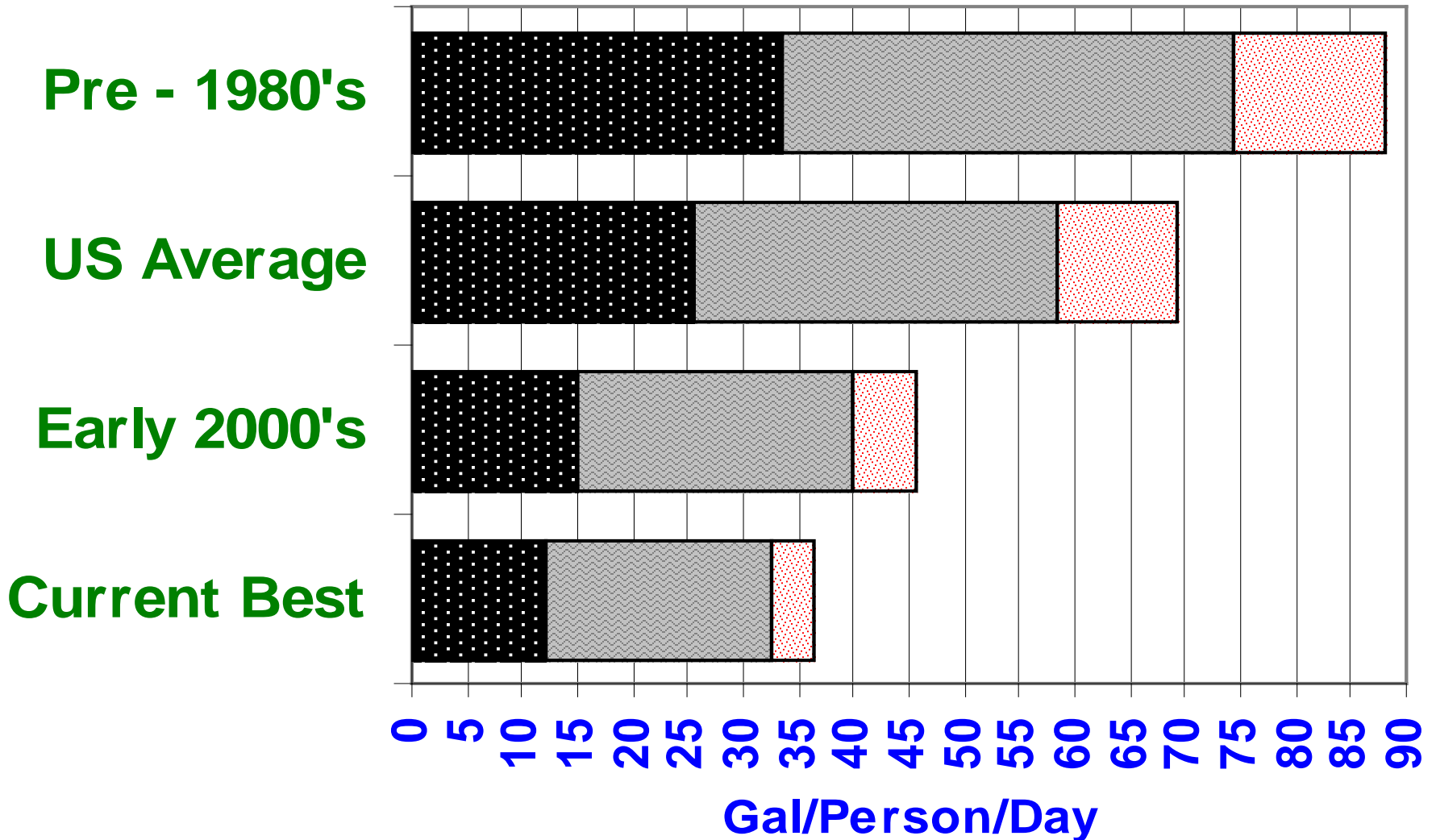




Gray Water and Other Things



In-Home Gray Water Production



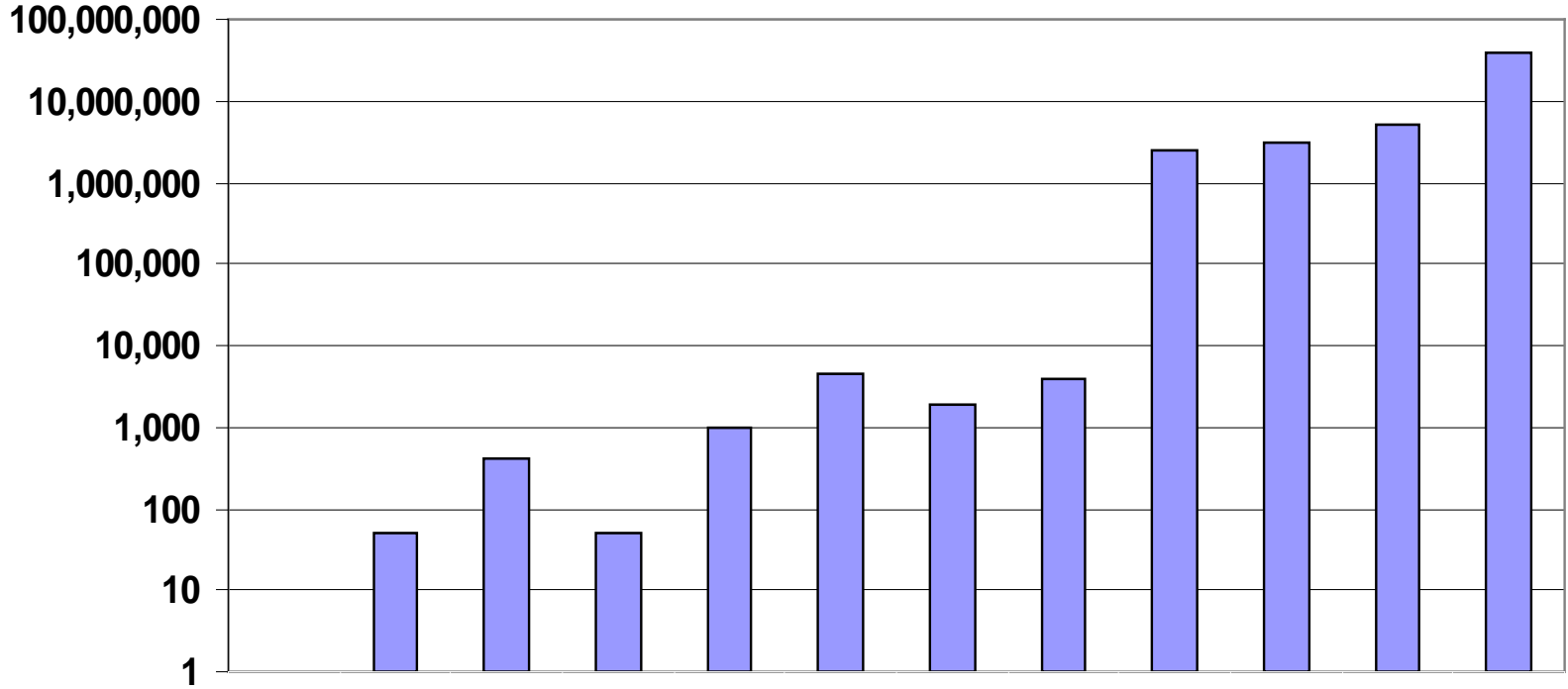
■ Black Water ■ Gray Water ■ Leaks + Misc.

Actual Gray Water Requirements

- In Tokyo, Japan, gray water recycling is mandatory for buildings with an area greater than 30,000m² or with a potential non-potable demand of more than 100m³ per day.
- In Cyprus, the use of gray water for garden irrigation and toilet flushing has been subsidized to the tune of approximately \$2,000 per dwelling.

