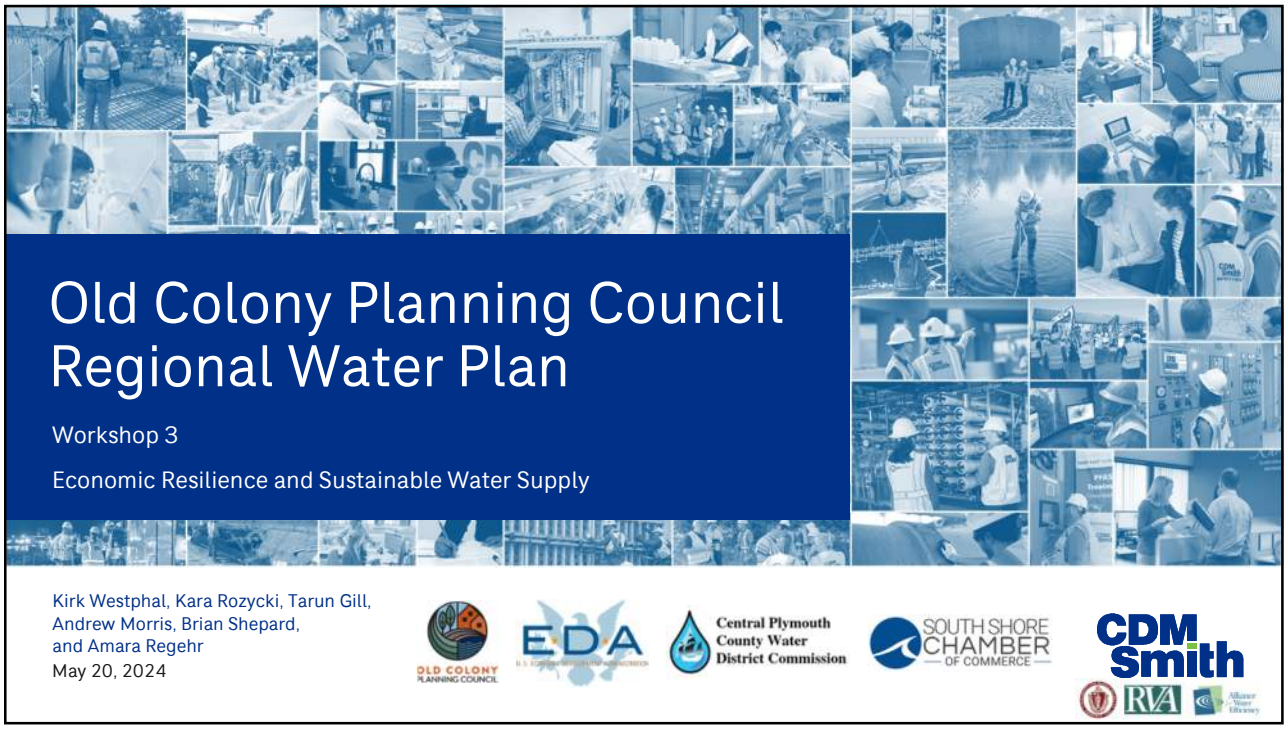
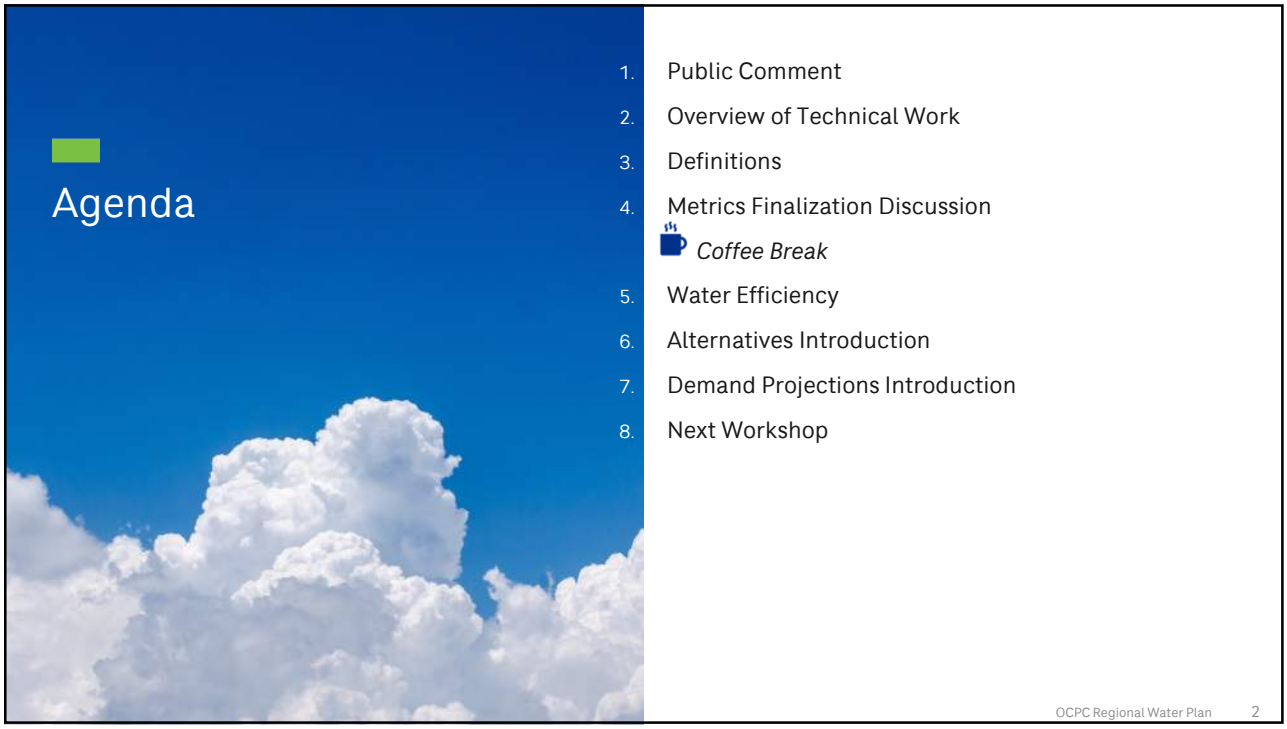

Old Colony Planning Council
Regional Water Plan
Workshop 3
Economic Resilience and Sustainable Water Supply
Kirk Westphal, Kara Rozycki, Tarun Gill,
Andrew Morris, Brian Shepard,
and Amara Regehr
May 20, 2024
OLD COLONY PLANNING COUNCIL
EDA
Central Plymouth County Water District Commission
SOUTH SHORE CHAMBER OF COMMERCE
CDM Smith
RVA

1

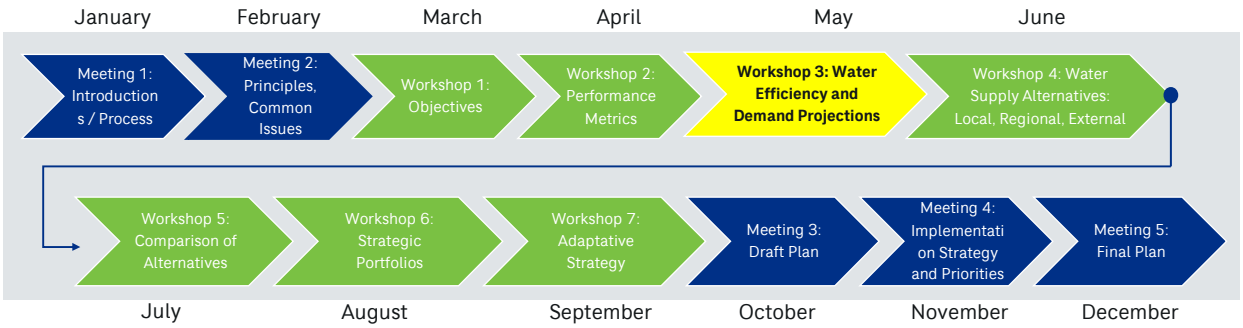

Agenda
1. Public Comment
2. Overview of Technical Work
3. Definitions
4. Metrics Finalization Discussion
Coffee Break
5. Water Efficiency
6. Alternatives Introduction
7. Demand Projections Introduction
8. Next Workshop
OCPC Regional Water Plan 2

2

3

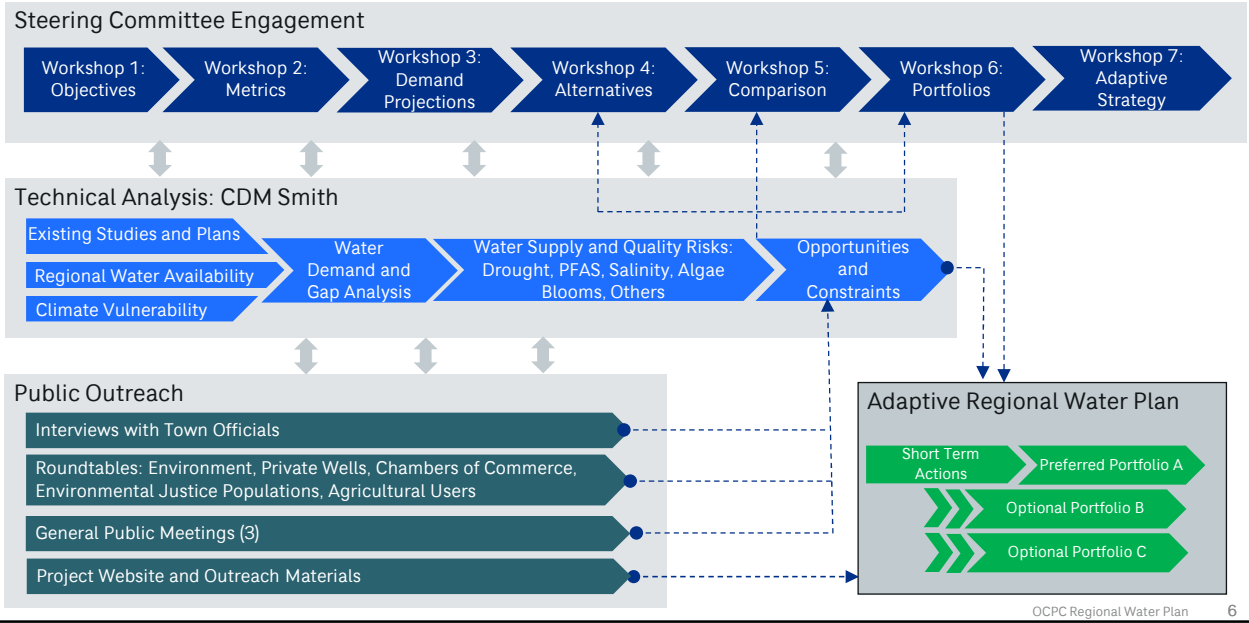
4

Overview of Regional Water Plan Process



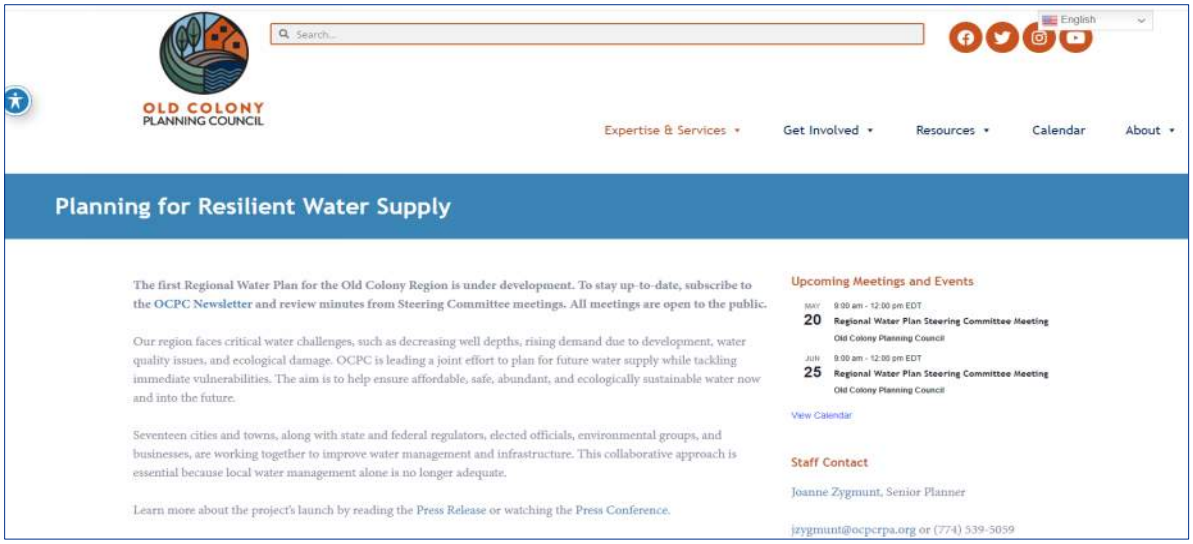
5

Project Roadmap



6

Project Website



https://oldcolonyplanning.org/waterplan/

Technical Work

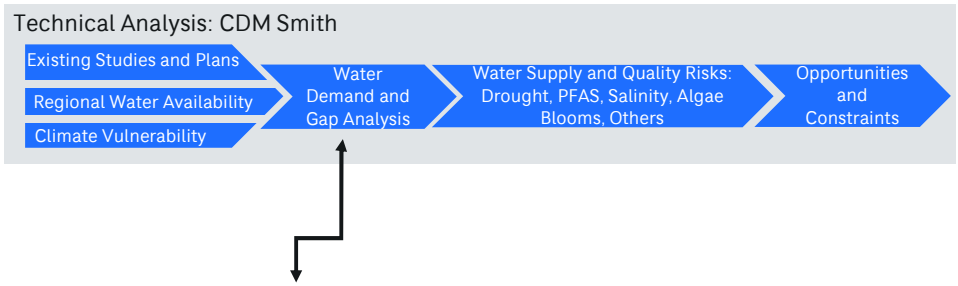
Technical Analysis: CDM Smith

- Existing Studies and Plans
- Regional Water Availability
- Climate Vulnerability

