



Final Report

Strategic Planning for San Francisco's Water Quality Future

San Francisco Public Utilities Commission



consulting • engineering • construction • operations

June, 2009



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June 11, 2009

Mr. Andrew DeGraca
Director
Water Quality Division
San Francisco Public Utilities Commission
1657 Rollins Road
Burlingame CA 94010

Subject: Strategic Planning for San Francisco's Water Quality Future - Final Report

Dear Andrew:

Amidst the many immediate pressing issues, both of on-going operational and regulatory compliance activities, it was an expression of sound leadership of both Mayor Newsom in directing preparation of a Water Quality Protection Plan and of the Water Quality Division in driving this effort focused on issues that may impact the future of the San Francisco Public Utilities Commission and its customers 30 year out into the future.

While the exact changes that lie ahead are uncertain, it is clear that the responsibilities for managing and delivering water quality will continue to encompass a wider range of issues. These issues include different approaches to evaluating risks, technological advances, emerging contaminants, demographic and health status changes, an increased focus on delivering high quality water to the tap, and a need for flexibility to respond to emergencies, climate change and water resource pressures.

We hope that this long-range strategic plan, forged by a team of internationally recognized experts and a compliment of staff, local water agencies and other stakeholders, serves to guide the SFPUC into the critical investigations necessary to develop cost-effective solutions.

We count ourselves privileged to have worked with you and your staff on this effort. We trust that it bears much fruit.

Sincerely,

A handwritten signature in blue ink that reads "Phillippe Daniel". The signature is written in a cursive, flowing style.

Phillippe Daniel
Vice President
Camp Dresser & McKee Inc.

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Acronyms

AWWA	American Water Works Association
CCR	Consumer Confidence Report
CDPH	California Department of Public Health
DBP	Disinfection By-Products
EBMUD	East Bay Municipal Utility District
GHG	greenhouse gas
HAA	haloacetic acids
HACCP	Hazard Analysis and Critical Control Points
HTWTP	Harry Tracy Water Treatment Plant
LADWP	Los Angeles Department of Water and Power
MCLs	maximum contaminant levels
mgd	million gallons per day
MWRA	Massachusetts Water Resources Authority
NWQAC	National Water Quality Advisory Council
OEHHA	Office of Environmental Health Hazard Assessment
PHGs	public health goals
ppb	parts per billion
QA/QC	quality assurance/quality control
SFDPH	San Francisco Department of Public Health
SFPUC	San Francisco Public Utilities Commission
SPU	Seattle Public Utilities
THMs	trihalomethanes
TM	technical memorandum
TOC	Total Organic Carbon
TTHMs	total trihalomethanes
US EPA	United States Environmental Protection Agency
UV	ultraviolet
WQD	Water Quality Division
WQPP	Water Quality Protection Plan
WRF	Water Research Foundation
WSIP	Water System Improvement Program
WTP	water treatment plant
WUCA	Water Utility Climate Alliance
WWEIS	Water/Wastewater Enterprise Information System

Acknowledgements

CDM wishes to acknowledge the valuable contributions of many participants in successfully completing this Strategic Plan for San Francisco's Water Quality Future. In particular, the Expert Panel whose input and guidance was indispensable for this project:

- Jeffrey Griffiths, M.D - Tufts University School of Medicine
- William Glaze, Ph.D - University of North Carolina, Chapel Hill (emeritus)
- David Hilmoe, P.E., BCEE - Seattle Public Utilities
- Stephen Estes-Smargiassi - Massachusetts Water Resources Authority
- Pankaj Parekh, Ph.D - Los Angeles Department of Water and Power
- June Weintraub, D.Sc - San Francisco Department of Public Health
- Bruce Macler, Ph.D - United States Environmental Protection Agency

The SFPUC project team included:

- Andrew DeGraca, Water Quality Division Director
- Manouchehr Boozarpour, Water Quality Division Engineering Services Manager
- Andrzej Wilczak, Project Manager/Senior Sanitary Engineer

Additionally, numerous stakeholders participated in the guiding workshop and acted as valuable resources to the project team and panel (see Appendix C for workshop attendees).

Camp Dresser & McKee Inc.'s project team included:

- Phillippe Daniel, Project Manager
- Jenny VanCalcar, Project Engineer
- Julie Hinchcliff, Word Processing
- Juan Tijero, Graphic Design

Executive Summary

The San Francisco Public Utilities Commission (SFPUC) has a history of being proactive in identifying issues and considerations that influence its capital and operational decisions. This practice has enabled the SFPUC to more cost-effectively comply with all state and federal regulations. To create a sound basis for capital and operational investments that may be required in the next 20 to 25 years, the SFPUC has assessed some scenarios and concerns that may emerge in the future, leading to consideration and analysis of potential alternatives that may be implemented circa 2030.

In this section:

Strategic Planning Process	E-1
Priority Areas.....	E-3
Formulating the Work Plan.....	E-4

E.1 Strategic Planning Process

The future is deeply uncertain. The rate of social, environmental, and technological change appears to be accelerating. Nevertheless, anticipating what might happen can aid in preparing an organization to more wisely and prudently respond as new challenges emerge. That is the primary motivator for the Water Quality Division (WQD)¹ in undertaking this strategic planning effort.

The scope for this project included:

- a) Literature reviews – This included a regulatory review encompassing US and international efforts, alternative regulatory approaches, emerging contaminants, other utility planning efforts and public health information. In addition, it included reviewing activities of EPA and the Water Research Foundation in framing the research agenda for distribution system water quality, pharmaceuticals and climate change.
- b) Data analysis - An evaluation of SFPUC water quality data, operational experiences and facilities was conducted. In addition, an exploratory water quality risk analysis was undertaken.

Gallup Poll: Pollution of drinking water is Americans' No. 1 environmental concern

59% saying they worry "a great deal" about the issue. That exceeds the 45% worried about air pollution, the 42% worried about the loss of tropical rain forests, and lower levels worried about extinction of species and global warming.

Source: Saad, Lydia "Water Pollution Americans' Top Green Concern" March 25, 2009.
<http://www.gallup.com/poll/117079/Water-Pollution-Americans-Top-Green-Concern.aspx>, accessed April 7, 2009.

¹ The WQD is comprised of over 100 employees organized into five sections: engineering, environmental services, laboratories, capital improvement program coordination and business services.

- c) Workshops – A group of nationally recognized experts provided review and direction into the planning process in multiple workshops including external stakeholders.
- d) Documentation – Meetings summaries, project memoranda and a summary report were prepared.

To guide the WQD in how to invest limited resources to achieve highest returns, a structured approach was used. The steps involved include: identifying the need, gathering background information, analyzing plausible trends and scenarios, and recommending priority actions (Figure E-1).

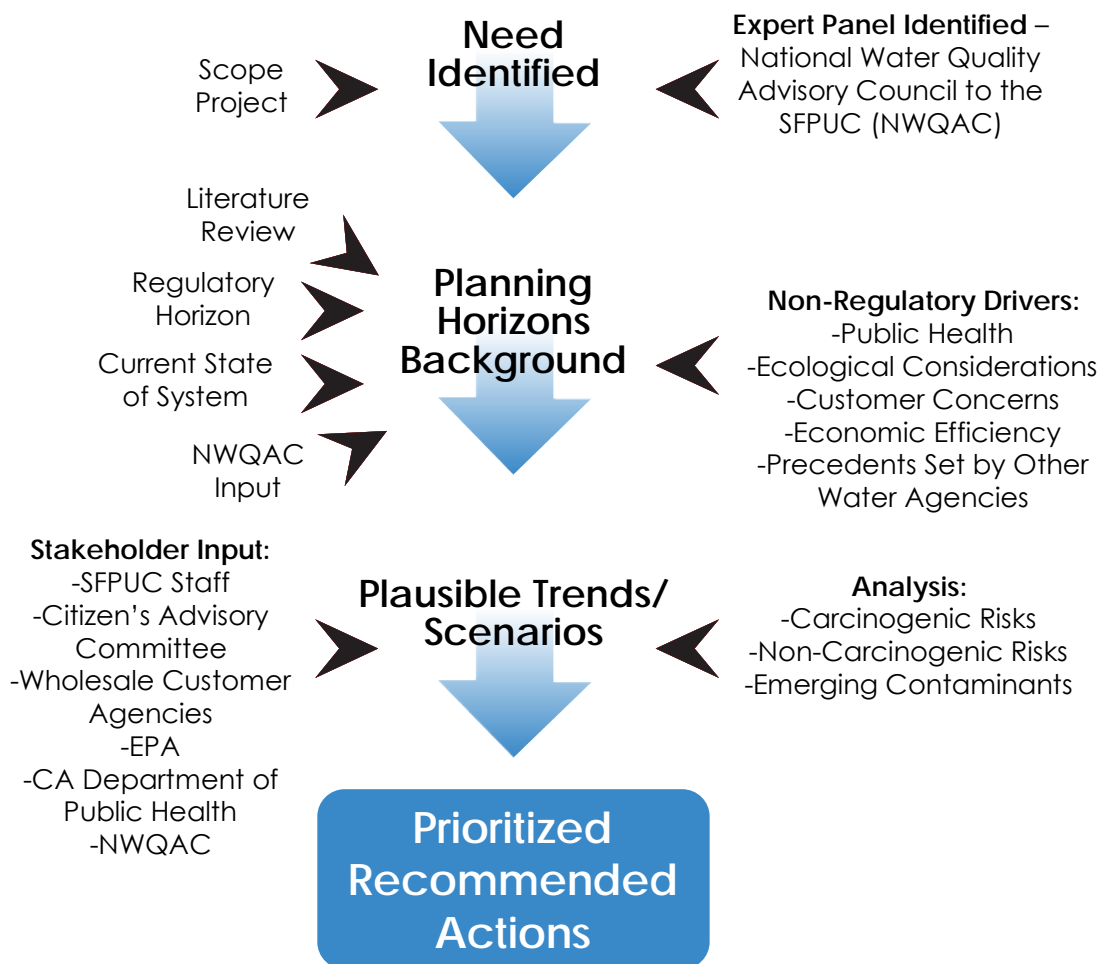


Figure E-1: Strategic Planning Process

E.2 Priority Areas

Ten categories emerged from the analysis and discussion involving various SFPUC divisions, external stakeholders, outside experts and members of other utilities. These ten priority areas form the framework for the recommendations:

1. *Role as a Utility* – Should the role of SFPUC move from the meter to the tap?
2. *Public Health and Emerging Contaminants* – What is the best way to prepare for emerging diseases? Are there risk management options for consumers with specific health concerns?
3. *Technological Advances* – What implications will advances in analytical techniques, membranes, nanotechnology, remote sensing, genetics, communications, etc. have on SFPUC?
4. *Regulations* – What changes will new regulations bring, especially for distribution system monitoring and emerging contaminants?
5. *Water Quality Management Approach* – What practices should SFPUC adopt to go beyond regulations?² Should risk management be the main driver?
6. *Communication with Customers* – How can focus groups and willingness to pay studies aid SFPUC’s understanding of customer concerns and how can SFPUC better communicate information and needs back to customers?
7. *Quantity* – Will increased demand affect water quality through the introduction of new source waters?
8. *Climate Change* – How will a changing climate (e.g., larger storms, more severe drought, less snow pack) affect SFPUC operations?
9. *Sustainability* – How can sustainability concerns be better implemented into SFPUC’s culture and services?
10. *Catastrophic Events* – Is SFPUC fully prepared to maintain level of service for possible catastrophic events?

Recommendations were developed for each priority area and are detailed in Sections 4 and 5.

² See the City and County of San Francisco Charter SEC. 8B.122 Goals and Objectives Related to Water and Clean Water.

<http://www.municode.com/content/4201/14130/HTML/ch008b.html>

Implementation and refinements to the work plan will consider current WQD workload (see Figure E-3), available resources, new research and regulatory developments.

The recommendations are presented in Table E-1. As a starting point, a preliminary schedule for implementation of the recommendations is presented in Figure E-4. Details on each of these recommendations are outlined in Section 5 according to rationale, objective and potential steps.

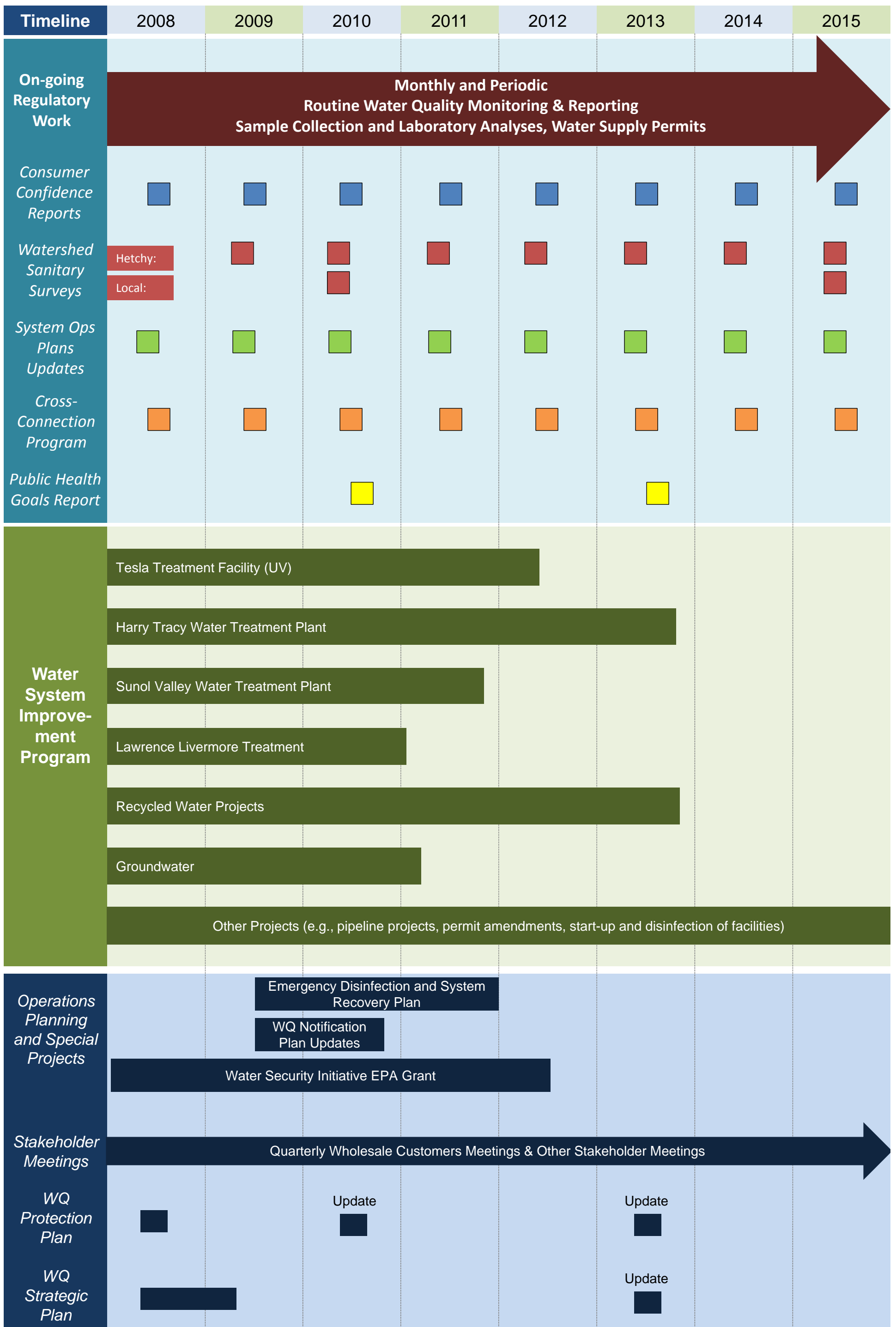


Figure E-3
 Current Water Quality Division Workload
 (Does not Include Operations Support Activities)

