This presentation premiered at WaterSmart Innovations

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Net Blue Ordinance: Making New Development Water Neutral

Mary Ann Dickinson, President and CEO
Alliance for Water Efficiency

An initiative of

Alliance for Water Efficiency

river NETWORK
connecting people·saving rivers

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The Problem

- Many cities in North America are already challenged to meet their customer demands for water
- Growing population and certain economic growth will place even more pressure
- Current trends indicate the housing sector has gained significant momentum
- The National Association of Home Builders documents a 100% increase in housing starts from 2010 to 2015
- Offsets can help

Source: Google Earth. 2014.

What is a Water Demand Offset?

- Allow growth without increasing system-wide water consumption across a community or a water supply service area
- Achieved through a combination of on-site water efficiency and off-site water efficiency
- Reduces or completely eliminates impact of new development on water supply
- Can help avoid building moratoriums in resource-constrained communities
- Not a new concept

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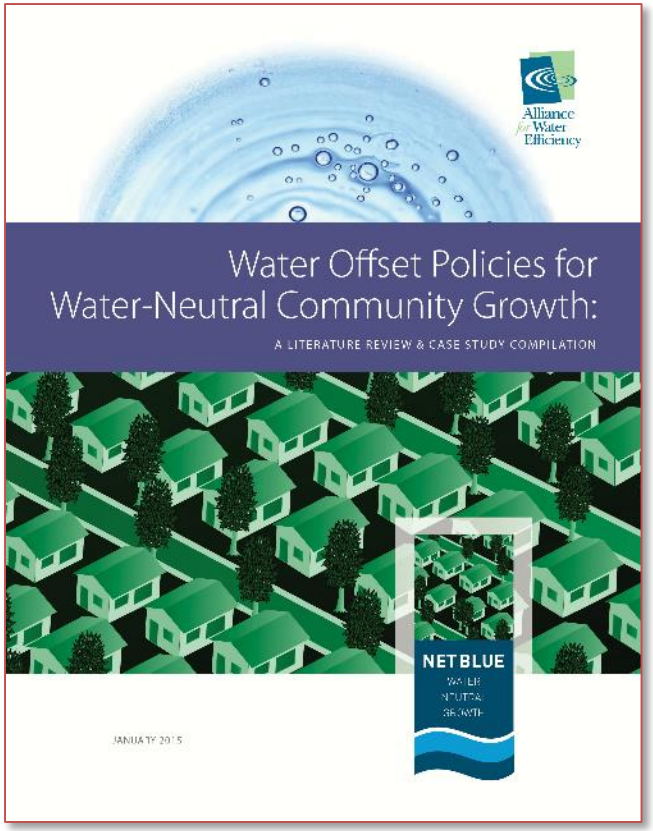
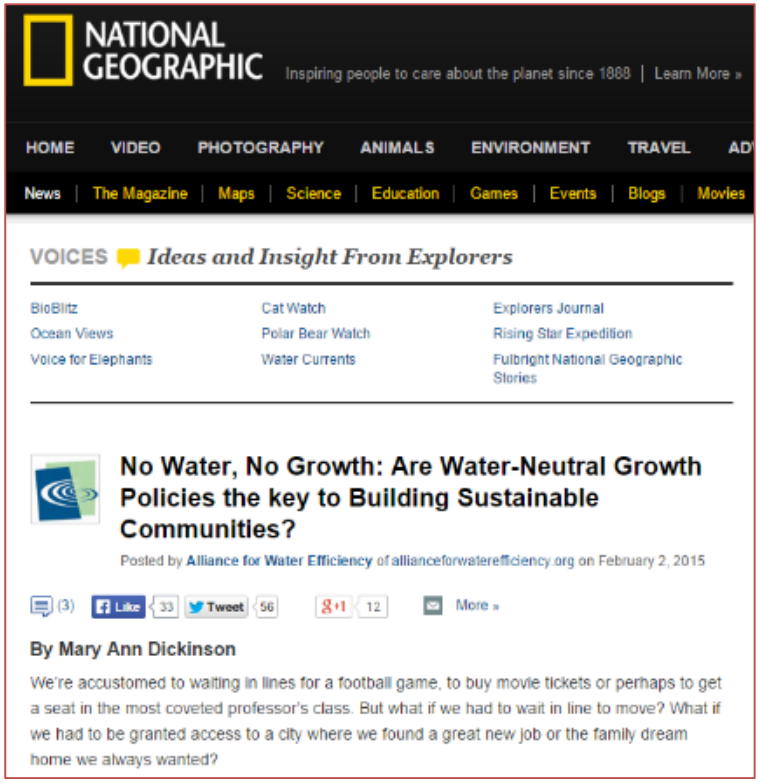
Reviewing What Has Been Done

- AWE conducted research related to water demand offset policies
  - ✓ Reviewed terminology
  - ✓ Reviewed literature
  - ✓ Reviewed existing and past policies
- Provided basis for the development of a model ordinance
- Santa Fe, NM one example
- Download at ww.a4we.org



Net Blue: Water-Neutral Growth

- 3-year project to promote sustainable communities
- Develop a national Model ordinance communities can tailor to create a water demand offset approach
- Flexible approach and structure
- Will work with 7 partner cities to pilot approach
- Partners: Environmental Law Institute and River Network



