City of Vacaville
Recycled Water Master Plan
Feasibility Study

Bay Area WaterReuse
Christina Castro, P.E.
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Background/Project Goals
Background

• In 2015, the City completed tertiary treatment project at Easterly

• City 2015 – 2017 Strategic Plan identifies the Recycled Water Master Plan as a key element

• In 2017, the City hired Carollo Engineers to prepare a Recycled Water Feasibility Study including CEQA
Recycled Water Program Goals

• Reduce current debt burden and maximize return on investment
• Provide recycled water as an attraction for businesses
• Conserve potable water supplies
• Define the best combination of projects that will provide maximum, practical cost recovery at minimal cost
• Deliver a Feasibility Study and associated environmental documentation that meets the SWRCB requirements for the grant
Preliminary Planning
Preliminary Planning

- Define use categories
- Identify customers
- Develop phasing
- Quantify Easterly recycled water supply

Develop recycled water concepts

Final Screening and Phasing Determination

Recommended Recycled Water Portfolio
Recycled Water Availability

- Current Easterly discharge ~7.2 mgd
- Projected to increase with population growth
Project Phasing

- **Immediate Term** – 1 to 5 years
- **Near Term** – 6 to 12 years
- **Long Term** – 13 to 20 years
- **Distant Term** – more than 21 years
## Potential Recycled Water Uses

<table>
<thead>
<tr>
<th>Category</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Downstream Diversion</td>
<td>Exchange/sell water to entities downstream of Easterly</td>
</tr>
<tr>
<td>Direct Industrial Reuse</td>
<td>Boilers/chillers, process water</td>
</tr>
<tr>
<td>Agricultural Reuse</td>
<td>Farming</td>
</tr>
<tr>
<td>Urban Irrigation</td>
<td>Medians, residential landscaping, toilet flushing</td>
</tr>
<tr>
<td>Indirect Potable Reuse/Groundwater Recharge</td>
<td>Injection wells and surface water spreading</td>
</tr>
<tr>
<td>Direct Potable Reuse</td>
<td>Advanced treatment at Easterly, then to City water treatment plant, then to distribution system</td>
</tr>
</tbody>
</table>
Potential Customers

- Identified 30+ potential Customers/locations
- Customers both within and outside City limits
## Urban Irrigation Within the City

<table>
<thead>
<tr>
<th>Name</th>
<th>Timing</th>
</tr>
</thead>
<tbody>
<tr>
<td>City Athletic Fields near EWWTP</td>
<td>1 – 5 Years</td>
</tr>
<tr>
<td>Vanden Meadows Development</td>
<td>1 – 5 Years</td>
</tr>
<tr>
<td>Souhtown Development</td>
<td>1 – 5 Years</td>
</tr>
<tr>
<td>Souhtown Commons / Moody</td>
<td>1 – 5 Years</td>
</tr>
<tr>
<td>Roberts Ranch</td>
<td>1 – 5 Years</td>
</tr>
<tr>
<td>Brighton Landing</td>
<td>1 – 5 Years</td>
</tr>
<tr>
<td>The Farm at Alamo Creek</td>
<td>1 – 5 Years</td>
</tr>
<tr>
<td>East of Leisure Town Rd Dev (South)</td>
<td>6 – 12 Years</td>
</tr>
<tr>
<td>East of Leisure Town Rd Dev (North)</td>
<td>6 – 12 Years</td>
</tr>
<tr>
<td>Green Tree Development</td>
<td>6 – 12 Years</td>
</tr>
<tr>
<td>Northeast Area Development</td>
<td>13 – 20 Years</td>
</tr>
<tr>
<td>North Village</td>
<td>13 – 20 Years</td>
</tr>
<tr>
<td>Gibson Canyon Creek WWTP</td>
<td>13 – 20 Years</td>
</tr>
</tbody>
</table>
Business and Industrial Parks

- Recycled Water helps businesses meet sustainability goals
- Recycled Water conserves potable water for other purposes
Customers Outside City Limits