Fecal Levels Chart-Log Scale

Fecal Coliforms/100ml or PPB feces



Source:
Oasis
Design

Some Products from Australia



Gator



Water Browser

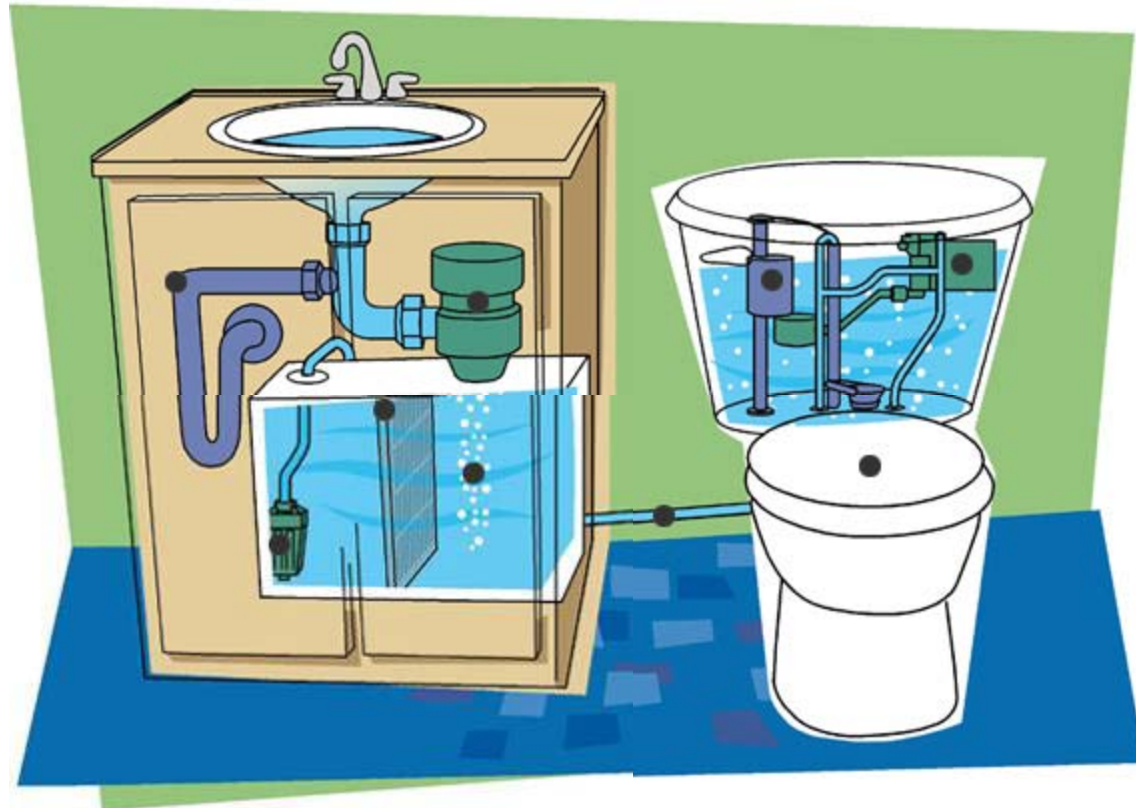


H2Gro



EcoCare Diverter

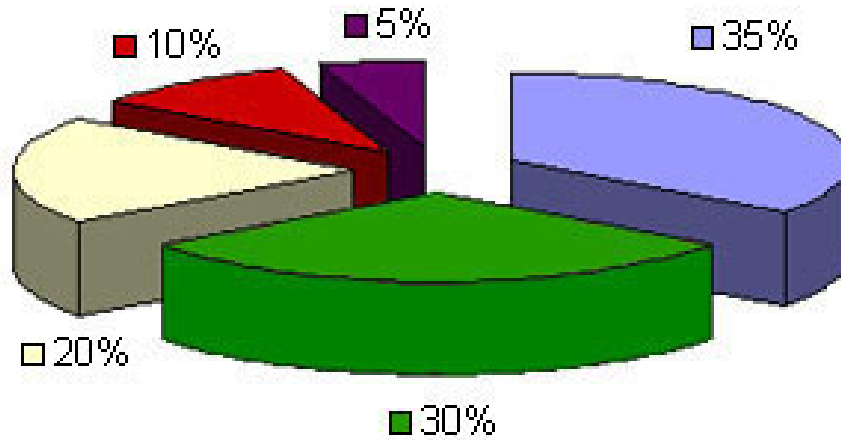
AQUS™ System



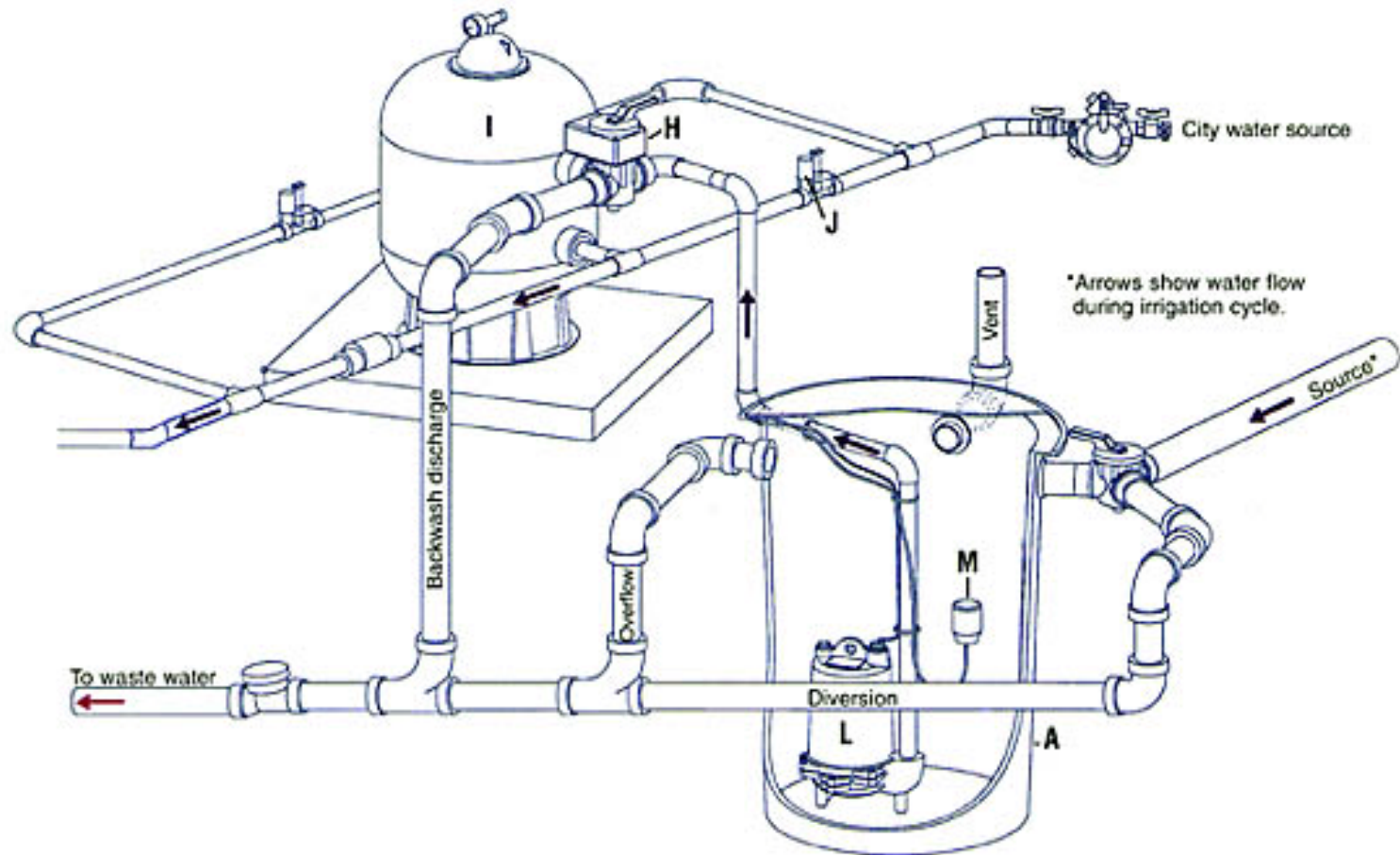
Brac Indoor System for Flushing



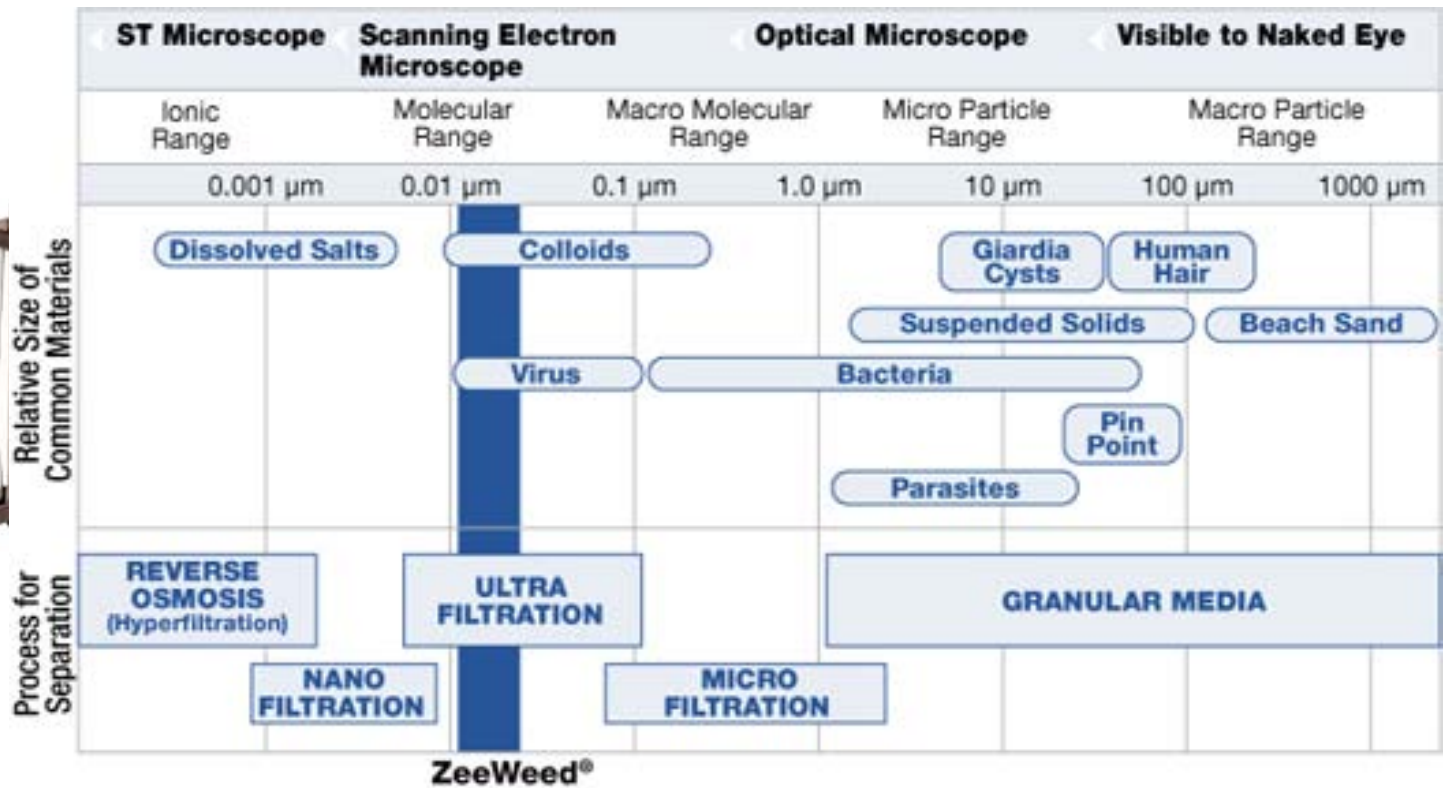
Brac System



- Shower and bath
- Toilet flushing
- Laundry
- Kitchen & Drinking
- Cleaning



GE Zenon Technology



Some Gray Water Systems and Their Cost

System	~Cost
AQUIS	\$300
Brac Greywater	\$2500
Australian “Wheelie Bin”	\$400