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Project Advisory Committee

1. Dave Anderson (Planning & Zoning)
2. Jacob Atalla (Builder)
3. Sarah Bates (Water law)
4. Bill Cesanek (APA Water Task Force)
5. Doug Farr (Sustainability architect)
6. Kyle Harwood (Offset ordinance attorney)
7. Paula Kehoe (City)
8. Cooper Martin (League of Cities)
9. Dwight Merriam (Developer attorney)
10. Brian Richter (Environmental expert)

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The Model Ordinance Tool

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Approach

- Reviewed literature and identified potential water constraint scenarios for which the ordinance may be used
- Dissected existing water offset ordinances
- Designed framework for ordinance
- Drafted a model ordinance tool with:
  - Elements of existing water offset ordinances
  - Elements drawn from other laws
  - The results of AWE's water offset work

The Draft Ordinance Tool

- We are building an ordinance-development tool, in addition to a few example ordinances, because:
  - Variety of settings: constraints, governing entities, enabling laws
  - We anticipate a variety of users (not just lawyers)
  - It is intended to assist with outreach
- This tool is intended to help the users identify and think about critical issues

Organization of the Ordinance

1. Purpose
2. Findings
3. Authority
4. Requirement and Applicability (or Incentive)
5. Definitions

Organization of the Ordinance

6. Determining the Offset

- Projecting the Net Increase in Annual Water Demand
- Determining the Amount of Water that Must Be Offset
- Identifying and Implementing the Offsets

7. Compliance with the Offset

- Verification
- Monitoring
- Enforcement
- In-Lieu Fee

Organization of the Ordinance

8. Offset Credit Bank

9. Fees

10. Variances

11. Appeals

12. Severability

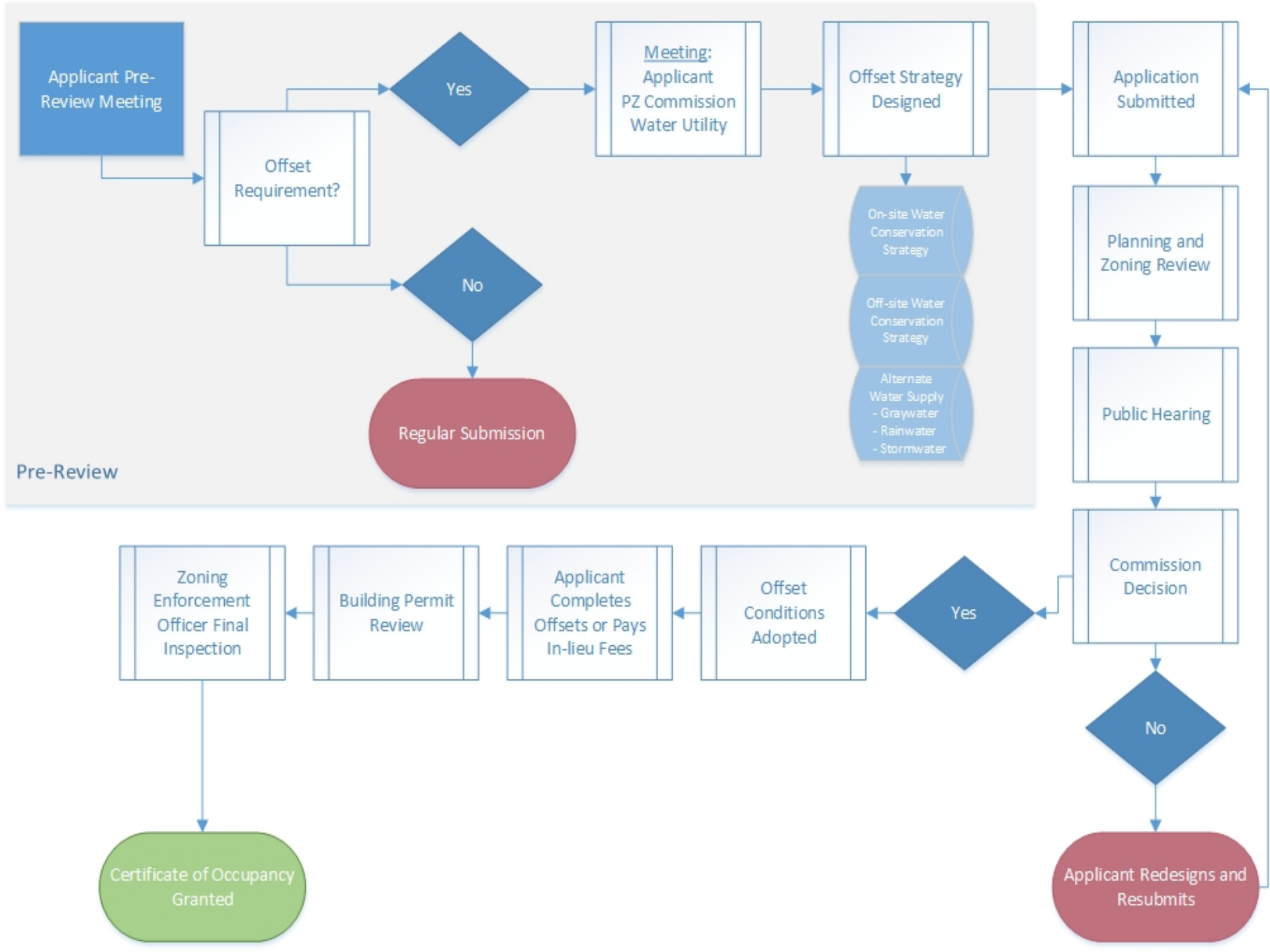
13. Consistency with Other Laws

14. Effective Date

Projecting the Net Increase in Annual Water Demand

The projection of the net increase in annual water demand resulting from the proposed development is comprised of three calculations:

- The total projected annual water demand of the property, once construction is completed;
- The existing annual water demand of the property, if applicable; and
- The amount of water, if any, from alternative sources that will supply the development.


