

Strategic Water Supply Assessment

COMMUNITY WORKSHOP #2

June 2, 2022



Workshop Agenda: Strategic Water Supply Assessment

- Project Overview
- Review of Progress To-Date
- Schedule
- **Q&A**

Strategic Water Supply Assessment: Glossary

- AF Acre foot (1 acre foot= 325,850 gallons)
- AFY Acre feet per year
- TAF Thousand acre feet
- AR Atmospheric River
- GPCD Gallons per capita per day
- GPHD Gallons per household per day
- GW Ground Water
- DPR Direct Potable Re-use
- IPR Indirect Potable Re-use
- WTP Water Treatment Plant
- AWTP Advanced Water Treatment Plant
- WWTP Waste Water Treatment Plant
- PS Pump Station
- Synthetic Drought hypothetical drought or artificially created
- Trace line of reservoir storage on a chart
- Paleoclimate Climate prior to modern observations

Project and Process Overview

Project Overview

- Strategic Water Supply Assessment builds on past planning efforts and is designed to fill in the gaps on water supply alternatives
- Comparative analysis of water supply options available to MMWD and provide recommendations on a strategic water supply roadmap
- Respond to accelerated pace of climate change and greater hydrologic extremes than those that have occurred in the past

Strategic Water Supply Assessment: Project Overview

The Assessment will address the following questions:

- 1. What is the current risk to MMWD's water delivery reliability under recent and projected future droughts?
- 2. How much additional water supply is needed under different future hydrologic drought and demand scenarios?
- 3. What are the range of water supply alternatives that could increase resiliency of MMWD's system? And what are their strengths and weaknesses?
- 4. What recommendations can be developed to support MMWD's near-term investment in drought resiliency?

Strategic Water Supply Assessment: Draft Goals

- Water Supply Provide a reliable and resilient water supply now and for the future
- Water Quality Assure that water produced is of high quality and protects public health from source to customer's tap
- Sustainability and Environmental Protect and enhance the biodiversity of the watershed and protect the environment for future generations
- Economic and Financial Maintain and improve the District's infrastructure and operations in a cost-effective manner

Strategic Water Supply Assessment: Strategy Considerations

- What is drought? How does it manifest itself?
- Future is uncertain ... embrace it!
- Responding to uncertainty ... how to best make decisions
- Consideration of supplemental supplies and demand management

Strategic Water Supply Assessment: Key Project Scope Elements

Recommendations Understanding Current Risks & Establishing Goals Identifying & Evaluating Alternatives & Path Forward Confirm Develop Develop Conduct Develop Prepare **Evaluation** of Water Supply Decision Water Supply Water Supply Roadmap and Demand Strategy and Water Supply Support **Alternatives** and Report **Alternatives** Goals Model **Scenarios**

Strategic Water Supply Assessment: Water Supply and Demand Scenarios

- Recognizing that future is uncertain
 - Climate change
 - Drought variability
 - Demands
 - Policies and regulations
- Seeking robust solutions
- Scenarios allow us to explore plausible future conditions and identify promising solutions
 - Historical droughts
 - Climate projections
 - Paleo reconstructions
 - Stress tests



Scenarios are alternative views of how the future might unfold. Scenarios are not predictions or forecasts of the future

Strategic Water Supply Assessment: Scenarios

- Scenarios are intended to capture uncertainty that is NOT in management control for this decision
- Water Supply Hydroclimate
 - Historical
 - Climate projections
 - Paleoclimate reconstructions
 - Synthetic droughts
- Water Demand
 - Recent trends
 - Population growth and land use
 - Passive levels increasing water use efficiency

Drought Scenarios

Strategic Water Supply Assessment: Drought – Often Defined by Lack of Significant Atmospheric Rivers



- The lack of strong or greater magnitude ARs over California over multiple water years has resulted in extremely dry conditions.
- On average, California experiences SEVEN strong or greater magnitude ARs in a Water Year
- California only experienced strong or greater magnitude AR conditions THREE times during Water Years 2020 & 2021 combined
- While Water Year 2022 began with an exceptional AR over California in October, the state only experienced strong or greater magnitude AR conditions FIVE times, resulting in three straight water years of below normal activity.



*Arrows are placed on the map where each AR was strongest over the coast



Total Precipitation Anomaly (inches)



Marin County Water Year Average Temperature and Total Precipitation Anomaly (Climate Projections 2005-2099)

Strategic Water Supply Assessment: Historical Observed Droughts 1940 - 2021



What do the Climate Projections Show?