- Cypress Lakes Golf Course
- Agriculture parcels (outside SID jurisdiction)
- Travis Air Force Base
- Downstream diversions
Concept Development

- Supply
- Demand
- Customers

Meetings with City Staff

Develop 9 Recycled Water Concepts

Meeting with Wastewater Committee

1. Downstream Diversions
2. City athletic fields near Easterly
3. Agricultural irrigation
4. Cypress Lakes Golf Course and Travis AFB
5. Northern developments and industrial
6. Indirect potable reuse – injection wells
7. Indirect potable reuse – Noonan Reservoir
8. Direct potable reuse to WTPs
9. No project
Concept 1 – Downstream Diversions
Concepts 2, 3, and 4

- **Concept 2** – athletic fields adjacent to Easterly

- **Concept 3** – agricultural customers

- **Concept 4** – Cypress Lakes Golf Course and Travis AFB
Concept 5 – North Developments/Industrial

- Utilizes new and existing recycled water pipelines
- Development Specific Plans require/encourage recycled water use
- Attractive to industries
- Frees up potable water for other uses
Concepts 6, 7, 8, and 9

- **Concept 6** – Indirect Potable Reuse via injection wells
- **Concept 7** – Indirect Potable Reuse via reservoir augmentation (Noonan Reservoir)
- **Concept 8** – Direct Potable Reuse to NBR WTP or City DE WTP
- **Concept 9** – No Project Alternative

→ Concepts 6 – 8 all require additional treatment facilities
→ Benefits would primarily be environmental, with minimal ROI
Concept Screening
Preliminary Screening

Feasibility considerations

Infeasible concepts

Not considered further

Feasible concepts

Recommended Recycled Water Portfolio
## Qualitative Comparison of Concepts

<table>
<thead>
<tr>
<th>Concept</th>
<th>Customer Location</th>
<th>Energy Use</th>
<th>Environmental Impact</th>
<th>Community/Stakeholder Acceptance</th>
<th>Ease of Implementation</th>
<th>Agency Coordination</th>
<th>Volume of Use/Seasonality</th>
<th>Return on Investment</th>
<th>OVERALL RANKING</th>
</tr>
</thead>
<tbody>
<tr>
<td>1: Downstream Diversions</td>
<td>+</td>
<td>N/A</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>++</td>
<td>+</td>
<td>++</td>
<td>1</td>
</tr>
<tr>
<td>2: Athletic Fields</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>++</td>
<td>++</td>
<td>++</td>
<td>2</td>
</tr>
<tr>
<td>3: Agricultural Irrigation</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>++</td>
<td>++</td>
<td>++</td>
<td>++</td>
<td>4</td>
</tr>
<tr>
<td>4: Cypress Golf Course/Travis</td>
<td>++</td>
<td>++</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>++</td>
<td>++</td>
<td>++</td>
<td>5</td>
</tr>
<tr>
<td>5: East of Leisure Town Rd Developments/Industrial</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>++</td>
<td>+</td>
<td>++</td>
<td>++</td>
<td>++</td>
<td>3</td>
</tr>
<tr>
<td>6: Wells, IPR</td>
<td>++</td>
<td>+++</td>
<td>++</td>
<td>+</td>
<td>++</td>
<td>+++</td>
<td>+</td>
<td>+</td>
<td>8</td>
</tr>
<tr>
<td>7: Reservoir Augmentation, IPR</td>
<td>+++</td>
<td>++</td>
<td>+++</td>
<td>++</td>
<td>+++</td>
<td>+</td>
<td>+</td>
<td>++</td>
<td>10</td>
</tr>
<tr>
<td>8: DPR to NBR WTP</td>
<td>+++</td>
<td>+++</td>
<td>+</td>
<td>+++</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+++</td>
<td>9</td>
</tr>
</tbody>
</table>
Infeasible Concepts

- IPR – Injection wells located near the Gibson Creek Canyon WWTP
- IPR – Reservoir augmentation at Noonan Reservoir
- DPR to the DE WTP
- DPR to the NBR WTP
Final Screening