Applicant Pre-Review Meeting
Offset Requirement?
Yes
No
Regular Submission
Meeting: Applicant PZ Commission Water Utility
Offset Strategy Designed
On-site Water Conservation Strategy
Off-site Water Conservation Strategy
Alternate Water Supply - Graywater - Rainwater - Stormwater
Application Submitted
Planning and Zoning Review
Public Hearing
Commission Decision
Yes
No
Offset Conditions Adopted
Applicant Completes Offsets or Pays In-lieu Fees
Building Permit Review
Zoning Enforcement Officer Final Inspection
Certificate of Occupancy Granted
Applicant Redesigns and Resubmits
Pre-Review

Calculating Offsets

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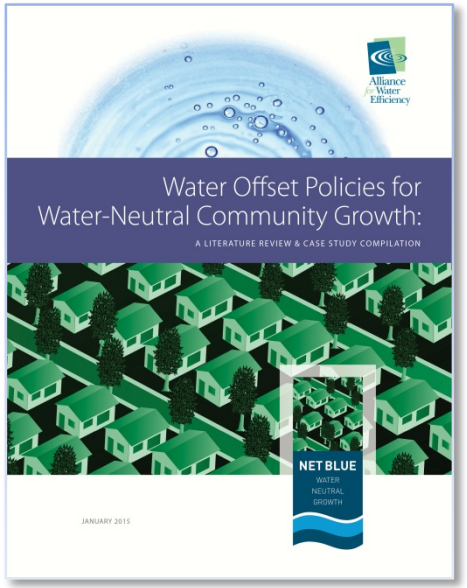
Offset Components

- A condition that triggers the requirement for a water demand offset (i.e., new development and/or expanded use of an existing connection)
- Water demand projection of new development
  - On-site efficiency
  - Offset ratio (% of demand that is required to be offset)



Calculating Off-site Offsets

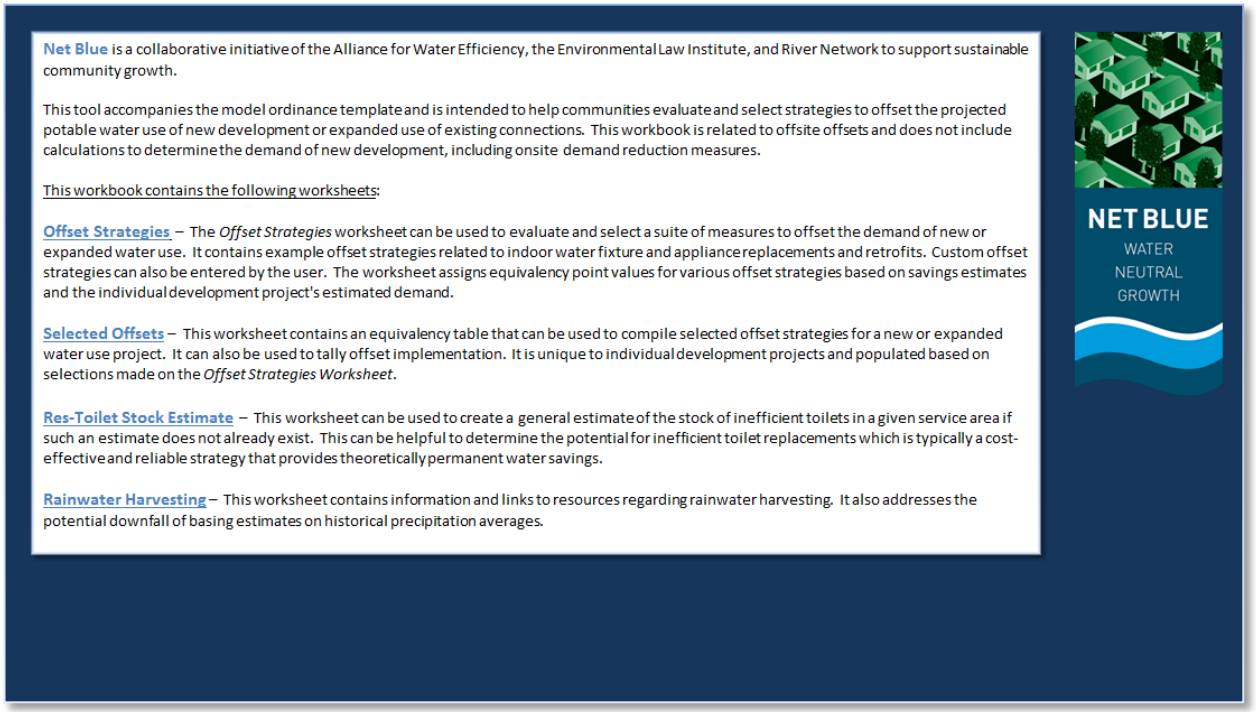
- Predetermined based on credits or equivalency units published as part of the ordinance; or
- “As determined by the Water Department”

Offset Considerations

- Plumbing code interaction
- Reliability and certainty of estimates
- Seasonality
- Useful Life

What We Have Now

- A draft workbook to help communities evaluate and select off-site offsets for individual development projects



Net Blue is a collaborative initiative of the Alliance for Water Efficiency, the Environmental Law Institute, and River Network to support sustainable community growth.