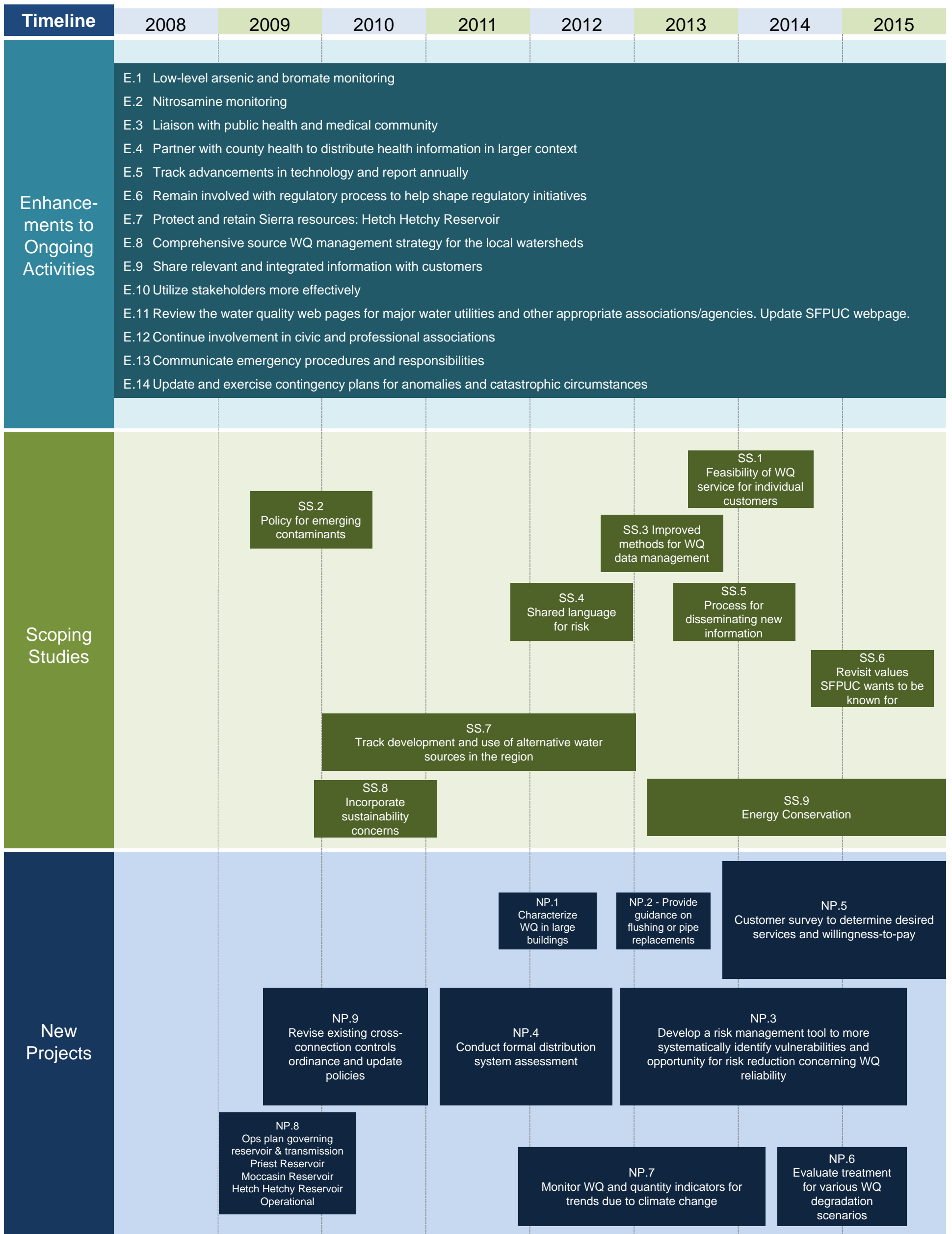


Figure E-4
Proposed Implementation for
Water Quality Planning Recommendations

Table E-1: Summary of Recommendations			
Ten Priority Areas	Enhancements to Ongoing Activities	Scoping Studies	New Projects
Role as a Utility		SS.1 Assess feasibility of providing water quality services for individual customers	NP.1 Characterize water quality in large buildings NP.2 Provide guidance on flushing, point-of-use devices, or pipe replacement if issues are determined
Public Health and Emerging Contaminants	E.1 Continue low-level arsenic monitoring of the source waters and watershed. Consider expansion of bromate monitoring at HTWTP and within the distribution system E.2 Continued attention should be paid to formation of nitrosamines E.3 Continue liaison with public health and medical community locally to ascertain any shifts in health patterns that could plausibly be associated with drinking water E.4 Partner with county health departments to distribute health information in larger context (i.e., lead in water as a portion of lead exposure)	SS.2 Develop policy for addressing emerging contaminants	
Technological Advances	E.5 Continue to track advancements in technology and understanding of health risks		
Regulations	E.6 Remain involved with legislative/regulatory process as early as possible to help shape regulatory initiatives		
Water Quality Management Approach	E.7 Protect and retain Sierra resources especially Hetch Hetchy Reservoir E.8 Build more comprehensive source water quality management strategy for the local watersheds particularly with regards to nutrient management	SS.3 Assess improved methods for water quality data management beyond the current LIMS system	NP.3 Develop a risk management tool to more systematically identify vulnerabilities and opportunity for risk reduction concerning water quality reliability NP.4 Conduct formal distribution system assessment NP.5 Revise existing cross-connection controls ordinance and update policies
Communication with Customers	E.9 Share relevant and integrated information with customers through a variety of means (website, CCR reports, media outlets, public health groups) and in a variety of languages E.10 Utilize stakeholders more effectively for guiding outreach efforts and informing on alternatives for future action E.11 Review the contents of water quality web pages annually for major water utilities appropriate natural and international associations/agencies. Update SFPUC webpage and provide links to relevant topics.	SS.4 Develop risk metrics and shared understanding of risk amongst SFPUC leaders and stakeholders ³ SS.5 Refine internal process and procedure for disseminating new and historical information SS.6 Determine the values SFPUC wants to be known for (i.e., consistent water quality, efficiency, responsiveness, vigilant testing) and align internal structures with them	NP.6 Survey customer base to determine desired services and willingness-to-pay
Quantity		SS.7 Track development and use of alternative sources in the area such as groundwater, Delta water, desalination and reuse to stay informed if quantity or quality concerns arise	
Climate Change	E.12 Continue involvement in civic and professional associations tracking developments, identifying measures and implementing best practices	SS.9 Energy conservation, minimizing greenhouse gases and minimizing chemical use.	NP.7 Evaluate unit process and overall treatment capacity for various source water quality degradation scenarios NP.8 Monitor key source and treated water quality and quantity indicators for long-term, annual and seasonal trends (e.g., temperature, turbidity, coliforms, algal blooms, algal toxins, TOC, DBPs, chlorine residuals, metals, nitrite) NP.9 Develop and/or update operations plan governing reservoir and transmission operations for water quality impacts
Sustainability ⁴		SS.8 Assess need for tracking additional sustainability metrics.	
Catastrophic Events	E.13 Communicate emergency procedures and responsibilities thoroughly before and during events to SFPUC staff, wholesale customer, outside aid agencies and the service population E.14 Continue to update and exercise contingency plans for anomalies and catastrophic circumstances		

³ SS.4 and NP.3 echo the emphasis on a “systematic, Department-wide risk management plan, applied consistently across the enterprises and bureaus, will add value to these efforts by helping to identify other and future risks and ensure that risk exposure is reduced to a level that is acceptable to the SFPUC” addressed in the *Sustainability Plan and Program 2008*, http://sfwater.org/detail.cfm/MC_ID/18/MSD_ID/121/C_ID/4287

⁴ SS.8 and SS.9 are expressions of recommendations also contained in the *Sustainability Plan and Program 2008*, http://sfwater.org/detail.cfm/MC_ID/18/MSD_ID/121/C_ID/4287 specifically noted are “environmental impacts stemming from the SFPUC’s internal operations and functions include: greenhouse gas emissions...”

Section 1

Introduction

Change is the law of life. And those who look only to the past or present are certain to miss the future.
John F. Kennedy

Prediction is very difficult, especially of the future.
Niels Bohr

My interest is in the future because I am going to spend the rest of my life there.
Charles F. Kettering

The San Francisco Public Utilities Commission (SFPUC) has a history of being proactive in identifying issues and considerations that influence its capital and operational decisions. This practice has enabled the SFPUC to more cost-effectively comply with all state and federal regulations. To create a sound basis for capital and operational investments that may be required in the next 20 to 25 years, the SFPUC has assessed some scenarios and concerns that may emerge in the future, leading to consideration and analysis of potential alternatives that may be implemented circa 2030.

In this section:

Scope of Strategic Planning Effort	1-2
Framing the Water Quality Strategic Plan	1-3
System Overview.....	1-7
Report Contents	1-8

This document provides an overview of the strategic planning process, context of activities currently underway within the Water Quality Division (WQD), recommendations for the scope of priority actions to be carried forward as well as outlining a suggested schedule and approximate budget for activities. Additionally the appendices contain technical memoranda providing in-depth background information as well as summaries of all stakeholder workshops.

In contrast to previous planning efforts, this document represents the beginning of a new process for stakeholder consultation and deliberation. Contained herein are ten priority areas that were identified in consultations with internationally recognized experts, outside utilities and internal/external stakeholders. These priorities, and some associated activities will serve as the start point for a new process of regular consultations with stakeholders on strategic actions and budgetary priorities. The envisioned process is presented in Figure 1-1.



Legend

- ① Major update every 6 years
- ② Report revised every 3 years
- ③ Key stakeholders
 - Wholesale Customer Agencies! (SFPUC - Wholesale Agency, WQ Committee Proposal)
 - Retail Customers (CAC - Water Subcommittee)
 - Regulatory Agencies (CDPH, USEPA)
 - Public Health Agencies (SFPUC, SMCODPH, etc.)
 - Community Organizations/NGO's
 - Other Government/City Departments, etc

**Figure 1-1
Stakeholder Involvement in Implementation of Water Quality Strategic Plan**

1.1 Scope of Strategic Planning Effort

The scope for this project included:

- a) Literature reviews – This included a regulatory review encompassing US and international efforts, alternative regulatory approaches, emerging contaminants, other utility planning efforts and public health information. This included reviewing activities of EPA and the Water Research Foundation in framing the research agenda for distribution system water quality, pharmaceuticals and climate change.
- b) Data analysis - An evaluation of SFPUC water quality data, operational experiences and facilities was conducted. In addition, an exploratory water quality risk analysis was undertaken.
- c) Workshops – A group of nationally recognized experts provided review and direction into the planning process in multiple workshops including external stakeholders.

- d) Documentation – Meetings summaries, project memoranda and a summary report were prepared.

This document represents the summary of major considerations and potential actions for implementation so that the SFPUC will have a sound basis for decision-making about alternative water quality management strategies for the 2030 planning horizon. A 20 to 25 year planning horizon is both ambitious (for who can foresee what will actually happen?) yet responsible as infrastructure improvements in the public sector are not conceived, financed, designed and constructed in the blink of an eye.

Although the scope of this project focused on the Water Quality Division, many of the recommendations developed cross multiple divisions of SFPUC (e.g., water supply, environmental, wastewater treatment, human resource and other issues).

1.2 Framing the Water Quality Strategic Plan

The WQD's strategic planning effort is framed by and consistent with the City Charter, the SFPUC Mission and other SFPUC planning efforts (i.e., the Water Quality Protection Plan, the Sustainability Plan and the Water System Improvement Program).

1.2.1 San Francisco City Charter

The City and County of San Francisco Charter¹ includes a series of goals and objectives related to maintaining clean water:

The Commission shall develop, periodically update and implement programs to achieve goals and objectives consistent with the following:

- (1) Provide water and clean water services to San Francisco and water service to its wholesale customers while maintaining stewardship of the system by the City;*
- (2) Establish equitable rates sufficient to meet and maintain operation, maintenance and financial health of the system;*
- (3) Provide reliable water and clean water services and optimize the systems' ability to withstand disasters;*
- (4) Protect and manage lands and natural resources used by the Commission to provide utility services consistent with applicable laws in an environmentally sustainable manner. Operate hydroelectric generation facilities in a manner that causes no reasonably anticipated adverse impacts on water service and habitat;*
- (5) Develop and implement priority programs to increase and to monitor water conservation and efficiency system-wide;*
- (6) Utilize state-of-the-art innovative technologies where feasible and beneficial;*
- (7) Develop and implement a comprehensive set of environmental justice guidelines for use in connection with its operations and projects in the City;*

¹ Goals and Objectives Related to Water and Clean Water.
<http://www.municode.com/content/4201/14130/HTML/ch008b.html>

- (8) *Create opportunities for meaningful community participation in development and implementation of the Commission's policies and programs; and*
- (9) *Improve drinking water quality with a goal of exceeding applicable drinking water standards if feasible.*

1.2.2 SFPUC Mission

The Water Quality Protection Plan occurs within the broader mission of SFPUC to²:

- Serve San Francisco and its Bay Area customers with reliable, high-quality and affordable water, while maximizing benefits from power operations and responsibly managing the resources entrusted to its care;
- Protect public health, public safety and the environment by providing reliable and efficient collection, treatment and disposal of San Francisco's wastewater;
- Conduct its business affairs in a manner that promotes efficiency, minimize wastes, and assures rate payer's confidence; and
- Promote diversity and the health, safety, and professional development of its employees.

1.2.3 Relevant SFPUC Plans

To ensure the recommendations are compatible with SFPUC-wide planning efforts, the recommendations have been linked to goals identified within the Water Quality Protection Plan, the SFPUC Sustainability Plan, and the Water System Improvement Program (WSIP).

1.2.3.1 Water Quality Protection Plan

At a World Water Day event, on March 20th, 2008, San Francisco Mayor Gavin Newsom directed SFPUC to "produce a detailed and specific Water Quality Protection Plan". The Water Quality Protection Plan (Appendix D) assesses both strengths and weaknesses of SFPUC's water system and makes recommendations to protect and improve San Francisco's high water quality into the future. The 11 priority recommendations determined by a panel of experts in cooperation with SFPUC and outside stakeholders are shown in Table 1-1.

² SFPUC, 2002. "Long Term Strategic Plan for Capital Improvements."

Table 1-1: Priority Recommendations from Water Quality Protection Plan

1. Protect and retain Hetch Hetchy Reservoir as SFPUC's primary source water.
2. Continue watershed protection efforts at local reservoirs as outlined in the watershed management plans.
3. Continue to evaluate advanced treatment options to bring alternative supply sources to Hetch Hetchy quality.
4. Continue to monitor technology developments.
5. Conduct a formal distribution system operations assessment.
6. Clarify and revise the monitoring framework for emerging contaminants.
7. Evaluate and utilize appropriate on-line water quality monitoring instruments.
8. Improve the depth and frequency of interaction, consultation and engagement with customers.
9. Explore opportunities to extend SFPUC engagement beyond the meter.
10. Develop a comprehensive, analytical integrated risk management framework for guiding allocation of resources.
11. Integrate fundamental objectives for water quality protection across various SFPUC divisions and task Water Quality Director to review capital and operational decisions.

1.2.3.2 SFPUC Sustainability Plan

The SFPUC embarked on a sustainability plan to guide future actions within the utility as a whole. Within the process SFPUC has defined sustainability as:

“the framework through which SFPUC will responsibly manage the resources under its care, protect public health and balance its social and environmental responsibilities to the citizens and community, while providing cost effective services to its ratepayers.”³

This water quality strategic plan helps advance the pertinent four of the six goals identified in the Sustainability Plan:

- Customers: Provide good service to customers at appropriate rates.
- Infrastructure and Assets: Effectively manage and maintain and ensure reliability and efficiency of infrastructure and assets.
- Environment and Natural Resources: Ensure effective environmental and natural resources management. Planned capital improvements will increase conservation, while advanced programs for recycled water, groundwater, desalination, stormwater and rain water collection will increase the SFPUC's resilience to drought. In addition, optimization of chemical use in treatment will further reduce SFPUC's footprint.

³ SFPUC, 2007c. *Sustainability Plan – Sustainability Baseline Assessment F05/06*.
http://sfwater.org/Files/Reports/BASELINEASSESSMENT_v2_JUN11.pdf

- Community: Be actively responsive to community needs and a good citizen of the community.⁴

1.2.3.3 Water System Improvement Program

WSIP is a \$4.6 billion multi-year capital program to enhance SFPUC's ability to provide reliable, affordable, high quality drinking water to its 28 wholesale customers and regional retail customers in an environmentally sustainable manner. The proposed WSIP is structured to meet water quality regulatory requirements⁵, improve seismic and delivery reliability, and meet water supply reliability goals. The most recent amendments to WSIP were reported on March 31, 2008⁶.

The two fundamental principles of the WSIP are:

- 1) A clean unfiltered water source; and
- 2) A gravity driven system.

All measures of reliability have evolved and been evaluated from these principles. Projects within the WSIP continue to incorporate key principles of SFPUC, including sustainability and environmental stewardship policies.

The objectives of the program (as defined in November 2005) are to:

- Furnish system improvements to provide high quality water that reliably meets current and foreseeable local, state, and federal requirements.
- Reduce vulnerability of the water system to damage from earthquakes.
- Increase reliability of the system to deliver water by improving redundancy needed to accommodate planned outages for maintenance and unplanned outages resulting from facility failure.
- Provide near-term improvement of water supply/drought protection.
- Set forth long-term water supply/drought management options for technical evaluation, cost analysis, and environmental review.
- Enhance sustainability through improvements that optimize protection of the natural and human environment.

⁴ The other two areas are: a) *Workplan* – Preserve the well-being and continued development of staff and maintain equitable HR practices, and b) *Governance and Management* – Ensure effective management practices, financial performance, accountability and leadership.

⁵ There is some discrepancy between WSIP which plans to *meet* water quality regulations verse the City Charter which has the goal to *exceed* drinking water regulations, *if feasible*.

⁶ <http://sfwater.org/Files/FactSheets/NoticeofChangeCoverLetterState.pdf>

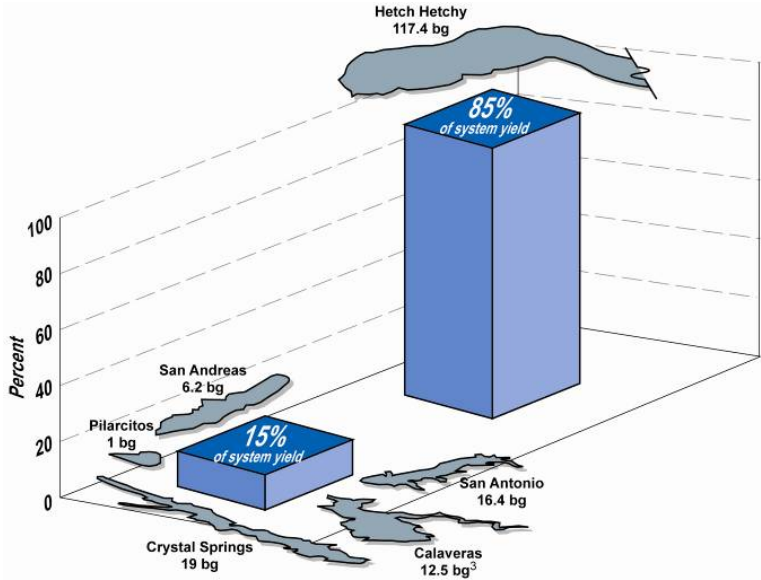
1.3 System Overview

Serving a population of 2.4 million people in over 30 cities, SFPUC is the largest water purveyor in Northern California. Customers are divided into three categories: retail customers in the City and County of San Francisco; wholesale regional customer agencies on the San Francisco Peninsula, in the South Bay and parts of the East Bay; and regional system retail customers. The SFPUC Service Area is shown in Figure 1-2. About 32 percent of SFPUC’s water supply is served to customers in the City and County of San Francisco; the remaining 68 percent is served to regional wholesale and retail customers.