Water Supply Assessment: Hydroclimate Summary

- Climate projections indicate potential for warmer and more severe droughts
- Planning for Droughts:
 - 2-year severe drought
 - 4-year extended, severe drought
 - 6- to 8-year prolonged drought

Demand

Strategic Water Supply Assessment: Water Production & Population



Population

Strategic Water Supply Assessment: Monthly Water Production



Strategic Water Supply Assessment: Potable Demand by Sector - Average Breakdown

Sector	5-year Average (2016-2020)	
Single-family	13,702	55%
Multi-family	3,078	12%
Landscape	1,381	5.6%
Commercial	2,560	10%
Institutional	1,349	5.5%
Other	2,664	11%
Total	24,733	



Figure 2-3 Percentage of Total Water Demand by Sector: 2016-2020

Single Family
 Commercial (Business/Industrial)
 Landscape

Multi-Family

- Institutional/Governmental
- Other (incl. Non-Revenue Water)

Strategic Water Supply Assessment: Current Demand



Strategic Water Supply Assessment: Residential Indoor GPCD



Strategic Water Supply Assessment: End-Use Survey

- Majority of toilets are low flow
- Showers are relatively short in duration and limited room for savings



Strategic Water Supply Assessment: End Use Survey – Toilet Flushing



Strategic Water Supply Assessment: Residential Outdoor Usage



Strategic Water Supply Assessment: Residential Outdoor GPHD By Irrigation Type



Strategic Water Supply Assessment: Average Residential GPCD





Strategic Water Supply Assessment: Comparison of Marin Water to other Highly Efficient Agencies



Strategic Water Supply Assessment: Comparison of Marin Water to other Highly Efficient Agencies



Strategic Water Supply Assessment: Demand Summary

- A rebound to near pre-drought levels of water use is likely based on history indicating average 5-year water use - 24,733 AFY as current demand
- Main opportunities for water use savings lies in residential outdoor water use
- The 2045 conservation savings determined to be 8% for passive savings and 14% for combined passive and incentivized savings.

Baseline Scenarios

Strategic Water Supply Assessment: Scenarios

- Scenarios are intended to capture uncertainty that is NOT in management control for this decision
- Water Supply Hydroclimate
 - Historical
 - Climate projections
 - Paleoclimate reconstructions
 - Synthetic droughts
- Water Demand
 - Recent trends
 - Population growth and land use
 - Passive levels increasing water use efficiency

Strategic Water Supply Assessment: Scenarios

 Draft Scenarios – Explore Uncertainties We Don't Control

Scenario 1 – Current Trends

Scenario 2 – Accelerated Conservation

Scenario 3 – Short and Severe Drought

Scenario 4 – Beyond Drought of Record

Scenario 5 – Abrupt Disruptions

Draft Scenario Assumptions

Scenario	Hydroclimate Assumptions	Demand Assumptions	Operational Assumptions
Scenario 1 – Current Trends	Historical observed	Passive-level savings per Urban Water Management Plan	Current operations; local supply preference; supplemental water with Kastania Pump Station rehabilitation
Scenario 2 – Accelerated Conservation	Historical observed	Passive <u>plus</u> programmatic savings	Current operations; local supply preference; supplemental water with Kastania Pump Station rehabilitation
Scenario 3 – Short and Severe Drought	Severe 4-Yr drought (2020, 2021, 1976, 1977)	Passive <u>plus</u> programmatic savings	Current operations; local supply preference; supplemental water with Kastania Pump Station rehabilitation
Scenario 4 – Beyond Drought of Record	Long-range, extended 6- or 7-Yr drought (based on climate change projections)	Passive <u>plus</u> programmatic savings	Current operations; local supply preference; supplemental water with Kastania Pump Station rehabilitation
Scenario 5 – Abrupt Disruptions (TBD)	Severe 4-Yr drought (2020, 2021, 1976, 1977); high wildfire likelihood	Passive <u>plus</u> programmatic savings	EX: Operational disruptions due to post-wildfire sediment loads

Strategic Water Supply Assessment: Defining Minimum Acceptable Storage Levels



Decision Support Model

Strategic Water Supply Assessment: Model Purpose

- Model to provide information on system performance under various scenarios and water management
 - What is the current risk to MMWD's water delivery reliability under recent and projected future droughts?
 - How much additional water supply is needed under different future hydrologic drought and demand scenarios?
 - Test performance of future water management alternatives
- Water balance and system operations representation of the MMWD system
- Not a Hydraulic model