This tool accompanies the model ordinance template and is intended to help communities evaluate and select strategies to offset the projected potable water use of new development or expanded use of existing connections. This workbook is related to offsite offsets and does not include calculations to determine the demand of new development, including onsite demand reduction measures.

This workbook contains the following worksheets:

Offset Strategies – The *Offset Strategies* worksheet can be used to evaluate and select a suite of measures to offset the demand of new or expanded water use. It contains example offset strategies related to indoor water fixture and appliance replacements and retrofits. Custom offset strategies can also be entered by the user. The worksheet assigns equivalency point values for various offset strategies based on savings estimates and the individual development project's estimated demand.

Selected Offsets – This worksheet contains an equivalency table that can be used to compile selected offset strategies for a new or expanded water use project. It can also be used to tally offset implementation. It is unique to individual development projects and populated based on selections made on the *Offset Strategies Worksheet*.

Res-Toilet Stock Estimate – This worksheet can be used to create a general estimate of the stock of inefficient toilets in a given service area if such an estimate does not already exist. This can be helpful to determine the potential for inefficient toilet replacements which is typically a cost-effective and reliable strategy that provides theoretically permanent water savings.

Rainwater Harvesting – This worksheet contains information and links to resources regarding rainwater harvesting. It also addresses the potential downfall of basing estimates on historical precipitation averages.

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Workbook Components

- New demand information
- Offset strategy evaluation worksheet
- Selected offsets worksheet
- Supplemental worksheets
  - Residential inefficient toilet stock estimator
  - Rainwater harvesting information and resources
  - More to come…

Offset Strategy Worksheet

Offset Strategy Worksheet

This worksheet can be used to evaluate and select a suite of measures to offset the demand of new or expanded water use. It contains example offset strategies related to indoor water fixture and appliance replacements and retrofits. Cooling tower retrofits are also included. Additionally, the user can enter custom measures. Example savings estimates are provided for the included offsets, but the user is encouraged to evaluate savings of offset strategies in relation to their service area.

User inputs and selections are required in cells with a white background: User Input Green cells do not require any input or selection.

Selecting "Yes" in 'Column J' will include the offset measure in the *Selected Offsets* worksheet as long a 'Column D' is populated with a savings estimate value.

Step 1: Enter Information about New or Expanded Water Use

Projected Water Demand of New or Expanded Use	450,000.00	Gallons per Year	*Select Gallons, Million Gallons, or Acre-Feet per Year*
Percent of New or Expanded Use that Must be Offset	200%		
Total Offset Requirement for New or Expanded Water Use	900,000.00	*Gallons per Year*	

Step 2: Enter Persons Per Household for the Service Area (used to generate savings for toilet replacements)

Service Area Average Persons Per Household Single-Family	2.5
Service Area Average Persons Per Household Multifamily	2

Step 3: Define and Select Water Demand Offset Strategies

Offset Strategy	Example Savings Estimate Per Replacement/Retrofit in Gallons Per Year*	User Specified Savings Estimate Per Replacement/Retrofit in Gallons Per Year	Approximate Number of Replacements/Retrofits to Meet Offset if Sole Strategy?	Related Plumbing Code?	Useful Life	Seasonality of Water Savings	Percent of Total Offset Requirement per Replacement/Retrofit	Include in Selected Offset Table?
Single-Family High-Efficiency Toilet Replacements	9,541	9,500	189	Yes	Theoretically Permanent	Even throughout year	1%	Yes
Multifamily High-Efficiency Toilet Replacements	16,472	16,000	113	Yes	Theoretically Permanent	Even throughout year	2%	Yes
Showerhead Replacement Single-Family	2,062	2,062	873	Yes	Theoretically Permanent	Even throughout year	0%	No
Showerhead Replacement Multifamily	1,898	1,898	948	Yes	Theoretically Permanent	Even throughout year	0%	No
Single-Family Clothes Washer Replacement	7,043	7,043	256	Yes	Theoretically Permanent	Even throughout year	1%	Yes
Multifamily Clothes Washer Replacement	25,310	25,310	71	Yes	Theoretically Permanent	Even throughout year	3%	Yes
CII Urinal Replacements or Retrofits	6,206	6,206	290	Yes	Theoretically Permanent	Even throughout year	1%	No
CII High-Efficiency Toilet Replacements	13,020	13,020	138	Yes	Theoretically Permanent	Even throughout year	1%	Yes
Laundromat Clothes Washer Replacements	31,435	31,435	57	Yes	Theoretically Permanent	Even throughout year	3%	Yes
Commercial Dishwasher Replacements	57,757	57,757	31	No	20 Years	Even throughout year	6%	No
Pre-Rinse Spray Valve Replacements	28,285	28,285	64	Yes	Theoretically Permanent	Even throughout year	3%	Yes
Commercial Food Steamer Installation	81,500	81,500	22	No	10 Years	Even throughout year	9%	Yes
Cooling Tower Retrofits	209,880	209,880	8.58	No	5 Years	Higher during peak season	23%	No
Custom Offset (to be entered by user)	N/A	-	-				0%	No
Custom Offset (to be entered by user)	N/A	-	-				0%	No
Custom Offset (to be entered by user)	N/A	-	-				0%	No
Custom Offset (to be entered by user)	N/A	-	-				0%	No
Custom Offset (to be entered by user)	N/A	-	-				0%	No
Custom Offset (to be entered by user)	N/A	-	-				0%	No
Custom Offset (to be entered by user)	N/A	-	-				0%	No