→ Water Demand and Gap Analysis → Water Supply and Quality Risks: Drought, PFAS, Salinity, Algae Blooms, Others → Opportunities and Constraints

- Annotated Bibliography Draft (complete)
  - Updates from communities (ongoing)
- Water availability models for Taunton and South Coastal Watersheds
  - Accounts for both surface and groundwater availability based on USGS data
  - Can be used to model future climate conditions based off projections for temperature and precipitation

Technical Work

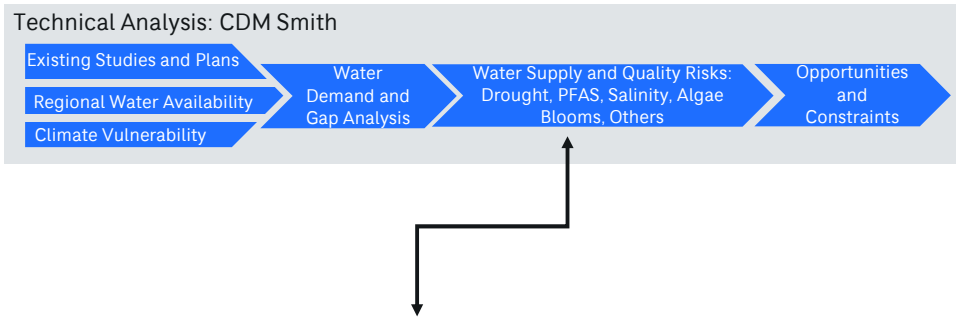


Discuss Today

- Introduction to the demand analysis conducted by CDM Smith
- Water efficiency by Alliance for Water Efficiency

9

Technical Work

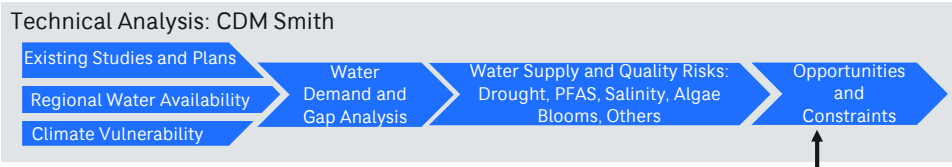


Upcoming technical work

- Work with Professor Casey Brown of UMass Amherst to understand future climate conditions and impacts to water quality and water quantity

10

Technical Work



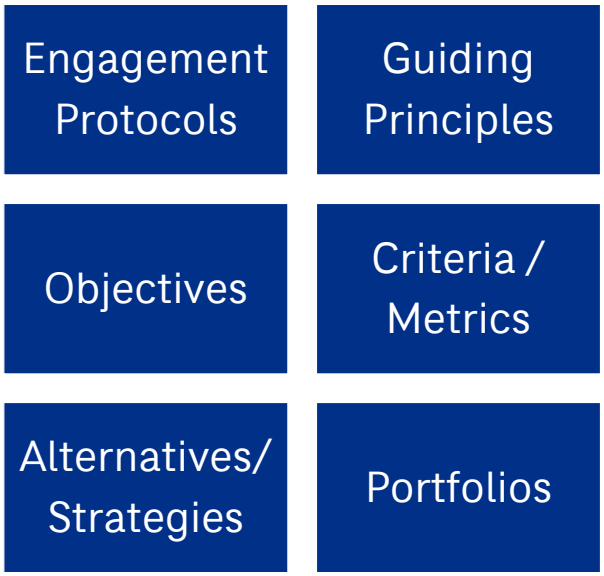
Ongoing: CDM Smith to support the development of alternatives with creation of figures, high level costs, and other pieces to support future implementation

11

Definitions

12

Definitions of Terms for Strategic Planning



13

Terms used in our Guiding Principles

- Recommend sustainable water supply strategies that balance social, environmental, and economic needs for the region.
- Align with values of good stewardship and wise use of water.
- Reflect the limits of our natural resources and current/anticipated regulations.
- Incorporate uncertainties so implementation of recommendations can adapt over time.
- Strive for **environmental justice and** equity ~~and social justice~~ within and among the communities.
- Produce a list of "early-win" projects that can be aligned with available outside funding.

14

Terms used in our Objectives

- Meet all current and future peak water demands with climate resilient supply side and demand side strategies.
- Meet safe drinking water quality regulations, current and future.
- Improve ecosystem health.
- Prioritize alternatives with high cost-benefit value.
- Promote environmental justice and equity **between communities** ~~by incorporating affordability, accessibility, and distribution of infrastructure impacts.~~
- Consider innovative and alternative solutions such as stormwater capture, wastewater reuse and water use efficiency.
- Encourage sustainable potential for housing, economic development and prosperity.

15

Definitions of Highlighted Terms

Highlighted Term	Definition	Source
Sustainability	In practice, sustainability refers to efforts to align economic development with environmental protection and human well-being. Sustainability is commonly characterized in terms of the interdependence among three broad dimensions—environment, economy, and society—while considering both present and future generations.	United States EPA
Equity	Equity is defined as being fair and impartial, and providing what each group needs so they can experience fair and equitable treatment.	Massachusetts Office of Diversity and Equal Opportunity
Environmental Justice	Based on the principle that all people have a right to be protected from environmental hazards and to live in and enjoy a clean and healthful environment regardless of race, color, national origin, income, or English language proficiency. Environmental justice is the equal protection and meaningful involvement of all people and communities with respect to the development, implementation, and enforcement of energy, climate change, and environmental laws, regulations, and policies and the equitable distribution of energy and environmental benefits and burdens.	Massachusetts Municipal Vulnerability Preparedness (MVP) Program

16

Definitions of Highlighted Terms

Highlighted Term	Definition	Source
Climate Resilience	The ability of a community to address the needs of its built, social, and natural environment in order to anticipate, cope with, and rebound stronger from events and trends related to climate change hazards, including temperature changes, extreme weather, sea level rise, coastal and inland flooding, changes in precipitation, and other impacts.	Massachusetts MVP Program

17

Metrics Finalization Discussion

18

A	B	C	D (hybrid)
Objectives	**Objectives**	**Objectives**	**Objectives**
Meet all current and future peak water demands with climate resilient supply side and demand side strategies.	Promote equity by incorporating affordability, accessibility, and distribution of infrastructure impacts.	Consider innovative and alternative solutions such as stormwater capture, wastewater reuse, and water use efficiency.	Encourage sustainable water use to meet the needs for housing and economic prosperity.
Improve ecosystem health.	Meet current and future safe drinking water quality.	Prioritize alternatives with high cost-benefit value.	
People	**People**	**People**	**People**
Pine DuBois	Jason Duff	Jonathan Beder	Peter Forman
John Haines	Kimberly Groff	Peter Gordon	Jon Hobill
Bob Kostka	Shane O'Brien	Duane LaVangie	Gavin Murphy
Kendra Martin	Noreen O'Toole	Phil McNulty	Jimmy Powell
Val Massard	Wayne Parks	Greg Tansey	Brian Vasa
Liz Shea	Greg Swan	**Bill and Grace**	Art Edgerton
Dan Sullivan	Brian Vasa		Martin Pillsbury
Kirk	**Amara**		Margherita Prior
			Joanne and Kara

OCPC Regional Water Plan 19

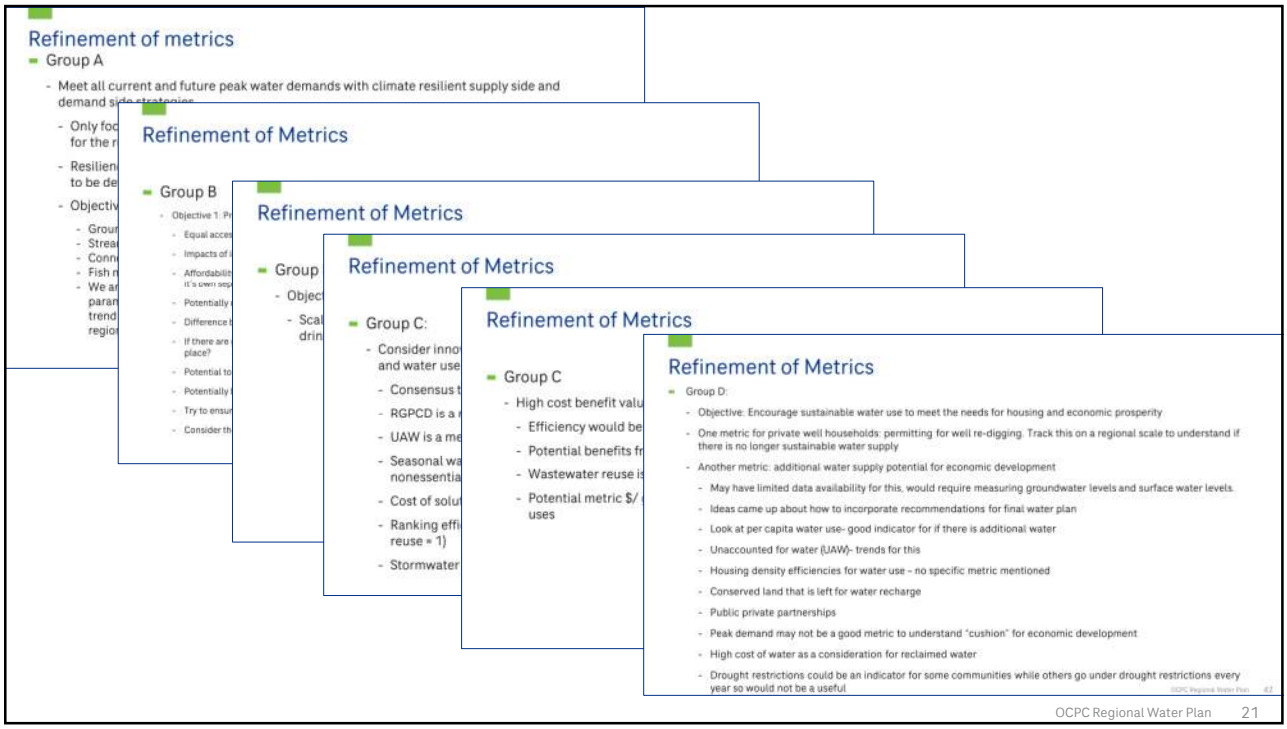
19

Metrics Finalization

- CDM Smith used input from the April steering committee meeting to develop meaningful metrics for this region
- The steering committee will review the draft metrics today
- The steering committee can revisit these metrics prior to their application later in July/August as needed

OCPC Regional Water Plan 20

20



21

Decision Framework

Objective	Metric	Units (or qualitative)
Meet all current and future peak water demands with climate resilient supply side and demand side strategies	Amount of regional supply gap filled (seasonal peak)	% of gap
	Supply volume beyond local needs	% of gap
Improve ecosystem health	Connectivity of natural waters	Qualitative
	Quantity and/or quality of natural waters	Qualitative
High Benefit: Cost value	Volume of supply gap reduced per unit cost	MG/$M
Consider innovative and alternative solutions such as stormwater capture, wastewater reuse and water use efficiency	Water supply- volume of supply that is considered innovative	MG
	Water efficiency- volume of demand decreased	MG
Promote environmental justice and equity between communities	Percent of MA designated EJ census tracts served by alternative	% of census tracts
	Percent of MA designated EJ census tracts not impacted by construction	% of census tracts
Meet current and future drinking water quality standards	Total supply vulnerable to salinity/PFAS, etc.	% of total new supply
Encourage sustainable water use to meet the needs for housing and economic prosperity	Flexibility in phasing and supply capacity	Qualitative

