Blueprint for One Water

PROJECT #4660

Water Research Foundation®

Blueprint for **One Water**

The One Water concept, an integrated planning and implementation approach to managing finite water resources, has been adopted by some, and is of great interest to many others, for its collaborative approach to achieving sustainable, reliable, and resilient water systems. Previous efforts helped set the stage for integrated water resources planning, but many utilities have identified the need for tactical steps or guidance to develop a One Water framework. This blueprint provides practical guidance for One Water or Integrated Water Management efforts, including a roadmap for integrating a multi-stakeholder planning process as well as lessons learned from a diverse group of municipalities and water professionals.
This blueprint includes:

- Critical steps to developing a One Water approach
- Case study examples describing how utilities have taken innovative approaches to incorporate integrated water resources planning
- Methods for overcoming potential barriers and obstacles
- Key outcomes and milestones for each critical step

This document is intended to guide One Water planning processes and support utilities, cities, counties, municipalities, water professionals, and other stakeholders across multiple water resource sectors, including water supply, wastewater, reuse, watershed management, stormwater, and energy and resource recovery.

This blueprint was sponsored by Water Research Foundation (WRF) project 4660 and developed by Brown and Caldwell. The research methodology included an international survey with responses from more than 800 water professionals, more than ten one-on-one interviews, and a two-day international workshop with 35 water professionals.

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“One Water is the future of the water industry. Many benefits are realized when the barriers traditionally separating water, wastewater, stormwater, and reuse are broken down. One Water is a guiding principle of the Water Research Foundation, which works to advance the science of water in all portions of the water cycle.”

Robert C. Renner, PE, BCEE
Chief Executive Officer | Water Research Foundation

A Shift in How We Manage Our Water Resources

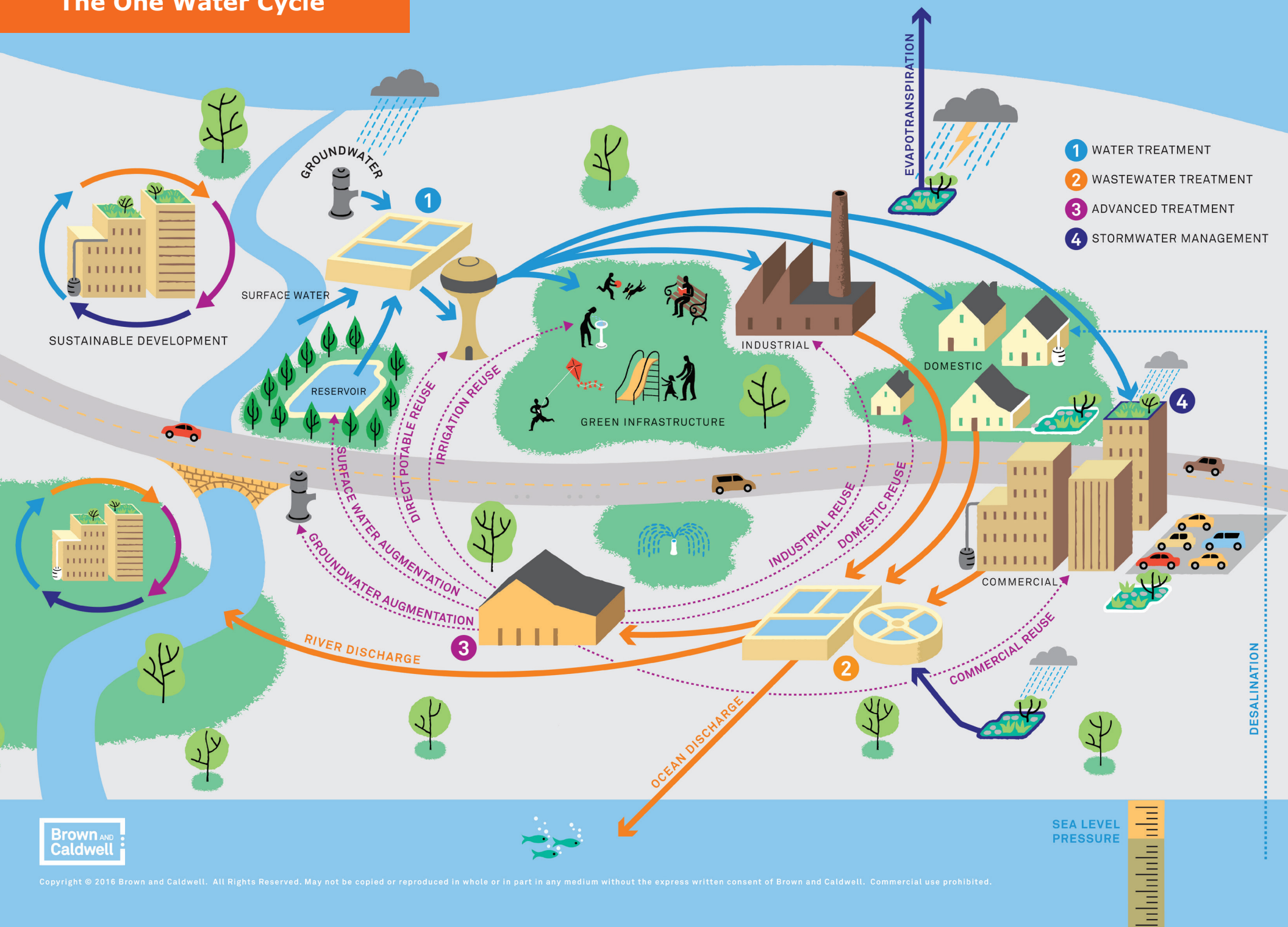
Increasingly, water utilities and municipalities are being challenged to consider the multifaceted nature of water in their communities. Several drivers, such as climate change, catastrophic weather events, water shortages or droughts, degradation of water quality, changing regulations, and aging infrastructure, are causing utilities to manage water in new ways.

As a result, there is greater awareness of the need for environmentally sustainable and reliable water infrastructure that increases the beneficial use of water resources and identifies efficiencies from a collaborative framework. A growing body of research indicates that a One Water approach is an effective way to address these increasingly complex issues.[1]

One Water Defined

One Water is an integrated planning and implementation approach to managing finite water resources for long-term resilience and reliability, meeting both community and ecosystem needs.

The One Water Cycle



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What is a **One Water** framework?

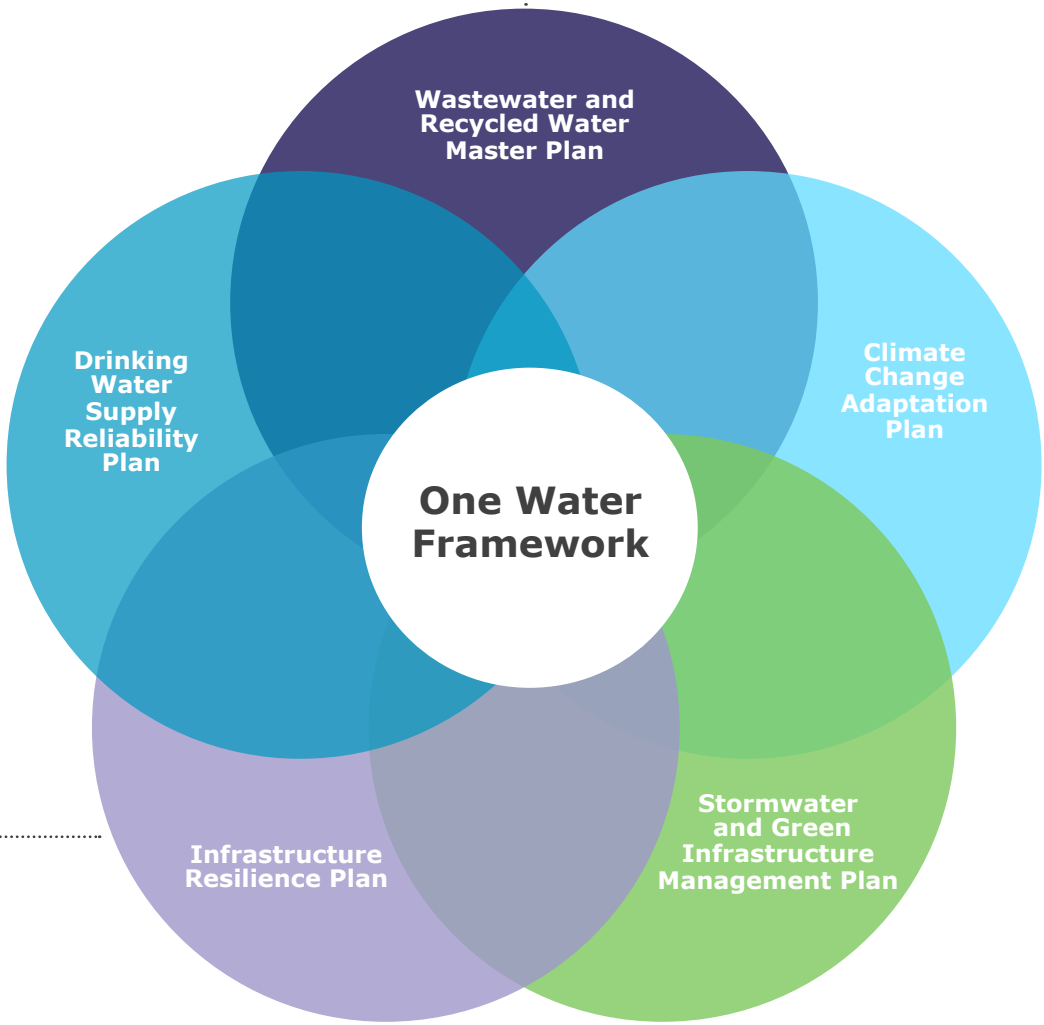
A One Water approach considers the water cycle as an integrated system, recognizing the interconnectedness of surface water and groundwater supply, stormwater, wastewater, and energy.[2,3] Many utilities have already developed plans associated with various elements captured in a One Water approach including drinking water supply reliability, climate change adaptation, stormwater management, green infrastructure, and wastewater infrastructure resilience.