Selected Offset Table

Selected Offsets

This worksheet contains an auto-populating table based on user selections made in the *Offset Strategies* worksheet. The table can be populated using the "Update Selected Offsets Table" button to the right of the Net Blue logo. The user manually enters the implementation value (e.g., number of toilet replacements) in 'Column D.' The 'Percent of Total Offset Requirement' column is automatically calculated after the user specifies implementation. If changes are made in the *Offset Strategies* worksheet, the user must update the selected offsets table using the "Update Selected Offsets Table" button.

Offset Strategy	Gallons Saved per Unit	Number to be Implemented	Percent of Total Offset Requirement
Single-Family High-Efficiency Toilet Replacements	9,500	5	5%
Multifamily High-Efficiency Toilet Replacements	16,000	5	9%
Single-Family Clothes Washer Replacement	7,043	5	4%
Multifamily Clothes Washer Replacement	25,310	5	14%
CII High-Efficiency Toilet Replacements	13,020	7	10%
Laundromat Clothes Washer Replacements	31,435	5	17%
Pre-Rinse Spray Valve Replacements	28,285	10	31%
Commercial Food Steamer Installation	81,500	1	9%
Total			**100%**

Update Selected Offsets Table

Inefficient Toilet Stock Estimator

Residential Inefficient Toilet Stock Estimate Worksheet

This worksheet can be used to create a general estimate of the stock of residential inefficient toilets (assumed flush volume 3.5 gallons or more) in a given service area if such an estimate does not already exist. The assumptions are based on natural replacement resulting from the Energy Policy Act of 1992. The Energy Policy Act of 1992 took effect in 1994 and required 1.6 gpf toilets for all point of sale and installations. California and Texas required 1.6 gpf toilets beginning in 1992. Utility implemented toilet replacement programs could be factored into the toilet fixture stock estimates as well. The estimates for single-family and multifamily are generated in rows 24 and 25 of 'Column C.'

Enter Current Year	2016
Community Located in California or Texas?	No
Single-Family Housing Units Built before 1994	100,000
Multifamily Housing Units Built before 1994	50,000
Full Bathrooms Per Household - Single-Family	1.75
Half Bathrooms Per Household - Single-Family	0.75
Full Bathrooms Per Household - Multifamily	1.00
Half Bathrooms Per Household - Multifamily	0.25

Assumed Annual Toilet Replacement Rate: 4%

Bathroom Per Household Table

If bathrooms per household are unknown, the Bathroom per Household Table provides estimates for many Standard Metropolitan Statistical Areas.

	2016
Estimated Inefficient Single-Family Toilet Stock	101,840
Estimated Inefficient Multifamily Toilet Stock	25,460

Rainwater Harvesting Information

Rainwater Harvesting Information

Rainwater harvesting projects vary greatly in terms of scale, from the household rain barrel to large installations. It is difficult to estimate broadly applicable savings for rainwater harvesting projects. Each should be evaluated individually based on local weather conditions, and the project scale and specifications. Additionally, local laws and regulations vary throughout the U.S. This worksheet contains information and links to resources regarding rainwater harvesting. It also addresses the potential downfall of basing estimates on historical averages.

There are several **key variables** to consider when pursuing rainwater capture as a potable water demand offset. These include but may not be limited to:

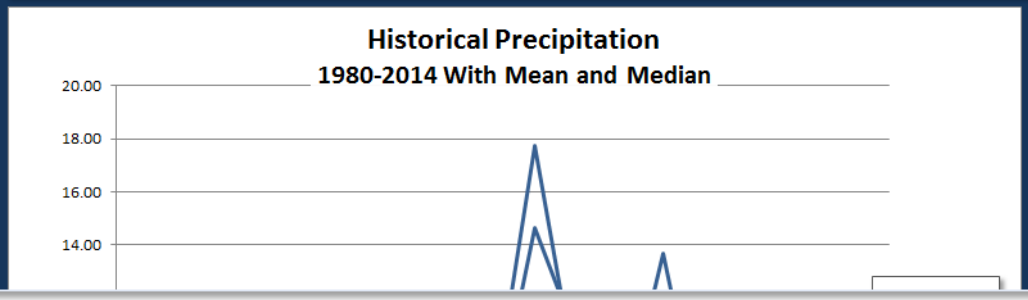
- Climate (Rainfall and Evapotranspiration)
- Catchment Area
- Collection Efficiency
- Storage Capacity
- End Use of Captured Rainwater
- Weather Variability and Uncertainty

Rainwater harvesting calculators can be used to estimate rainwater capture quantities and help determine the appropriate size of cisterns. Below are examples:

- ARCSA Website Hosted Rainwater Harvesting Calculator - http://www.arcsa.org/?page=268
- San Francisco Public Utilities Commission Rainwater Harvesting Calculator - http://sfwater.org/modules/showdocument.aspx?documentid=6402
- Washington State Department of Ecology Rainwater Harvesting Calculator - http://www.ecy.wa.gov/programs/wr/hq/images/ecy_rwcalc.xlsm
- Texas AgriLife Extension Service Rainwater Harvesting Calculator - http://rainwaterharvesting.tamu.edu/files/2011/08/AgriLife-Ext-RWH-Calculator.xlsx