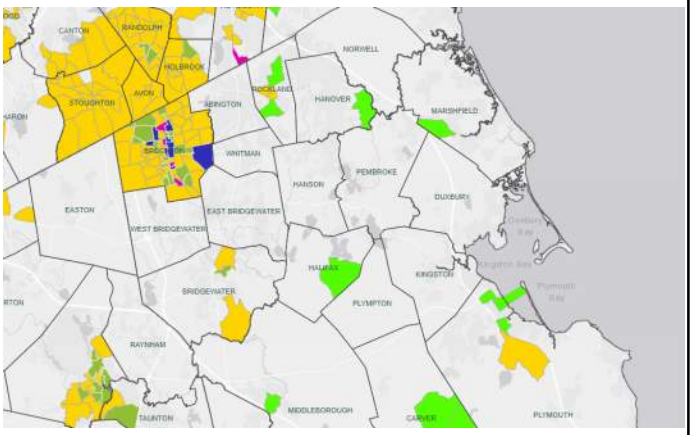
More info on following slides

OCPC Regional Water Plan 22

22

Objective: Promote environmental justice and equity between communities

- Before we get into qualitative scales, lets look briefly at the state's data source that will be used for evaluating this metric



https://mass-eoeea.maps.arcgis.com/apps/webappviewer/index.html?id=1d6f63e7762a48e5930de84ed4849212

23

Objective: Improve ecosystem health

Objective	Metric	Units (or qualitative)	Qualitative Scales				
			1	2	3	4	5
Improve ecosystem health	Connectivity of natural waters	Qualitative	Major detrimental impact to connectivity	Minor detrimental impact to connectivity	Neutral impact to connectivity	Minor positive impact to connectivity	Major positive impact to connectivity
	Quantity and/or quality of natural waters	Qualitative	Major detrimental impact to quantity and/or quality	Minor detrimental impact to quantity and/or quality	Neutral impact to quantity and/or quality	Minor positive impact to quantity and/or quality	Major positive impact to quantity and/or quality

24

Objective: Encourage sustainable water use to meet the needs for housing and economic prosperity

Objective	Metric	Units (or qualitative)	Qualitative Scales		
			1	2	3
Encourage sustainable water use to meet the needs for housing and economic prosperity	Flexibility in phasing and supply capacity	Qualitative	Low flexibility in time or volume	High flexibility in time or volume	Fully able to meet anticipated future needs

25

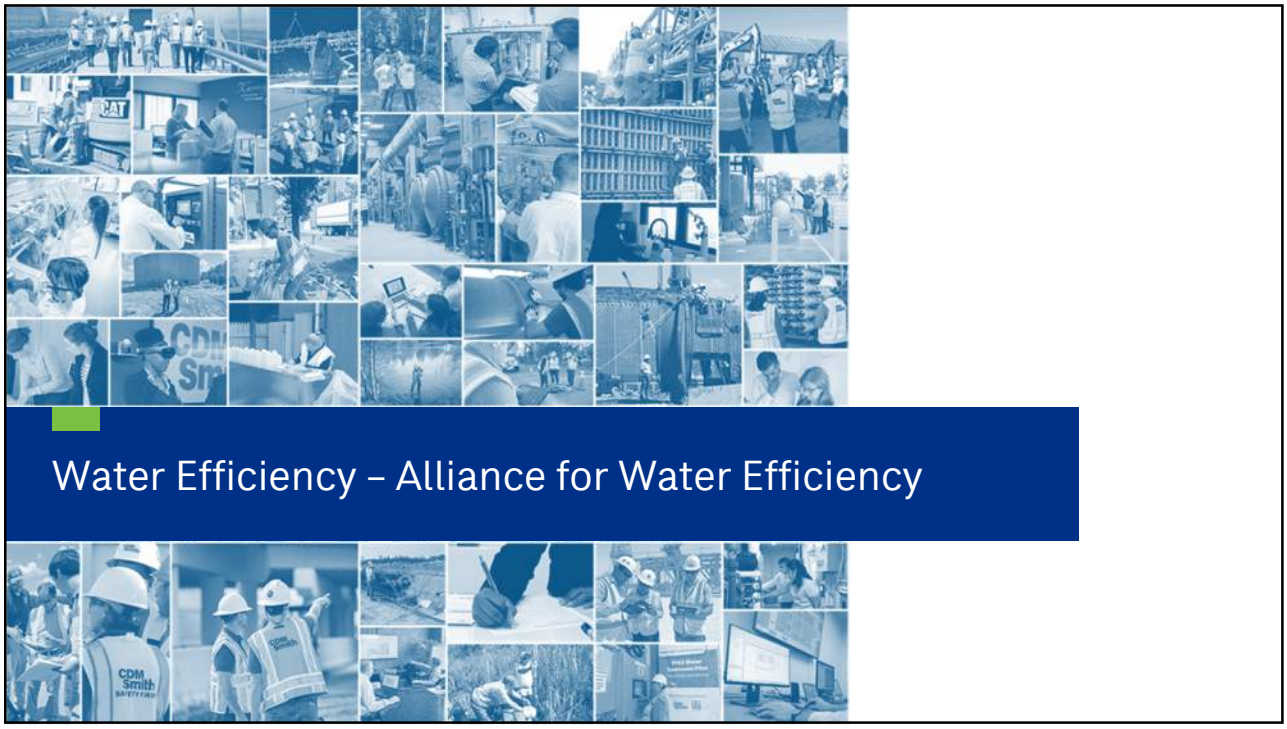
Future updates to metrics

- Opportunities to update metrics later in the process
- We will be conducting roundtable discussions with:
  - Private well users
  - Environmental groups
  - Chambers of commerce
  - Environmental justice communities
  - Cranberry growers

26


Coffee Break

27


Water Efficiency – Alliance for Water Efficiency

28

29

About The Process

Process for developing preliminary recommendations:

1. Reviewed the annotated bibliography CDM prepared
2. Reviewed water data from OCPC communities
3. Reviewed state laws, plans, and standards
4. Reviewed water rates and structures from OCPC communities
5. Reviewed several OCPC regional plans
6. Compared regional efforts to other regions in the Eastern U.S. and beyond
7. Compared regional efforts to American Water Works Association G480-20 Standard for Water Conservation and Efficiency Program Operation and Management

My Background: 15 years experience working for utilities on law, policy, and planning. Major focus areas include developing supplies and implementing demand-side alternatives. Experience in the private, public, and nonprofit sectors. Certified utility water loss validator and trainer in Georgia, one of the two leading states for water loss. Education: JD from University of Notre Dame; BA from the University of Georgia.

30

Let's Start with an Icebreaker

When I say water efficiency, what words come to mind?

31

Focus for Today – Water efficiency recommendations for long-term demand reductions

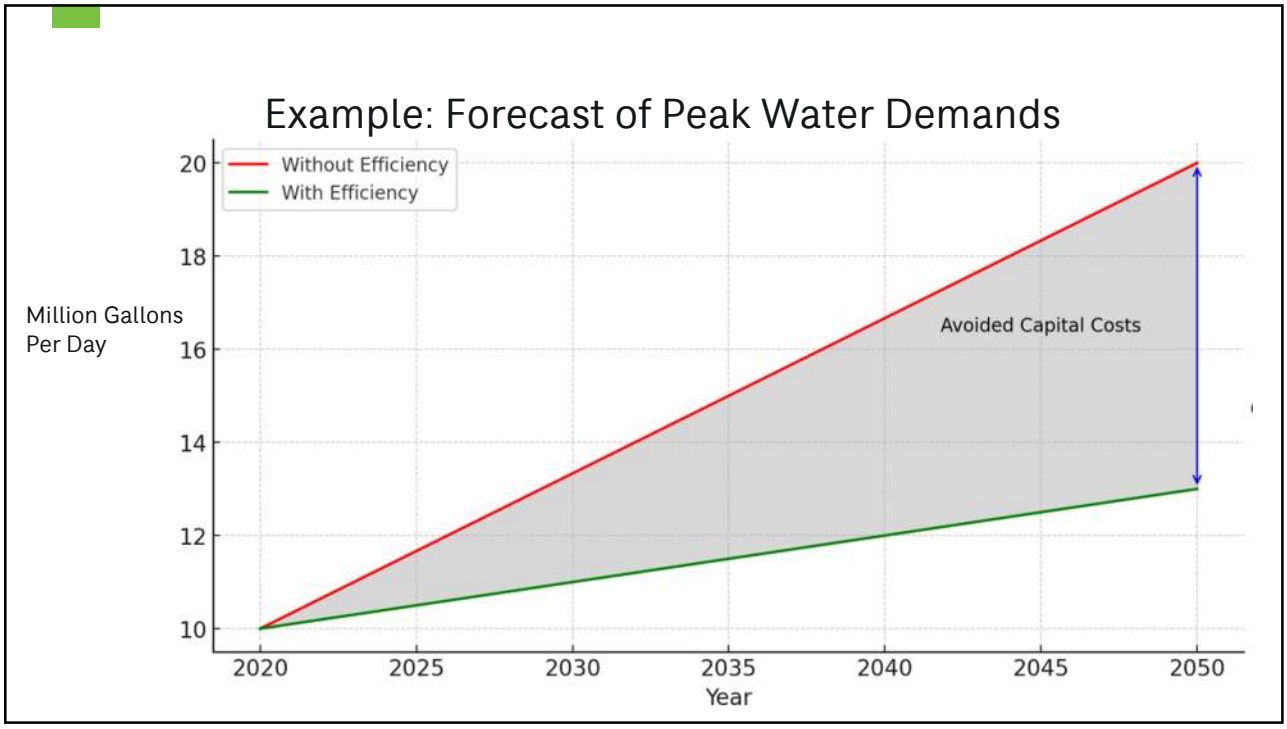
Broader Analysis to Come – Written report that will also cover:

1. Advanced approaches to water efficiency
2. Drought planning and response
3. Efficiency and Affordability
4. Public Education
5. Passive Water Efficiency: State and Federal Codes and Standards

32

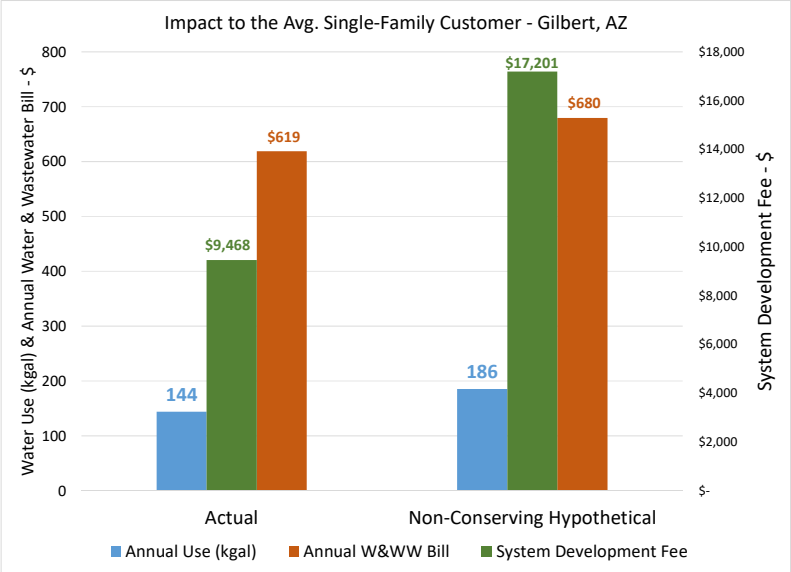

Water Efficiency and Conservation:
Important Even When Water is Abundant
Alliance for Water Efficiency
Water efficiency and conservation are typically the fastest and least expensive ways to help ensure that communities and agriculture have access to affordable, sustainable water supplies. Climate change is fueling hotter, dryer weather, and nearly every state experienced drought in 2022, which was the worst drought in hundreds of years in the Western U.S.
However, water efficiency and conservation offer multiple sustainability benefits beyond keeping the water running, just as energy efficiency does more than keep the lights on. It's time to de-bunk the common misperception that water efficiency and conservation are only important in arid regions or when drought sets in.
A brief overview of water efficiency and conservation's other benefits:
Mitigating climate change by reducing energy use and greenhouse gas emissions associated with heating, pumping, and treating water/wastewater.
Adapting to climate change by making communities more resilient to drought and heavy rain events.
Reducing costs for businesses and supporting corporate sustainability goals.
Making more water available to support healthy stream flows and lake levels for plants and animals.
Reducing the need to build or expand expensive drinking water and wastewater systems.
Limiting nutrient runoff associated with landscape and agriculture.
Helping communities manage water shortages related to water quality problems.
Using technologies that detect leaks to save water and help prevent property damage.
Making water bills more affordable.
Minimizing land subsidence linked to excess groundwater withdrawals.
ALLIANCEFORWATEREFFICIENCY.ORG CHICAGO, IL 773.360.5100 INFO@A4WE.ORG
WIN
WIN