A One Water framework builds on the interconnectedness of these plans and identifies efficiencies. The result of this effort may take the form of a separate comprehensive plan, but the end product can also be a framework, guiding the collaborative actions of a group of separate but connected entities; a document describing how to leverage existing plans; or a simple scope defining the prioritized water resource management initiatives. An outcome of the plan or framework can be the identification of projects with multiple benefits.

One Water can look different from entity to entity depending on varying needs and opportunities. One Water can also be applied at different scales (regional, city, or utility level). Despite these differences, a One Water framework has similar elements, which are captured and described in greater detail within this document.

Many utilities are already realizing a number of benefits by implementing a **One Water** approach. As reported in this project's survey and ten one-on-one interviews, the top reasons to apply a One Water approach are as follows (in order of importance):

- Greater resilience and reliability
- Opportunities to optimize regional infrastructure
- Sustainable community development
- New regulatory flexibility or opportunity
- Economic growth opportunity
- Increased coordination among agencies/departments



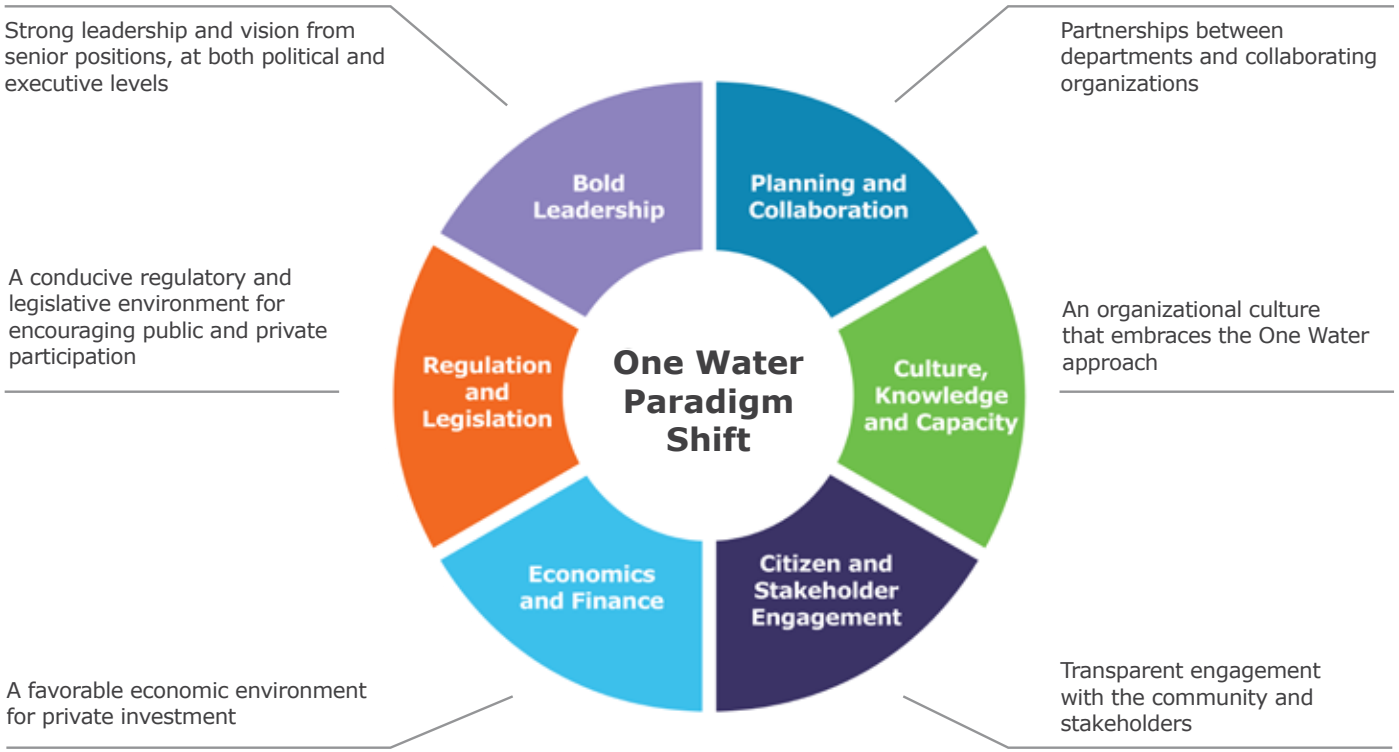
Possible **One Water** Objectives[2]

- ✓ Provide reliable, secure, clean water supplies
- ✓ Contribute to a livable city
- ✓ Protect human health
- ✓ Provide flood protection
- ✓ Minimize environmental pollution
- ✓ Use and reuse natural resources efficiently
- ✓ Provide resiliency to climate and economic changes
- ✓ Promote long-term sustainability, equity, and economic growth/ prosperity

Key Elements of a **One Water** Approach

The Water Environment and Reuse Foundation (WE&RF), in partnership with WRF, examined the One Water paradigm in the project, *Pathways to One Water: A Guide to Institutional Innovation*. This study identified six key elements that contribute positively to a One Water approach.[2] These six elements are depicted in the graphic below.

The survey respondents for this project indicated that with respect to the six elements, the most progress had been made in four of the areas. Listed in descending order, those areas are: **planning and collaboration; bold leadership; citizen and stakeholder engagement; and culture, knowledge, and capacity.**



Modified from Mukheibir and Howe 2015

This Blueprint for One Water incorporates these six key elements, and expands upon them to include tactical steps that utilities can take for One Water planning and implementation.

Experience with **One Water**

Based on responses to a survey distributed to more than 800 water professionals around the globe, more than sixty percent of respondents have knowledge of One Water, have considered it, or have direct experience with One Water planning.