Figure 1-2: SFPUC Service Area

Source water comes from three systems. These are the Hetch Hetchy system (Hetch Hetchy, Lake Lloyd, and Lake Eleanor Reservoirs), the Alameda Reservoirs (Calaveras and San Antonio), and the Peninsula Reservoirs (Crystal Springs, Pillarcitos, and San Andreas). Average annual water production of the SFPUC is approximately 300 million gallons per day (mgd). About 85 percent (255 mgd) is derived from the Hetch Hetchy system, 10 percent (29 mgd) from the Alameda Reservoirs, and 5 percent (15 mgd) from the Peninsula Reservoirs (see Figure 1-3).



- Notes: 1. Storage capacity of reservoirs shown in billion gallons (bg).
- 2. Although they account for 32% of the total system storage, local watersheds account for approximately 15% of the total system yield.
- 3. Per DSOD restrictions.

Figure 1-3: Regional Water System Sources

The major transmission routes and locations of key infrastructure in each system are displayed in Figure 1-4.



Figure 1-4: Regional Water System Overview

1.4 Report Contents

The remaining sections of this report are:

- Section 2 – Strategic Planning Process
- Section 3 – Priority Areas
- Section 4 – Recommendations
- Section 5 – Implementation
- Section 6 – References
- Appendices

Section 2

Strategic Planning Process

If you don't know where you're going, you might end up somewhere else.

*Yogi Berra
Baseball player-coach*

We don't think about problems we don't have. Why, indeed, should we? In solving problems that involve complex dynamic realities, however, we must think about problems we may not have at the moment...¹

*Dietrich Dorner
The Logic of Failure*

...predictions in the form of point estimates betray a fundamental misunderstanding of what the future actually is. The future is a range of possible outcomes, not a specific set of circumstances that will inevitably come to pass.

*Michael E. Raynor
Deloitte Consultant*

The future is deeply uncertain. The rate of social and technological change appears to be accelerating. Nevertheless, anticipating what might happen can aid in preparing an organization to more wisely and prudently respond as new challenges emerge. That is the primary motivator for the WQD in undertaking this strategic planning effort.

In this section:

Identifying the Need	2-2
Gathering Background Information	2-3
Analyzing Trends and Scenarios	2-5
Recommending Priority Actions ...	2-6

To guide the WQD in how to invest limited resources to achieve highest returns, a structured approach was used. The steps involved include: identifying the need, gathering background information, analyzing plausible trends and scenarios, and recommending priority actions (Figure 2-1). This section details each of those steps.

¹ Dorner, D. The Logic of Failure: Recognizing and Avoiding Error in Complex Situations. (1996)

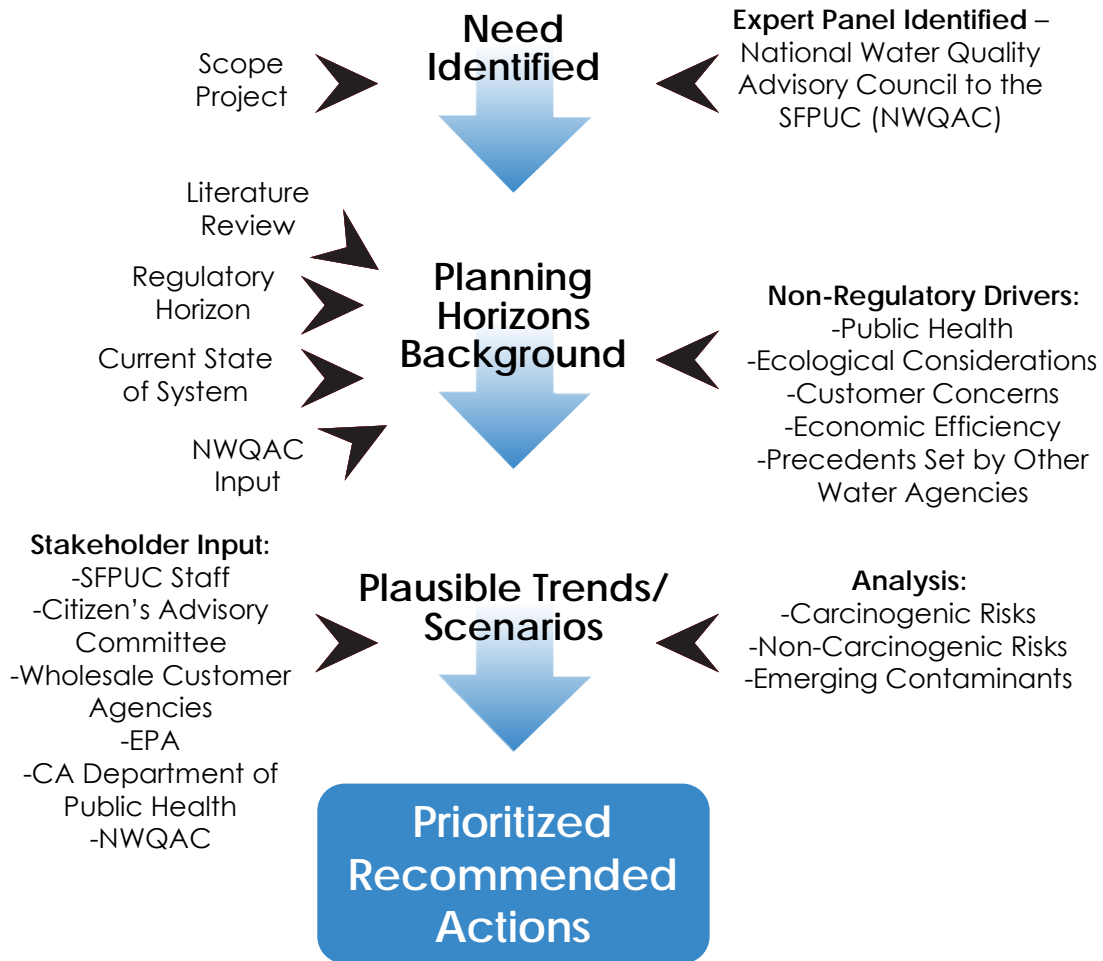


Figure 2-1: Strategic Planning Process

2.1 Identifying the Need

SFPUC recognized the benefits of strategic planning as a necessity for future allocation of resources. A 25 year planning horizon is both ambitious (for who can foresee what will actually happen) yet responsible as infrastructure improvements in the public sector are not conceived, financed, designed and constructed in the blink of an eye.

To aid in the process, an expert council was formed consisting of water quality experts in academia, the industry and the US Environmental Protection Agency (USEPA) (Table 2-1). Experts were chosen for their water quality expertise and understanding of SFPUC specific issues. The experts provided input through review of draft documents, conference calls and a series of workshops. In the midst of the strategic planning effort, the panelists were also called upon to help formulate the *Water Quality Protection Plan* for San Francisco – a request from Mayor Gavin Newsom.

Table 2-1: SFPUC National Water Quality Advisory Council Panelists

<i>Panelist</i>	<i>Affiliation</i>	<i>Expertise</i>
Jeffrey Griffiths, M.D.	Associate Professor, Tufts University School of Medicine Member of EPA's Science Advisory Board	Epidemiology, Sensitive Sub-populations
William Glaze, Ph.D	Professor Emeritus, UNC-Chapel Hill Ex- Chair, EPA Science Advisory Board Ex-Editor-in-Chief, Environmental Science & Technology, pre-eminent journal in the field.	Policy, Future Trends, Technology, Water Quality
Dave Hilmoie, P.E., BCEE	Drinking Water Director, Seattle Public Utilities (SPU)	Utility Operations, Water Quality
Stephen Estes-Smargiassi	Director of Planning, Massachusetts Water Resources Authority (MWRA), AWWA Research Foundation (AwwaRF), Research Advisory Council Chair	Public Policy, Utility Operations, Water Quality
Pankaj Parekh, Ph.D	Director for Water Quality Compliance, Los Angeles Dept of Water & Power (LADWP), Chair of Strategic Initiative for Distribution System Research Expert Panel (AwwaRF)	Risk Management, Water Quality, Utility Operations
Phillippe Daniel	Vice President, Camp Dresser & McKee AWWARF RAC and Strategic Initiative on Endocrine Disrupting Chemicals and Pharmaceuticals and Personal Care Products	Water Quality, Treatment, Risk, Strategic Planning
June Weintraub, Sc.D.	Senior Epidemiologist, San Francisco Department of Public Health	Public Health
Bruce Macler, Ph.D.	USEPA Region 9	Regulations, Toxicology, Risk Assessment

2.2 Gathering Background Information

The strategic plan was developed within the specific context of the SFPUC complete with its organization structure, its legal mandate, political realities, regulatory constraints, current conditions and boundaries for action.

The “Planning Horizon Considerations” technical memorandum (Appendix A) presents foundational background material. The memorandum’s first section describes each of the sources, watersheds, treatment facilities and the distribution system of SFPUC. The next section summarizes the key regulations and their significance for SFPUC both in the present and projected into the future. A final section summarizes other factors that may influence SFPUC investment choices such as public health, ecosystem considerations, customer concerns, economic efficiency and precedents set by other water agencies.

Key considerations for the planning horizon included:

- While water quality is very good, unusual situations (anomalies) have occurred in the past that have necessitated both operational changes and capital improvements (e.g., turbidity spikes from pipeline shut-down and start-up, algae

blooms). Is the past indicative of the future? If so, other anomalies, as yet unknown, may arise and drive need for improvements.

- A number of regulations have been proposed and promulgated over the last few years that the SFPUC has been addressing (e.g., those governing disinfection, disinfection by-products and lead). The upcoming revisions to the Total Coliform Rule may require capital investment and the process of the revisions should be actively monitored. Revisions of the Lead and Copper Rule are not anticipated to cause compliance issues although lead remains a sensitive community issue.
- A consistent theme amongst other regulatory efforts (i.e., European Union, World Health Organization, Health Canada, the Australian National Health and Medical Research Council plus the Natural Resource Management Ministerial Council) is that they embrace a systems approach whereby the entire system from source to consumer is evaluated. In addition, the notions of multi-barriers, hazard analysis and critical control points (HACCP) are interwoven into developing water safety plans. The World Health Organization suggests considerable flexibility in setting water quality targets with an emphasis on tailoring them to the values of the particular stakeholders.
- As customers become more educated and concerned over water quality issues, increased outreach will be necessary to properly communicate risks.
- The “green” movement will require a more complete analysis of the full environmental impact of activities. This will not only include life-cycle assessments of construction activities and materials, but also choice of safety factors for design criteria and operating rules (e.g., trade-off between energy consumption and margin of safety for regulatory compliance).
- Continued scrutiny of rates will increase pressure to improve overall efficiency within SFPUC. Coordination with outside departments and other utilities will help this effort.

After completion of the background document, a workshop was held to identify issues of importance to SFPUC over the planning horizon. The workshop brought together the expert panel, members of the water quality division, members of other SFPUC divisions, representatives from other utilities and additional stakeholders. A full summary of the workshop is in Appendix C.1.

At the workshop, core items concerning SFPUC in the future were deemed to be similar to today: maintaining supply reliability and providing high water quality. The challenge was determined to be mitigating externalities that may hinder the provision of the core components as well as to continue to advance water quality levels. Ten priority areas were identified along with key questions needing to be addressed over the strategic planning process:

1. *Role as a Utility* – Should the role of SFPUC move from the meter to the tap?
2. *Public Health and Emerging Contaminants* – What is the best way to prepare for emerging diseases? Are there risk management options for consumers with specific health concerns?
3. *Technological Advances* – What implications will advances in membranes, nanotechnology, remote sensing, genetics, etc. have on SFPUC?
4. *Regulations* – What changes will new regulations bring, especially for distribution system monitoring and emerging contaminants?
5. *Water Quality Management Approach* – What practices should SFPUC adopt to go beyond regulations? Should risk management be the main driver?
6. *Communication with Customers* – How can focus groups and willingness to pay studies aid SFPUC’s understanding of customer concerns and how can SFPUC better communicate information and needs back to customers?
7. *Quantity* – Will increased demand affect water quality through the introduction of new source waters?
8. *Climate Change* – How will a changing climate (e.g., larger storms, more severe drought, less snow pack) affect SFPUC operations?
9. *Sustainability* – How can sustainability’s concerns be better implemented into SFPUC’s culture and services?
10. *Catastrophic Events* – Is SFPUC fully prepared to maintain level of service for possible catastrophic events?

2.3 Analyzing Trends and Scenarios

The second technical memorandum and Workshop #2 both focused on evaluating future options. The purpose of the second TM (Appendix B) was to provide further analysis to help evaluate available options. An analysis of carcinogenic and non-carcinogenic risks due to water quality constituents monitored within the SFPUC system and a comprehensive analysis of emerging contaminants was performed. Major findings from the TM include:

- Even though the levels of naturally occurring arsenic are well below the regulatory limit of 10 µg/l (i.e., below 1 µg/l), the calculated theoretical cancer risk is dominated by arsenic. Other risk contributors are bromate at Harry Tracy WTP and disinfection by-products, particularly THMs and NDMA.

- Non-cancer risk is below the threshold of concern for the endpoints evaluated which included: hepatotoxicity, non-necrotic hepatotoxicity, kidney necrosis, reproductive and developmental effects, neurotoxicity, thyroid effects, cardiovascular effects, methemoglobinemia, and gastrointestinal lesions
- Emerging contaminants of most potential significance were deemed to be disinfection by-products followed by algal toxins. More information is needed concerning microorganisms in the distribution system and flame retardant policy for watersheds. The future of other contaminant classes such as nanoparticles is unknown.

Workshop #2 convened similar stakeholders as in Workshop #1. The workshop focused on identifying potential action items for SFPUC to address the priority areas of concern. A full summary of the workshop and action items identified can be found in Appendix C.2.

2.4 Recommending Priority Actions

The next sections of the report detail the ten priority areas, presents recommendations and highlight projects for consideration in the implementation phase. The recommendations were based off those discussed and formulated during Workshop #2 and during the formulation of the Water Quality Protection Plan; however reorganized, focused and prioritized into a comprehensive plan.

Section 3

Priority Areas

This section summarizes the priority areas identified by the Expert Panel, stakeholders and SFPUC staff. It also presents some recommendations in light of current SFPUC activities.

In this section:

Priority Area Summary.....	3-1
Priority Area Descriptions	3-3

3.1 Priority Area Summary

Through the strategic planning process ten priority areas emerged as key areas for the WQD to address. These are grouped categorically below and displayed in Figure 3-1.

Two priority areas highlight what may be the largest changes facing the WQD moving into the future:

1. *Role of the Utility:* The structure and function of the WQD may change with new services required or desired by customers. For example, SFPUC's role may move from the meter to the tap through increased programs focused on in-home plumbing and guidance on point-of-use devices.
2. *Communication with Customers:* Increased communication with the customer base is recommended to aid SFPUC's understanding of customer concerns and desires. SFPUC may also develop enhanced methods to communicate information back to the customers, forming an open discourse and more transparency. This would require significant coordination across SFPUC divisions and may require additional staffing.

Three priority areas focus on major drivers facing the WQD:

3. *Integrated Risk Management/Water Quality Management Approach:* As future issues arise, the WQD needs to have a clear management approach about the values to be upheld and the main drivers to induce action. As recommended in the Water Quality Protection Plan, an integrated risk management framework to inform priority setting that is both comprehensive and quantitative is needed (e.g., identifying potential threats to water quality according to where they might be introduced into the system, the factors governing the anticipated magnitude of these threats, the control measures in place, factors influencing their effectiveness, potential risk mitigation alternatives). It is vital that such a framework be informed not only by risks of a retrospective nature, but by anticipation of issues that may emerge (e.g., new pipe materials/tank coatings, climate change, new technologies, etc.).

4. *Emerging Contaminants*: Determining the health effects and proper response to emerging contaminants is a difficult task as detection levels continually advance beyond the boundary of our understanding of the implications.
5. *Regulations*: SFPUC consistently meets and moves beyond all regulatory requirements as an important protection of public health. In the future, new regulations focused around distribution system monitoring and emerging contaminants will arise and SFPUC should remain engaged in the formulation of these regulations.

While the major drivers affecting the WQD are certain to exist in the future, the full consequences of the next three priority areas are unknown and require contingency planning.

6. *Catastrophic Events*: While SFPUC has emergency operations plans in place for varying events, continued focus should be given to exercising and evaluating these plans both internally, with partner organizations and with the customer base.
7. *Climate Change*: It remains unclear to what magnitude climate change will affect the field of water resources. Continued diligence is needed to prepare for varying climate change scenarios.
8. *Quantity*: If demand rises or current sources are compromised, bringing new water sources into the system will affect water quality and contingency plans are needed.

The final two priority areas encompass all activities within WQD.