33


Example: Forecast of Peak Water Demands
Without Efficiency
With Efficiency
Avoided Capital Costs
Million Gallons Per Day
20
18
16
14
12
10
2020
2025
2030
2035
2040
2045
2050
Year

34

Example AWE Report: Conservation Minimizes Rate Increases for an Arizona Utility



www.allianceforwaterefficiency.org/resources/financing-sustainable-water

35

Preliminary recommendations for long-term demand reductions

1. Conduct, Validate, and Act on Annual American Water Works Association (AWWA) Water Loss Audits
2. Adopt Advanced Metering Infrastructure and Monthly Billing
3. Implement Customer-Side Leak Detection Programs
4. Improve Increasing Block Rate Designs

36

Preliminary Recommendation #1:

Conduct, Validate, and act on AWWA Water loss audits

37

Unaccounted for water Methodology in Massachusetts

Water Treated *minus*
Metered Water Use *minus*
Confidential Estimated Municipal Use =
Unaccounted For Water

Unaccounted for water includes, among other things, physical leak in the water utility's distribution system; **reducing leaks is an alternative to increasing supplies**

38

Confidently Estimated Municipal Use (CEMU)		Estimated million gallons per year
Fire protection & training		0.25
Hydrant/water main flushing/main construction	+	4.15
Flow testing	+	0.1
Bleeders/ Blow offs	+	0
Tank overflow & drainage	+	2.5
Sewer & stormwater system flushing	+	0.02
Street cleaning	+	0.05
Source meter calibration adjustments	+	0
Major water main breaks (not leak detection)	+	0.5
Total Confidently Estimated Municipal Use	=	7.57

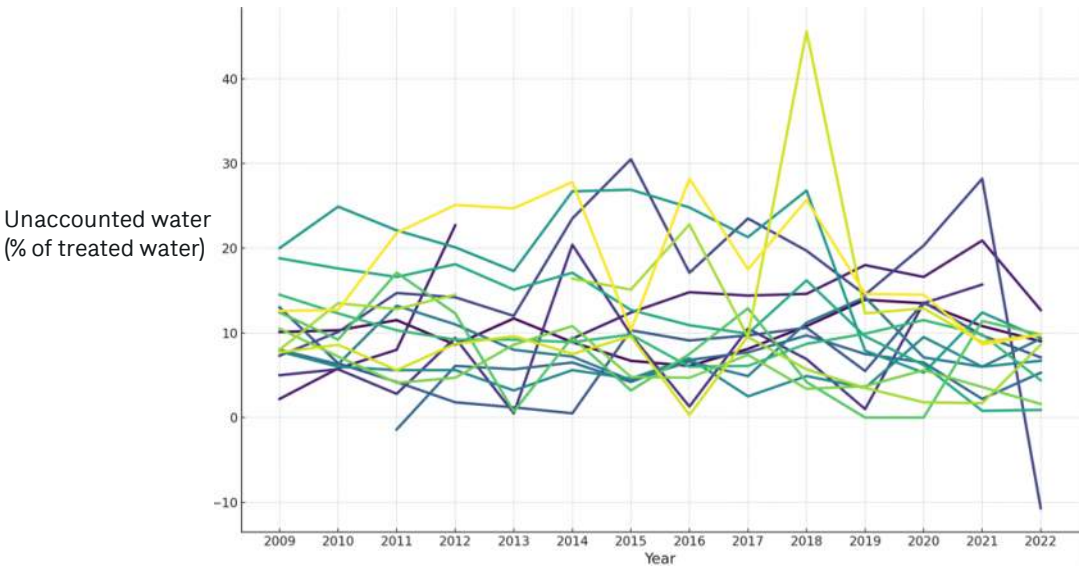
ReCalculate Total

YOU MUST PROVIDE DOCUMENTATION FOR ALL OF YOUR CEMU VOLUMES.

Source: Massachusetts Department of Environmental Protection Drinking Water Program Instructions for the Annual Statistical Report

39

OCPC Region - Unaccounted for water as % of Treated Water



40

Water Loss – Preliminary Recommendations

Each year water systems could:

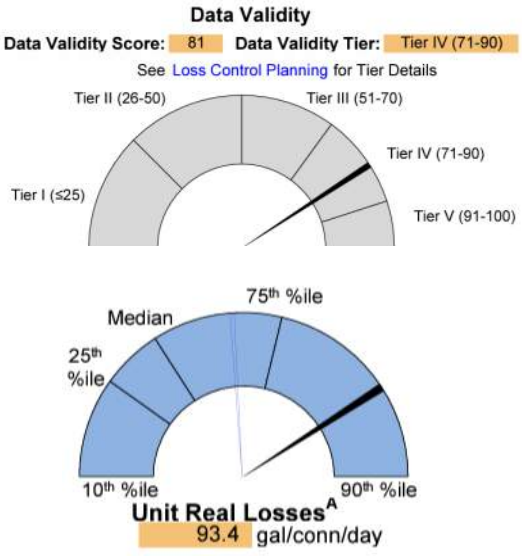
- Conduct water loss audit using AWWA M36 manual and free water loss audit software
- Validate water loss audits using a third-party trained to conduct Level 1 validations pursuant to Water Research Foundation project #5057
- Act on the results by improving data grades and reducing real water losses

Potential demand reductions: Based on study of data from CA, GA, TN and TX, the median utility studied could cost effectively **reduce real water losses by more than 1/3rd; however, reductions vary based on utility-specific factors**

41

3 benefits of awwa methodology

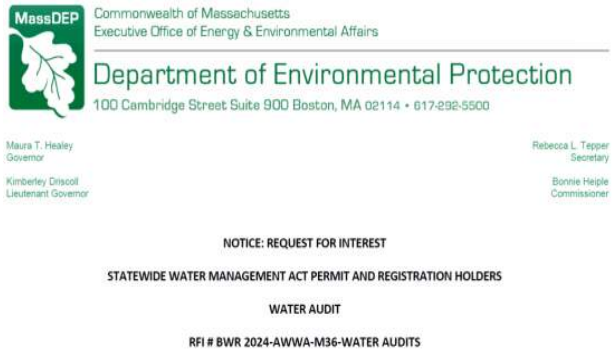
1. Provides data validity grades
2. Generates actionable recommendations
3. Relies on metered data and validated industry ranges; limited use of estimates



42

Water Loss – Regional recommendation

OCPC or another regional entity could coordinate and assist with grant applications for multiple interested communities in the region and then host regional training.



MassDEP

Commonwealth of Massachusetts
Executive Office of Energy & Environmental Affairs

Department of Environmental Protection

100 Cambridge Street Suite 900 Boston, MA 02114 • 617-292-5500

Maura T. Healey
Governor

Kimberley Driscoll
Lieutenant Governor

Rebecca L. Tepper
Secretary

Bonnie Heiple
Commissioner

NOTICE: REQUEST FOR INTEREST

STATEWIDE WATER MANAGEMENT ACT PERMIT AND REGISTRATION HOLDERS

WATER AUDIT

RFI # BWR 2024-AWWA-M36-WATER AUDITS

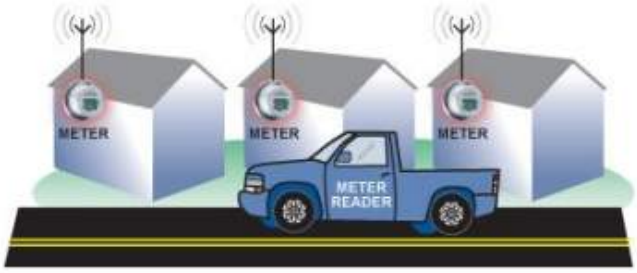
https://www.mass.gov/doc/m36-water-audit-opportunity-notice-fy2024/download

43

Preliminary Recommendation #2:

implement Advanced metering infrastructure (AMI) & monthly billing

44



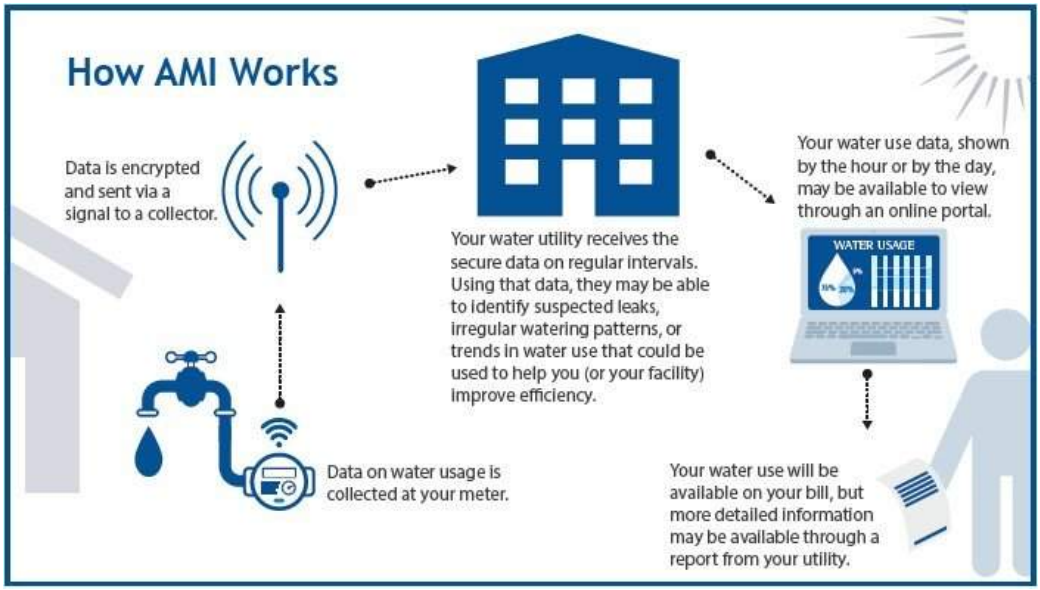
Manual Reading

AMR

AMR = Automated Meter Reading

Source: Presentation by Suez to AWWA Section on April 28, 2022 "Advanced Metering Infrastructure (AMI) Is It Now Within Reach for Small to Mid-Sized Utilities?"

45



Source: www.epa.gov/watersense/advanced-metering-infrastructure

46

Metering and billing - Status quo in OCPC Region

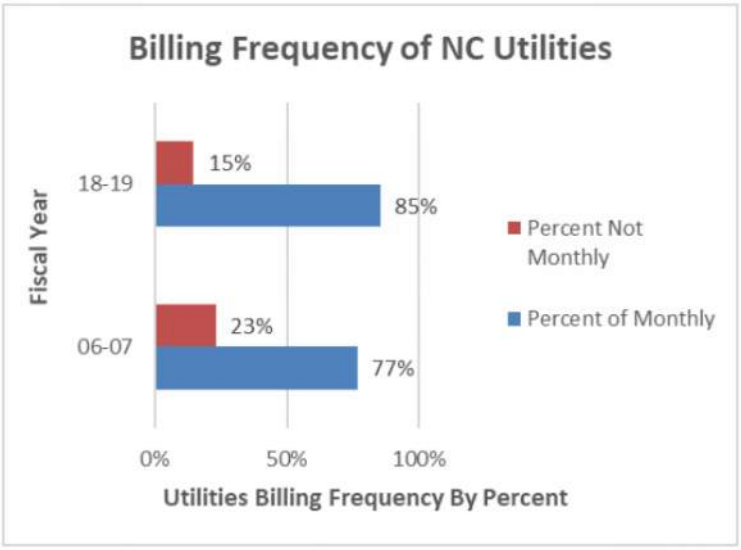
Current meter types – Predominantly manual reading and AMR (automated meter reading)

Infrequent Billing – Bimonthly, quarterly, semiannually + ~10 to 30+ days from time meter is read until bills are sent

Impacts on Water Use – customers may be unaware of customer-side leaks for a very long time; limits customer feedback on water usage; limits utility's ability to understand usage during peak months

47

Example of billing practices from NC



Source: https://efc.web.unc.edu/2020/05/07/does-how-often-you-pay-for-it-matter-the-impacts-of-billing-frequency/