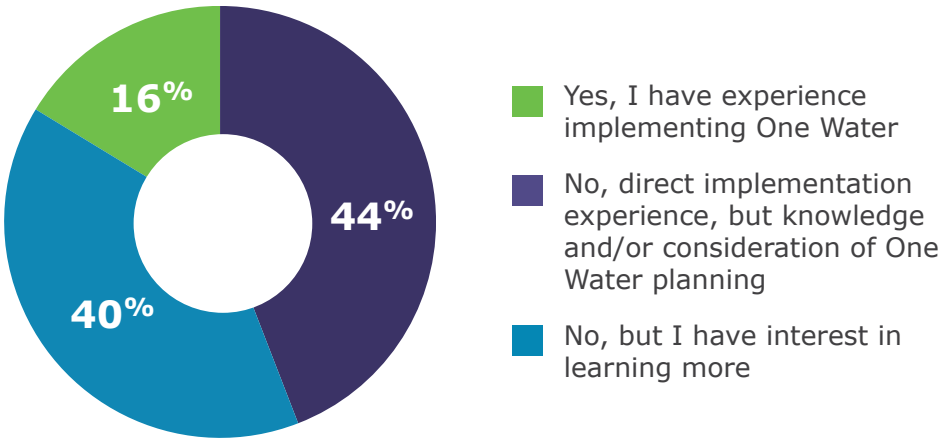


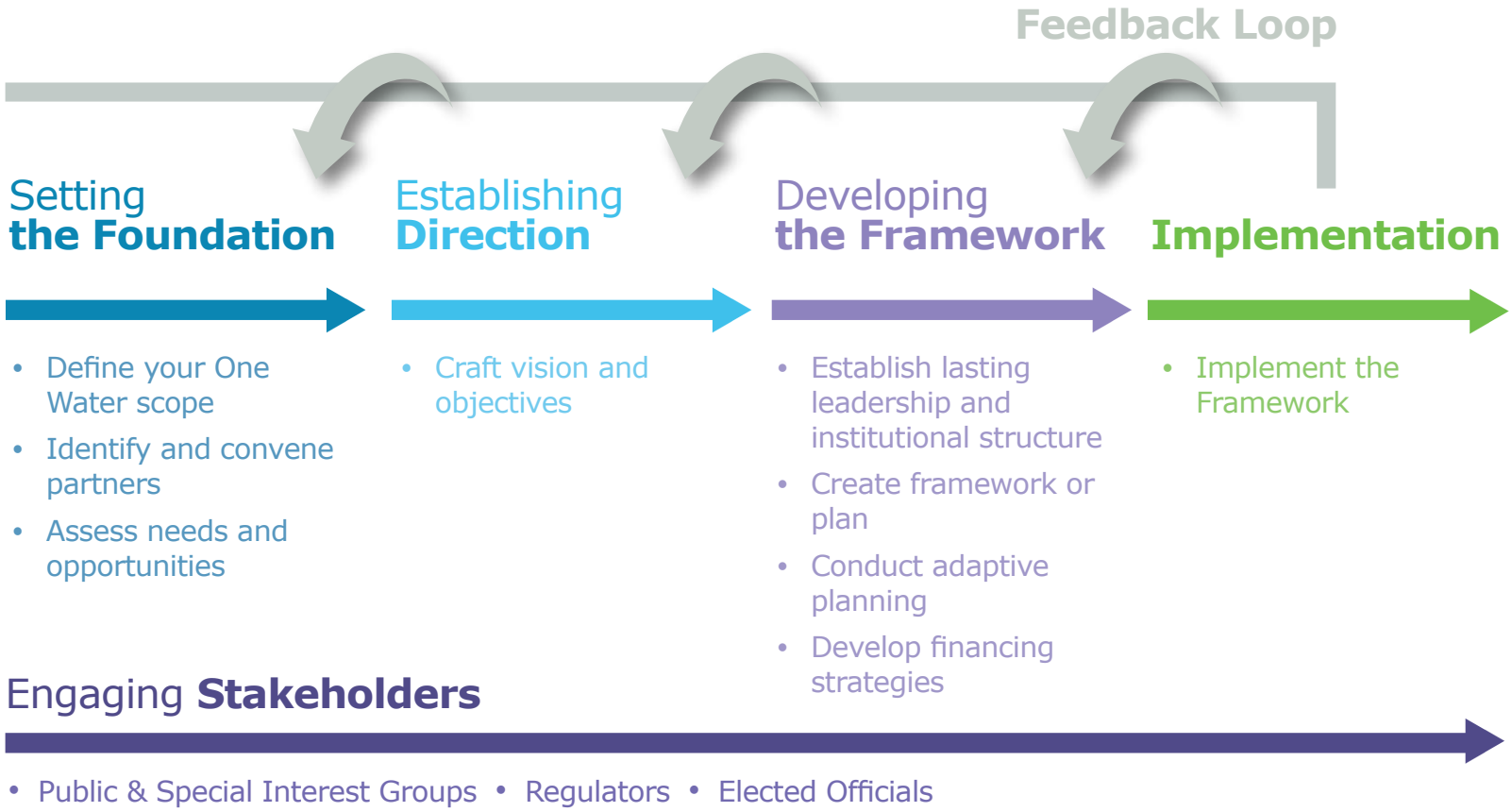
Photo: Cathy Green, president of the Orange County Water District (OCWD) in California, and others raise glasses of recycled water to toast the unveiling of OCWD's wastewater recycling facility. The new facility increases recycled water production from 70 million gallons per day (mgd) to 100 mgd, providing enough recycled water to meet the needs of about 850,000 Orange County residents.

Blueprint for a **One Water** Approach

Developing and implementing a One Water framework involves several steps within five key phases. The phases and steps in this blueprint are based on the research team's knowledge and input from water professionals through the project's survey, one-on-one interviews, and a two-day workshop. This blueprint demonstrates the iterative nature of a One Water approach—while presented in a general order, there is no rigid chronology for these steps.

It is recommended that the Engaging Stakeholders phase occur in parallel with the other four phases. Developing and implementing One Water is an ongoing process. Feedback will prompt reassessment as the phases progress, particularly when moving through implementation. However, the process is not meant to be an endless feedback loop. Feedback should help refine prior actions as an organization progresses through the framework. The key is to create a One Water framework that can be flexible enough to meet your utility's evolving needs.

The remainder of this document outlines the five phases and critical steps, identifying important actions to advance each step forward, key outcomes, potential challenges, and lessons learned from other water utilities across the United States.


Feedback Loop
Setting the Foundation
Establishing Direction
Developing the Framework
Implementation
• Define your One Water scope
• Identify and convene partners
• Assess needs and opportunities
• Craft vision and objectives
• Establish lasting leadership and institutional structure
• Create framework or plan
• Conduct adaptive planning
• Develop financing strategies
• Implement the Framework
Engaging Stakeholders
• Public & Special Interest Groups • Regulators • Elected Officials

Setting
the Foundation

This phase kicks off the entire One Water planning approach by defining what One Water means to your entity, identifying a core group of critical partners, and assessing the needs and opportunities that your One Water approach would address.

Define Your **One Water** Scope

One Water can look very different from one place to the next depending on your climate and geography, water resources, and environmental stressors. Developing a One Water framework begins with defining what One Water is or could be for your entity.

IMPORTANT ACTIONS

- ✓ Determine the challenges that your entity, community, and region are facing that may impact long-term water supply reliability, water resource resilience, or water quality needs.
- ✓ Reach out to other cities and utilities of similar size and with similar attributes that have implemented a One Water approach for insights to seed internal dialogue.
- ✓ Consider using a "re-imagining" exercise to explore how you might do things differently if you were creating your system from scratch. How can your entity:
  - Manage water resources differently?
  - Collaborate with other groups inside and outside of your organization?
  - Change modes of operation to achieve greater efficiencies?
  - Use what we now know about climate uncertainty and challenges to our water systems?
- ✓ Consider what your organization is already doing or planning for to enhance sustainability and determine how best to leverage these existing activities.
- ✓ Decide what issues you want to address with an integrated One Water approach and what form it will take. Will this be a simple framework or a comprehensive plan?
- ✓ Begin to identify internal and external partners to include in the development of your One Water approach.

KEY OUTCOMES

- A rough definition of One Water for your entity including what will and won't be included

POTENTIAL CHALLENGES

- Identifying innovative approaches to water management
- Thinking big
- Defining a workable scale and scope

Utilities' Thoughts on Defining **One Water**

Note: Comments captured on this page are based on input from workshop attendees.

Identify and Convene Partners

As the premise of a One Water approach is to make the most effective use of resources through the interconnectedness of the urban water cycle, identifying potential partners with similar interests can help you accomplish goals that cannot be achieved alone. Partners may include separate departments within your own agency, regional departments and agencies responsible for water supply reliability, wastewater treatment, and/or stormwater management—or even other city departments such as planning, parks, or transportation.

IMPORTANT ACTIONS

- ✓ Gather decision makers from each partner entity and establish working relationships. Understand individual drivers and existing relationships with other stakeholders, such as regulators, customers, and other partners.
- ✓ Identify a champion who will lead the effort.
- ✓ Define levels of engagement and structure for the group.
- ✓ Create a safe space to exchange ideas and set the ground rules for the engagement process.
- ✓ Involve an objective, independent facilitator to help remind each partner of their obligations and to work through potential conflicts.
- ✓ Engage critical partners in regular meetings to guide the planning process.