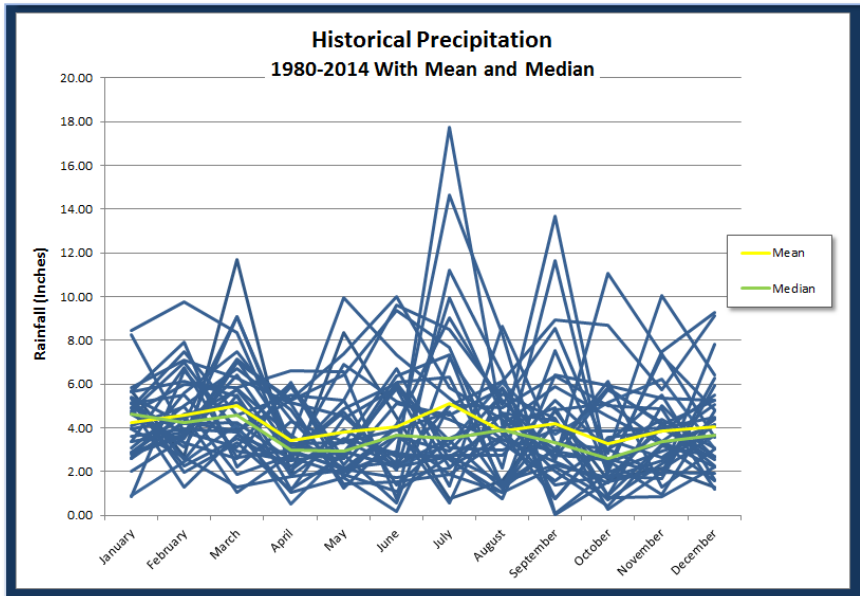
Weather variability is sometimes overlooked when planning rainwater harvesting projects, as many calculations rely on historical average, or median, monthly rainfall values. This ignores times of low (or zero) rainfall and may give too much weight to historical months with abnormally high levels of precipitation. For example purposes, the below graph illustrates historical precipitation data from 1980-2014 for four cities in the U.S., and compares it to average and median rainfall values. The city can be selected from the drop down menu.

The table to right of the charts lists summary statistics related to the precipitation data including , minimum, maximum, mean, and median values. The standard deviation is also included. The last row of the table shows the percent of readings for a given month that were equal to, or exceeded, the average value from 1980-2014.



Atlanta, GA

Weather Variability



Atlanta, GA

Atlanta, GA - 1980 to 2014 Precipitation Summary Statistics

	January	February	March	April	May	June	July	August	September	October	November	December
Min	0.84	1.26	1.04	0.49	1.23	0.17	0.57	0.77	0.04	0.26	0.87	1.21
Max	8.46	9.75	11.67	6.62	9.93	9.99	17.72	8.66	13.65	11.04	10.05	9.27
Mean	4.24	4.59	5.03	3.41	3.78	4.07	5.09	3.86	4.17	3.25	3.86	4.05
Median	4.64	4.25	4.59	3.00	2.95	3.66	3.53	3.89	3.31	2.57	3.34	3.67
Standard Deviation	1.67	1.87	2.37	1.61	2.08	2.55	3.77	2.03	3.00	2.35	2.05	2.01
% of Months that Met or Exceeded Mean (1980-2014)	51%	43%	49%	40%	37%	43%	34%	51%	43%	40%	46%	49%

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Engaging Communities in the Net Blue Project

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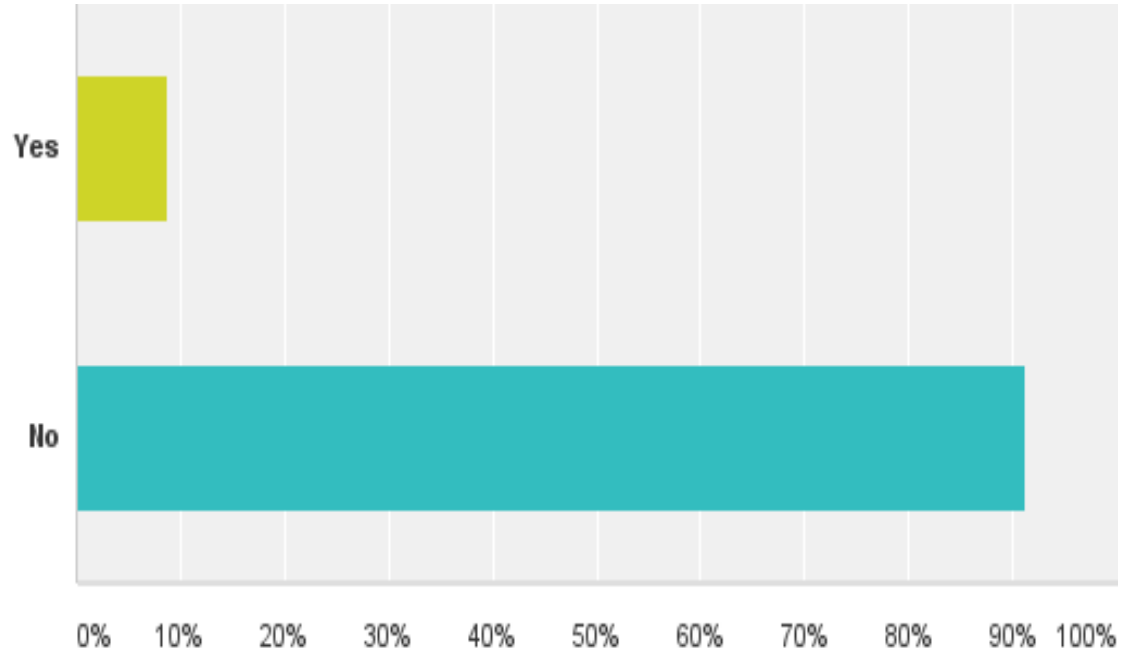
http://www.allianceforwaterefficiency.org/net-blue.aspx