48

Metering and billing – Preliminary recommendations

Adopt AMI – Adopt advanced metering infrastructure by creating a plan to install AMI meters and related infrastructure for most customer meters (can be phased)

Adopt Monthly Billing – Begin issuing monthly bills (possible even before/without AMI)

Potential demand reductions: AMI metering and monthly billing are best practices; they are necessary building blocks for improved water loss auditing, customer-side leak detection, and improved inclining block rates

49

Benefits of AMI

www.awwa.org/Portals/0/AWWA/ETS/Resources/Technical%20Reports/ami_guidebook_feb_2022.pdf

Multiple Benefits

- Improves revenue forecasting
- Reduces bill adjustments
- Improves rate design
- Enables other smart monitoring (e.g. pressure monitoring, leak detection)
- Improves theft detection
- Supports customer service
- Reduces meter reading costs

50

Metering and billing – Implementation

Learn More by Joining AWE's Conservation and AMI Users Group (CAMI)*

*CAMI is currently free and open to all

Note – AWE member only resource

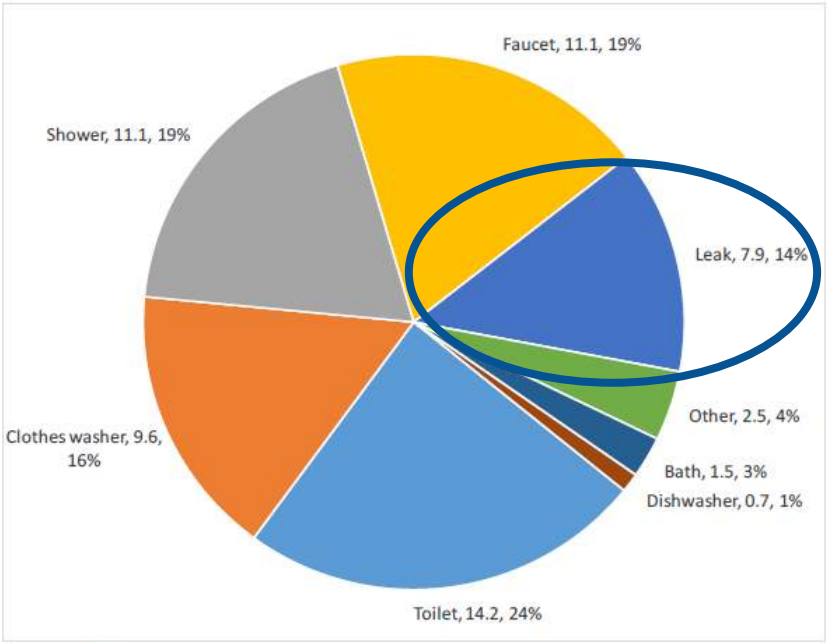
51

Preliminary Recommendation #3:

implement customer-side leak detection programs

52

Customer-Side leak detection - Status quo



Source: Residential End Uses of Water Version 2, 2016 (WRF Project No. 4309)

Figure ES.4 Indoor per capita use (gpcd and percent of indoor use) by fixture, 9 study sites, n=737

53

Customer-side leak detection – Preliminary recommendations

AMI-Based Programs

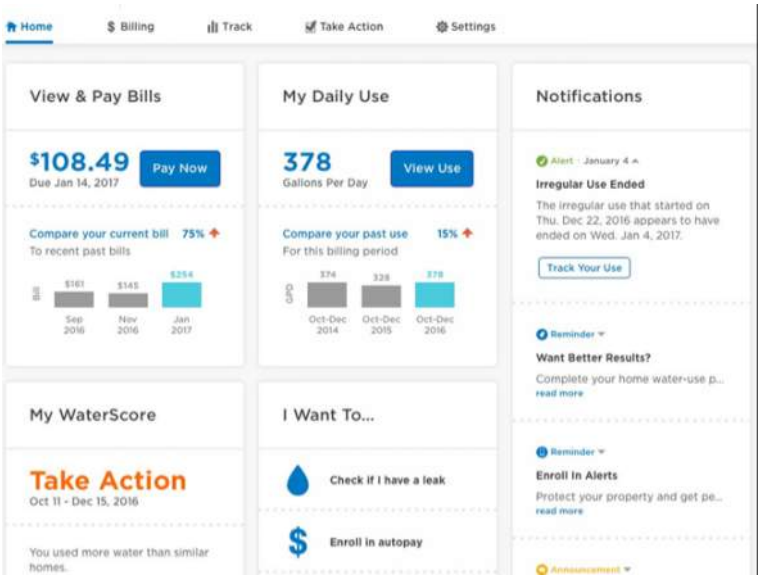
- Utility periodically sends constant consumption reports; can be automated with AMI interface
- Offer customer-facing portal; customers set constant consumption thresholds

In the first three months of the program, the WaterSmart platform delivered over 150 leak alerts to Park City residents, 70% of which were closed within ten days of the notification.

Rebate Programs – Offer a rebate for behind the meter leak detectors

54

Customer-Facing portal

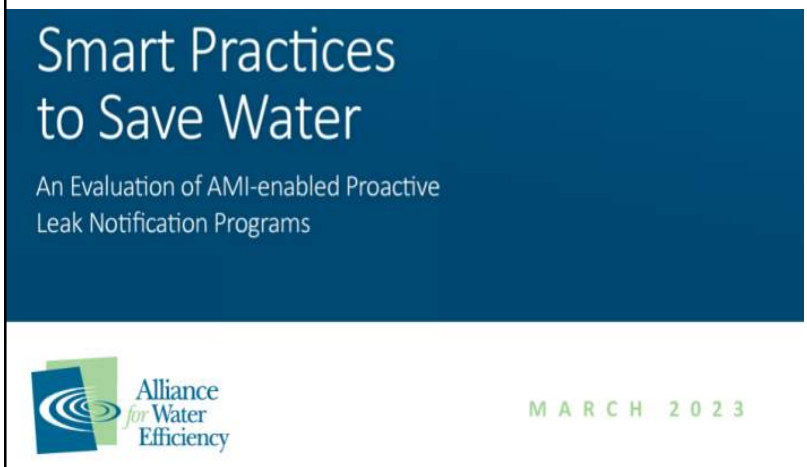


Potential Demand Reductions: Water savings for enrolled customers range from 2 to 10%; participation is key!

Source: https://www.azwater.gov/sites/default/files/media/2020_TownofPrescottValleyCustomerPortal_Redacted_2.pdf

55

Utility-side Leak Notification Programs



Potential Demand Reductions: Up to 1% savings for overall single-family water use for well designed programs

56

Preliminary Recommendation #4:

Improve increasing block rate design

57

Water Rate Per Thousand Gallons

Current Rates Effective January 1, 2024

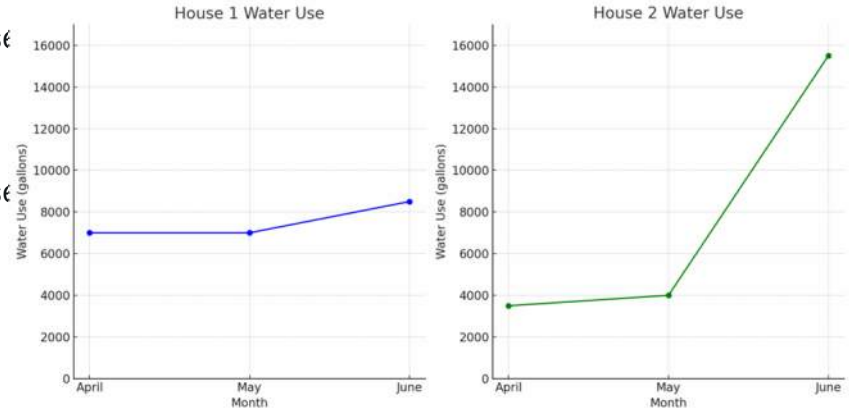
	Quarterly	2023 Per Thousand Gallons	*2024 Per Thousand Gallons*
1st Step	0 -20,000 gals	$5.03	*$5.44*
2nd Step	20,001-50,000 gals	$6.12	*$6.61*
3rd Step	Over 50,000 gals	$7.65	*$8.26*

58

Example of limitation of quarterly billing in rate design

House 1 Quarterly Use
23,00 gallons

House 2 Quarterly Use
23,00 gallons



59

Good Example of increasing block rate structure

Proposed Water Blocks	Approx. % of Bills in New Blocks	Water Usage Examples (CF)	Current Monthly Bill	Proposed Monthly Bill	Impact ($)
Basic Needs 0-600	55%	588	$33.97	$33.40	-$0.57
Larger Family 600-1,200	25%	1200	$60.22	$60.88	$0.66
Efficient Irrigation 1,200-2,600	15%	1600	$79.58	$85.04	$5.46
Enhanced Irrigation >2,600	5%	3208	$160.74	$191.28	$30.55

Source: https://www.olatheks.gov/Home/Components/News/News/3362/57

60

Improve increasing block rate structures – Preliminary recommendations

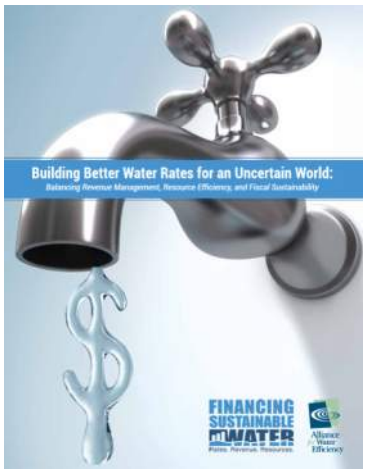
Size blocks based on basic indoor use, efficient outdoor use, and excessive outdoor use

Ensure the costs of serving peak customers are allocated to peak customers, which better reflects cost of service, promotes conservation, and improves relative affordability for customers with only basic indoor use

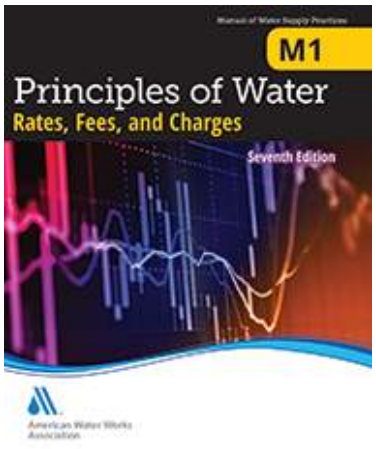
Potential demand reductions: Demand reductions will vary. Poorly designed structures will not reduce demands and well-designed structures **can reduce demands by 10% or more and be revenue neutral**. Revenue and demand impacts of a given rate structure can be estimated as part of a rate study that accounts for price elasticity and strength of the conservation signal.

61

Rate Designs – implementation



Free resource available at www.allianceforwaterefficiency.org/resources/financing-sustainable-water



Available at AWWA bookstore

62

Preliminary recommendations for long-term demand reductions

1. Conduct, Validate, and Act on Annual American Water Works Association (AWWA) Water Loss Audits
2. Adopt Advanced Metering Infrastructure and Monthly Billing
3. Implement Customer-Side Leak Detection Programs
4. Improve Increasing Block Rate Designs

63

Alliance for Water Efficiency

318 W Adams St., Ste. 1514
Chicago, IL 60606

OFFICE 773-360-5100

https://www.allianceforwaterefficiency.org

Alliance *for* Water Efficiency

Thank You!