> "At the very earliest stage of the development of a resilient program, a one-page high-level agreement was prepared, which was necessarily brief and broad so that it could enable the leaders of the organizations to sign without risk should the program not succeed. These leaders' signatures enabled the officers to devote time to a specific project plan, which outlined a shared understanding of what the work entailed, key tasks, and timelines."
>
> **– Seqwater**

KEY OUTCOMES

- An agreement or statement of support to jointly pursue One Water

POTENTIAL CHALLENGES

- Ensuring that you have engaged the right partners and identified the right lead for each entity
- Conflict arising by bringing together separate entities with differing agendas

CASE STUDY

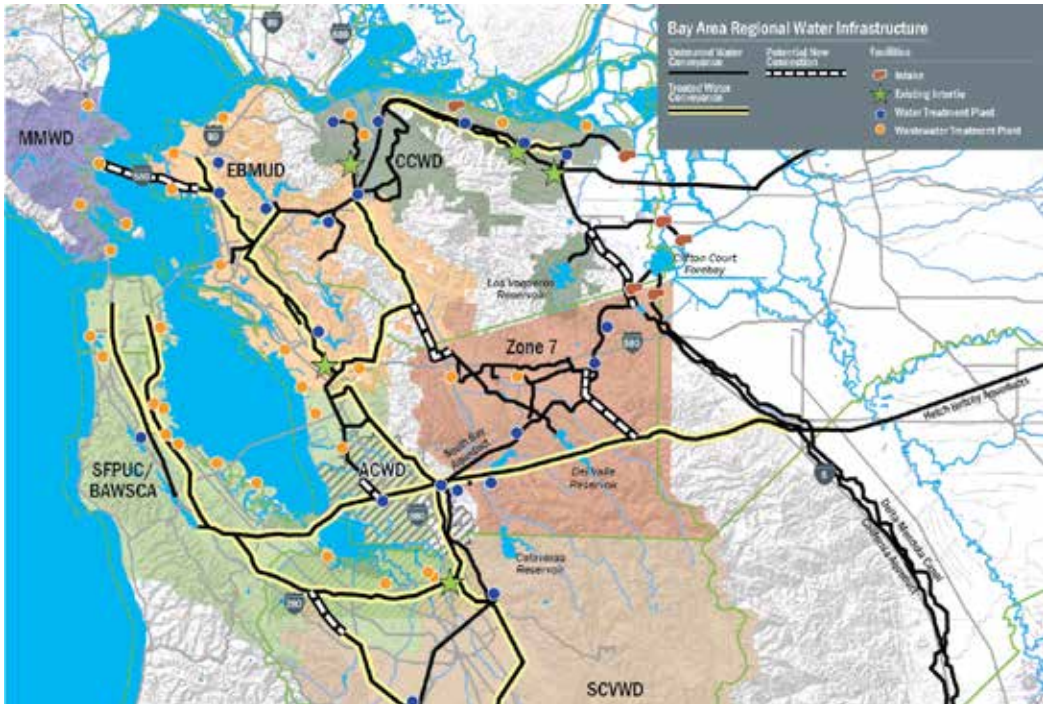
Bay Area Regional Water Supply Reliability Partnership

The Bay Area Regional Water Supply Reliability Partnership (BARR) established a Memorandum of Agreement (MOA) structuring a partnership between its eight agencies.

Attached to the MOA is a set of guiding principles for BARR partnership development, describing how partners will work collaboratively to address water supply reliability concerns on a mutually beneficial and regionally focused basis.

As the BARR partnership was setting the foundation, the group evaluated existing resources including water supply, conveyance, treatment, and storage facilities to determine which assets could be leveraged regionally. A Scope of Effort including response and mitigation actions could then be developed to address the specific needs and opportunities the group identified.

For more information:
Bay Area Integrated Regional Water Plan
http://tinyurl.com/BayAreaWaterPlan



“I can’t tell you how proud we were to get eight agencies on one sheet.”

– Marguerite Patil describing their early success in developing a one-page fact sheet.
Contra Costa Water District

Assess Needs and Opportunities

System knowledge is a basic building block for the development of a One Water framework. With a foundational knowledge of the needs across the entire system, partner entities can begin to identify and evaluate opportunities for collaboration and integration.

IMPORTANT ACTIONS

Gather Information

- ✓ Gather information from each participating department, agency, or city to assess the current state of the system. What data are available and where are there gaps? Gain a better understanding of existing assets and planned projects.
- ✓ Evaluate various water sources in terms of quantity, quality, costs, and reliability to understand detailed needs and challenges.
- ✓ Estimate and identify resources and data needed for future steps (such as stakeholder engagement, adaptive planning, or developing financing strategies).

Identify Needs and Opportunities

- ✓ Determine what weaknesses or challenges prevent your entity from achieving supply reliability, meeting regulations, ensuring infrastructure resilience, or improving affordability.
- ✓ Consider how uncertainty and pressure with regard to climate change, demand trends, population, water quality rules, and other environmental considerations may impact water resources in the future.
- ✓ Determine the obstacles your One Water approach faces, so you can address them in your framework or strategy.
- ✓ Confirm as a group where opportunities exist for improved resilience and greater efficiencies. This assessment will help to develop overarching goals and find common areas of concern among participating entities.

KEY OUTCOMES

- An understanding of the needs that need to be addressed that will serve as the basis for developing goals and solutions
- A list of potential opportunities and synergies between partners to achieve multiple benefits and optimize use of existing resources

POTENTIAL CHALLENGES

- Balancing competing drivers and needs
- Achieving agreement on needs or opportunities given conflicting agendas

CASE STUDY

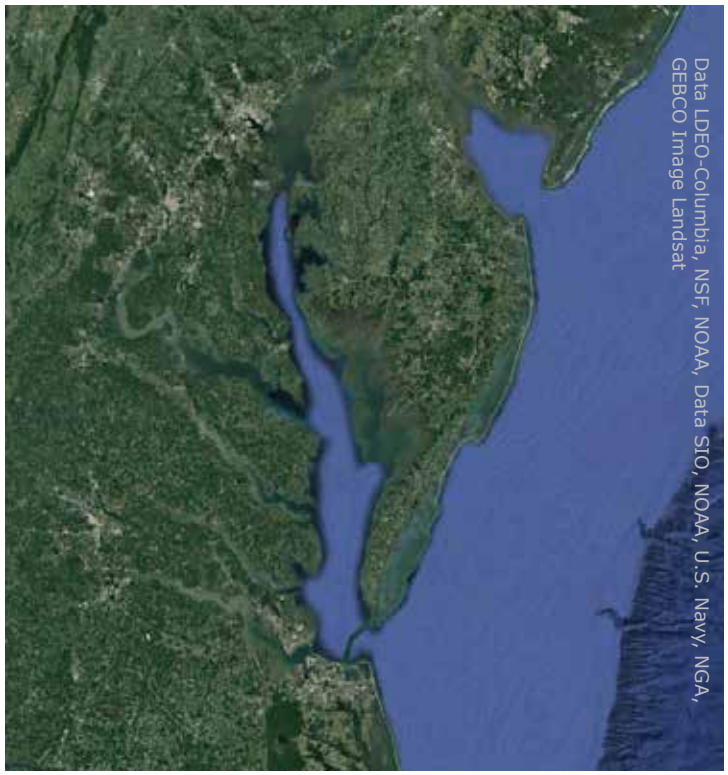
Identifying Innovative Approaches

The Hampton Roads Sanitation District (HRSD), located in Virginia, is under a consent decree to eliminate sanitary sewer overflows. After reviewing a range of needs, HRSD identified a multi-benefit solution to decrease nutrient loadings to the Chesapeake Bay while helping to reduce saltwater intrusion and address sea level rise. HRSD is breaking the mold and expanding its mission beyond wastewater treatment and discharge by exploring recharge of the region's aquifers with advanced treated wastewater.

In addition to the consent decree, groundwater in the region is being greatly depleted. Geologists have attributed land subsidence throughout coastal Virginia to groundwater withdrawals from wells. They've estimated that more than half of the region's sea level rise over the past century is due to groundwater withdrawals.

HRSD plans to pilot a 1 mgd advanced treated wastewater purification and injection system. This demonstration testing will guide the full-scale systems, which aim to purify and inject 120 mgd into the region's main aquifer. HRSD is targeting full-scale operation by 2030.

HRSD estimates that the amount of nitrogen and phosphorus discharged to the region's watersheds would be reduced by 90 to 95 percent. Meanwhile, groundwater replenishment could help development officials grow the economy by providing a reliable source of water to businesses and manufacturers with significant water needs.



"Water is a very valuable resource, and a lot of money already goes into treating it. It just seems terrible to throw it all away.[4]"

– Robert Burnley, a former director of Virginia's Department of Environmental Quality

Establishing Direction

This phase establishes a vision and objectives to guide the development and implementation of a One Water approach.

Craft Vision and Objectives

Implementing an integrated One Water approach often involves collaboration among multiple departments and agencies, each with separate missions. This step establishes an overarching vision and develops objectives that broadly define what your team intends to accomplish.