9. *Sustainability*: Sustainability is becoming an ever more prevalent and important issue, with SFPUC taking a leading role in many areas. However, sustainability's concerns should continue to be implemented into SFPUC's services and culture.
10. *Technological Advances*: What implications will advances in analytical techniques, membranes, nanotechnology, remote sensing, genetics, communications, etc. have on SFPUC?

3.2 Priority Area Descriptions

This section presents more detail on each priority area included current activities already in place and recommendations for future activities and expansion.

3.2.1 Role as a Utility

3.2.1.1 Current Activities

SFPUC has implemented an aggressive and multi-faceted program to remove lead sources from piping and appurtenances. SFPUC corrosion control treatment is optimized and minimizes the release of metals to drinking water. Moving past the meter, SFPUC has a lead faucet replacement program, which provides low lead faucets to residents of San Francisco at a much reduced price. Extremely small amounts of lead may enter the drinking water primarily through leaching from lead solder joints and lead in faucets while water is left to sit in pipes overnight. Even low-levels of lead intake can have health effects, especially in young children. Running the faucet to flush out old water can solve this problem; however, replacing faucets is a sure step to cut down lead exposure. As part of its public education efforts, the SFPUC advised customers in its 2004, 2005, and 2006 Consumer Confidence Reports to have their water tested or to allow water to flow from the tap for 30 seconds to two minutes whenever the tap has not been used for several hours.

Ten Priority Areas

1. *Role as a Utility*
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SFPUC has been active in promoting the use of tap water, most recently encouraging restaurants to serve tap water and providing stainless steel water bottles to individuals signing a pledge to stop buying bottled water. In 2006 and 2007, the WQD provided water quality testing to public buildings throughout San Francisco in an effort to halt the use of bottled water by city agencies.

3.2.1.2 Recommendations

Providing additional services that extend to the customer tap would mark a significant policy decision for the SFPUC. A number of challenges would be associated with implementation including: a) property rights and privacy concerns, b) defining base level of service, c) setting of and pricing for different levels of service (e.g., point of use treatment devices, tailored higher level treatment, sampling and inspection, etc.), d) social justice considerations, and e) decentralize a portion of treatment. However, it could potentially have significant value for relieving customer concerns over quality and providing positive interactions between SFPUC and rate payers.

Large buildings are a reasonable first step to move beyond the tap. Office buildings can especially pose challenges since water left standing over the weekend may be

compromised. Guidance on flushing or pipe replacement may be provided if water quality issues are discovered.

3.2.2 Emerging Contaminants

3.2.2.1 Current Activities

In 2006, the SFPUC participated in a nation-wide research project testing for 62 pharmaceuticals, personal care products and endocrine disruptors in untreated and treated waters. The study showed that 0 out of 62 tested chemicals were found in SF drinking waters and 2 out of 62 tested chemicals were found at parts per trillion levels in the San Andreas reservoir source water. However, these trace amounts were subsequently removed by the ozone treatment at the water treatment plant. The principal investigator noted “San Francisco literally had some of the most pristine drinking water I have ever observed in terms of these emerging contaminants”¹.

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New forms of disinfection by-products (DBPs), especially nitrosamines are another group of emerging contaminants. Traditionally, total trihalomethanes (TTHMs) and haloacetic acids (HAA5s) have been the disinfection by-products of concern. SFPUC converted to chloramine as a disinfectant in 2004 in a successful effort to reduce the levels the TTHMs. SFPUC actively monitors NDMA in the distribution system with levels all below the required reporting limit of 10 ng/L. No NDMA has been detected in chloraminated Hetch Hetchy source water or Sunol/Hetch Hetchy blend.

3.2.2.2 Recommendations

A standard approach, vetted externally and internally, for addressing emerging contaminants would help the SFPUC engage with customers and regulators as new contaminants and potential health risks emerge. A variety of frameworks are available including: 1) monitor for all emerging contaminants 2) save resources by limiting monitoring to those required 3) create a checklist of criteria (i.e. plausibility of occurrence in the system, knowledge of health implications, etc) to induce monitoring efforts.

SFPUC should continue its liaison with the public health and medical community to ascertain shifts in infection patterns since early signals of emerging microbes and contaminants of concern may be detected on the clinical side rather than through drinking water research channels. SFPUC already has a strong relationship with SFDPH and this should be continued. As part of this partnership, SFPUC should coordinate with SFDPH and other local county health departments to distribute

¹ Email from Dr. Shane Synder, Southern Nevada Water System, to Dr. Andrzej Wilczak, SFPUC, March 19, 2008.

health information in larger context (i.e., lead in water as a portion of lead exposure). The general public receives multiple and often fragmented messages. Decreasing the number of sources of information and integration of messages across media will improve clarity.

3.2.3 Technological Advances

3.2.3.1 Current Activities

Technological advances can often be slow to work their way into the government sector and particularly water utilities. This slowness, however, can be prudent in some cases due to the potential for secondary or unanticipated consequences of technology implementation consequences. However, SFPUC remains connected to industry trends through collaborative projects with other agencies and research organizations.

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3.2.3.2 Recommendations

Develop a way to efficiently and soundly examine new technologies. Potentially have an annual internal briefing on new technology to keep staff up to date. Exchange information with other utilities to provide tech transfer – continue association with SPU, MWRA, EBMUD, LADWP and MWD. Engage BAWSCA, other Bay Area utilities and local universities in new technological research and information sharing. Participate in AWWA committees and PAC of WRF projects. Participate in research testing of new technology (i.e., UV application to unfiltered water, new disinfectants).

More information sharing is needed for inter-department cooperation as well as inter-agency. The creation of an SFPUC library may be useful as an access point for information across departments.

3.2.4 Regulations

3.2.4.1 Current Activities

SFPUC currently meets all federal and state regulatory requirements. Operating targets are often set with a margin of safety above regulatory levels to ensure compliance and provide the highest level of water quality feasible. In addition to federal regulations the Office of Environmental Health Hazard Assessment (OEHHA) develops and adopts non-enforceable Public Health Goals (PHGs). PHGs are based only on public health considerations and do not depend on feasibility or cost/benefit like federal MCLs. The SFPUC meets

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all of the public health goals except for arsenic in some special sampling studies of Hetch Hetchy water. Arsenic has a public health goal of 0.004 ppb as compared to the MCL of 10 ppb. Current technologies cannot lower arsenic levels reliably below the PHG and the health effects at such a low level of exposure are still not completely understood.

3.2.4.2 Recommendations

SFPUC needs to remain involved with regulatory process as early as possible to help shape regulatory initiatives. This will provide the best protection of public health and level of service possible through being proactive about maximizing regulatory flexibility. Distribution system configuration and operation will become a major focus in the future. Updating the Cross-Connection Ordinance and developing program guidelines in San Francisco will be consistent with increased use of recycled water and regulatory interests.

Low-level arsenic monitoring should continue on the Hetch Hetchy source.

3.2.5 Water Quality Management Approach

3.2.5.1 Current Activities

SFPUC currently employs the multi-barrier approach to protect water quality. A multiple-barrier approach provides back-up protection should one barrier fail. Barriers in place to protect water quality include source water selection, watershed protection, treatment technologies, disinfectant residual, monitoring programs and contingency plans.

SFPUC also manages water quality by meeting and surpassing all regulatory requirements. The United States Environmental Protection Agency (USEPA), due to Congressional mandates, sets maximum contaminant levels for various organic and inorganic chemicals, microorganisms, disinfection by-products and radionuclides. The regulatory levels are set at levels to protect of public health and by surpassing the regulations, SFPUC takes extra precaution.

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3.2.5.2 Recommendations

Increasingly a more analytical system is needed as there is greater pressure to allocate resources as efficiently as possible. This means *more strategically* addressing quality from source selection, watershed management, treatment and distribution to the customers tap. This encompassing model has been increasingly used by the World Health Organization, the European Union, and Health Canada. Water Research Foundation has developed an application based on this concept for distribution systems. This model is derived from the food industry's approach: Hazard

Assessment and Critical Control Point (HACCP). HACCP focuses on determining what points in the process are most critical for ensuring quality in order to develop the water quality management strategy.

Improved management of water quality data would ease the dissemination of information internally and externally as well as promote increased analysis. It is recommended that SFPUC consider adopting improved methods beyond the current LIMS system.

3.2.6 Communication with Customers

3.2.6.1 Current Activities

SFPUC surveys its wholesale customers every two years. The survey is a joint effort by the Water Supply & Treatment Division and the Water Quality Division. The purpose of the surveys is to track performance, customer satisfaction and receive feedback on desired improvements.

The Water Quality Division reaches out to the retail community through inserts in bills that reach all rate payers bi-monthly and the Consumer Confidence Report on water quality is delivered annually. WQD maintains a 24/7 response program for consumer inquiries and complaints. Staff attends fairs where blind taste tests of tap water are held at the SFPUC booth. Numerous community meetings are set up to inform the public of new projects or changes in operations. The SFPUC website is updated regularly and contains information on various water quality topics written in conjunction with SFDPH, cross connection control and backflow prevention, *Cryptosporidium* and *Giardia* monitoring, fluoridation, chloramine and lead information. Every three years the SFPUC holds a public hearing to present its Public Health Goal report in compliance with state requirements.

SFPUC utilizes a stakeholder group to provide recommendations regarding the agency's long-term strategic, financial and capital improvement plans. The current stakeholders are appointed by the Mayor and Board of Supervisors. There are four smaller subcommittees, one dedicated to water, to explore specific issues in greater depth. Members of the subcommittee typically come from the larger stakeholder group, although interested member of the general population may apply. These stakeholders meet once a month with the meetings open to the public and agenda and minutes posted to the SFPUC website.

3.2.6.2 Recommendations

SFPUC already shares information with customers through a variety of means (website, stakeholder reports, media outlets, and public health groups); however,

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more attention could be made to ensure the information is relevant to customer concerns and integrated with complementary agencies (i.e. public health groups). Information should directly address customer concerns broadly rather than simply providing water-specific information (i.e., more health end point driven for using or how to reduce risks from multiple exposure sources). Additionally, a broader discussion of public health risks, the inherent uncertainties and options available should be provided.

The internal disclosure policy for new information needs to be refined since it is essential that SFPUC staff who interface with the public know what is occurring within the organization. This increases the accuracy of information provided to customers and transparency.

In providing more integrated information, SFPUC needs to move from anecdotal to a more systematic assessment of customer needs and concerns through continued surveying efforts and response to concerns highlighted both from wholesale customers and retail consumers.

The stakeholder group can be used both as a proxy for larger customer base input and an advisor on further outreach efforts. Increased effort should be made to interact with stakeholders regularly, include them in workshops and invite their comments on planned projects strongly affecting the customer base.

Periodic (e.g., annual) review of the websites of CDPH, USEPA, AWWA, WRF, WHO, Medical Research Council and major national utilities with recommendations for links or information to include on SFPUC's website would be beneficial to providing customers up-to-date information.

3.2.7 Quantity Concerns

3.2.7.1 Current Activities

To prepare for dry weather conditions, SFPUC utilizes a design drought comprised of two years of extreme drought followed by six years of less severe dry weather. The upstream reservoirs are kept at 85% to 90% capacity to ensure water supply for these conditions. Staff feels comfortable that the current operations could handle the design drought and that the design drought is a conservative scenario.

Demand projections for retail users over the next 25 years indicate a slight decrease in water use in San Francisco, while the demand from wholesale customers will increase 19%². New groundwater and recycled water

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² Discussion from Workshop #1 held August 29th and 30th 2007.

use will serve as alternative supplies with their own attendant issues (e.g., cross-connection control).

To offset increasing demand, SFPUC currently encourages water conservation through rebates on low-flow toilets and washing machines, free high-efficiency showerheads and faucet aerators are also available to those who apply. A free “Water-Wise” house call is available to all SFPUC residential customers. During the visit, a SFPUC employee will review consumption history, determine flush volumes and flow rates of household fixtures, install showerheads and faucet aerators as needed, inspect landscape irrigation equipment for leaks or maintenance needs and teach customers to read their meters. The quantitative results of these programs are hard to measure and only reach those customers within San Francisco and not wholesale customers who receive two-thirds of the delivered water. A regional conservation program was implemented in 2007, with the theme “Water Saving Hero”. The campaign featured print ads and billboards promoting tips to save water as well as a website featuring information on different rebate programs available throughout the Bay Area as well as conservation tips.

SFPUC actively explores new supply possibilities through recycled water and desalination projects. There is currently no recycled water use in San Francisco buildings, but ground water is utilized for irrigation at Golden Gate Park and the San Francisco Zoo. Utilizing recycled water instead would free 4 mgd of groundwater for potable uses and is being considered. Golden Gate Park and golf courses are already dual plumbed but other areas will require plumbing improvements to incorporate recycled water. New construction projects within the City are required to have dual plumbing in common use areas. Desalination is currently being considered as an additional dry weather supply option. SFPUC is considering a 20 to 30 mgd share of a 60 mgd plant. The location of the plant is still under evaluation.

3.2.7.2 Recommendations

Track development and use of alternative sources locally such as Delta water, desalination and reuse as well as nationally to stay informed of the current quality and feasibility of potential alternative supplies. The use of a standing committee to track the information is recommended. Support could also be provided to programs in the wholesale area on efforts to conserve and build alternate supplies.

3.2.8 Climate Change

3.2.8.1 Current Activities

SFPUC initiated a literature review of climate change research in 2006 to determine potential impacts for SFPUC operations and water quality. The results included³:

- Reduction in the average annual snowpack due to a rise in the snowline and thinner snowpack in low- and medium-elevation zones
- Changes in the timing, intensity, location, amount, and variability of precipitation, including a shift in snowmelt runoff to earlier in the year, and an increased amount of precipitation falling as rain instead of as snow
- Long-term changes in watershed vegetation and increased incidence of wildfires that could affect water quality
- Increased water temperatures with accompanying adverse effects on some fisheries
- Increase in evaporation and concomitant increased demand by SFPUC customers

SFPUC analysis predicted that the snowline will rise from the current position around 6000 feet to 6500 feet by 2025, assuming a 1.5 °C rise in temperature. The shift in runoff timing from spring to fall should remain within the range planned for standard operating procedures. However, if a larger shift does occur, reservoir operating procedures will need to be changed. With the rising snowline, the watershed area uncovered by snow will increase providing more area for erosion hazard. Combined with changing intensity of storms, the effects on reservoir turbidity levels and treatment options should be investigated.

The SFPUC has taken a national leadership position on climate change. In early 2007, San Francisco hosted a Water Utility Climate Change Summit. From this summit, the SFPUC helped form and will chair the newly created Water Utility Climate Alliance (WUCA). The alliance is comprised of eight water utilities throughout the country and aims to “improve research into the impacts of climate change on water utilities, develop strategies for adapting to climate change and implement tactics to reduce their greenhouse gas emissions”⁴. In addition, SFPUC is involved in various national

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³ McGurk, Bruce. Unpublished Internal SFPUC Report.

⁴ SFPUC, Communications and Public Outreach. “Major U.S. Water Agencies Form New National Climate Alliance” February 25, 2008.

http://www.sfwater.org/detail.cfm/MC_ID/20/MSC_ID/357/MTO_ID/552/C_ID/3867

and regional committees (e.g., Association of Metropolitan Water Agencies, AWWA and WRF).

3.2.8.2 Recommendations

Climate change will create a changing baseline for many key indicators in the SFPUC system. It is important to monitor key water quality and quantity indicators for annual and seasonal trends (temperature, turbidity, coliforms, TOC, DBPs, chlorine demand, metals, nitrite). This will ensure SFPUC has current information on the status of climate change locally and can plan for potential effects on system operation and performance. Partnerships should be created with other agencies (NPS, USGS, DWR) and universities to monitor and analyze information on snow pack, sea level rise, mean air temperature, weather patterns and other water quantity/quality indicators throughout California.

A vulnerability study should be completed of potential system disruptions due to climate change including a unit process and overall treatment capacity evaluation for various source water degradation scenarios. There are two possible alternatives for analysis:

- 1) A “bottom-up” approach would determine thresholds/tipping points where water resource planning and treatment processes would be disrupted. Then work with climatologists to determine how likely these scenarios are.
 - 2) A “top-down” approach where information from current climate models is used to deduce the effect on water resource planning and treatment.
- Overall a portfolio approach of supply options is wise for future scenarios.

SFPUC should continue its involvement on national and regional committees to address common challenges and cooperative solutions. SFPUC is potentially in a better position than other regional utilities (i.e. rising sea levels could affect Bay-Delta levees and water infrastructure). A united regional effort may help raise awareness and determine contingency plans for varying climate change scenarios.

Public awareness is needed to bring about effective action by the customer base in conservation of water and other habits to decrease GHG emissions. SFPUC should encourage conservation and public awareness of climate change as well as support actions to limit GHG emissions.

3.2.9 Sustainability

3.2.9.1 Current Activities

The SFPUC is underway with a Commission wide Sustainability Plan. Within the process SFPUC has defined sustainability as:

...the framework through which SFPUC will responsibly manage the resources under its care, protect public health and balance its social and environmental responsibilities to the citizens and community, while providing cost effective services to its ratepayers (SFPUC, 2007).

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Within the WQD, numerous programs fit into the sustainability framework. Natural resources are managed through watershed protection plans, public health is protected through the provision of high quality drinking water, and educational material is distributed to the community.

Sustainability issues of note include the production of hydropower from the operation of the upcountry reservoirs. This provides enough electricity to power all municipal functions within the City.

In support of the Mayor's initiative to halt bottled water use by City agencies, the WQD provided water quality testing in public buildings throughout the city. This leads to the public agencies of San Francisco no longer purchasing bottled water.