64

Alternatives Introduction

65

Hypothetical Alternatives ("Projects/Policies") for OCPC

Supply Side

- MWRA for all communities
- MWRA for communities abutting Stoughton and Weymouth
- MWRA for communities abutting Weymouth
- More MWRA for Stoughton
- Desalination at max capacity to supply X communities
- Desalination at 80% capacity to retain buffer
- Centralized PFAS treatment facilities
- Decentralized PFAS treatment programs
- Interconnections: A, B, C, D, E, F, ...etc.
- Brackish groundwater
- Stormwater capture
- Reclaimed water for non-potable uses
- Additional operational staff

Demand Side

- Conduct, Validate, and Act on Annual AWWA Water Loss Audits
- Adopt AMI and Monthly Billing
- Implement Customer-Side Leak Program
- Improve Tiered Rate Designs

Examples

66

66

Demand Side Alternatives Discussion

A

People
Pine DuBois
John Haines
Bob Kostka
Kendra Martin
Val Massard
Liz Shea
Dan Sullivan
Kirk

B

People
Jason Duff
Kimberly Groff
Shane O'Brien
Noreen O'Toole
Wayne Parks
Greg Swan
Brian Vasa
Amara

C

People
Jonathan Beder
Peter Gordon
Duane LaVangie
Phil McNulty
Greg Tansey
Kara and Grace Inman

D (hybrid)

People
Peter Forman
Jon Hobill
Gavin Murphy
Jimmy Powell
Brian Vasa
Art Edgerton
Martin Pillsbury
Margherita Prior
Grace Houghton

OCPC Regional Water Plan 67

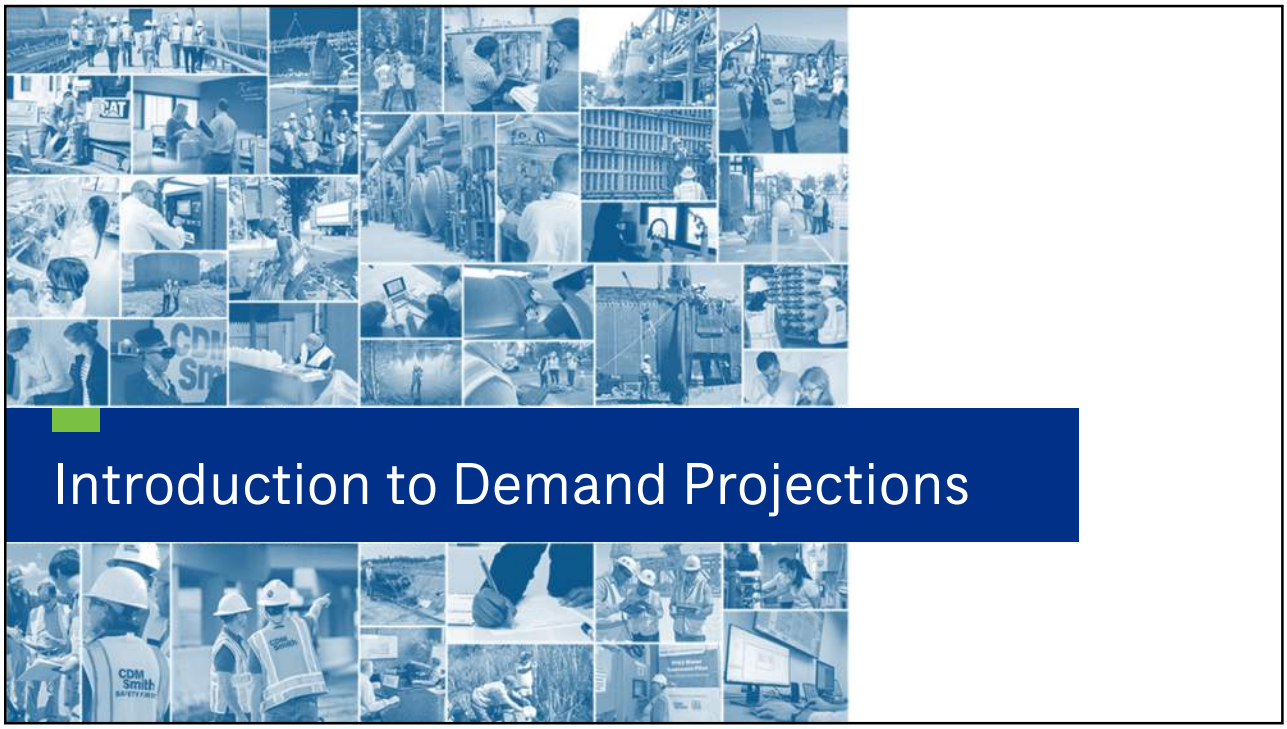
67

Discussion Questions

1. What are your reactions to these preliminary recommendations?
2. Are there demand side management strategies your community already has in place?
3. Are there recommendations that you think your community is more likely to implement?
4. Are there any demand side management that you don't think seem feasible for your community?
5. Are there other demand side management strategies you would like to hear more about?
6. Do you have any additional questions about the recommendations for demand side management presented today?

OCPC Regional Water Plan 68

68



Introduction to Demand Projections

69

Demand Projections Introduction

- Different methodologies exist with varying cost and complexity
- Methods fall along a spectrum rather than being a strict or exact approach
- Selecting which method depends on purpose of forecast (e.g., policy vs master planning), data availability and quality, cost and time constraints, and importance of geospatial accuracy

OCPC Regional Water Plan 70

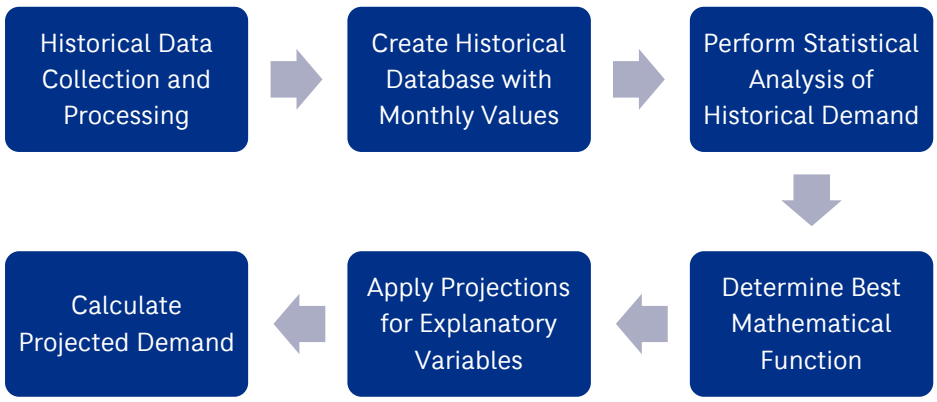
70

Demand Projections Methodology

- Econometric Function
  - Form of regression analysis that incorporates economic variable(s)
  - Assumes ***per unit water use*** (dependent variable) is a **function** of several ***explanatory factors*** (independent variables)
  - Unit use rate changes over time as those explanatory factors change
- Variables included in function are based on iterative process to determine combination with highest correlation with historical water use
- Adjusted R^2 to measure correlation – adjusts for number of terms in model, only increases if new variable improves model

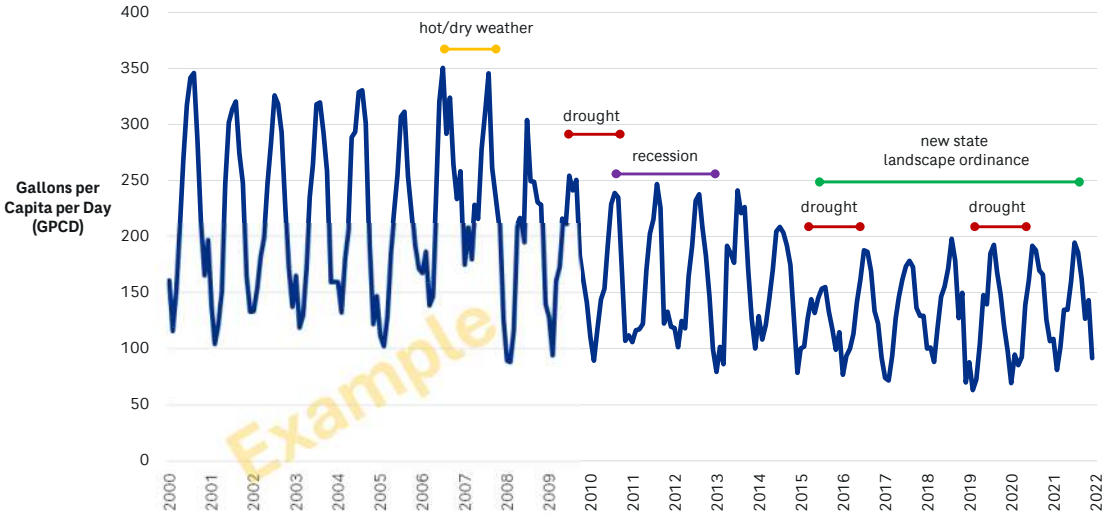
71

Overview of Econometric Demand Projection Process



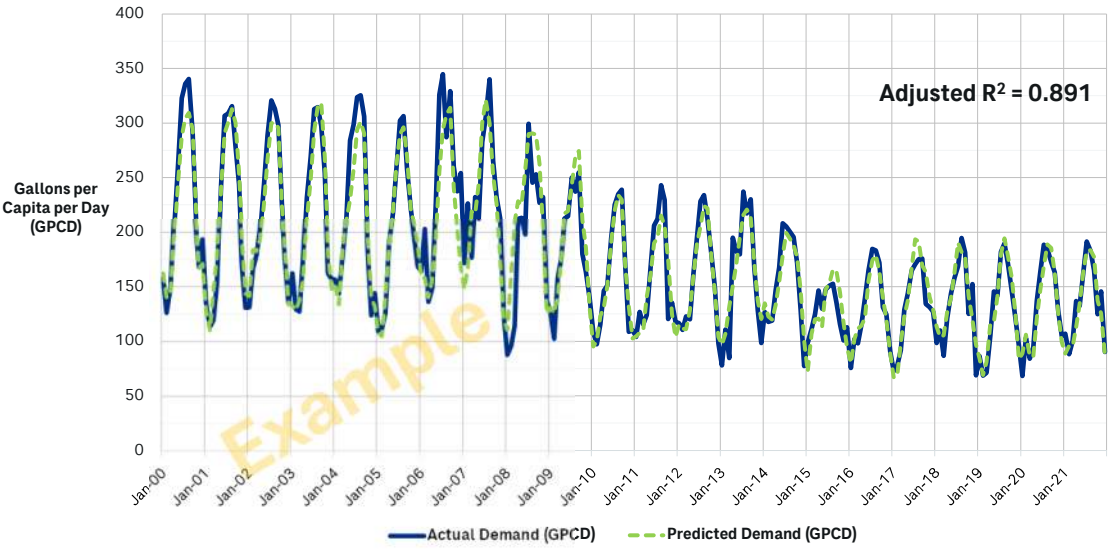
72

Example of Historical Water Use Trends and Impacts



73

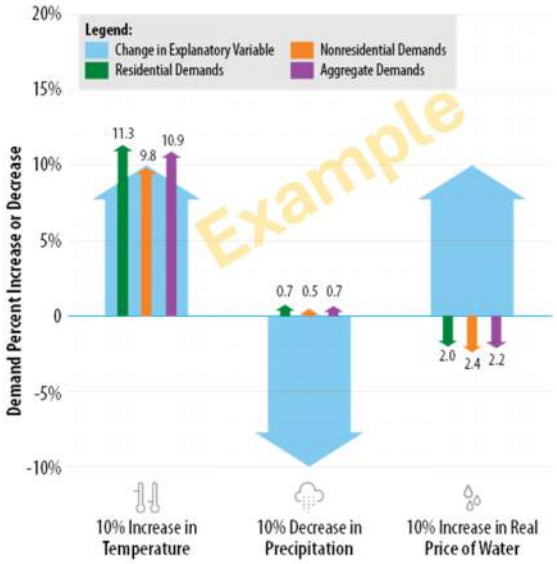
Example Demand Model Verification



74

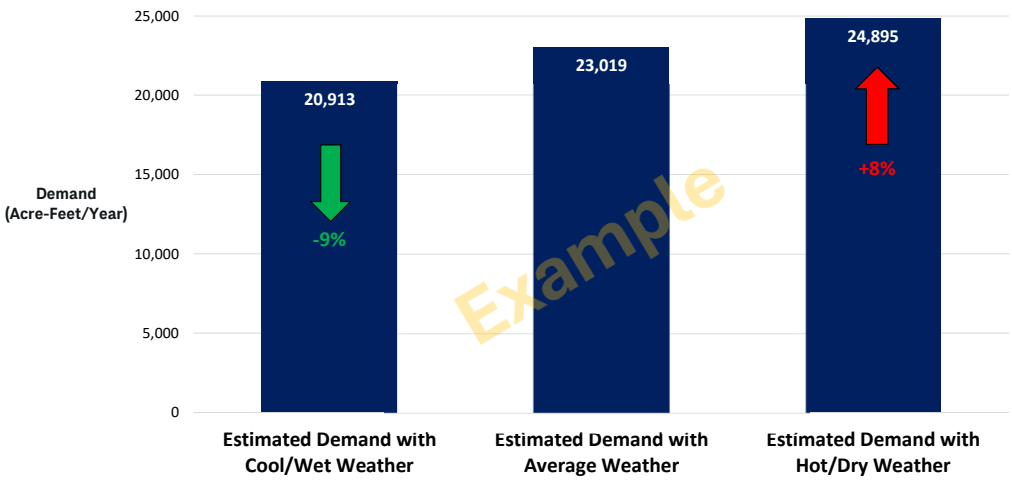
Demand Projections Methodology

- Percent change in independent variable(s) has a measurable percent change in the dependent variable.
- Relationship to Demand
  - Direct (e.g., temperature)
  - Inverse (e.g., precipitation)
- Available research, sound reasoning, and justifiable assumptions should support causal relationships of independent variables to dependent variable