IMPORTANT ACTIONS

- ✓ Jointly establish the vision that your partnership aims to achieve, including tangible benefits of your One Water approach.
- ✓ Involve staff and decision makers in developing the vision to encourage internal champions for your organization.
- ✓ Engage stakeholders in crafting the vision and objectives.
- ✓ Consider using your One Water vision as a means to align with and advance your entity's brand (image of your utility's culture and mission) and message.
- ✓ Develop a set of high-level objectives describing the types of initiatives that will be pursued, in line with the vision, to help direct development of the framework. For example, if water supply reliability is part of the vision, consider that one objective may be diversification of the local water supply portfolio.
- ✓ Given the iterative nature of this process, the development of the vision and objectives may also inform previous steps including the identification of new partners or evaluation of new opportunities. Allow for flexibility while setting the foundation and establishing direction for your One Water framework.

KEY OUTCOMES

- A brief, high-level document summarizing the vision and objectives for your integrated One Water framework

POTENTIAL CHALLENGES

- Finding an agreeable balance point, reflecting a compromise among multiple entities with enough substance to motivate real outcomes
- Preventing the group from achieving closure within a reasonable timeframe because of too much focus on the details
- Limiting the framework's future potential by creating objectives that are too narrowly defined

CASE STUDY

One Water Los Angeles

The Los Angeles Department of Water and Power (LADWP) and City of Los Angeles Department of Public Works, Bureau of Sanitation (LASAN) came together as partners to build on an Integrated Resources Plan (IRP)[5] from 2006 that focused on watershed planning, aging infrastructure, and water reuse.

The new IRP, called One Water LA[6], looks out to 2040 and focuses on water reuse, stormwater capture, community assets, and green infrastructure. The plan incorporates integrated strategies, wastewater and stormwater facilities planning, climate change and resilience planning, alternative funding sources, marketing, and outreach.

One Water LA began with a steering committee that included key decision makers from LADWP and LA Sanitation.[7] It has since evolved to include full collaboration with multiple City departments and agencies, as it is now widely understood that everyone has a stake in the region's water supply.

The process began by laying the groundwork, including a vision statement and key objectives. This created the foundation for the One Water LA plan. The process also included public stakeholder participation, which is described in more detail on page 24.

Vision Statement

One Water LA is a collaborative approach to develop an integrated framework for managing the City's watersheds, water resources, and water facilities in an environmentally, economically and socially beneficial manner.

One Water LA will lead to smarter land use practices, healthier watersheds, greater reliability of our water and wastewater systems, increased efficiency and operation of our utilities, enhanced livable communities, resilience against climate change, and protection of public health.

Objectives

- **Integrate management of water resources and policies** by increasing coordination and cooperation between all City departments, partners and stakeholders.
- **Balance environmental, economic, and societal goals** by implementing affordable and equitable projects and programs that provide multiple benefits to all communities.
- **Improve health of local watersheds** by reducing impervious cover, restoring ecosystems, decreasing pollutants in our waterways, and mitigating local flood impacts.
- **Improve local water supply reliability** by increasing capture of stormwater, conserving potable water, and expanding water reuse.
- **Implement, monitor, and maintain a reliable wastewater system** that safely conveys, treats and reuses wastewater, while also reducing sewer overflows and odors.
- **Increase climate resilience** by planning for climate change mitigation and adaptation strategies in all City actions.
- **Increase community awareness and advocacy for sustainable water** by active engagement, public outreach and education.

Engaging Stakeholders

To effectively implement a One Water framework, engagement needs to occur externally to include elected officials, regulating bodies, special interest groups, technical advisors, and the community. Stakeholder engagement should continue throughout the process. This phase outlines the various stakeholders and best practices for engagement.

Engage Public and Special Interest Groups

This step is focused on outreach to the community. The goal is to bring individuals into the process who represent groups that can provide valuable input and guidance to help spread the message and serve as ambassadors for the entire process.

IMPORTANT ACTIONS

- ✓ Develop a separate advisory group made up of vocal and active stakeholders.
- ✓ Ensure a diverse stakeholder group. Identify individuals with different interests and from various locations within the region.
- ✓ Hold workshops and communicate with stakeholder groups to engage them in the process. Set clear ground rules and specific expectations with the advisory group early. Make it clear that you are open to and interested in their input, but that the plan may not reflect the exact recommendations offered.
- ✓ Inform and listen. Share background on participating entities and educate them on the current state of the system. Inform them of the identified needs and share the established vision and key objectives. Encourage and listen to their feedback. Stakeholder engagement is not just a task to check off, but a process that should add to the inclusion, cohesion, and effectiveness of One Water management.
- ✓ Establish a value proposition for One Water objectives and communicate with key stakeholders and ratepayers. Develop a compelling and consistent message including why One Water is being implemented and what benefits can be expected.

HELPFUL TOOLS: The City of Los Angeles (LA) relied on a matrix for public outreach that informed the level of stakeholder participation at each step of the plan's development. The matrix is an international standard provided by the International Association for Public Participation (IAP2).

For more information:
LA Matrix and Toolbox
http://tinyurl.com/IAP2Toolbox

KEY OUTCOMES

- Documented input from the advisory group
- Consensus-based value proposition
- Next steps for engagement

POTENTIAL CHALLENGES

- Ensuring that the process is transparent and all voices have an opportunity to be heard and acknowledged
- Achieving effective engagement within budget constraints

CASE STUDY

Incorporating Equity Planning into a Transparent One Water Approach

Seattle Public Utilities (SPU) has created an Environmental Justice and Service Equity Division to provide all customers with equitable services and a transparent view of SPU's decision-making processes.

A One Water approach seeks to balance impacts to rate payers with community and environmental needs. As part of project assessment activities and a triple-bottom-line analysis, SPU employs an Equity Planning Toolkit. The goal of this toolkit is to understand possible unintentional racial socioeconomic disparities that may be created from a policy, service, program, or project. An Equity Stakeholder Analysis is conducted to determine where more targeted outreach is required.

The assessment evaluates whether one stakeholder group carries more influence. It also looks to ensure that under-represented stakeholders have more equitable participation and influence in the outreach and engagement efforts.

For more information:
Seattle Public Utilities Equity Planning and Analysis
http://tinyurl.com/equityplanning

Engage Regulators

Utilities facing changing regulations or consent decrees have found that strong relationships and engagement with regulators early in the process leads to more openness to innovative approaches.

IMPORTANT ACTIONS

- ✓ Maintain a strong working relationship with regulators.
  - Build trust with regulating authorities through a strong record of commitment to full compliance with regulatory requirements
  - Build connections between your staff and the regulatory organization's leadership
  - Identify gatekeepers and challengers within the regulatory agency or agencies
  - Be open and transparent
- ✓ Look for common ground and mutually beneficial solutions. Help regulators understand your agency's mission/challenges while working to understand their charge and challenges. Work together to explore possible approaches to achieving mutual goals.

KEY OUTCOMES

- Establishment of trust and working relationships
- Active interest in and support for a One Water approach
- Aspirational goal: a new regulatory framework or approval for innovative approaches to addressing key challenges, such as watershed-based permits, approvals for new beneficial uses for recycled water or stormwater, or special permitting for alternative uses of easements

POTENTIAL CHALLENGES

- In some regions, existing regulatory structures such as existing water laws and separate regulating entities
- A lack of regulatory guidance on new One Water approaches

CASE STUDY

Paving the Way for New Approaches to Water Management with Regulatory Engagement

Engaging regulators throughout program development is helping San Francisco and San Diego identify new ways to permit innovative water reuse strategies.

San Diego's Pure Water Program

Through demonstration testing, research projects, and multiple meetings with regulators, the California State Water Resources Control Board's Division of Drinking Water (DDW) has indicated that the City could proceed with developing a scenario to put advanced treated purified water into a reservoir significantly smaller than the originally approved San Vicente Reservoir. This approach would not meet the current language for the proposed surface water augmentation criteria, so the City is collaborating with regulators on proposed language that would be fully protective of public health and allow the smaller reservoir to be considered acceptable.