Australian “Eco-Care”	\$900
Australian “H2O grO	\$3,000
Zenon system for large buildings	\$750,000

Other Single Source Examples



ONLY IN TEXAS!



Ranges of Use Reported in Literature

Freshwater use in gallons per vehicle (gpv)	Self-Service	In-Bay Automatic	Conveyor	
			Friction	Frictionless
no Reclaim	15	50 – 60	65.8	85.3
Separation Only	n/a	30*	34.8	70
Filtration	n/a	8	7.8 – 13.8	16.8 – 31.8

Water Reclaim Systems







**An
Example
of Water
Reuse at
a Hotel
Laundry.**

Large Laundry Recycle



Lab Water Recovery Systems at The University of Texas at Austin



Combining Sources



What You Want To See!





Cook+Fox Architect

New Bank of America Tower in Manhattan

This LEED Platinum project collects rainwater, gray-water foundation drain water and A/C condensate water for reuse in toilet flushing and cooling tower makeup.

AMD Lantana Site

- **Largest known rainwater/AC condensate harvesting project**
- **Used for irrigation and cooling tower makeup**
- **1.3 Million Gallons**

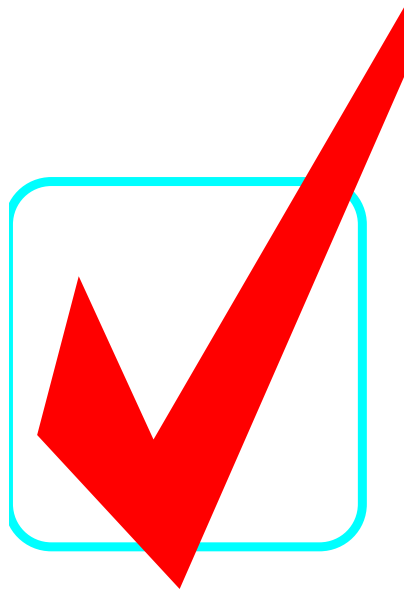




Part of rainwater harvesting system at Austin's new Homeless Shelter.

Rainwater & AC condensate will be used for toilet and urinal flushing and landscape (planter box) irrigation.

The



End

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