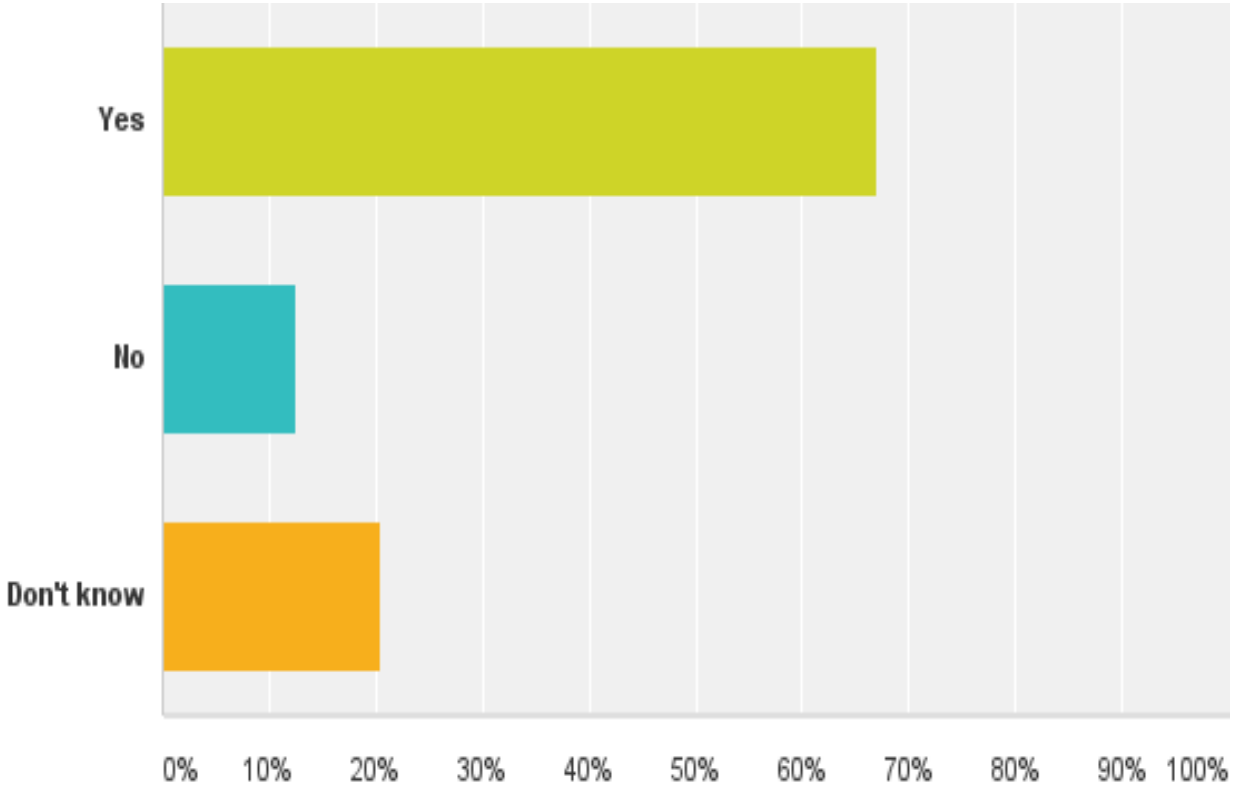
Broad outreach survey

Are you aware of an ordinance of this nature in a nearby community?

