CITY OF SAN DIEGO
POTABLE REUSE PLANNING

AMY DORMAN
SENIOR ENGINEER

JANUARY 22, 2014
WATER PURIFICATION DEMONSTRATION PROJECT

COMPONENTS

- Advanced Water Purification (AWP) Facility
- Independent Advisory Panel (IAP)
- San Vicente Reservoir Study
- Regulatory requirements
- Energy and cost analysis
- Education and outreach program
TREATMENT TESTING RESULTS

• Testing period August 1, 2011 to July 31, 2012
• Measured for 342 constituents and parameters in recycled water, purified water, and imported water
• Conducted 9,000 individual water quality laboratory tests
• Implemented continuous and daily monitoring before and after each treatment step to verify integrity of each treatment process
San Vicente Reservoir Study Results

• Reservoir provides an environmental barrier that satisfies anticipated regulatory requirements

• Purified water will be diluted at least 200:1 under all anticipated reservoir operations

• Water quality in San Vicente will not be affected by adding purified water
REGULATORS

- California Department of Public Health (CDPH) concept approval letter 9/7/2012

  “Based on CDPH’s review of the City’s ... submittal ... CDPH approves the San Vicente Reservoir Augmentation Concept.”

- City received a letter of concurrence from the Regional Water Board on 2/12/2013

  “The ... Water Board, with concurrence from USEPA, strongly supports the efforts of the City to develop the San Vicente Reservoir Augmentation Project...”
Energy & Cost Analysis

Energy:

- Energy consumption and greenhouse gas emissions of purified water delivered to San Vicente comparable to that of imported water

Cost:

- $2,000 per acre-foot to produce and convey 15 mgd of purified water to San Vicente Reservoir
PUBLIC OUTREACH & EDUCATION PROGRAM

Program Statistics as of Dec. 31, 2013:

- Speakers Bureau presentations/attendees  198/4,100+
- Community events/attendees  60/7,500
- Facility tour attendees  4,294
PUBLIC OUTREACH & EDUCATION PROGRAM RESEARCH RESULTS

USE ADVANCED TREATED RECYCLED WATER AS AN ADDITION TO DRINKING WATER SUPPLY

<table>
<thead>
<tr>
<th></th>
<th>2004</th>
<th>2011</th>
<th>2012</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Strongly Favor</strong></td>
<td>10%</td>
<td>16%</td>
<td>12%</td>
</tr>
<tr>
<td><strong>Somewhat Favor</strong></td>
<td>35%</td>
<td>33%</td>
<td>37%</td>
</tr>
<tr>
<td><strong>Somewhat Oppose</strong></td>
<td>19%</td>
<td>12%</td>
<td>12%</td>
</tr>
<tr>
<td><strong>Strongly Oppose</strong></td>
<td>45%</td>
<td>11%</td>
<td>11%</td>
</tr>
<tr>
<td><strong>Unsure</strong></td>
<td>10%</td>
<td>9%</td>
<td>4%</td>
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SUMMARY

ADVANCED WATER PURIFICATION FACILITY
Operated 12 months; produced water that met all state and federal standards

SAN VICENTE RESERVOIR STUDY
Satisfied all anticipated regulatory requirements

REGULATORY FRAMEWORK
Received conceptual approval for a full-scale project from CDPH & Regional Water Board

ENERGY & COST ANALYSIS
Determined energy use is comparable to imported water and costs $2,000 per AF

EDUCATION & OUTREACH
Increased understanding and approval of water purification

PROJECT REPORT
Adopted by City Council in April 2013
BACKGROUND AND OBJECTIVES

• Driver: Point Loma Wastewater Treatment Plant’s 2010 Permit Renewal
• Objective: Identify opportunities to increase recycling of wastewater for Indirect Potable Reuse (IPR) and Non-Potable Reuse (NPR) for a 2035 planning horizon
• Determine the extent recycling can reduce wastewater flows to the Point Loma Wastewater Treatment Plant
• Determine implementation costs
REUSE OPPORTUNITIES

• Non Potable Reuse (NPR)
  – Demand from potential customers is minimal compared to Point Loma flows; limited offload opportunity
  – Serving new customers requires significant amount of new infrastructure

• Indirect potable reuse (IPR)
  – Presents largest opportunity to offload Point Loma
  – Higher level of treatment relieves restriction on use
  – No need for separate delivery system
POTABLE REUSE FACILITY ALTERNATIVES
REUSE ALTERNATIVES
(2035 PLANNING HORIZON)

• Divert 135 mgd away from Point Loma to new and existing reuse facilities
• Resultant average daily Point Loma flow of 143 mgd
  — Reduces cost of upgrades by 40%
• All alternatives would lead to 101 mgd of reuse
  — 18 mgd non-potable
  — 83 mgd indirect potable
• Cost\(^1\): $1700 - $1900/acre-foot