75

Example of Impact of Potential Climate Change on Demand



76

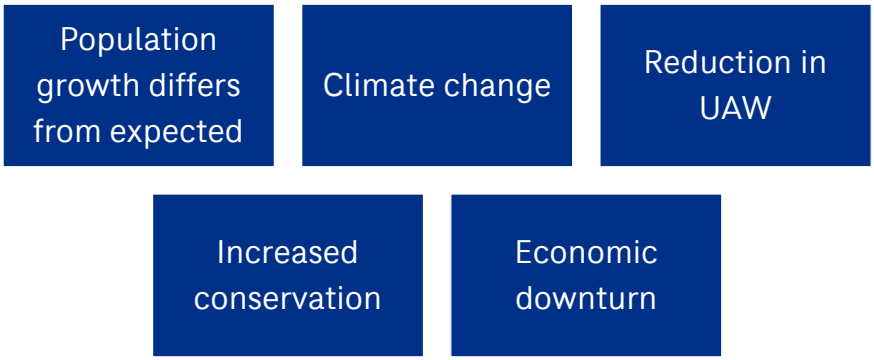
Future Scenario Planning

- Projected demands are based on projections for the independent variables
- Typically, a "baseline" demand is calculated based on:
  - population forecast from state or regional demographic agency ("expected" growth)
  - historical long-term average climate
  - historical average UAW
  - average water use efficiency

77

Future Scenario Planning

- Different scenarios can be incorporated into the planning process that evaluate the impact on water demand under a variety of future conditions:



78

Example of Future Scenario Planning

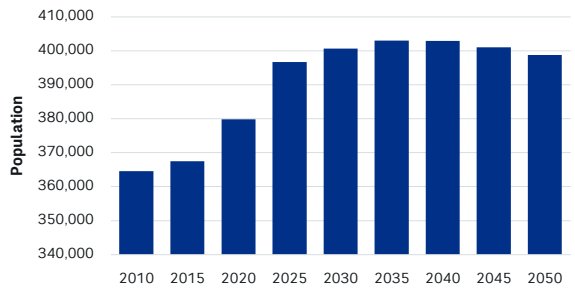
Planning Scenario	Population Growth	Future Climate Change	Median Household Income	Water Use Efficiency	Trend in UAW	Private Wells to Public Supply
1. **Baseline**	Expected	Historical Average	Modest Increase	Average increase in efficiency	Historical Average	None
2. **Lower Stress**	Lower than expected	Cool/Wet	No Increase	Greater than average increase	Decrease	None
3. **Moderate Stress**	Greater than expected	Warm/Dry	Modest Increase	Average increase in efficiency	Historical Average	25%
4. **Significant Stress**	Much greater than expected	Hot/Dry	Significant Increase	Less than average increase	Increase	75%
5. **Significant Stress with Mitigation**	Much greater than expected	Hot/Dry	Significant Increase	Greater than average increase	Decrease	75%

Example

79

Historical and Projected Population

- Historical population
  - combination of data provided by communities for population served and American Community Survey (ACS) data
- Projected population
  - from UMass Donahue Institute
  - same population numbers used by state for permits

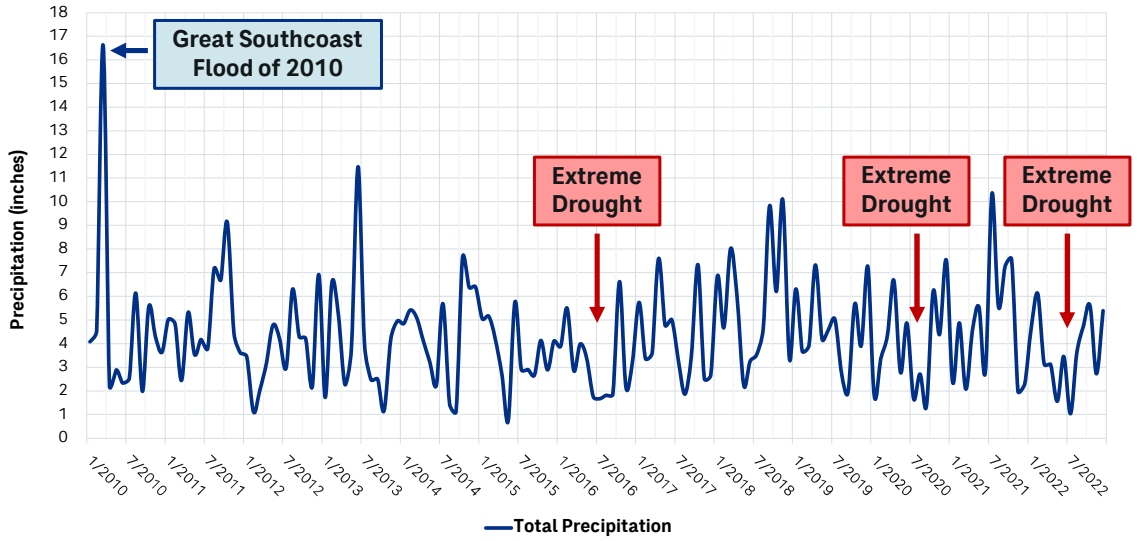


2020 to 2040: +6.1%

Year	OCPC Member Community Population Projection
2010	364,607
2015	367,470
2020	379,781
2025	396,647
2030	400,662
2035	402,960
2040	402,915
2045	401,028
2050	398,695

80

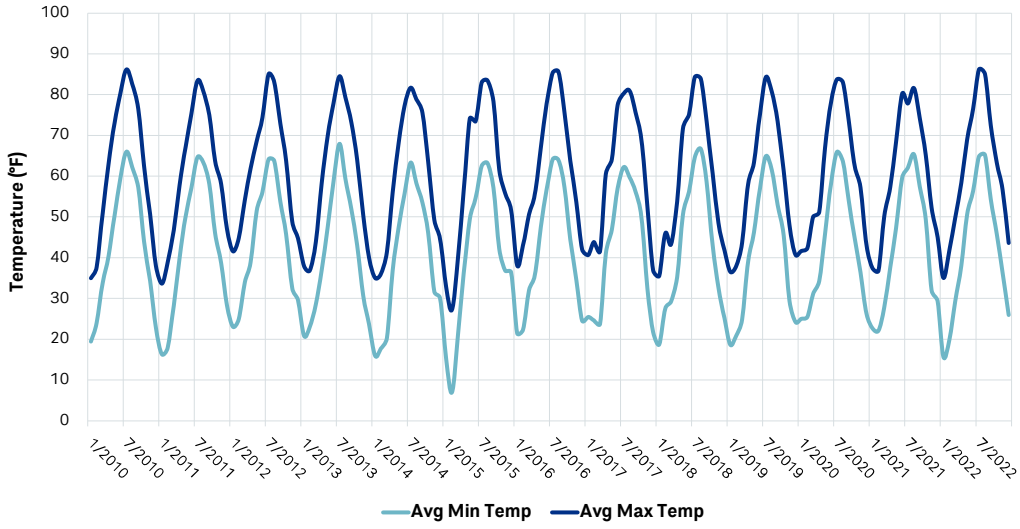
Historical Precipitation for OCPC Region



Note: Extreme Drought (D3) as categorized and defined by the U.S. Drought Monitor

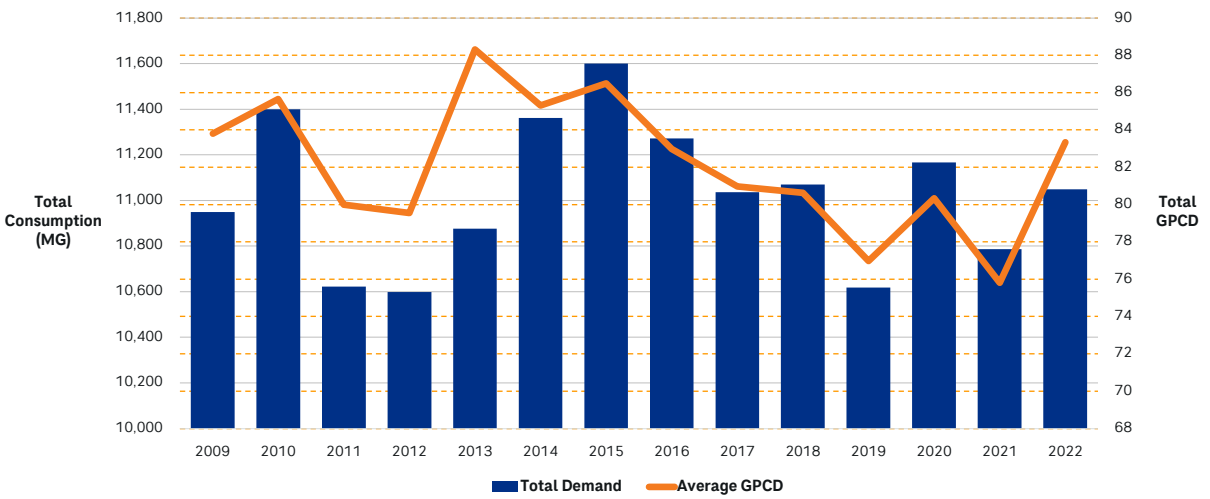
81

Historical Temperature for OCPC Region



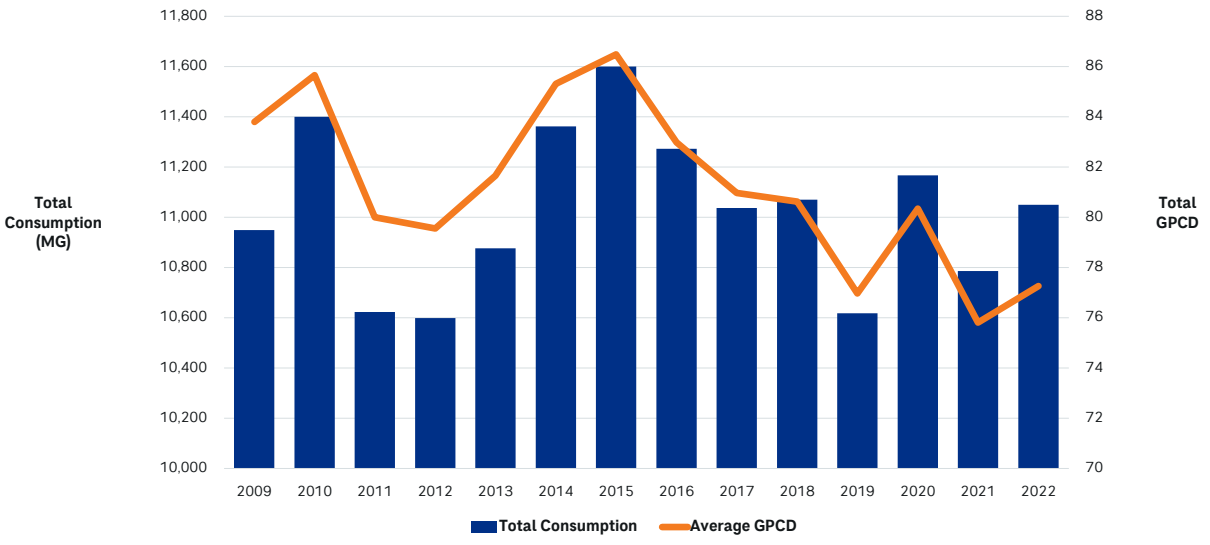
82

Historical Annual Demand (Consumption)



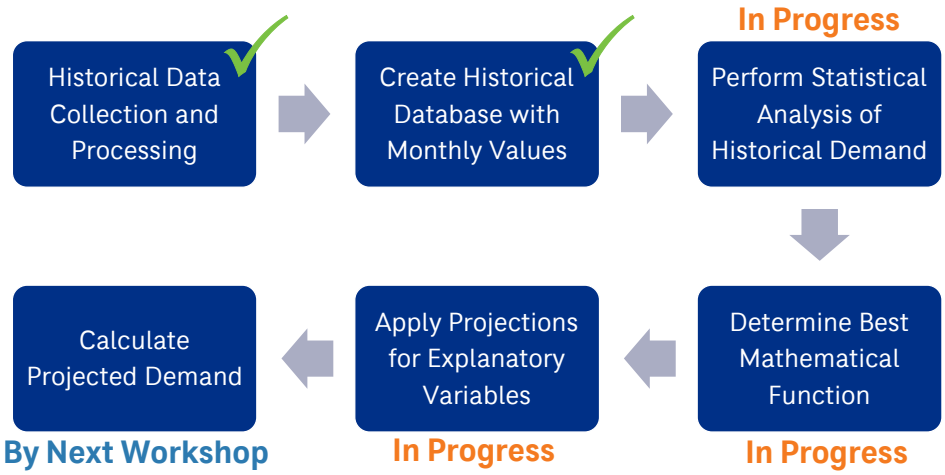
83

Historical Annual Demand (Consumption)