3.2.9.2 Recommendations

Sustainability is typically a bigger issue in many European nations than in the United States. However, San Francisco and California are known as leaders in the field of sustainability within the US. SFPUC should incorporate sustainability concerns into routine activities and decisions. Through leading by example, SFPUC will demonstrate that sustainability is a core value. SFPUC should review current evaluation metrics for alternatives analysis. Then, determine gaps and additional metrics that would assist in decision-making reflective of sustainability concerns. In leading by example, the baseline for GHG emissions, waste production, and chemical use within the WQD could be determined and reduced.⁵

⁵ In the Sustainability Plan and Program 2008, http://sfwater.org/detail.cfm/MC_ID/18/MSC_ID/121/C_ID/4287 specifically noted are "environmental impacts stemming from the SFPUC's internal operations and functions include: greenhouse gas emissions; production and disposal of solid waste from office and construction operations; the need to improve green building and sustainable construction practices; use of chemicals in treatment and operations; and in-house water and energy consumption." Increased attention will be focused on chemical optimization and energy use at water treatment facilities while maintain high water quality.

3.2.10 Catastrophic Events

3.2.10.1 Current Activities

SFPUC has had a series of Disaster and Emergency Plans dating back decades. Three staff members from WQD are on-call at all times to respond to various types of emergencies: one from the Engineering Services Section for potential water quality regulatory violations and operational water quality problems; one from the Laboratory Section for emergency and after-hours testing; and one from Environmental Field Services Section for fires (cross-connection issue), consumer complaint response (includes after hours staffing), and emergency sampling/field testing. Per SFPUC policy, WQD has been assigned the responsibility to facilitate responses to potential water contamination events and other water quality emergencies.

Ten Priority Areas

1. *Role as a Utility*
2. *Public Health and Emerging Contaminants*
3. *Technological Advances*
4. *Regulations*
5. *Water Quality Management Approach*
6. *Communication with Customers*
7. *Quantity*
8. *Climate Change*
9. *Sustainability*
10. *Catastrophic Events*

SFPUC is currently in the midst of a \$4.6 billion retrofit project to improve service reliability in the circumstance of a major earthquake.

3.2.10.2 Recommendations

It is important to communicate to the customer base the levels of service SFPUC is prepared to offer for a variety of situations from unusual to catastrophic. If the public knows and agrees with what to expect under ranges of circumstances, they can plan accordingly. It is recommended to test emergency notices on unfamiliar staff to ensure understanding and clarity. The customer base needs to understand exactly what a 'boil water' notice means or what a 'do not use' notice involves. This will eliminate misunderstandings within real emergency situations.

Develop standard procedure and infrastructure for emergency calls to customers. A variety of standard notifications should be prepared for varying events. Alerting the customer base quickly of an event could be more critical to protecting health than restoring water quality quickly.

Regular exercise of procedures is essential to respond to unusual and emergency events efficiently. It may be beneficial to open the emergency operations center at lower levels to ensure protocol is exercised on a more regular basis. Table-top and on-ground exercises are also recommended to ensure everyone is familiar with procedures and to resolve potential bottlenecks. Timely communication is critical because it takes 24-hours for bacteriological analysis, and once results are available, response must proceed efficiently.

It is important to absorb important emergency activities into the routine so that an emergency event is just an extension of managing normal events. The same workers and the same tools will be utilized in an emergency as are utilized every day.

Efficiency can be increased by eliminating redundant efforts and streamlining activities. SFPUC should facilitate clear interfaces across sectors through on-going exercises and discussions (e.g., Red Cross distributing chlorine tablets and bottled water).

Section 4

Recommendations

4.1 Recommendations

Recommendations were developed per priority area through workshops bringing together various SFPUC divisions, external stakeholders, outside experts and members of other utilities. The recommendations are organized into three categories based on their resource requirements:

In this section...	
Recommendations.....	4-1
Relationship to Water Quality Protection Plan.....	4-1

- *Enhancements to On-Going Activities:* These projects are a continuation of or slightly build upon current efforts. Some staffing adjustment may be required to current efforts but substantial new resources are not required.
- *Scoping Studies:* These projects require more study and thought before specific actions are developed. Some resources will be needed for the planning studies which will determine the extent of future action.
- *New Projects:* These projects have a more defined scope. An approximation of needed resources can be more clearly estimated.

All these recommendations are displayed according to the ten priority areas in Table 4-1.

4.2 Relationship to Water Quality Protection Plan

The key recommendations are listed in Table 4-2 and cross referenced to recommendations from the 2008 SFPUC Water Quality Protection Plan (WQPP). The eleven (11) WQPP recommendations are:

1. Protect and retain Hetch Hetchy Reservoir as SFPUC's primary source water.
2. Continue watershed protection efforts at local reservoirs as outlined in the watershed management plans.
3. Continue to evaluate advanced treatment options to bring alternative supply sources to Hetch Hetchy quality.
4. Continue to monitor technology developments.
5. Conduct a formal distribution system operations assessment.
6. Clarify and revise the monitoring framework for emerging contaminants.

Table 4-1: Summary of Recommendations			
Ten Priority Areas	Enhancements to Ongoing Activities	Scoping Studies	New Projects
Role as a Utility		SS.1 Assess feasibility of providing water quality services for individual customers	NP.1 Characterize water quality in large buildings NP.2 Provide guidance on flushing, point-of-use devices, or pipe replacement if issues are determined
Public Health and Emerging Contaminants	E.1 Continue low-level arsenic monitoring of the source waters and watershed. Consider expansion of bromate monitoring at HTWTP and within the distribution system E.2 Continued attention should be paid to formation of nitrosamines E.3 Continue liaison with public health and medical community locally to ascertain any shifts in health patterns that could plausibly be associated with drinking water E.4 Partner with county health departments to distribute health information in larger context (i.e., lead in water as a portion of lead exposure)	SS.2 Develop policy for addressing emerging contaminants	
Technological Advances	E.5 Continue to track advancements in technology and understanding of health risks		
Regulations	E.6 Remain involved with legislative/regulatory process as early as possible to help shape regulatory initiatives		
Water Quality Management Approach	E.7 Protect and retain Sierra resources especially Hetch Hetchy Reservoir E.8 Build more comprehensive source water quality management strategy for the local watersheds particularly with regards to nutrient management	SS.3 Assess improved methods for water quality data management beyond the current LIMS system	NP.3 Develop a risk management tool to more systematically identify vulnerabilities and opportunity for risk reduction concerning water quality reliability NP.4 Conduct formal distribution system assessment NP.5 Revise existing cross-connection controls ordinance and update policies
Communication with Customers	E.9 Share relevant and integrated information with customers through a variety of means (website, CCR reports, media outlets, public health groups) and in a variety of languages E.10 Utilize stakeholders more effectively for guiding outreach efforts and informing on alternatives for future action E.11 Review the contents of water quality web pages annually for major water utilities appropriate natural and international associations/agencies. Update SFPUC webpage and provide links to relevant topics.	SS.4 Develop risk metrics and shared understanding of risk amongst SFPUC leaders and stakeholders ¹ SS.5 Refine internal process and procedure for disseminating new and historical information SS.6 Determine the values SFPUC wants to be known for (i.e., consistent water quality, efficiency, responsiveness, vigilant testing) and align internal structures with them	NP.6 Survey customer base to determine desired services and willingness-to-pay
Quantity		SS.7 Track development and use of alternative sources in the area such as groundwater, Delta water, desalination and reuse to stay informed if quantity or quality concerns arise	
Climate Change	E.12 Continue involvement in civic and professional associations tracking developments, identifying measures and implementing best practices	SS.9 Energy conservation, minimizing greenhouse gases and minimizing chemical use.	NP.7 Evaluate unit process and overall treatment capacity for various source water quality degradation scenarios NP.8 Monitor key source and treated water quality and quantity indicators for long-term, annual and seasonal trends (e.g., temperature, turbidity, coliforms, algal blooms, algal toxins, TOC, DBPs, chlorine residuals, metals, nitrite) NP.9 Develop and/or update operations plan governing reservoir and transmission operations for water quality impacts
Sustainability ²		SS.8 Assess need for tracking additional sustainability metrics.	
Catastrophic Events	E.13 Communicate emergency procedures and responsibilities thoroughly before and during events to SFPUC staff, wholesale customer, outside aid agencies and the service population E.14 Continue to update and exercise contingency plans for anomalies and catastrophic circumstances		

¹ SS.4 and NP.3 echo the emphasis on a “systematic, Department-wide risk management plan, applied consistently across the enterprises and bureaus, will add value to these efforts by helping to identify other and future risks and ensure that risk exposure is reduced to a level that is acceptable to the SFPUC” addressed in the *Sustainability Plan and Program 2008*, http://sfwater.org/detail.cfm/MC_ID/18/MS_C_ID/121/C_ID/4287

² SS.8 and SS.9 are expressions of recommendations also contained in the *Sustainability Plan and Program 2008*, http://sfwater.org/detail.cfm/MC_ID/18/MS_C_ID/121/C_ID/4287 specifically noted are “environmental impacts stemming from the SFPUC’s internal operations and functions include: greenhouse gas emissions...”

7. Evaluate and utilize appropriate on-line water quality monitoring instruments.
8. Improve the depth and frequency of interaction, consultation and engagement with customers.
9. Explore opportunities to extend SFPUC engagement beyond the meter.
10. Develop a comprehensive, analytical integrated risk management framework for guiding allocation of resources.
11. Integrate fundamental objectives for water quality protection across various SFPUC divisions and task Water Quality Director to review capital and operational decisions.

Table 4-2: Near-Term Strategic Planning Recommendations

<i>Priority Area</i>	<i>Recommendation</i>	<i>WQPP Recs</i>
HIGHEST PRIORITIES		
Role of Utility	Characterize water quality in large buildings. Provide guidance on flushing or pipe replacement if significant needs are ascertained.	9
	Assess feasibility of providing special water quality services for individual customers.	9
Public Health and Emerging Contaminants	Develop policy for addressing emerging contaminants.	6
Technological Advances	Continue to track advancements in technology and understanding of health risks. Includes industry engagement through committees and key conferences.	4, 7
Regulations	Remain involved with regulatory process as early as possible to help shape regulatory initiatives (e.g., AMWA, AWWA, ACWA, etc.).	8, 9, 10
Water Quality Management Approach <i>(Source, Treatment, Distribution and overall Integration)</i>	<i>Source:</i> Protect and retain Sierra resources especially Hetch Hetchy Reservoir	1
	<i>Source:</i> Build more comprehensive source water quality management strategy for the local watersheds particularly with regards to nutrient management.	2
	<i>Integration:</i> Develop an integrated risk management tool to more systematically and comprehensively identify vulnerabilities and opportunities for risk reduction concerning water quality reliability.	10
	<i>Distribution:</i> Conduct formal distribution system assessment.	5
Communication with Customers	Share relevant and integrated information with customers through a variety of means (website, consumer confidence reports, media outlets, public health groups) and in a variety of languages.	8
	Develop a shared understanding and language for risk amongst SFPUC leaders and stakeholders.	8
	Survey customer base to determine desired services and willingness-to-pay.	8, 9
Quantity	Track development and use of alternative sources such as groundwater, Delta water, desalination and reuse to stay informed if quantity or quality concerns arise through active WSIP engagement.	3
Climate Change	Monitor key source and treated water quality and quantity indicators for annual and seasonal trends (temperature, turbidity, coliforms, algal blooms, algal toxins, TOC, DBPs, chlorine residuals, metals, nitrite).	1, 2, 6
	Evaluate unit process and overall treatment capacity for various source water quality degradation scenarios.	10

Table 4-2: Near-Term Strategic Planning Recommendations

Priority Area	Recommendation	WQPP Recs
Catastrophic Events	Communicate emergency procedures and responsibilities thoroughly before and during events to SFPUC staff, BAWSCA, outside aid agencies and the service population (e.g., 2009 drill).	10
	Continue to update and exercise contingency plans for anomalies and catastrophic circumstances (e.g., notifications plan update, emergency disinfection system recovery plan).	10
HIGH PRIORITIES		
Public Health and Emerging Contaminants	Continue monitoring the source waters and watershed for arsenic. Consider expansion of bromate monitoring at HTWTP and within the distribution system	1,2,5
	Continue liaison with public health and medical community locally to ascertain shifts in health patterns that could plausibly be associated with drinking water.	6
	Continued attention should be paid to formation of nitrosamines.	6
	Partner with county health departments to distribute health information in larger context (i.e., lead in water as a portion of lead exposure).	6, 8
Water Quality Management Approach	Assess improved methods for water quality data management beyond the current LIMS system.	4
Communication with Customers	Refine internal disclosure policy of new and historical information.	8
	Determine the values WQD wants to be known for (i.e., consistent water quality, efficiency, responsiveness, vigilant testing) and align internal structures with them.	11
MEDIUM PRIORITIES		
Communication with Customers	Utilize stakeholders more effectively for guiding outreach and informing alternatives for future actions.	8
	Review annually the contents of water quality web pages for major water utilities and semi-annually the contents of water quality pages of CDPH, USEPA, AWWA, WRF, WHO, etc.	8
	Update SFPUC webpage and provide links to relevant topics.	
Sustainability and Climate Change	Incorporate sustainability concerns into routine activities and decisions.	-
	Evaluate potential impacts of climate change. Focus on energy conservation, minimizing greenhouse gas (GHG) emissions and minimizing chemical use.	-

Section 5 Implementation

As noted in Section 1, this document represents the beginning of a regular process for stakeholder consultation and deliberation: the stakeholders will work with SFPUC staff to identify strategic actions for the WQD workplan (see Figure 5-1).

In this section:	
Table 5-1: Enhancements to On-Going Activities	5-3
Table 5-2: Scoping Studies.....	5-7
Table 5-3: New Projects.....	5-11



Legend

- ① Major update every 6 years
- ② Report revised every 3 years
- ③ Key stakeholders
 - Wholesale Customer Agencies (SFPUC - Wholesale Agency, WQ Committee Proposal)
 - Retail Customers (CAC - Water Subcommittee)
 - Regulatory Agencies (CDPH, USEPA)
 - Public Health Agencies (SFDPH, SMCODPH, etc.)
 - Community Organizations/NGO's
 - Other Government/City Departments, etc.

**Figure 5-1
Stakeholder Involvement in Implementation of Water Quality Strategic Plan**

Development (and subsequent revisions) of the work plan will take into consideration such factors as current WQD workload (see Figure 5-2), available resources, new research and regulatory developments. WQD mission, organization and work areas are described in Appendix E.

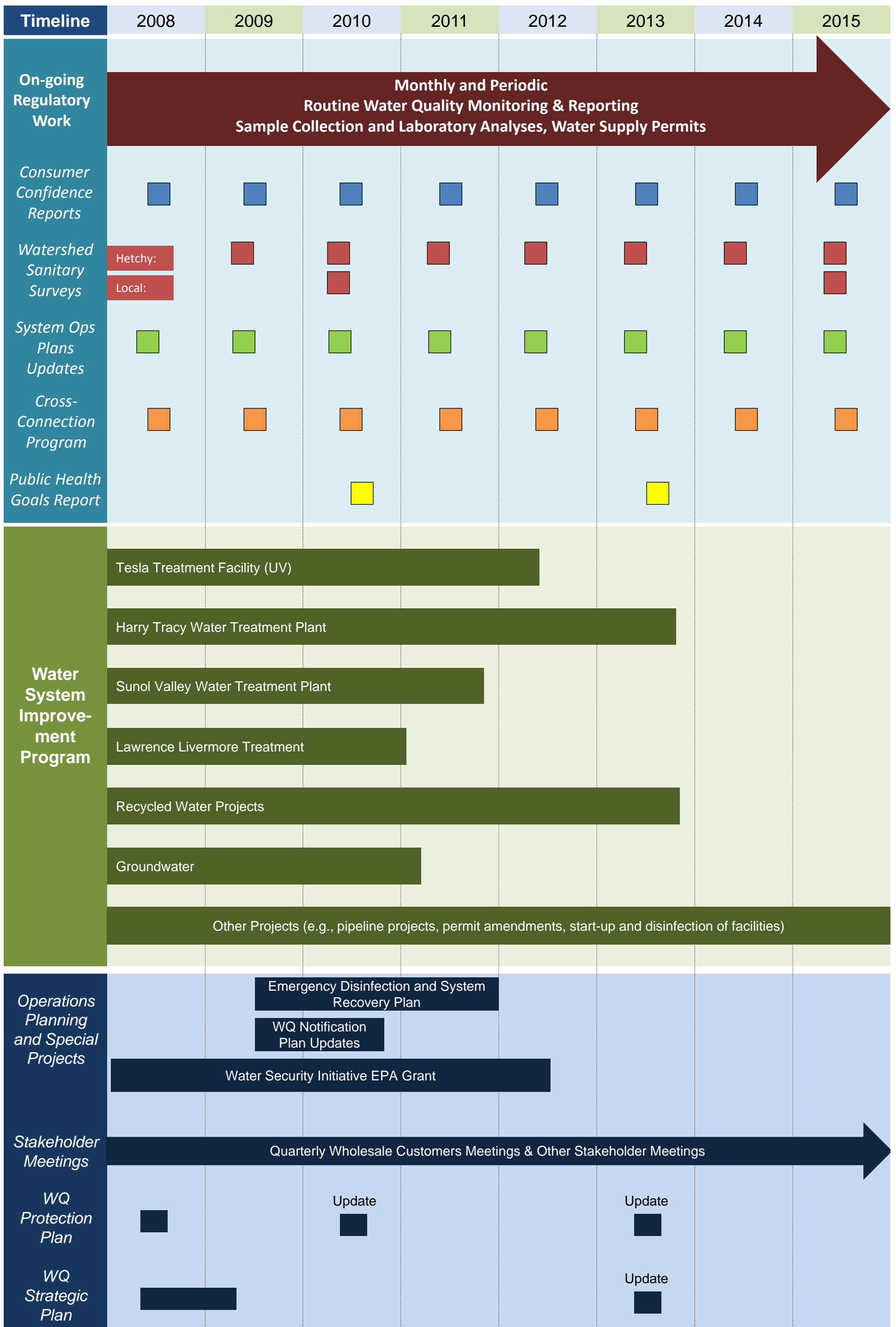


Figure 5-2
 Current Water Quality Division Workload
 (Does not Include Operations Support Activities)

As a starting point, the enhancements to on-going activities, scoping studies and new projects have been outlined in Tables 5-1 to 5-3 according to rationale, objective and potential steps. Enhancements to on-going activities build on the details of the current programs described in Section 3 and list the additional resources necessary to expand the program as recommended. Scoping studies and new projects list precedents set by other agencies, relevant research, items for consideration, cost and duration.