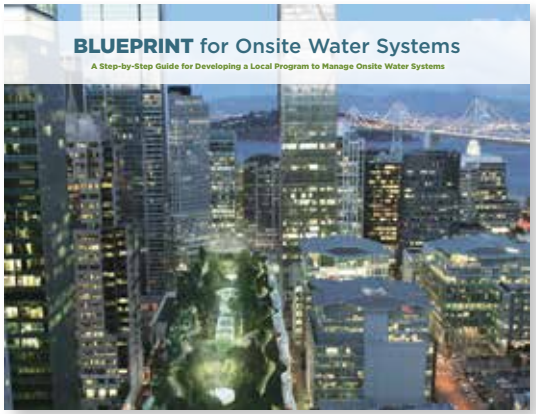
As uniform criteria for direct potable reuse (DPR) have not yet been established (DDW is currently determining the feasibility of doing so, to be completed by December 2016), any DPR application will need to be permitted on a case-by-case basis. The City's approach to involving DDW throughout its project has been critical to gaining buy-in.

For more information:
Pure Water San Diego Program
https://www.sandiego.gov/water/purewater

San Francisco's Decentralized Non-Potable Water Program

The San Francisco Public Utilities Commission (SFPUC) convened a working group to address jurisdictional and water quality issues with decentralized treatment and onsite building reuse. In 2014, SFPUC partnered with research institutions and local, state, and federal agencies from across North America. SFPUC mapped out a plan to determine responsibilities in onsite reuse. This group published its BLUEPRINT for Onsite Water Systems—a 10-step guide, based on SPFUC's and others' experiences, for developing a local program to manage onsite water systems.

Recently, The National Blue Ribbon Commission to Advance Innovation in Decentralized Water Systems was convened by the U.S. Water Alliance and chaired by SFPUC. The Commission intends to identify new business models for water utilities in the design, development, integration and operation of decentralized non-potable water systems; and craft model state guidelines and policies for the management and oversight of decentralized non-potable water systems (e.g. water quality criteria, monitoring and reporting requirements, and operational and permitting strategies). The Commission included partners from utilities and regulators from nine states and the U.S. Environmental Protection Agency's (EPA) Office of Research and Development. This project is WE&RF Project SIWM10C15, with funding from WRF, SFPUC, and WE&RF.



For more information:
BLUEPRINT for Onsite Water Systems
http://tinyurl.com/sfwater

Engage Elected Officials

This step focuses on getting political leaders involved in and supportive of your One Water approach.

IMPORTANT ACTIONS

- ✓ Share your organization's One Water vision and objectives
- ✓ Provide decision-makers with examples of a One Water management success stories
- ✓ Highlight ways that a One Water approach can advance your goals and empower leaders to communicate these goals to the community
  - Demonstrate the business case and value of the One Water approach
  - Find alignment with overall goals or strategic plans
  - Articulate successes—the One Water approach can be used as a branding or messaging opportunity for your entity
- ✓ Develop a group that interacts directly with political leadership, who can communicate with other government departments on key elements of the One Water framework
- ✓ Focus on ways that a One Water approach can support different platforms in terms of community enhancement, affordability, sustainability, or other key benefits

KEY OUTCOMES

- Political backing for the One Water approach and framework
- Talking points or messaging for political leaders to communicate the importance and benefit of a One Water framework for their constituency

POTENTIAL CHALLENGES

- Progress blocked by individual agendas
- Slow and lengthy political processes
- Political turnover causing the need for continuous outreach and education of political leaders

CASE STUDY

LA's Water Cabinet

The mayor of Los Angeles initiated a Water Cabinet in 2015 consisting of the mayor, a number of key department heads, general managers, and outside advisors to achieve aggressive water conservation goals and promote vertical and inter-agency integration.

Learning about the challenges each City department faces with its projects allowed these different groups to understand how their work impacted, and was impacted by, water. The intent was not to slow existing efforts, but to benefit or supplement ongoing projects throughout the city with the goal of reducing potable water demand or increasing reuse and stormwater capture.

Extensive stakeholder and public engagement was used in the development of LA's One Water Plan 2040. Special Topic Groups were formed, including public participants, to integrate ideas into the One Water LA 2040 Plan. The ideas that resulted were presented to the Water Cabinet.

These public participants have become ambassadors of the One Water message and are able to talk about the plan to people they know in neighboring councils and environmental groups. LADWP and LA Sanitation ensured that they had a diverse group of stakeholders—an approach they feel was key from the very beginning.

For more information:
One Water LA Stakeholders
http://tinyurl.com/OneWaterLA

A diverse and inclusive stakeholder involvement process had substantial benefits for One Water LA.

Developing
the Framework

This phase focuses on setting up a necessary structure for an effective and long-lasting One Water framework. It includes creating a plan or program to achieve the objectives and presents strategies for lasting leadership, adaptive planning, and funding to sustain the One Water framework over time.

Establish Lasting Leadership and Institutional Structure

Foster an internal culture that advances the One Water vision. Many utilities implement One Water projects by starting small and building on successes, having discovered that as they innovate, others follow their lead.

IMPORTANT ACTIONS

- ✓ Work with partner entities to explore development of a new or revised institutional structure that crosses traditional boundaries to enable more cohesive implementation of One Water actions.
- ✓ Proactively address governance issues by looking at internal communications and structure.
- ✓ Establish ownership at the senior leadership and staff levels.
  - Identify One Water champions who can provide lasting leadership for One Water.
  - Establish cross-functional networks to facilitate the sharing of resources and advance strategic goals.
  - Discuss the vision and scope of your approach with staff; discuss the high-level steps and how they support overall goals.
  - Assign elements of the framework to internal staff and partners.
  - Provide guidance—but believe in your staff and give them the opportunity to create innovative solutions.

KEY OUTCOMES

- A culture of support and passion throughout the organization in the One Water vision that persists even as leaders come and go
- Shared resources and funding for planning efforts and project development to address One Water objectives

POTENTIAL CHALLENGES

- Implementing new types of cross-functional institutional structures and responsibilities, amidst resistance to change and institutional inertia
- Significant time and effort required to design and implement new institutional structures or strategic teams
- Making cultural changes without buy-in from all levels of the organization (e.g., policy makers and implementing staff)

CASE STUDY

Orange County's Joint Board Committee Advances Groundwater Replenishment

Orange County's Groundwater Replenishment System (GWRS) is the world's largest advanced water purification system for potable reuse. A key element of its successful development is the early creation of an institutional framework allowing Orange County Water District (OCWD) and the Orange County Sanitation District (OCSD) to work together corroboratively and pool resources.

OCWD and OCSD created a joint board committee made up of three Board members from each agency to represent both utilities' interests while developing goals, and making monetary or policy decisions. They also established working groups at the executive and staff levels to collaborate on project development activities.

A key element of this successful venture is the fact that both agencies have a very similar service area and financial impacts affect the same ratepayers.

Governance was established such that any decisions made by the Joint Board Committee had to be approved by OCWD. If any decision carried a monetary value greater than a certain amount, both boards were required to give their approval. With each expansion, the agreement is revisited and adjusted to address the current need.

For more information:
Orange County's Groundwater Replenishment System
http://www.ocwd.com/gwrs/

Create Framework or Plan

The result of this effort may take the form of a separate published plan (e.g., a One Water Plan or Integrated Water Management Plan) or in some cases, a framework (i.e., a document describing how best to leverage existing plans or a simple scope defining a prioritized set of initiatives to achieve the goals). Either way, this framework or plan will guide the collaborative actions of a group of separate but connected entities.

IMPORTANT ACTIONS

- ✓ Consider methods for actualizing the vision with tangible projects and activities. Leverage existing projects, assets, and plans wherever possible to achieve efficiencies and make the best use of finite resources.
- ✓ Acknowledge obstacles that may inhibit progress toward the framework's development and begin implementing tactics to overcome them.
- ✓ Develop a working group that will meet on a regular basis to develop the One Water framework or plan.
  - Each partner should have dedicated staff who are the "doers," as well as decision makers to guide the framework
  - Set ground rules for this working group and define clear roles
  - Create specialty areas for each agency, such as having one agency lead GIS and another lead public relations
- ✓ Develop a communication plan as part of the framework.
- ✓ Establish a set of performance metrics to help monitor success.
- ✓ Determine clear deadlines and manage expectations.
- ✓ Involve an objective, independent, trusted third party to help facilitate coordination and manage multiple interests and differing agendas.

KEY OUTCOMES

- A scope summarizing the projects or activities necessary to achieve the One Water objectives
- A set of key metrics to monitor throughout implementation of the framework
- A flexible framework or plan to guide future actions and sustain effective One Water thinking

POTENTIAL CHALLENGES

- Funding
- Dedicating adequate staff time
- Making sure the plan is flexible enough to adapt to unpredictable future circumstances (see next step—Conduct Adaptive Planning—for suggestions on addressing this challenge)

CASE STUDY

Utilities take varied approaches to formalizing a One Water Framework or Plan

The City of Los Angeles has developed a formal plan called One Water LA. It builds on its IRP from 2006; focuses on water reuse, stormwater capture, community assets, and green infrastructure; and includes extensive stakeholder outreach (see pages 21 and 29 for additional details).