Preliminary Planning

Preliminary Screening

Final Screening and Phasing Determination

City objectives and needs

Potentially include in distant future

Not considered further at this time

Recommended Recycled Water Portfolio
Concepts Not Considered Further At This Time

- Travis AFB
- Some of the Agriculture Customers
- Industrial developments northwest of I-505
- Northeast Area Development
- IPR near Easterly and Ag Buffer
Recommended Portfolio
Final Screening

Preliminary Planning → Preliminary Screening → Final Screening and Phasing Determination → Recommended Recycled Water Portfolio
Phased Recycled Water Program

- Includes customers within and outside City limits

- Variety of use types:
  - Urban reuse,
  - Industrial uses,
  - Agriculture irrigation,
  - Downstream diversions

- Utilizes existing recycled water pipelines
## Recycled Water Demands by Type and Phase

<table>
<thead>
<tr>
<th>Phase</th>
<th>Urban Irrigation (afy)</th>
<th>Direct Agriculture (afy)</th>
<th>Industrial (afy)</th>
<th>Downstream Diversions (afy)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Immediate</td>
<td>745</td>
<td>0</td>
<td>0</td>
<td>1,680</td>
</tr>
<tr>
<td>Near</td>
<td>730</td>
<td>435</td>
<td>0</td>
<td>560</td>
</tr>
<tr>
<td>Long</td>
<td>670</td>
<td>1,545</td>
<td>310</td>
<td>0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>2,150</strong></td>
<td><strong>1,980</strong></td>
<td><strong>310</strong></td>
<td><strong>2,240</strong></td>
</tr>
</tbody>
</table>
## Potential Potable Water Off-Sets

<table>
<thead>
<tr>
<th>Phase</th>
<th>Ave Day Demand (MGD)</th>
<th>Ave Day Demand (AFY)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Immediate Term:</td>
<td>0.67</td>
<td>745</td>
</tr>
<tr>
<td>Near Term:</td>
<td>0.35</td>
<td>400</td>
</tr>
<tr>
<td>Long Term:</td>
<td>0.29</td>
<td>985</td>
</tr>
<tr>
<td><strong>TOTAL:</strong></td>
<td><strong>1.31</strong></td>
<td><strong>2,130</strong></td>
</tr>
</tbody>
</table>

- The potable off-set could be used for other purposes or available to other markets
## Recommended Recycled Water Program Costs

<table>
<thead>
<tr>
<th>Phase</th>
<th>Project Cost&lt;sup&gt;(1)&lt;/sup&gt; ($M)</th>
<th>Annual O&amp;M&lt;sup&gt;(1)&lt;/sup&gt; ($1,000)</th>
<th>Annualized Total Cost&lt;sup&gt;(2)&lt;/sup&gt; ($1,000)</th>
<th>Unit Cost&lt;sup&gt;(3)&lt;/sup&gt; ($/AF)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Immediate</td>
<td>$6.5</td>
<td>$30.5</td>
<td>$450</td>
<td>$285</td>
</tr>
<tr>
<td>Near</td>
<td>$12.6</td>
<td>$105.5</td>
<td>$1,350</td>
<td>$440</td>
</tr>
<tr>
<td>Long</td>
<td>$24.9</td>
<td>$419.8</td>
<td>$3,280</td>
<td>$590</td>
</tr>
<tr>
<td>Overall:</td>
<td>$43.9</td>
<td>$419.8</td>
<td>$3,280</td>
<td>$590</td>
</tr>
</tbody>
</table>

Notes:
(1) Includes markups for legal, engineering, and design. Costs are not cumulative.
(2) Includes O&amp;M and energy costs. Annualized costs are cumulative.
(3) Assumes 1.5 mgd downstream diversions outside Solano County and 0.5 mgd within Solano County.
Funding Sources

• State Water Resources Control Board Grants
• SFR loans
• Development Impact Fees
• User agreements
• Recycled water direct sales
• Potable water off-sets sales
Next Steps…

• Survey work
• Detailed Planning of the Immediate Phase Project
• Hydraulic Model Development