An initial schedule for implementation has been prepared as a starting point for deliberations (see Figure 5-3). As the strategic planning process is dynamic, adjustments will be required. It is envisioned that, in addition to annual refinements to the plan, broader re-examination of the trends and issues will be reviewed every other cycle of Public Health Goal reporting and Water Quality Protection Plan update.

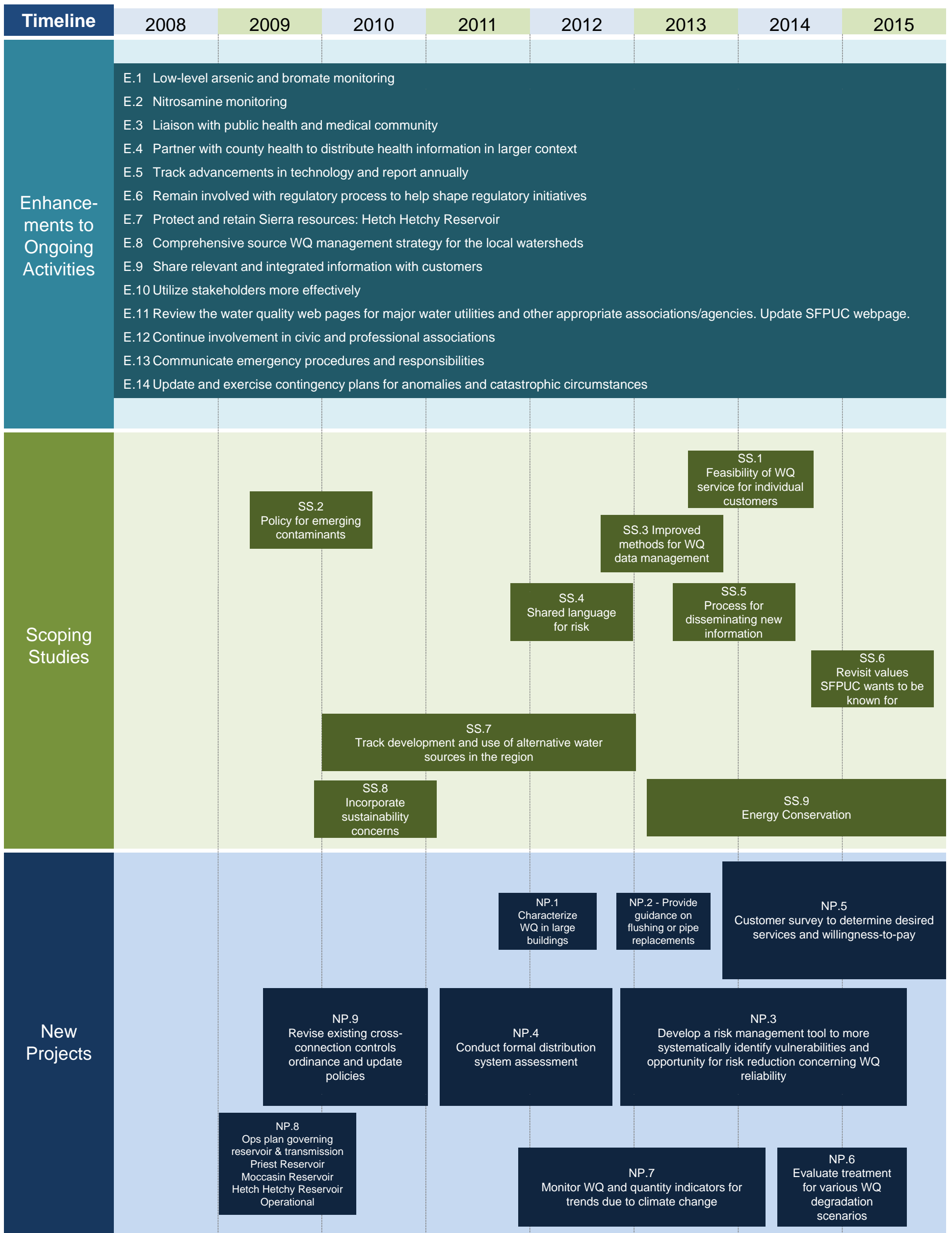


Figure 5-3
Proposed Implementation for
Water Quality Planning Recommendations

Table 5-1: Enhancements to On-Going Activities

Priority Area	Recommendation Rationale	Objectives	Current Activities – Precedent	Potential Steps	Additional Resources Needed
Role as a Utility	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
Public Health and Emerging Contaminants	<p>E.1 Continue low-level arsenic monitoring of the source waters and watershed. Consider expansion of bromate monitoring at HTWTP and within the distribution system¹.</p> <p><i>High potency constituents can be significant drivers of potential health effects (e.g., association between arsenic and diabetes). SFPUC may need to collect expanded information for constituents of interest (i.e., test at lower detection limits, more frequently than required and at more locations to provide data of interest to SFPUC and customers).</i></p>	<p>Refine estimates for overall chemical risks by improving the quality of occurrence data for high potency constituents known to occur in the SFPUC system.</p> <p>Inform the SFPUC and the public on chemicals of interest</p>	<p>Arsenic and bromate monitoring already in place. A limited low-level survey at additional locations has been completed.</p> <p>Public Health Goal report triennially developed (next in 2010).</p>	<ul style="list-style-type: none"> Identify appropriate detection limits, locations, and frequency for testing. Conduct bromate method detection limit studies. Determine how to respond to detections. 	<ul style="list-style-type: none"> Analytical support for lower detection limits. Staff time needed for sample collection. Financial resources for any outside lab work.
	<p>E.2 Continued attention should be paid to formation of nitrosamines.²</p> <p><i>Mixtures of DBPs are increasingly understood to pose measurable health risks. Regular literature reviews coupled with monitoring of key constituents aids identifying where to focus risk management efforts. Nitrogenous DBPs are of keen interest.</i></p>	<p>Strengthen knowledge of emerging contaminants with plausible human health effects that may be formed during treatment of SFPUC water.</p> <p>Inform the SFPUC and the public on chemicals of interest</p>	<p>NDMA is currently monitored and levels are below CA Notification Level of 10 ng/L. SFPUC has participated in an AWWARF iodo-acid study as well. Six nitrosoamines were monitored as part of UCMR2 at system entries and maximum detention distribution system sites.</p>	<ul style="list-style-type: none"> Review available information on national occurrence and any health effects information. Determine how to respond to detections. 	<ul style="list-style-type: none"> Access to literature and technical journals. Allotment of time for regular literature review and reporting. Resources needed for monitoring as indicated by literature and prior results.
	<p>E.3 Continue liaison with public health and medical community locally to ascertain shifts in health patterns that could plausibly be associated with drinking water.</p> <p><i>The ultimate endpoint is not specific water quality parameters or regulatory compliance, but specific health outcomes. Clues as to priorities might be obtained through health networks.</i></p>	<p>Develop an early signal network that might trigger examination for particular microbes or chemicals associated with water and the conditions that govern their occurrence.</p> <p>Help inform the public and address potential customer health concerns</p>	<p>SFPUC funds, through a work order, the Cryptosporidiosis Surveillance Project to monitor the occurrence of cryptosporidiosis throughout all counties served by the SFPUC.</p>	<ul style="list-style-type: none"> Review annual compilation of leading causes of morbidity and mortality, including alternative health metrics (e.g., disability adjusted life years). Formation of alliances with other health organizations. Waterborne disease monitoring, assessment and response activities are planned as part of the EPA Water Security Initiative Grant. 	<ul style="list-style-type: none"> Regularly review scope and direction of SFDPH program to ensure alignment with SFPUC insights and objectives.
	<p>E.4 Partner with county health departments to distribute health information in larger context (i.e., lead in water as a portion of lead exposure).</p> <p><i>Many contaminants found in water have multiple sources (e.g., food, commercial beverages, air, etc.). Providing context as to major versus minor sources can guide more prudent risk management decisions.</i></p>	<p>Integrate health messages on certain endpoints and/or contaminants to clarify relative risks and guide sensible personal risk management decisions.</p> <p>Help inform the public and address potential customer health concerns</p>	<p>SFPUC funds two epidemiologist positions within SFDPH. Bi-monthly Collaboration Meetings are held to discuss activities, including emergency response planning/support, emerging and existing contaminants, emerging and known public health issues, cross connection control, regulatory developments, and interagency projects. Other county health departments participate as invited.</p> <p>SFPUC partners with SFDPH to create and post factsheets to the SFPUC website for contaminants of interest; SFDPH maintains a separate website with water</p>	<ul style="list-style-type: none"> Develop guidance that considers the multi-media nature of exposure to various contaminants. Develop guidance that considers other exposures that might contribute to an endpoint of concern (e.g., miscarriage risks). Continued Bi-Monthly SFPUC-SFDPH Collaboration Meeting and as needed communications. Review number of webpage visits and fact sheet downloads every six months. Potential inclusion of other agencies (ie BAWSCA, county health departments) into discussions. EPA Water Security Initiative includes a component for bi-monthly meetings of a multi-county group of health 	<ul style="list-style-type: none"> Staff time for meeting with local health organizations to review current materials and discuss integration. Time and resources to create newly integrated informational material. Participation in national committees focused on health communication issues.

¹ Part of refining strategy on emerging contaminants (see pg 5-9 - SS.6).

² Part of refining strategy on emerging contaminants (see pg 5-9 - SS.6).

Table 5-1: Enhancements to On-Going Activities

Priority Area	Recommendation Rationale	Objectives	Current Activities – Precedent	Potential Steps	Additional Resources Needed
Technological Advances	<p>E.5 Continue to track advancements in technology and understanding of health risks.³</p> <p><i>Monitoring progress in these areas is essential to identifying key shifts, exploring new technologies and exploring implementation issues.</i></p>	Regularly report to relevant SFPUC staff on technological advances in monitoring, treatment, health risks, customer service, etc.	<p>epidemiology information relevant to the SFPUC.</p> <p>SFPUC currently remains connected to industry trends through collaborative projects with other agencies and research organizations as well as leadership through professional organizations.</p> <p>Current access to subscription service publications is limited.</p>	<p>officials for the purpose of waterborne contamination emergency planning.</p> <ul style="list-style-type: none"> • Maintain library of SFPUC reports and memos as well as provide access to technical publications through library subscriptions. • Continue to fund AWWA Webcasts. • Continue WRF subscription and provide WRF webcasts. • Consider an annual internal briefing on technology advances by industry experts to keep staff up to date. • SFDPH could provide annual update on health issues. • Fund SFGTV workorder to record trainings and important events for continuing education. • Use laboratory research group to follow emerging contaminant research and improvements in detection limits. 	<ul style="list-style-type: none"> • Staff time for review of journal articles and summary of new research of interest to SFPUC. • Resources for pilot studies of new technologies within SFPUC system (e.g., UV, etc.). • Resources for publication subscriptions and webcasts. • Professional services support.
Regulations	<p>E.6 Remain involved with regulatory process as early as possible to help shape regulatory initiatives.</p> <p><i>Early involvement is crucial to framing the direction of various regulatory efforts so that the focus is on maximizing efficient risk reduction.</i></p>	Shape regulatory initiatives to increase flexibility for how SFPUC invests its resources to best reduce its particular risks.	SFPUC has commented on various regulations in the past: Surface Water Treatment Rule, Disinfection By-Product Rule and others. SFPUC has also been involved in industry committees providing input to EPA on such rules.	<ul style="list-style-type: none"> • Continue industry associate committee involvement. • Review and comment to USEPA on upcoming regulations. • Consolidate SFPUC comments. • Review AWWA comments. 	<ul style="list-style-type: none"> • Staff time and resources to monitor regulatory activities, participate in steering committees and submit comments on public documents.
Water Quality Management Approach (Source, Treatment, Distribution and overall Integration)	<p>E.7 Protect and retain Sierra resources especially Hetch Hetchy Reservoir.⁴</p> <p><i>Selection of high quality source water is perhaps the most important factor governing water quality at the tap.</i></p>	<p>Maintain status of having some of the cleanest and most pristine source water in the nation.</p> <p>SFPUC's policy is to maintain filtration waiver and continue having a system that requires no pumping (i.e., gravity-fed).</p>	<p>SFPUC works with the National Parks Service to protect the Hetch Hetchy watershed.</p> <p>Some environmental groups have called for the dismantling of Hetch Hetchy O'Shaughnessy Dam to restore the valley to its initial state.</p>	<ul style="list-style-type: none"> • Continue watershed protection program and involvement on water rights issues. • Characterize potential for long-term water quality changes. • Consider improvements to Priest and Moccasin Reservoirs since there is higher vulnerability to contamination than at Hetch Hetchy. 	<ul style="list-style-type: none"> • Staff time and resources.
	<p>E.8 Build more comprehensive source water quality management strategy for the local watersheds particularly with regards to nutrient management.⁵</p> <p><i>Growth of algae can produce off-tastes and odors (a source of customer complaints) plus limit capacity of treatment facilities.</i></p>	Protect source water quality.	Water quality data indicates that generally water from the Alameda and Peninsula sources is of excellent quality; however frequency and levels of algae growth have increased recently.	<ul style="list-style-type: none"> • Develop and implement a nutrient control strategy particularly in Crystal Springs and San Andreas Reservoirs including optimization of Pulgas Facility. • Develop algae monitoring and mitigation program. • Evaluate effectiveness of current hypolimnetic oxygenation systems. • Evaluate current algaecide efforts. • Implement Watershed Management Plans. • Continue to limit access to watersheds. 	<ul style="list-style-type: none"> • Staff time and resources for developing a nutrient control strategy and algae monitoring and mitigation program. • Professional services support. • Resources to implement priority recommendations from Watershed Management Plans. • Laboratory resources for TON and Flavor Profile Analysis.

³ Linked with WQPP Recommendation #4 on monitoring and reporting on technology developments.

⁴ Linked to WQPP Recommendation #1 to protect and retain Hetch Hetchy Reservoir.

⁵ Linked to WQPP Recommendation #2 to continue watershed protection efforts on local watersheds.

Table 5-1: Enhancements to On-Going Activities

Priority Area	Recommendation Rationale	Objectives	Current Activities – Precedent	Potential Steps	Additional Resources Needed
Communication with Customers	<p>E.9 Share relevant and integrated information with customers through a variety of means (website, CCR reports, media outlets, public health groups) and in a variety of languages.</p> <p><i>A variety of modes of communication are important with a heterogeneous population.</i></p>	<p>Be proactive and responsive to customers; incorporate cultural differences in communications strategies; target underserved populations, such as low income renters.</p> <p>Provide up-to-date information. Ensure consistent message between WQD, SFDPH, Communications</p>	<p>The Communications group sends out various materials to customers. SFDPH and SFPUC post a variety of water quality information on their websites. WQD prepares annual consumer confidence reports (CCR).</p>	<ul style="list-style-type: none"> Establish procedure for development, review and publishing of water quality information for CCSF: priority, content, format, distribution, target audience. Establish a committee to advise on the above, as well as other customer communication issues regarding water quality: WQD, SFDPH, Communications. Begin strategically reviewing current documents for opportunities to integrate information and increase relevance to customer concerns. 	<ul style="list-style-type: none"> Staff time for review and planning of materials. Translation of materials as needed. Increased coordination with Communications Department (assign communications liaison to WQD).
	<p>E.10 Utilize stakeholders more effectively for guiding outreach efforts and informing on alternatives for future action.⁶</p> <p><i>Such participation incorporates a wider spectrum of preferences - essential in engaging issues marked by some uncertainty.</i></p>	<p>Gain insight from stakeholders as a proxy for issues to explore with the larger customer base.</p>	<p>Stakeholder involvement has occurred both informally (e.g., invitations and participation in workshops) and formally (e.g., scheduled meetings with stakeholders).</p>	<ul style="list-style-type: none"> WQD representative to review stakeholders agendas and minutes and attend meeting when appropriate. Provide information to stakeholders as requested. 	<ul style="list-style-type: none"> Time for staff to prepare for and attend meetings as appropriate. Potential for episodic additional workloads as major customer concerns arise (i.e., Citizens Concerned about Chloramine).
	<p>E.11 Review annually the contents of water quality web pages for major water utilities and CDPH, USEPA, AWWA, WRF, WHO, and appropriate international associations/agencies. Update SFPUC webpage and provide links to relevant topics.</p> <p><i>Perspectives gained from these organizations may enhance the quality of SFPUC communications.</i></p>	<p>Streamline efforts for creating and incorporating new material.</p> <p>Ensure SFPUC website remains an up-to-date and readily accessible source of information for customers.</p>	<p>SFPUC website is updated regularly with new and revised reports, press releases, meetings and water quality information.</p> <p>SFPUC website materials have been referenced nationally.</p>	<ul style="list-style-type: none"> Analyst review of appropriate websites and identification of information of interest. Preparation of informational packet for review by committee. Develop master list/entry of web page topics and update schedule. Develop a process to streamline webpage revisions, provide input and keep everyone informed. Tally of monthly web page visits and downloads reported to WQD to gauge information usage. 	<ul style="list-style-type: none"> Staff time for website review and incorporation of new material onto sfwater.org.
Quantity	See Section 3 for current activities.				
Climate Change	<p>E.12 Continue involvement in civic and professional associations tracking developments, identifying measures and implementing best practices.</p> <p><i>Participating in various efforts in this rapidly developing field is the most efficient and rapid manner for SFPUC to continue being at the leading edge of efforts to reduce footprint.</i></p>	<p>Track efforts being undertaken by others.</p> <p>Provide recommendations to SFPUC management and operations as necessary</p>	<p>SFPUC currently involved in various efforts directed by City to reduce carbon footprint including solar power and hybrid vehicles.</p> <p>SFPUC taking national leadership role with WUCA, WRF and other involvements.</p>	<ul style="list-style-type: none"> Review what steps are taken by other utilities and USEPA. Identify potential research efforts of particular relevance for SFPUC. 	
Sustainability	See Section 3 for current activities.				