\(^1\)2011 $
Next Steps
**TECHNICAL STUDIES**

- Detailed siting studies
- Reservoir studies
- Direct Potable Reuse
NON-TECHNICAL CONSIDERATIONS

• Continue Outreach Efforts
• Determine water-wastewater funding allocation
• Develop Financing Plan
IMPLEMENTATION STRATEGY

• Integrate indirect and direct potable reuse (IPR/DPR) options
• Emphasize flexibility and adaptability
• Identify IPR-DPR decision points
• Balance schedule and costs
• Sustain current momentum
Contact Info

Amy Dorman
adorman@sandiego.gov
619.533.5248
Purewatersd.org

Water Purification Demonstration Project

@PureWaterSD

purewatersd
BACK-UP SLIDES
### Factoring in the Savings

<table>
<thead>
<tr>
<th>Range of Alternative Costs</th>
<th>$ per ac-ft</th>
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</thead>
<tbody>
<tr>
<td><strong>Tier 1 Savings due to reduced wastewater CIP and O&amp;M costs</strong></td>
<td>($600)</td>
</tr>
<tr>
<td><strong>Tier 2 Savings due to reduced salinity</strong></td>
<td>($100)</td>
</tr>
<tr>
<td><strong>Tier 3 Savings due to avoiding Secondary upgrade at PLWTP and Maintaining it as Chemically Enhanced Primary Treatment Plant</strong></td>
<td>($400)</td>
</tr>
<tr>
<td><strong>Total potential savings</strong></td>
<td>($1100)</td>
</tr>
<tr>
<td><strong>Net cost after all savings</strong></td>
<td><strong>$600-$800</strong></td>
</tr>
</tbody>
</table>
Comparing the Cost of Water

**Tier 1 Reuse Net Cost**
Includes savings from reduced capital and O&M costs at downstream wastewater facilities.

**Tier 2 Reuse Net Cost**
Includes Tier 1 savings and savings in the municipal water and wastewater systems resulting from significant reductions in water salinity.

**Tier 3 Reuse Net Cost**
Includes Tier 1 and 2 savings, plus savings incurred if the reuse program results in avoiding secondary treatment upgrades at the Point Loma Plant (for remaining flows after reuse).

- Untreated imported water rates are projected to rise 5.8% annually through 2020.
- $904/AF 2011 Untreated Water Rate

Graph showing unit costs per acre-foot over years 2010-2050, with projected ranges and costs for each tier.
ROAD MAP TO IMPLEMENTATION

1. Determine a preferred implementation plan and schedule that considers potable reuse options for maximizing local water supply and reducing flows to the Point Loma Wastewater Treatment Plant.

2. Continue outreach efforts

3. Develop a strategy for allocating potable reuse costs among local water and wastewater funding sources

4. Develop a financing plan

5. Monitor the development of direct potable reuse regulations

6. Join the Direct Potable Reuse Initiative led by the WateReuse Research Foundation

7. Coordinate potable reuse implementation strategy with Point Loma 2015 Permit Renewal Application

8. Continue AWPF operations
City of San Diego’s
Water Purification Demonstration Project
Purification Process

Demonstration-Scale Project

Homes & Businesses
Industrial Waste Control Program
Wastewater

Industry

North City Water Reclamation Plant
Traditional Recycled Water Uses
- irrigation
- industrial

Advanced Water Purification Facility
- Membrane Filtration
- Reverse Osmosis
- UV Disinfection/Advanced Oxidation

Recycled Water

Water Sources
- Local Runoff
- Imported Water
- Colorado River
- Northern California

San Vicente Reservoir
- Detention
- Natural Treatment

Drinking Water Treatment Plant
- Coagulation
- Filtration
- Disinfection (Ozone & Chlorine)

Source Water
- Imported Water
- Local Runoff
- Purified Water

Drinking Water

Potential Full-Scale Advanced Water Purification System & Transmission Pipeline
Without the reservoir, additional barriers (treatment or monitoring) will be required to achieve the same level of public health protection. What are those additional barriers?
## Continued Studies at the Demonstration AWP Facility

<table>
<thead>
<tr>
<th>Year</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>2011</td>
<td>Water Purification Demonstration Project&lt;br&gt;temp water rate increase ($10.74M)&lt;br&gt;Prop 50 ($1.07M)&lt;br&gt;USBR ($2.95M)</td>
</tr>
<tr>
<td></td>
<td><strong>AWPF</strong>&lt;br&gt;Extended Testing&lt;br&gt;Prop 50 ($2.6M)&lt;br&gt;City share ($50K)</td>
</tr>
<tr>
<td></td>
<td><strong>Potable Reuse Studies; “FailSafe”</strong>&lt;br&gt;Prop 84 ($2.11M)&lt;br&gt;City share ($165)</td>
</tr>
</tbody>
</table>