Denver Water first developed an IRP in 1997. In 2016, Denver Water will be starting the fifth iteration of its IRP to incorporate adaptive planning and evaluate water resources more holistically by planning across the entire water system, encouraging innovation, and informing the capital plan (see page 37 for more details). The development of the IRP is an internally focused process involving collaboration among internal departments.

The City of Richmond, Virginia, is currently developing a plan with the goal of developing a watershed-based permit to collectively manage stormwater and wastewater, currently handled separately. The City has devoted considerable time to stakeholder outreach and communication, and created new partnerships not anticipated when the City began the process.

South Australia (SA) Water has implemented a One Water framework mostly driven out of a drought crisis. Their approach is a paradigm shift that reimagines water resources. It is not just another plan. SA Water utilized a change management approach through raising awareness of the problem, defining the desire for change and identifying quick wins, utilizing research and tools in making decisions, and implementing capacity building to achieve their goals.

New York City is working toward a One Water or integrated water management framework as a unifying approach to achieve broader citywide sustainability and resilience goals. Staff from various City departments participated in a one-day workshop to identify areas with the greatest potential for further integration and define what integrated water management means to them. Following the workshop, the City developed a vision statement and guiding principles.

Resource Guidance

Based on the experience of participating utilities in WRF 4660, general guidance on timing, staff, and cost to implement a One Water Framework or plan is noted below. This guidance depends on the size of your utility and partnerships, whether you are starting from scratch or building upon previous planning efforts, and whether you are producing a framework or a published plan.

1–5
years

3–7
staff

$500k–$10M
using consulting services

Conduct Adaptive Planning

Adaptive planning is a long-term planning method that uses an iterative process to promote flexible decision making in the face of uncertainties and to increase an organization's preparedness. This planning approach can be implemented for a range of potential changing conditions including factors such as future climate predictions, water supply demands, and economic development. This step is intended to illustrate how an entity may enhance the framework (developed in the previous step) to promote flexibility to changing circumstances.

IMPORTANT ACTIONS

- ✓ Establish level-of-service assumptions: what is the entity committed to provide today and into the future?
- ✓ Gather technical information to define the range of future possible scenarios.
  - Climate change can be used as the reasoning for the adaptive planning approach, given its great uncertainty.
  - Incorporation of a traditional planning scenario (as a comparison) can help achieve buy-in from internal staff for this planning approach.
- ✓ Use tools, such as a water balance or other models, to understand future water resource limitations. Work with outside technical experts or agencies with expertise in your impact area, such as the National Oceanic and Atmospheric Administration (NOAA) or U.S. Geological Survey (USGS) for climatic data.
- ✓ Develop a toolbox of options and strategies to address forecasted water quantity and quality and infrastructure deficiencies.
- ✓ Direct near-term investment toward low/no-regret actions effective across a range of future scenarios. For mid-term projects that are not needed today, triggers should be defined to allow projects to be built as conditions warrant. Long-term projects are options to preserve (i.e. buying land for new infrastructure).

KEY OUTCOMES

- A prioritized list of projects categorized as near-term, mid-term, and long-term based on the ability of the project to be successful in multiple planning scenarios

POTENTIAL CHALLENGES

- Building institutional understanding and capacity amidst a shift in thinking from a deterministic mindset to one acknowledging that the future cannot be predicted
- Taking more time and resources than traditional planning approaches

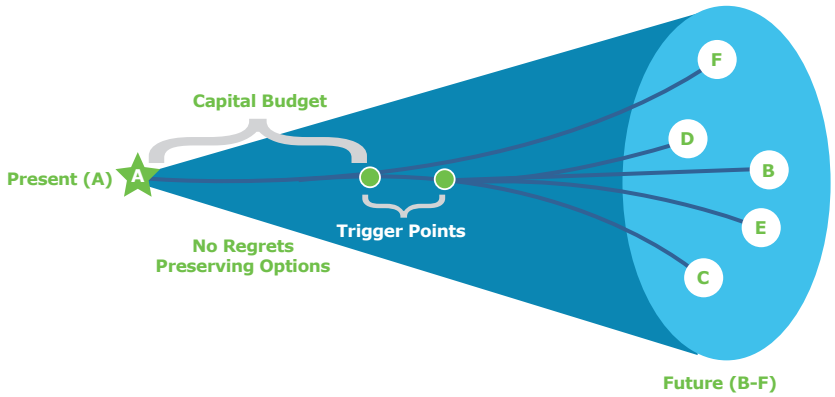
HELPFUL TOOLS: NOAA's Climate Resiliency Toolkit: https://toolkit.climate.gov/
EPA CREAT for Climate Resilient Utilities: http://tinyurl.com/EPAbuild

For more information:
WRF Climate Change Knowledge Portal
http://www.waterrf.org/knowledge/climatechange/Pages/default.aspx

CASE STUDY
Denver Water

Denver Water is a member of the Water Utility Climate Alliance (WUCA), which provides leadership in adaptive planning and assessment of the potential effects of climate change through collaborative action.[8] Denver Water incorporates a specific approach to adaptive planning and scenario planning into its IRP[9], which examines water collection, treatment, distribution, and recycling systems, and provides guidance about future needs. This approach scrutinizes water-demand projections, demand-management alternatives, and water-supply options to discover true deficiencies and actions that can be initiated for a more robust and reliable water system through analysis of multiple future scenarios.

The cone of uncertainty (image below) illustrates a range of future conditions for water demand, climate, and more. Scenario planning helps to develop near-, mid-, and long-term strategies for these multiple endpoints.



CASE STUDY
Sustaining Scioto

In central Ohio, a region that has recently experienced record-breaking heat, unprecedented flooding, toxic algal blooms, and prolonged periods of drought, research was undertaken to comprehensively assess climate change impacts on an entire watershed. The resulting Sustaining Scioto Adaptive Management Plan investigates climate change impacts to water supply, water quality, and wastewater services, providing the region with a more complete plan for the future.[10] Near-, mid-, and long-term adaptive management strategies were developed using climatic and hydrologic modeling to help utility managers and other stakeholders in the watershed prepare for possible changes. The Sustaining Scioto partners included the Mid-Ohio Regional Planning Commission, U.S. Geological Survey, Brown and Caldwell, the Water Research Foundation, the City of Columbus, the Ohio Water Development Authority, and Del-Co Water Company.

This work was recently showcased in the global publication Cities100, which highlights cities around the globe taking action on climate change.[11]

“The City of Columbus is involved because we want to ensure that our communities have adequate water resources in the future. Having good data and building consensus is critical as we plan our future capital projects and as we responsibly spend public dollars.”

- Rick Westerfield, Administrator,
Division of Water, City of Columbus

Develop Financing Strategies

To a greater extent, water systems are becoming more sophisticated, requiring increased investment, as the number of infrastructure assets expands. A One Water approach can find operational efficiencies, so that funding can be leveraged to its greatest value. Additionally, multi-purpose infrastructure solutions, such as green infrastructure and decentralized water systems, can broaden revenue sources. By collaborating with key stakeholders, you may identify available funding sources that go beyond traditional state and federal funding (e.g., bonds and revolving funds), including public-private partnerships (P3s), EPA innovation grants, and fees from developers and non-residential properties, and make compelling cases to increase rates.

IMPORTANT ACTIONS

- ✓ Engage the public to increase understanding and gain buy-in on the value of water, as well as other benefits associated with One Water efforts. Clearly communicate where the money is going and the outcomes expected from its use.
- ✓ Research alternative revenue sources.
- ✓ Reevaluate your existing rate structure and establish a rate structure conducive to meeting your One Water objectives.
- ✓ Use decision-making tools, such as triple-bottom-line analysis, classic decision matrices, or socioeconomic models.
  - Include a "do-nothing" or "status quo" scenario in the assessment of options to evaluate future costs if nothing
- ✓ Develop cost share schemes with partners based on shared benefits.
- ✓ Understand the public's ability to pay for new investments and explore possible means to address affordability challenges. Be particularly sensitive to environmental justice issues and potential solutions.