⁶ Linked to WQPP Recommendation #8 to improve the depth and frequency of interaction and engagement with customers.

Table 5-1: Enhancements to On-Going Activities

Priority Area	Recommendation Rationale	Objectives	Current Activities – Precedent	Potential Steps	Additional Resources Needed
Catastrophic Events	<p>E.13 Communicate emergency procedures and responsibilities thoroughly before and during events to SFPUC staff, wholesale customers, outside aid agencies and the service population.</p> <p><i>Preparation is essential for efficient responses and limiting adverse effects.</i></p>	<p>Streamline response of WQD staff and improve cooperation with outside agencies.</p> <p>Inform the public to manage expectations and improve preparedness.</p>	<p>Information on emergency preparedness is posted on the sfgov website; however emergency preparedness information is not clearly posted on the sfwater website</p> <p>Three WQD staff members are on call at all times to respond to emergency scenarios. Three WQD staff members are on call at all times to respond to emergency scenarios.</p>	<ul style="list-style-type: none"> Streamline WQD staff response during emergencies through meaningful training exercises (e.g., contaminant warning system, <i>Cryptosporidium</i> action plan, wholesale customer communication in early 2009 and in 2011). Informational materials on emergency preparedness to the public. Clearly post emergency preparedness webpage. Update WQD notification and communications plan. 	<ul style="list-style-type: none"> Staff time and resources for developing public outreach materials describing emergency procedures. Time to coordinate plans with outside agencies. Time and resources for staff training. Professional services support to update notification and communications plan.
	<p>E.14 Continue to update and exercise contingency plans for anomalies and catastrophic circumstances.</p> <p><i>New information needs to be incorporated. Preparation is key to efficient responses.</i></p>	<p>Increase familiarity with emergency equipment and procedures through drills to identify and address bottlenecks.</p> <p>Streamline WQD staff response during emergencies through meaningful training exercises.</p>	<p>Emergency operations centers and procedures in place. Process exists for regular updates through the EPA Security Grant.</p>	<ul style="list-style-type: none"> Exercise contingency plans for lower level events as a means to practice for higher level emergencies. Increased debriefing after events to identify lessons learned and address bottlenecks. Complete emergency disinfection system plan as required by AB 1832. Complete EPA Water Security Initiative grant. 	<ul style="list-style-type: none"> Cost incurred for opening emergency operations center during naturally occurring anomalies in system operation. Increase resources for debriefing after events.

Table 5-2: Scoping Studies								
Priority Area	Recommendation Rationale	Objectives	Precedent	Relevant Research	Potential Steps	Considerations	Cost ⁷	Duration (years)
Role as a Utility	<p>SS.1 Assess feasibility of providing water quality services for individual customers.</p> <p><i>Customers focus is on water quality out of the tap whereas most water quality testing occurs in source water, entry to the distribution system and before the water meter.</i></p>	Determine which services might be reasonably offered to customers and identify next steps for further evaluation.	<p>American Water offers both service line and in-house plumbing repair services. For example, for an additional \$3.99 per month to existing water or sewer line protection program customers, American Water covers the cost of up to \$1500 per repair, with no limit on the number of allowable repairs each year. Homeowners pay a \$50 service fee each time an authorized service provider is dispatched to investigate or service the water or sewer line within the home.⁸</p> <p>SFPUC provides lead tests to customers on request for a fee.</p>	<p>WRF Project 2638: "Customer Attitudes and Perception of Point of Use Applications and Bottled Water Use". 2003.</p> <p>WRF Project 2761: "Comparison of Conventional and Unconventional Approaches for the Provision of Water". 2004.</p>	<ol style="list-style-type: none"> 1. Review and summarize available literature along with what other utilities are doing. 2. Refine list of short-term (e.g., information and education; spot testing) and long-term alternatives (e.g., testing service for a fee, in-home inspections, database of officially certified plumbers, POU/POE devices, etc.). 3. Develop cost estimates for various services. Compare to willingness-to-pay data. 4. Discuss internally with Customer Service, City Attorney and City water supply system. 5. Develop consensus as to directions in which to proceed and further steps to take. 6. Present recommendations to the Commission. 	<ul style="list-style-type: none"> • Trade unions and local business impacts. • Liability issues. • Low income customer impacts. • SFPUC capacity. • Begin after extent of water quality deterioration in premise plumbing is determined (0.5 years). • Feeds into willingness to pay surveys. 	\$\$	0.5
Public Health and Emerging Contaminants	<p>SS.2 Determine policy for addressing emerging contaminants.⁹</p> <p><i>Determining the balance between participating in exploratory research and due diligence vs developing data open to a wide range of interpretations and unclear responses requires discussion.</i></p>	Develop standard approach to aid SFPUC as new contaminants and potential health risks emerge.	<p>SFPUC has participated in regulatory (UCMR), and non-regulatory (WRF PPCPs and EDCs, EPA iodo-DBPs) surveys of emerging contaminants.</p> <p>Some utilities address issues on an ad hoc basis, whereas others are more deliberate. For example, MWRA has developed its own internal guidance for addressing emerging contaminants. LADWP has created a risk framework for providing context.</p> <p>SFPUC measures VOC/SOC for new coatings in pipes and reservoirs.</p>	<p>WRF. "Risk Analysis Strategies for Credible and Defensible Utility Decisions". 2007.</p> <p>WRF Project 2776: "Risk Communication for Emerging Contaminants" 2004.</p> <p>WRF Project 4169: "Water Utility Framework for Responding to Emerging Contaminant Issues", (On-Going)</p>	<ol style="list-style-type: none"> 1. Review and summarize what other utilities are doing. 2. Form group to research various policy choices and provide recommendations. Possible policies to consider: <ul style="list-style-type: none"> • Monitor for all emerging contaminants • Participate in nationwide and statewide surveys by USEPA, WRF, CDPH • Save resources by limiting monitoring • Create checklist of criteria to induce monitoring efforts 3. Formalize policy in document including how to interpret and communicate monitoring results. 	<ul style="list-style-type: none"> • Partner with other utilities to give results of emerging contaminant monitoring greater context. • There may be a need to monitor regulated contaminants at lower levels and new locations; e.g., arsenic, bromate. • Need to interpret results in context. 	\$	0.3

⁷ \$ = less than or equal to \$100,000; \$\$ = \$100,000 - \$200,000; \$\$\$ = greater than \$200,000

⁸ See <http://www.amwater.com/products-and-services/Residential-Services/Service-Line-Protection-Program/page8528.html> and <http://www.amwater.com/products-and-services/Residential-Services/Service-Line-Protection-Program/page8526.html>

⁹ Linked with WQPP Recommendation #6 to clarify and revise the rationale monitoring emerging contaminants.

Table 5-2: Scoping Studies								
Priority Area	Recommendation Rationale	Objectives	Precedent	Relevant Research	Potential Steps	Considerations	Cost ⁷	Duration (years)
Water Quality Management Approach	<p>SS.3 Assess improved methods for water quality data management beyond the current LIMS system. ¹⁰</p> <p><i>Increasing amounts of data are being gathered for various purposes (e.g., regulatory compliance, system monitoring, operational and capital decision making). Facilitating access and analysis of data may improve efficiency.</i></p>	<p>Ease the dissemination of information internally and externally as well as promote increased analysis of gathered data.</p> <p>Better manage on-line data; improve reliability of on-line data. Streamline regulatory and operational reports</p>	<p>Most of the participating utilities in WRF Project 2764 used several different databases for water quality purposes with several utilities starting to integrate these databases to improve data access and utilization. Challenges related to water quality data management included use of outdated or inaccurate data, lack of standard methods for synthesizing water quality and system information, and difficulties with integrating databases. (WRF #2764)</p> <p>In-step, 311 SFPUC developed consumer complaints database, 311 call center provides input into the database as well as WQ staff.</p> <p>SFPUC In-step data historians archives on-line water quality data.</p>	<p>WRF Project 2764: "Data Integration for Water Quality Management". 2005.</p> <p>WRF Project 4097: "Optimizing Information Technology Solutions for Water Utilities" (On-Going)</p> <p>"Implementing LIMS: A 'How-To' Guide". Analytical Chemistry. January 2000. http://pubs.acs.org/doi/abs/10.1021/ac0027082</p>	<ol style="list-style-type: none"> 1. Inventory on-line water quality instrumentation, QA/QC procedures and on-line monitor maintenance. 2. Inventory of lab capabilities, pricing, detection limits, turnaround times. 3. Analyze additional data management systems for increased usability and analysis tools. 4. Recommendations for upgrading the data management strategy. 	<ul style="list-style-type: none"> • Coordination with EPA Security Grant which includes upgrading data management capabilities. • Varying technical skills of users. • Expandability for exponential growth in data storage needs. • Desirability of web-based system. 	\$\$	0.5
Communication with Customers	<p>SS.4 Develop risk metrics a shared understanding of risk amongst SFPUC leaders and stakeholders.</p> <p><i>Risk is often understood in a binary (i.e., safe vs dangerous) manner that does not reflect the complex nature of risk, nor is it helpful in making operational and capital decisions.</i></p>	<p>Determine strategy for improving fluency when discussing risk issues</p>	<p>United Utilities in the United Kingdom has regular risk management meetings to review controls and actions on significant exposures, a risk and issues database with established scoring protocols, procedures for escalating significant new risks to directors, and appointed roles of 'risk champion' and 'risk coordinator' in each division (WRF #2939)</p> <p>City West Water in Australia ranks risks and develops optimized risk treatment strategies for its most critical risks using Enterprise Risk Management tools to ensure risks are systematically identified across the organization and managed as needed.</p> <p>SFPUC's Sustainability Plan has proposed a comprehensive identification and assessment of risks posed to the organization along with the development of tools and mechanisms to monitor, evaluate, address, minimize, mitigate, manage and control risks as appropriate.¹¹</p>	<p>National Research Council. <i>Improving Risk Communication</i>. National Academy Press, 1989.</p> <p>National Research Council. <i>Understanding Risk: Informing Decisions in a Democratic Society</i>. National Academy Press, 1996.</p> <p>Presidential/Congressional Commission on Risk Assessment and Risk Management <i>Framework for Environmental Health Risk Management</i>. 1997.</p> <p>USEPA Risk Assessment Portal http://www.epa.gov/risk/</p> <p>WRF Project 2939: "Risk Analysis Strategies for Credible and Defensible Utility Decisions". 2007.</p> <p>WRF Project 4001: "Contaminant Risk Management Communication Strategy and Tools"</p>	<ol style="list-style-type: none"> 1. Review, summarize what other utilities are doing and available literature. 2. Prepare an initial assessment of how staff and interested parties conceptualize risk (e.g., stakeholders, wholesale customer, etc.) 3. Identify different method(s) for improving understanding of risk: workshops, meeting facilitation points, printed material, web course, etc. 4. Develop strategy, project benefits, cost estimates and identify performance measures. 5. Create report with final recommendations. 	<ul style="list-style-type: none"> • Risk comes in many forms such as legal, regulatory, financial, public health, environmental, and reputational risk. These should all be considered. 	\$	0.3

¹⁰ Linked with WQPP Recommendation #7 to utilize appropriate on-line water monitoring instruments.

¹¹ Sustainability Plan and Program 2008, http://sfwater.org/detail.cfm/MC_ID/18/MSD_ID/121/C_ID/4287

Table 5-2: Scoping Studies								
Priority Area	Recommendation Rationale	Objectives	Precedent	Relevant Research	Potential Steps	Considerations	Cost ⁷	Duration (years)
	<p>SS.5 Refine internal process and procedure for disseminating new and historical information.</p> <p><i>As new risks emerge, a premium on access to information is often demanded. Thinking through the policy issues surrounding dissemination of sensitive information is important.</i></p>	<p>Assess adequacy of communications across SFPUC divisions and determine what steps, if any, are needed to improve.</p> <p>Improve information flow and develop staff to better inform customers and provide consistent messages.</p>	<p>More than half the water utilities surveyed in WRF Project 2955 indicated they operated without a formal communication plan. Only 14 percent of the water utility managers surveyed had a formal communications plan integrated with other operational plans. (WRF #2955).</p> <p>Water Quality Notifications Plan</p> <p>Currently Cheryl Davis (SFPUC) is managing a project on Water/Wastewater Enterprise Information System (WWEIS).</p>	<p>WRF Project 2955: "Strategic Communication Planning: A Guide for Water Utilities" 2006.</p> <p>WRF Project 4003: "Organizational Development Needed to Implement a Knowledge Management Strategy at Water Utilities" (On-going).</p>	<ol style="list-style-type: none"> 1. Review and summarize what other utilities are doing along with available literature. 2. Form a working group across multiple divisions to discuss informational policy. 3. Collaborate with the Water/Wastewater Enterprise Information System (WWEIS) project. 4. Creation of a memorandum on informational policy. 	<ul style="list-style-type: none"> • Disclosure of sensitive material. • Compliance with CCSF Sunshine Ordinance. • Ensure the Communications & Public Outreach Department has up-to-date information to provide to customers/media. • Look for collaboration opportunities across divisions. 	\$	0.3
	<p>SS.6 Determine the values SFPUC wants to be known for (i.e., consistent water quality, efficiency, responsiveness, vigilant testing) and align internal structures with them.¹²</p> <p><i>Organizational reputation is built around a deep shared understanding of values and how it is communicated (or branded).</i></p>	<p>Assess current perception of values and how they inform actions and determine further steps WQD is interested in pursuing to build its reputation.</p>	<p>Branding is becoming more common in a variety of industries as a method to symbolize what the company stands for and embed those values into customer minds.</p> <p>California based Utility Branding Network is an organization offering branding services to water and wastewater utilities for a membership of \$5,000 per year.</p>	<p>"Re-examining a Utility's Brand Image" Journal AWWA, Vol. 99 Iss. 9, September 2007.</p> <p>Wheeler, Alina. <i>Designing Brand Identity: A Complete Guide to Creating, Building, and Maintaining Strong Brands</i>. John Wiley & Sons, Inc. 2006.</p>	<ol style="list-style-type: none"> 1. Conduct brief survey to assess perception of WQD/SFPUC values: internal and external. Review SFPUC Sustainability Plan for assessment of employee perceptions. 2. Gather cross-section of employees to review survey results and brainstorm major values for which SFPUC wants to be known. 3. Outline plan to communicate values internally and express values throughout WQD's activities. 4. Develop budget, schedule and performance measures. 	<ul style="list-style-type: none"> • Simplicity of message. • Varying priority of values across working groups. • Conflicting values across SFPUC divisions. 	\$	0.3
Quantity	<p>SS.7 Track development and use of alternative sources in the area such as groundwater, Delta water, desalination and reuse to stay informed if quantity or quality concerns arise.¹³</p> <p><i>Provision of adequate supply coupled with environmental and hydrological concerns will necessitate evaluation of alternative sources of supply inferior to Hetch Hetchy.</i></p>	<p>Coordinate across SFPUC divisions on how potential alternative sources are evaluated.</p>	<p>Recently, proposals from environmental groups to dismantle Hetch Hetchy Reservoir led to consideration of alternative diversion points, including the Delta. Water quality impacts were assessed, particularly with respect to providing comparable quality.</p> <p>Potential drought and emergency preparedness necessitate looking at alternative water supplies.</p> <p>Ongoing development of groundwater sources within SFPUC service area.</p>	<p>CALFED Bay-Delta Program http://calwater.ca.gov/index.aspx</p> <p>WRF Project 4006: Critical Assessment of Implementing Desalination Technology, (On-Going)</p>	<ol style="list-style-type: none"> 1. Form a standing committee to track status of alternative source waters. 2. Review available information. 3. Support wholesale customer programs to conserve water and build alternate supplies. 4. Support intra- and inter-agency projects for conserving potable water, such as Rainwater Harvesting MOU, approved uses for WWTP effluent (e.g. development of policies for use of recycled water for street cleaning equipment). 	<ul style="list-style-type: none"> • Non-deterioration in the eyes of consumers. • Blending and treatment issues. • Cross connection control. • Differing water quality across locations. • Vulnerability of alternative sources and potential watershed protection actions. • Additional regulatory and operational monitoring. 	\$	0.3

¹² Linked with WQPP Recommendation #11 to integrate water quality protection as fundamental goal across divisions.