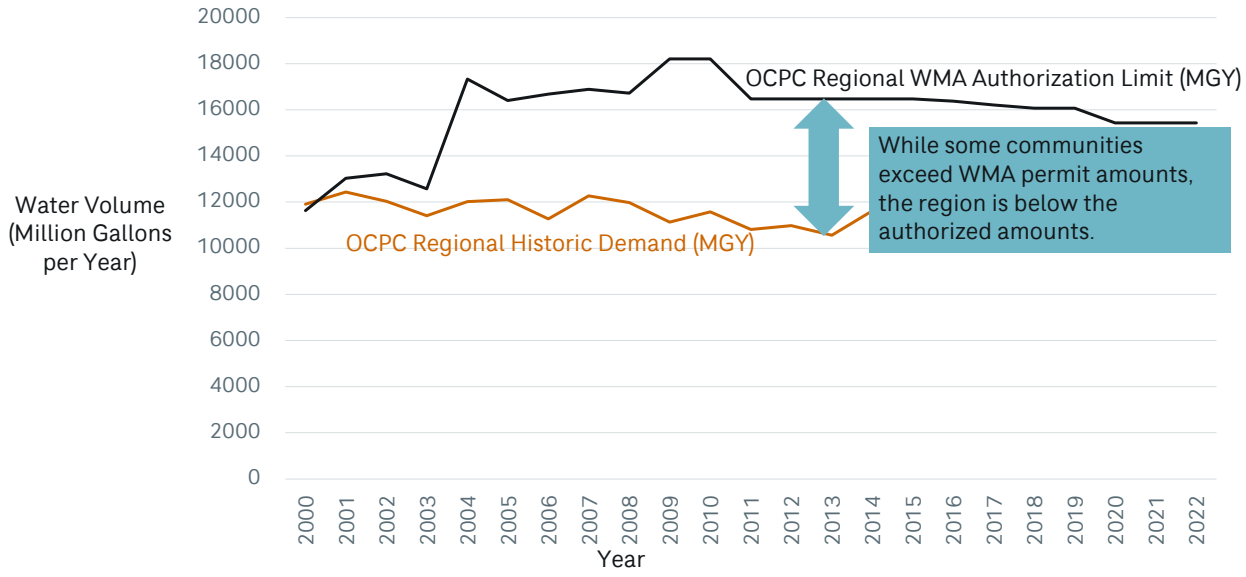
84

Overview of Demand Projection Process



85

Regional Historic Water Demand shown with Regional WMA Registration and Permit Limits



86

Step 1: Score Projects Against Metrics

Objectives	Reliability/Resilience Objective		Meet DW Regulations	Ecosystem Health	High B:C Ratio	Promote Equity		Innovative/ Alternative Solutions	Sustainable Economic Potential	
Alternatives										
MWRA for all communities	100%	10%	2	5	20M	0.1	3	N	1	5
MWRA for communities abutting Stoughton and Weymouth	70%	4%	2	3	12M	0.4	2	N	1	3
MWRA for communities abutting Weymouth	...									
More MWRA for Stoughton	...									
Desal at max capacity to supply X communities	...									
Desal at 80% capacity to retain buffer										
Centralized PFAS treatment facilities	75%	15%	3	3	18M	0.6	1	N	1	2
Decentralized PFAS treatment programs	...									
Interconnections: A, B, C, D, E, F, ...etc.	...									
Brackish groundwater	...									
Stormwater capture	5%	0%	1	3	4M	0.8	1	Y	1	1
Reclaimed water for non-potable uses										
Unaccounted-For Water reductions	80%	15%	2	4	6M	0.4	1	N	5	4
Incentivize 60 gpcd for all residential users	...									
Outreach to encourage water conservation	...									
Other water efficiency measures	...									
Grey water recycling for industries	...									

AR0

87

87

Step 2: Collect Stakeholder Weights

(Can be done for objectives or metrics – Here, objective weights can be distributed equally among multiple metrics, if applicable)

	Reliability	Safe DW	Ecosystem	High B:C	Equity	Innovation	Sustainable Economy
Stakeholder A	50	10	10	5	15	5	5
Stakeholder B	25	10	25	10	10	10	10
Stakeholder C	5	5	5	60	10	5	10
Stakeholder D	20	5	5	5	10	15	40
Stakeholder E	0	0	100	0	0	0	0
Stakeholder F	14.3	14.3	14.3	14.3	14.3	14.3	14.3
Stakeholder G	...	...	...	...			
Stakeholder H	...	...	...				
Stakeholder I	...	...					
Stakeholder J	...						
Stakeholder K							
Stakeholder L							
Stakeholder M							
Stakeholder N							
Stakeholder O							
Stakeholder P							
Stakeholder Q							

AR0

88

88

Slide 87

AR0 Update metrics so they match what our are
Regehr, Amara J., 2024-05-10T19:01:47.889

Slide 88

AR0 Update the se to match the objectives
Regehr, Amara J., 2024-05-10T19:02:19.194

Step 3: Use Multicriteria Ranking Software to Generate Ranked Lists of Projects

Sort on Average Rank

	Average	STAKEHOLDERS																
		A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
Unaccounted-For Water reductions	2.4	2	1	3	3	1	3	4	3	2	2	1	3	4	3	1	2	3
Desal at 80% capacity to retain buffer	3.0	1	3	5	2	5	4	5	2	1	1	3	2	5	4	3	3	2
MWRA for communities abutting Weymouth	3.6	6	4	6	4	2	1	3	6	6	3	2	1	2	2	5	7	1
Centralized PFAS treatment facilities	3.8	3	5	2	1	3	7	2	5	3	4	5	5	1	6	4	4	5
Incentivize 60 gpcd for all residential users	4.6	7	7	4	5	7	6	1	7	8	5	4	7	3	1	2	1	4
Other water efficiency measures	8.3	4	2	8	15	11	9	6	1	10	11	7	11	12	9	7	9	9
Reclaimed water for non-potable uses	9.2	13	8	1	6	6	2	14	8	13	8	17	8	10	5	13	14	11
Outreach to encourage water conservation	9.2	5	6	7	16	12	8	15	4	4	10	6	10	11	15	10	11	7
Interconnections: A, B, C, D, E, F, ...etc.	9.8	10	10	14	8	16	12	11	11	5	9	13	6	7	8	9	12	6
Decentralized PFAS treatment programs	9.8	9	11	13	9	15	11	10	12	7	6	11	4	6	16	8	10	8
Brackish groundwater	10.4	11	9	16	7	4	10	13	10	14	7	14	9	9	7	12	15	10
Grey water recycling for industries	10.8	16	15	9	13	10	5	7	9	9	12	8	12	13	13	14	6	13
More MWRA for Stoughton	12.2	14	14	10	12	13	17	8	14	16	13	9	15	14	10	6	5	17
Desal at max capacity to supply X communities	13.0	8	12	11	17	14	16	9	16	12	14	10	16	17	14	15	8	12
MWRA for communities abutting Stoughton and Weymouth	13.5	12	13	17	10	8	14	17	15	15	17	12	13	8	12	16	17	14
Stormwater capture	13.6	15	17	12	11	9	13	16	13	11	15	16	17	16	11	11	13	15
MWRA for all communities	15.6	17	16	15	14	17	15	12	17	17	16	15	14	15	17	17	16	16

Consistently High Ranking for all Stakeholders: Build portfolios starting with these

Wide ranges of rankings – explore with stakeholders to either elevate or de-emphasize

Consistently Low Ranking for all Stakeholders: Avoid these in portfolios

Examples

89

89

Step 4:Develop Portfolios (Exploratory, for comparison)

Themes to be developed with Steering Committee

Portfolio 1
Internal to Region

Project	Average Rank	Cost ($M)	Water Benefit (mgd)
UAW	2.4	$40	20%
Centralized PFAS	3.8	$80	40%
60 gpcd incentives	4.6	$10	10%
Efficiency measures	8.3	$12	15%
Inter-connections	9.8	$28	15%
TOTAL:		**$170**	**100%**

Portfolio 2
Internal and External

Project	Average Rank	Cost ($M)	Water Benefit (mgd)
UAW	2.4	$40	20%
Desal at 80%	3.0	$80	60%
MWRA abutting Weymouth	3.6	$20	15%
Efficiency measures	8.3	$12	15%
TOTAL:		**$152**	**110%**

Portfolio 3
Least Cost

Project	Average Rank	Cost ($M)	Water Benefit (mgd)
TOTAL:		**$170**	**100%**

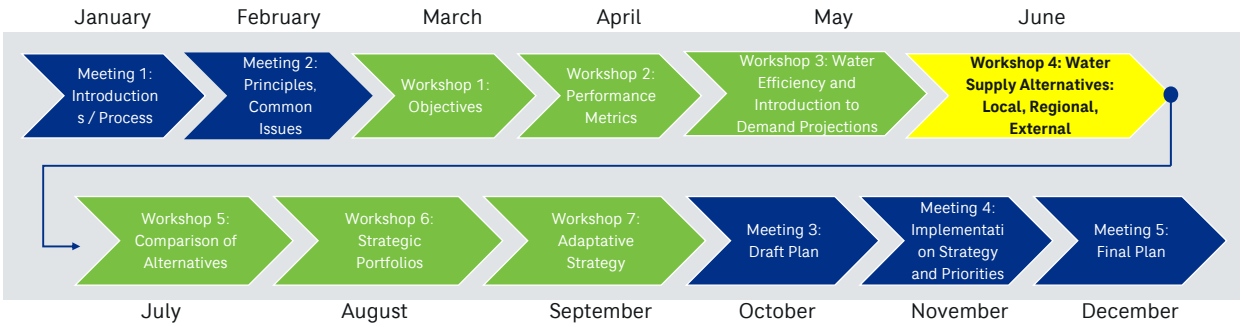
Examples

90

90

91

Next Workshop



92

Upcoming Schedule

WHEN	DETAILS
Tuesday, June 25th 9:00 am – 12:00 pm	Workshop 4
Wednesday July 31st 9:00 am – 12:00 pm	Workshop 5
Tuesday, August 27th 9:00 am – 12:00 pm	Workshop 6
Tuesday, September 24th 9:00 am – 12:00 pm	Workshop 7
Tuesday, October 29th 9:00 am – 12:00 pm	Meeting 3
Monday, November 18th 8:00 am – 12:00 pm	Meeting 4
Tuesday, December 10th 8:00 am – 12:00 pm	Meeting 5

93

Feedback Survey

94

Last Meeting: Feedback Survey Results

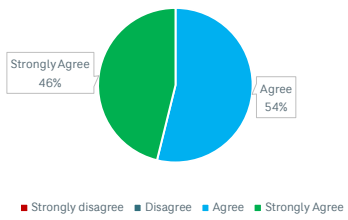
1. Please tick one box per row.
The meeting had a clear agenda.
Facilitation of today's meeting was effective.
I had plenty of opportunity to participate in the discussion today.
Interactions were positive and respectful.
I understand where we are in the process and where we are going.

Strongly disagree	Disagree	Agree	Strongly agree

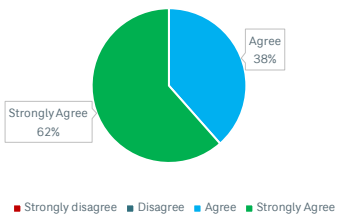
95

Last Meeting: Feedback Survey Results

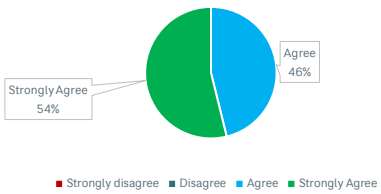
The meeting had a clear agenda.



Facilitation of today's meeting was effective.



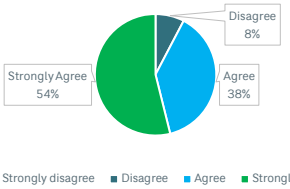
Interactions were positive and respectful.



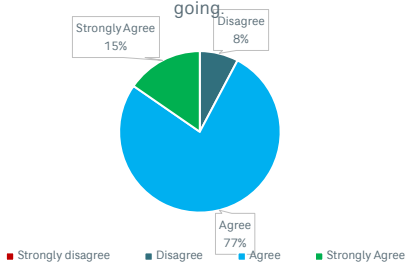
96

Last Meeting: Feedback Survey Results

I had plenty of opportunity to participate in the discussion today.



I understand where we are in the process and where we are going.



97