Decision Support Model – Marin Water Representation



Main Model Inputs:

- River flows
- Reservoir inflows
- Local supplies
- System demands
- Flow limitations
- System operation

Main Model Outputs:

- Model Scenarios
- System deliveries for different supplies
- Reservoir Levels
- System flows

Model Validation

- Main model validation is the historical run of the model, where historical demands and historical reservoir inflows are used
- Validation Period: 2009 2021
- Validation Parameters:
 - Reservoir storage, deliveries of supplies, water treatment plant production
- Validation Approach:
 - Review data, review operations, add more model detail
- MMWD staff is working together with Jacobs to validate model results independently based on systems knowledge

MMWD Total Surface Storage



Sample Model Simulation Results

- For each scenario:
 - Initial storage conditions
 - Demand assumptions
 - 107 individual hydrological inflow traces (each line represents one trace)
- Results evaluation:
 - Individual trace outcomes OR
 - Probabilities based on ensemble of results
- Compare to performance measure
 - Frequency and magnitude of deficits



Statistics for Model (Future Baseline)

50%

1%.5%/95%.99%

Min..1% / 99%...Max

25%..75%

5%..25% / 75%..95%

Summary, Schedule, Next Steps

Key Project Scope Elements



Long Term Water Supply Options



Evaluation Process

- Performance Criteria
 - Linked to water reliability and resiliency goals
- Evaluation Criteria
 - Additional criteria that help discern alternatives
- Application Approach
 - How do individual alternatives perform?
 - What combination of alternatives could be considered?
 - What portfolio strategy is most strategic?

Evaluation Criteria (DRAFT)	Description
Cost	Estimate of capital and annual costs.
Timing	Estimate of time required before project could be planned, designed, permitted, and implemented.
Environmental	Anticipated impacts on the natural environment
Feasibility	Maturity of the concept and technical ability to implement.
Energy	Estimated change in energy required to implement and operate.
Permitting/Legal	Anticipated permitting and legal challenges
Social	Description of positive or negative socioeconomic effects.
Jurisdiction	Primary jurisdiction for implementation

Water Supply Assessment: Schedule & Next Steps

- Full quantification of scenarios
- Updates to decision support model
- Further development of water supply alternatives including alignments, cost, quality, feasibility, etc.
- Detailed evaluation criteria

- Proposed Upcoming Board Discussion Focus Areas
 - May
 - ✓ May 10 Demand Management
 - ✓ May 24 Drought Scenarios & Baseline Reliability
 - June
 - June 14 Scenarios
 - June 28 Water Supply Alternatives
 - July/August
 - Evaluation Process
 - Roadmap Development
- Public Meetings
 - ✓ March 9 Public Workshop #1
 - ✓ June 2 Public Workshop #2
 - August TBD Public Workshop #3

Public Engagement

- Assessment Information
 - Web page: <u>marinwater.org/WaterSupplyResiliency</u>
- Marin Water e-News:
 - Sign up: <u>marinwater.org/e-News</u>
- Board Meetings
 - Receive meeting notifications: <u>marinwater.org/get-notifications</u>

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Water Supp	ly Resilienc	у					
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 Board Approval of A (Item 9) Scope of Work 	Assessment	Intertie (Richn Bridge Pipelin Winter Water f Local Storage Desalination Water Reuse	iond/San Rafael i) om Sonoma Water Expansion	Commu Wed, 3/ Commu Date TE Commu Date TE	nity Workshop 9, 5–7 p.m. nity Workshop 3D nity Workshop 3D	#1 #2 #3	
bout Our W	Vater Supp ent locally sourced drink , which include Phoenix, ld 79,566 acre-feet of w	ing water to its 191,000 Lagunitas, Bon Tempe, ater, or about 30 billion	customers. A total of 75 Alpine and Kent on Mt. T allons. The remaining 28	percent of that water amalpais, and Nicasi i percent of our water	supply is captu o and Soulajule r supply comes	ured and s in west M from neig	torec Iarin hbori



Attendee Questions & Comments

Instructions for indicating you have a question/comment

If watching from a computer or smart device:

Use the raise hand in Zoom

If listening from a phone:

Dial *9 to let the Zoom host know your hand is raised