2012: Potable Reuse Studies; “FailSafe”<br>Prop 84 ($2.11M)<br>City share ($165)

2013: AWPF Extended Testing<br>Prop 50 ($2.6M)<br>City share ($50K)

2014: Potable Reuse Studies; “FailSafe”<br>Prop 84 ($2.11M)<br>City share ($165)

2015: Continued Studies at the Demonstration AWP Facility
**WATER REUSE TIMELINE**

- **1993**  City & County Water Authority propose Water Repurification Project
- **1994-1998**  Planning, regulatory reviews & conditional approval, preliminary design on project
- **Fall 1998**  Water Repurification Project becomes an issue in several closely contested political campaigns
- **Spring 1999**  Project cancelled by City Council
- **2002-2004**  City enters into a settlement agreement with environmental groups committing to:
  - Evaluate improved ocean monitoring
  - Pilot test biological aerated filters
  - Study on increased water reuse
**WATER REUSE TIMELINE**

- **2004-2005**  
  City undertakes Water Reuse Study

- **October 2007**  
  City Council votes to proceed with the Demonstration Project

**Water Purification Demonstration Project**

- **November 2008**  
  City Council approves temporary water rate increase (3.08%) to fund $11.8 million Demonstration Project

- **January 2009 - August 2010**  
  Temporary water rates in effect
San Vicente Reservoir Study

San Vicente Dam and Reservoir constructed in 1944

Reservoir enlarged from 90,000 acre feet to 247,000 acre feet

Water Authority is constructing facilities

City will operate reservoir, dam, and outlet works

Refilling will take three to five years
Under normal operations, purified water is delivered to the Alvarado WTP and to the area in green.

In an extraordinary event, such as extended drought, purified water could go to six WTPs and to the crosshatched area.
22 mile, 36-inch pipeline to convey water from the AWP Facility to San Vicente Reservoir

Two potential alignments identified:

- State Route 52 alignment
- Mission Gorge alignment

Additional analysis is needed to refine alignment
### Regulated Constituents

<table>
<thead>
<tr>
<th>Regulations/Guidelines</th>
<th>Number of Constituents</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>California Department of Public Health Goals</strong></td>
<td></td>
</tr>
<tr>
<td>Primary Drinking Water Maximum Contaminant Levels (MCLs)</td>
<td>90</td>
</tr>
<tr>
<td>Secondary Drinking Water MCLs</td>
<td>18</td>
</tr>
<tr>
<td>Microbial</td>
<td>4</td>
</tr>
<tr>
<td>Notification Levels</td>
<td>30</td>
</tr>
<tr>
<td>Groundwater Replenishment Criteria</td>
<td>142</td>
</tr>
<tr>
<td><strong>San Diego Water Board (projected)</strong></td>
<td></td>
</tr>
<tr>
<td>San Vicente Reservoir Limits</td>
<td>143</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>231</td>
</tr>
</tbody>
</table>
COMPARING THE COST OF THE WATER

Projected cost of purified water (solid line) of a full-scale reservoir augmentation project at San Vicente Reservoir compared to actual and projected costs of untreated imported water (dashed lines).
## Demonstration Project
### San Vicente IPR/RA Cost Estimate

<table>
<thead>
<tr>
<th></th>
<th>Capital</th>
<th>Annual Operating and Maintenance</th>
</tr>
</thead>
<tbody>
<tr>
<td>AWP Facility</td>
<td>$144,700,000</td>
<td>$8,145,000</td>
</tr>
<tr>
<td>Pipeline &amp; Pump station</td>
<td>$224,500,000</td>
<td>$3,385,000</td>
</tr>
<tr>
<td>Increased North City Tertiary Treatment</td>
<td>$0</td>
<td>$3,965,000</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>$369,200,000</strong></td>
<td><strong>$15,495,000</strong></td>
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</table>

- Result - $2,000 per acre-foot to produce and convey 15 mgd of purified water to San Vicente Reservoir
## Demonstration Project, San Vicente IPR/RA Avoided Wastewater Costs

<table>
<thead>
<tr>
<th>Description</th>
<th>Capital</th>
<th>Annual Operating and Maintenance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Point Loma Wet Weather Storage Facility</td>
<td>$123,000,000</td>
<td>$6,150,000</td>
</tr>
<tr>
<td>Reduced Treatment at Point Loma</td>
<td>$0</td>
<td>$2,210,000</td>
</tr>
<tr>
<td>Reduced Pumping at Pump Station No. 2</td>
<td>$0</td>
<td>$450,000</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>$123,000,000</strong></td>
<td><strong>$8,810,000</strong></td>
</tr>
<tr>
<td><strong>Total (per-acre-foot basis)</strong></td>
<td></td>
<td><strong>$1,000</strong></td>
</tr>
</tbody>
</table>

- Net cost: $1,000 per acre-foot to produce and convey 15 mgd of purified water to San Vicente Reservoir