¹³ Linked with WQPP Recommendation #3 to evaluate options for bringing alternative supply sources to Hetch Hetchy quality.

Table 5-2: Scoping Studies								
Priority Area	Recommendation Rationale	Objectives	Precedent	Relevant Research	Potential Steps	Considerations	Cost ⁷	Duration (years)
Sustainability	<p>SS.8 Assess need for developing and/or tracking additional sustainability metrics.</p> <p><i>Sound measurements enhance credible decision making.</i></p>	Review current evaluation metrics for alternatives analysis (e.g., capital and operating cost, safety, reliability); determine gaps and additional metrics that would assist in decision-making reflective of sustainability concerns (e.g., GHG emissions, energy requirements).	<p>Melbourne Water has established a Community, Environment, Public Health Assessment Checklist to facilitate evaluation of projects on sustainability terms.</p> <p>Seattle Public Utilities is utilizing triple-bottom line reporting in assessing their actions.</p>	<p>WRF Project 4090: "Decision Support System for Sustainable Energy Management". 2007 (SFPUC or Advisory Committee)</p> <p>AMWA. "Implications of Climate Change for Urban Water Utilities". December 2007.</p> <p>SFPUC Sustainability Plan¹⁴</p>	<ol style="list-style-type: none"> 1. Review current evaluation metrics. 2. Form group to review current evaluation metrics and determine additional metrics to promote sustainability. Work cooperatively with the SFPUC Sustainability Plan. 3. Assess adequacy of metrics for new types of activities or projects likely to emerge in the next 5 to 10 years. 4. Determine necessary changes and incorporate. 	<ul style="list-style-type: none"> • Coordination with SFPUC Sustainability Plan. 	\$	0.3
	<p>SS.9 Focus on energy conservation, minimizing greenhouse gas (GHG) emissions and minimizing chemical use.</p> <p><i>San Francisco (and the State of California) are strongly encouraging reductions in environmental footprint.</i></p>	Identify opportunities and issues associated with reducing footprint for regulatory and water quality activities.	<p>Water UK has a benchmark that to supply 1 million liters of water, 0.07 tones of chemicals is an average value. However, this says nothing for the environment and health hazards of differing chemical choices.</p> <p>SFPUC chairs the national Water Utility Climate Alliance (WUCA), SFPUC chairs Water Research Foundation (former AwwaRF) climate chair strategic initiative panel, serves on AWWA climate change team, and AMWA climate change committee.</p> <p>The East Bay Municipal Utility District (EBMUD) joined the California Climate Action Registry to report its greenhouse gas emissions, earning the district a "Green Power Leadership" award from the Environmental Protection Agency. Since EBMUD joined the registry, more than a dozen California water agencies have joined as well as Seattle Public Utilities and the Salt River Project.</p>	<p>"Water Sector Benchmarking and Environmental Sustainability" Journal AWWA, Vol. 100 Iss. 4, April 2008.</p> <p>AMWA. "Implications of Climate Change for Urban Water Utilities". December 2007.</p> <p>Climate Change and Water Resources: A Primer for Municipal Water Providers, K. Miller and D. Yates, National Center for Atmospheric Research (NCAR), WRF Report #91120, 2006.</p> <p>NRDC. "Water Management Strategies to Weather the Effects of Global Warming". July 2007.</p>	<ol style="list-style-type: none"> 1. Determine what other utilities are doing and recommendation from the USEPA. 2. Determine baseline for GHG emissions, waste production, and chemical use within the SFPUC. 3. Consider implementing practices to reduce baselines (i.e. energy conservation, transportation options, on-line instrumentation). 4. WQD process engineers to evaluate energy and chemical optimization and tradeoffs with regulatory compliance. 5. Prepare recommendations. 6. Monitor progress. 	<ul style="list-style-type: none"> • Large safety factors for regulatory compliance can lead to increased energy and chemical usage. Trade-offs should be considered. • Coordinate with the SFPUC Sustainability Plan. 	\$\$	0.5

¹⁴ Sustainability Plan and Program 2008, http://sfwater.org/detail.cfm/MC_ID/18/MS_C_ID/121/C_ID/4287

Table 5-3: New Projects								
Priority Area	Recommendation Rationale	Objectives	Precedent	Relevant Research	Potential Steps	Considerations	Cost	Duration (years)
Role of Utility: Extending Water Quality Services from the Meter to the Tap	<p>NP.1 Characterize water quality in large buildings.</p> <p><i>Customers' experience of water quality is mediated by what is consumed at the tap, not what is at the meter. The large amount of premise plumbing and relatively easy access make large office building a good starting point for investigation.</i></p> <p>NP.2 Provide guidance on flushing, point-of-use devices, or pipe replacement if issues are determined.¹⁵</p> <p><i>A first line of response to water quality changes in premise plumbing is education, similar to guidance on lead for allowing the tap to run in the morning.</i></p>	<p>Ascertain degree of water quality changes between the meter and the customer tap.</p> <p>Identify potential actions for addressing water quality changes.</p> <p>Determine next steps including short-term (e.g., information and education; testing; customer interest in service) and long-term actions.</p>	<p>The Lead and Copper Rule has required in-house testing.</p> <p>Several water utilities have conducted special sampling in schools.</p> <p>Seattle has conducted testing of some buildings to ascertain extent of potential issues.</p> <p><i>Legionella</i> study in SFPUC service area in large buildings showed significant decrease in levels due to chloramine.</p> <p>Utilities in the UK are responsible for meeting water quality standards at public building taps; however not in individual homes.</p> <p>Seoul, Korea tap certification program</p>	<p>National Academy of Sciences. <i>Drinking Water Distribution Systems: Assessing and Reducing Risks</i>. 2006 http://books.nap.edu/openbook.php?record_id=11728</p>	<ol style="list-style-type: none"> 1. Survey and summarize similar programs performed elsewhere. Track activities of WRF Water Quality Distribution Strategic Initiative Program, and TCR/Distribution System FAC follow-up research recommendation. 2. Compile records of building sampling programs for complaints, testing data and recommendations. 3. Evaluate data. 4. Make preliminary determination of extent of issue. Assess need for additional sampling. Determine water quality targets at the tap. 5. Develop survey for targeted buildings determining perceived issues and current water system management practices. 6. Identify buildings and the building managers. 7. Conduct survey (both on-line and telephone with sampling if necessary). 8. Compile and analyze results. 9. Review with stakeholder panel. 10. Develop recommendations. 	<ul style="list-style-type: none"> • Are there other utilities who would be interested in collaborating? • Water Research Foundation funding for Tailored Collaboration? • Should focus be on corrosion by-products or include microbiological evaluation? • Is it desirable to include hospitals in survey or is this a special case? 	\$\$	0.5
Water Quality Management Approach	<p>NP.3 Develop a risk management tool to more systematically identify vulnerabilities and opportunity for risk reduction concerning water quality reliability.¹⁶</p> <p><i>More optimal decisions emerge when considering the overall context of risk. Tools are needed to better understand this overall risk context.</i></p>	<p>Provide basis for more rationally setting investment priorities, whether they be operational or capital. Use results to inform state and federal rule-making efforts.</p> <p>Better inform customers about SFPUC decisions</p>	<p>LADWP employed a risk assessment approach in considering implementation of various treatment technology alternatives.</p> <p>City West Water in Melbourne, Australia has developed a risk management tool to identify and address significant risks to the organization. The utility ranks risks and develops optimized risk treatment strategies for its most critical risks.</p>	<p>EPA Reducing Risk and State of California Comparative Risk Project.</p> <p>Hrudey, Steve. <i>Drinking Water Quality: A Risk Management Approach</i>. Journal of the Australian Water Association, January 2001.</p> <p>WRF 2939 Risk Analysis Strategies for Credible and Defensible Utility Decisions (2007)</p> <p>Prevost, Michele et al. "Development and Application of a QMRA Model for Process Evaluation and Selection" Proceedings of the AWWA 2007 Water Quality Technology Conference.</p>	<ol style="list-style-type: none"> 1. Identify options. 2. Create basic system model with critical components. 3. Identify failure modes for steady-state and non steady state conditions. 4. Determine risk scenarios and probability of occurrence. 5. Conduct analysis for sources, treatment and distribution systems to determine impacts of risk scenarios. 6. Vary operational conditions to determine impacts on risk. 7. Document model and identify procedures for updating and expanding model and database. 	<ul style="list-style-type: none"> • Are there other utilities who would be interested in collaborating? • WRF funding for Tailored Collaboration? 	\$\$\$	1.5
	<p>NP.4 Conduct formal distribution system assessment¹⁷</p> <p><i>Risk of contamination through the distribution system has not received high priority historically. It is now an area of particular interest</i></p>	<p>Identify key vulnerabilities and develop a strategy on how to address.</p>	<p>National regulators are promoting the use of Water Safety Plans in Portugal, England and Wales. In New Zealand, WSPs will be required for drinking water systems in 2013.</p> <p>Distribution System Optimization</p>	<p>National Research Council Committee on Public Water Supply Distribution Systems, 2006. <i>Assessing and Reducing Risks. Drinking Water Distribution Systems: Assessing and Reducing Risk</i>. The National Academies Press, 2006.</p>	<ol style="list-style-type: none"> 1. Determine method to utilize 2. Conduct system assessment 3. Report internally 4. Assess next steps 	<ul style="list-style-type: none"> • WRF funding for Tailored Collaboration? • Identifying old water locations in the distribution system is one vulnerability needing 	\$\$\$	1.5

¹⁵ Linked with WQPP Recommendation #7 to explore deeper engagement with customers on water quality at the tap.

¹⁶ Linked with WQPP Recommendation #9 to develop an integrated risk management framework to inform priority setting.

¹⁷ Linked with WQPP Recommendation #5 to conduct a formal distribution system assessment.

Table 5-3: New Projects								
Priority Area	Recommendation Rationale	Objectives	Precedent	Relevant Research	Potential Steps	Considerations	Cost	Duration (years)
	<i>amongst water professionals and regulators. SFPUC should be in front of the curve.</i>		Plans have been completed in Cincinnati, OH; Everett, WA; and Calgary, Alberta. The state of Ohio requires water systems to prepare DSOPs if internal action levels are exceeded for TTHMs and HAA5s.	WRF Application of HACCP for Distribution System Protection #2856 (2005), Methodologies for Assessing and Improving Water Quality Sampling Programs in Drinking Water Distribution Systems #3017 (2008), Cross-Connection and Backflow Vulnerability: Monitoring and Detection #3022 (in progress)		consideration.		
	NP.5 Revise existing cross-connection controls ordinance and update policies. <i>Current ordinance is 25 years old. Poor practices are evident (e.g., back-flow devices are being located within buildings and therefore inaccessible to inspection). As water supply becomes more constrained, use of recycled water will increase. Adequate controls are needed to assure public health protection.</i>	Develop sound policies for cross-connection control that are protective of public health, operationally sensible and cost-effective.	Have existing ordinance.	Broader work summarized by EPA and WRF.	<ol style="list-style-type: none"> 1. Identify project coordinator. 2. Convene the key city departments 3. Review ordinances from Los Angeles, Portland and Seattle. 4. Determine potential changes. 5. Set priorities for changes and assess implementation issues with each. 6. Circulate draft changes to impacted parties. 7. Finalize ordinance 8. Pass on to Board of Supervisors. 	Involves 7 city departments. Very complicated.	\$\$	1.0
Communication with Customers	NP.6 Survey customer base to determine desired services and willingness-to-pay. ¹⁸ <i>If SFPUC is to be more customer-driven in setting priorities, it needs to use state-of-the-art tools and methods to do so.</i>	<p>Develop a sound methodology for receiving customer feedback on particular preferences, and ensuring the ability of underserved and non-English speaking populations to provide input.</p> <p>Obtain quantitative information on customer preferences for different services, especially regarding their cost thresholds for interest in new SFPUC services.</p> <p>Evaluate decision-making usefulness of information and develop refinements to improve information quality.</p>	<p>Utilities in Britain and Australia have employed “willingness to pay” (WTP) surveys for determining strength of public support for proposed actions, because regulatory compliance requires utilities to provide evidence of public support for proposed changes.</p> <p>The Seattle Public Utilities has conducted some similar WTP surveys in 2006 entitled “Role of Customers in Setting Service Levels” which addressed customer preferences and willingness to pay related to: - In-home water quality - Mainline sewer backups - Planned water outages</p> <p>The Los Angeles Department of Water and Power has convened focus groups addressing perceptions about water quality and point-of-use treatment.</p>	<p>WRF projects include Developing Customer Service Targets by Assessing Customer Perspectives (publ. 90988F, 2004), Risk Communication for Emerging Contaminants (publ. 91047F, 2004), The Value of Water: Concepts, Estimates, and Applications for Water Managers (91068F, 2005), Stakeholder Perceptions of Utility Role in Environmental Leadership (publ. 91104, 2006) and Customer Acceptance of Water Main Structure Reliability (publ. 91081, 2006).</p> <p>CSIRO in Australia also developed a methodology in Determining Customer Service Levels – Development of a Methodology Overarching Report (2002)</p>	<ol style="list-style-type: none"> 1. Develop draft survey instrument 2. Develop plan to ensure inclusion of underserved and non-English speaking populations. 3. Obtain internal SFPUC feedback 4. Consult stakeholders & wholesale customer 5. Procure outside resources 6. Conduct survey 7. Report internally 8. Assess next steps 	<ul style="list-style-type: none"> • What services should be identified? When will the premise plumbing project identify some alternative services and costs? • Are there other utilities who would be interested in collaborating? • Should SFPUC participate in upcoming WTP project with WRF? 	\$\$\$	1.5

¹⁸ Linked with WQPP Recommendation #8 to improve the depth and frequency of interaction, consultation and engagement with customers.

Table 5-3: New Projects								
Priority Area	Recommendation Rationale	Objectives	Precedent	Relevant Research	Potential Steps	Considerations	Cost	Duration (years)
Climate Change	<p>NP.7 Evaluate unit process and overall treatment capacity for various source water quality degradation scenarios.</p> <p><i>Climate change may impact the pattern of precipitation and run-off, which in turn may alter the quality of water treated at SFPUC facilities. In addition, increased wildfires could lead to episodic alterations of water quality. Assessing the impacts is an important planning element.</i></p>	<p>Determine what operational strategies can be employed to manage episodic changes in water quality. Identify the triggers for capital investments for the treatment facilities.</p> <p>Identify treatment capacity constraints</p>	<p>Water utilities are particularly concerned over water resource impacts, particularly as snow-packs may diminish.</p>	<p>CalFed Science Program has multiple reports on changes in precipitation patterns, sea-level change and implications for water management strategies. See State of Bay Delta Science at http://www.science.calwater.ca.gov/publications/sbds.html</p> <p>Hetch Hetchy precipitation assessment</p> <p>Water Research Foundation Strategic Initiative on Climate Change: workplan and various sponsored studies.</p>	<ol style="list-style-type: none"> 1. Assess impacts of changed precipitation patterns and intensity 2. Project impacts of increased wildfires on principal watersheds 3. Determine potential operational and capital modifications for water treatment facilities to changing water quality conditions: turbidity, coliforms, temperature, color, algae, T&O 4. Evaluate critical triggers for reconsidering Hetch Hetchy's unfiltered status 5. Identify new operating rules for reservoirs based on changed precipitation patterns 	<ul style="list-style-type: none"> • Are there other utilities who would be interested in collaborating? • Could this be a joint effort with LADWP, MWD, and EBMUD? • WRF funds for Tailored Collaboration? 	<p>\$\$</p>	<p>0.5</p>
	<p>NP.8 Monitor key source and treated water quality and quantity indicators for annual and seasonal trends (e.g., temperature, turbidity, coliforms, algal blooms, algal toxins, TOC, DBPs, chlorine residuals, metals, nitrite).</p> <p><i>Determining the baseline and tracking long-term trends is essential for identifying unusual events.</i></p>	<p>Track potential effects on system operation and performance.</p> <p>Provide recommendations to SFPUC management and operations as necessary for reservoir management and other items.</p>	<p>SFPUC currently has a large monitoring program in place for regulatory compliance and process optimization.</p>		<ol style="list-style-type: none"> 1. Inventory data trending studies that have been previously conducted, along with current reporting. 2. Identify critical trending gaps for parameters that may impact future operations. 3. Determine necessary statistics and correlations (with monthly rainfall, snowfall and air temperature) to monitor for annual and seasonal trends 4. Evaluate data quality and "noise level" to assess potential success of effort. 5. Scope analysis including annual updates of water quality trends beginning in 1995 (data available in LIMS). Note relationship between copper sulfate application and algae populations. 6. Determine necessary laboratory resources to perform testing. 		<p>\$\$</p>	<p>1.0</p>
	<p>NP.9 Develop and/or update operations plan governing reservoir and transmission operations for water quality impacts.</p>	<p>Focusing on Priest and Moccasin by-pass, adits at Hetch Hetchy reservoir and transmission. Refine procedure for implementing by-pass. How blend water back into system and under what conditions?</p>	<p>Have existing systems operations plan. Some consideration as to criteria for triggering by-pass</p>		<ol style="list-style-type: none"> 1. Review systems operation plan. 2. Identify recent challenges and forecast new ones. 3. Revise plan. 4. Check for potential conflicts 		<p>\$</p>	<p>0.5</p>

Section 6

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