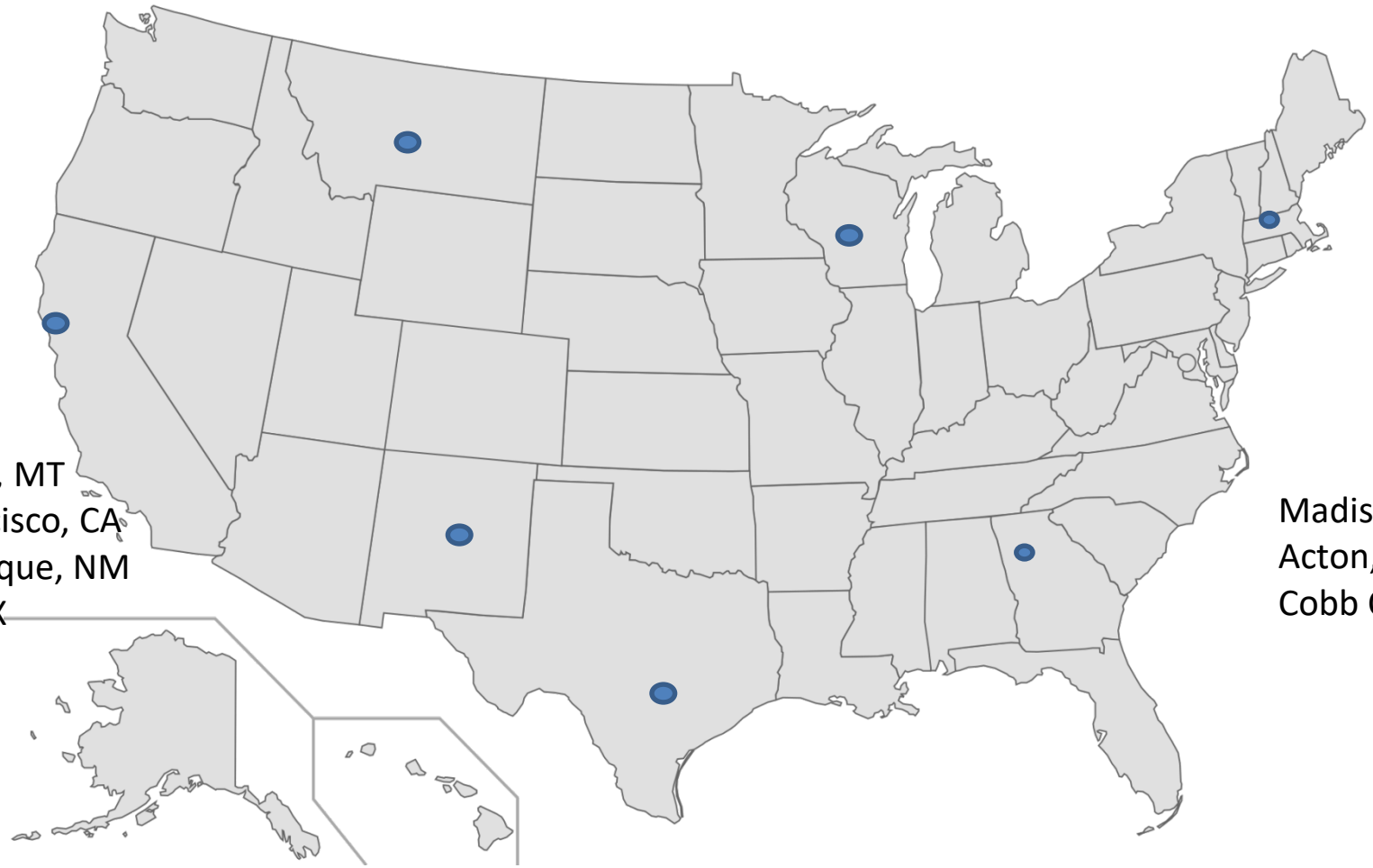


Broad outreach survey

Do you believe your community would benefit from a Net Blue type ordinance?



Partner Communities



Bozeman, MT
San Francisco, CA
Albuquerque, NM
Austin, TX

Madison, WI
Acton, MA
Cobb County, GA

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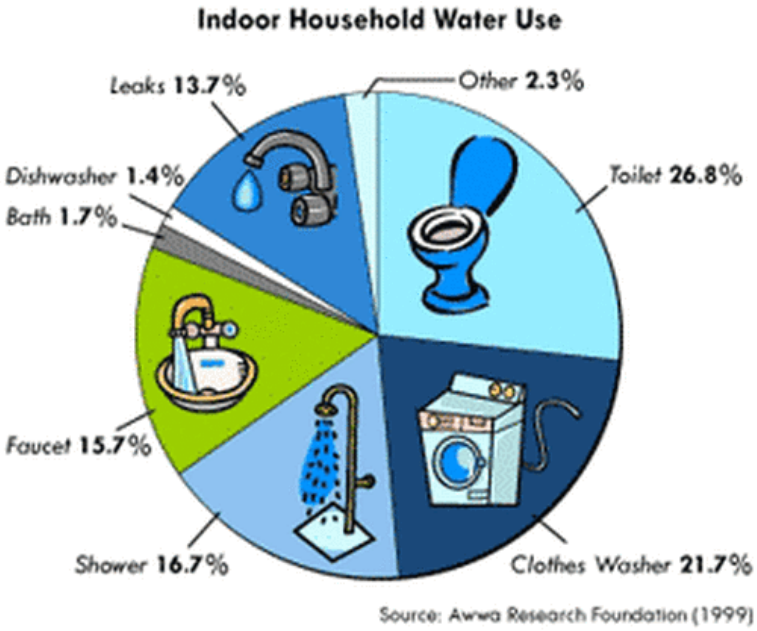
In-Person Community Meetings

- Feedback and input on refining ordinance language
- Input from:
  - Water system
  - Municipal and private planners
  - Watershed and community groups
  - Developers
  - Local leaders
  - Others as identified

In-Person Community Meetings

- Input on:
  - Model ordinance
  - How to make it happen
  - Offset methodology



Source: wateruseitwisely.org

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Project Timeline

- 5/2015: PAC and Partner Cities selected
- 6/2015: Legal framework developed
- 7/2015: PAC Meeting
- 12/2015: Offset methodology & ordinance text written
- 2/2016: PAC Meeting to review draft work products
- 4/2016: Net Blue Panel at APA conference
- 5/2016: Net Blue Workshop at River Rally
- 7/2016: Partner City Meetings to start
- 11/2016: PAC Meeting to review final work products
- 2017: Partner City implementation

Mary Ann Dickinson

Alliance for Water Efficiency

(773) 360-5100

maryann@a4we.org

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http://www.allianceforwaterefficiency.org/net-blue.aspx