HELPFUL TOOLS:
Tapping into Alternative Ways to Fund Innovative and Multi-purpose Water Projects - Water in the West, ReNUWIt[12]
http://tinyurl.com/financingframework

KEY OUTCOMES

- New sources of funding made available through partnership cost sharing
- New potential funding streams

POTENTIAL CHALLENGES

- Dedicating resources to finding funding sources, such as grants
- The public not paying for true cost of water
- Applying decision-making tools in an unbiased manner (without expecting a specific outcome)
- Monetizing the social and environmental benefits of One Water projects

CASE STUDY

Philadelphia Water Department

The Philadelphia Water Department (PWD) developed a 25-year plan (Green City, Clean Waters Program) to transform the landscape of Philadelphia's urban environment. As a part of the plan, PWD estimates that it will save $4.8B from investment in green infrastructure compared to traditional gray infrastructure.

PWD is using multiple mechanisms to fund its stormwater improvement programs. A stormwater fee charges non-residential properties based on the ratio of impervious surface area to total property area. Developers implementing green infrastructure receive a stormwater credit to reduce their fee.

PWD has also initiated a grant program to promote green infrastructure implementation. The Greened Acre Retrofit Program allows property owners to pool together multiple properties to apply stormwater retrofit grants.

For more information:
Green City, Clean Waters Program
http://tinyurl.com/PhillyWaterShed

Implementing the Framework

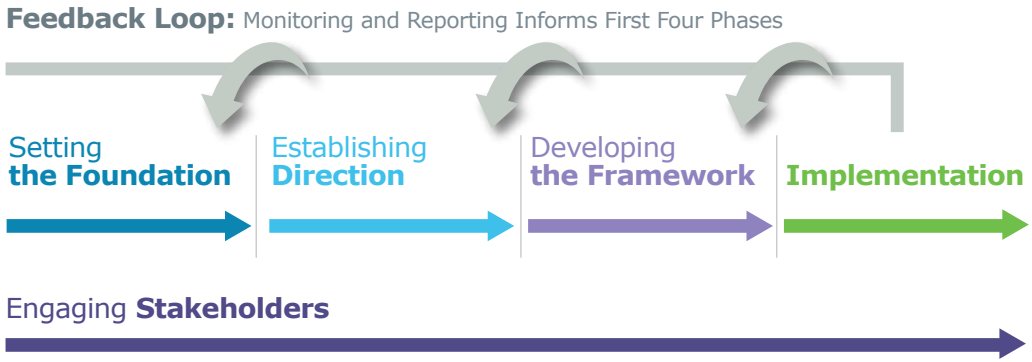
In this phase, the framework is implemented, monitored, reported on, and revised in a collaborative fashion to achieve your overall vision and objectives.

Implementing the Framework

This step measures progress with the One Water planning approach and provides feedback on the first four phases. The goal is to take early actions and start small, then build on your progress to inform the next round of One Water actions. Some utilities have found success from starting with pilot or demonstration projects.

IMPORTANT ACTIONS

- ✓ Begin tracking key performance metrics to evaluate the success of the One Water framework and specific projects.
- ✓ Communicate early successes with external stakeholders—such as elected officials or the public—and internal stakeholders to promote a One Water culture.
- ✓ As information is gathered, reflect on how the implementation has impacted the understanding of lessons learned, challenges, and risks.
- ✓ As implementation progresses, occasionally reevaluate the One Water vision, the potential inclusion of other partners, and the scope of the framework to ensure continued progress toward your utility's One Water future.



KEY OUTCOMES

- Progress reports on key metrics, successes, challenges, and opportunities to reevaluate direction and approach.
- A One Water culture and brand that continues to evolve to help address challenges and achieve your utility's goals.

HELPFUL TOOLS:

Effective utility management:
http://watereum.org/

Four step management process:
http://tinyurl.com/PDCAtool

WRF Utility Management Knowledge Portal:
http://tinyurl.com/WRF-UM

CASE STUDY

Practicing and Advancing OneWaterSF

SFPUC is formalizing their approach to water and energy resources management through the development of their OneWaterSF framework. The framework necessitates an evolution in thinking from developing single-benefit projects within existing silos to considering the impact of each water source on the other and the potential synergies between projects.[13]

Vision. "With our OneWaterSF approach, San Francisco will optimize the use of our finite water and energy resources to balance community and ecosystem needs, creating a more resilient and reliable future".[13]

Implementing OneWaterSF. SFPUC has already been effectively connecting the planning of local and regional water supplies and energy generation opportunities that embody OneWaterSF including water efficiency, recycled water, decentralized water reuse, capturing and reusing stormwater, energy efficiency and renewable energy opportunities within the water and wastewater treatment process.[13]

Implementation of OneWaterSF begins with an Implementation Roadmap that will:

- **Identify new opportunities** for projects and programs under OneWaterSF
- **Develop recommendations** related to research and development
- **Suggest partnerships** for research or project implementation
- **Identify policy** needs to help further OneWaterSF

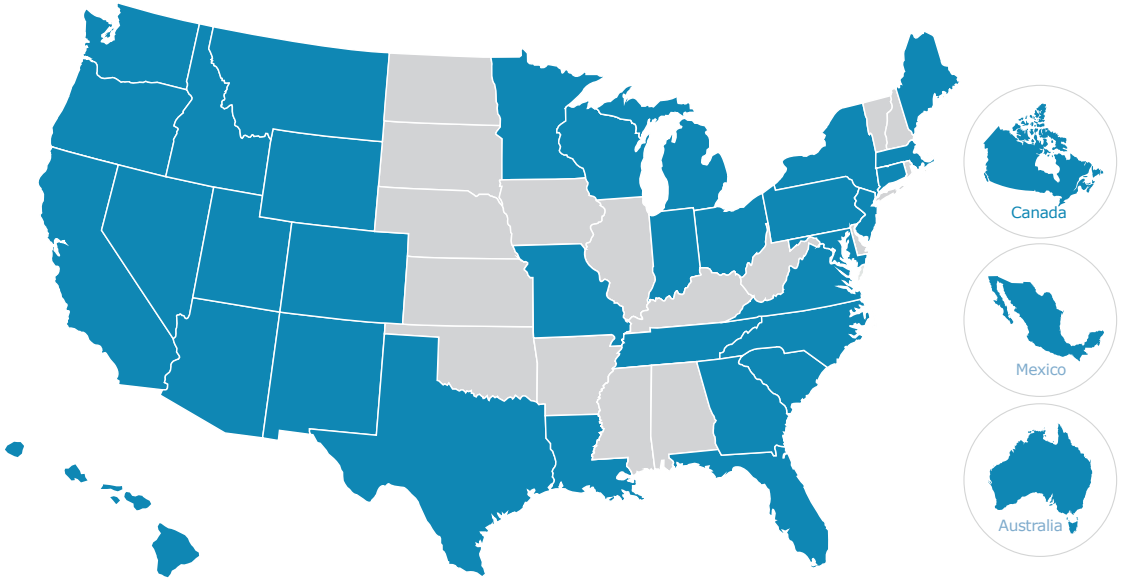
The Roadmap is intended to prioritize short-term and long-term activities to fulfill the SFPUC's vision of creating a more resilient and reliable future for San Francisco.

For more information:
OneWaterSF
http://tinyurl.com/OneWaterSF

Acknowledgements

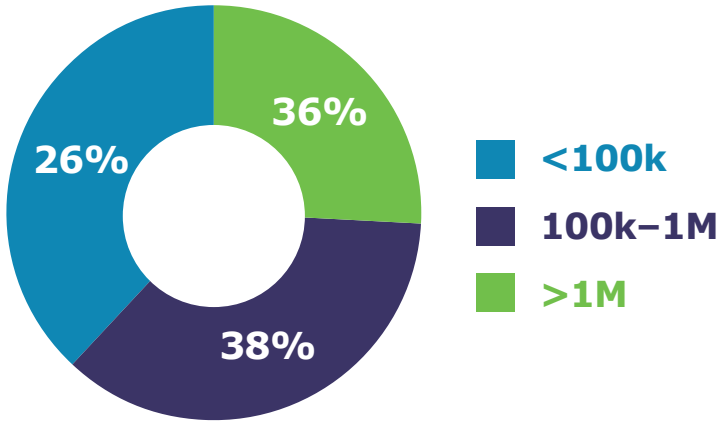
This blueprint was developed based on input from water professionals around the world.

A survey was completed by more than 800 water professionals from Australia, Canada, Mexico, and 32 states in the United States, including more than 400 utility employees. The map below illustrates the states and countries (blue) that participated in the survey.



Customers Served. Most survey respondents (60 percent) provide more than one service to their customers, such as water, stormwater, wastewater, recycled water, power, and/or solid waste. An even distribution of small, medium, and large utilities participated in the survey (as shown in the chart on the right).

Number of Customers Served



Acknowledgements Cont.

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Key elements in a One Water paradigm shift. Graphic modified from Mukheibir and Howe 2015

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