Engineering Analysis and Draft Report

Water Resources Advisory Committee | November 7, 2007

Paso Robles Groundwater Basin Groundwater Banking Feasibility Study
Agenda

1. Project Goals and Approach
2. Review Hydrogeologic Feasibility
3. Engineering Evaluation
4. Environmental and Permitting Issues
5. Conclusions and Recommendations
6. Project Report Outline
The goal of this project is to determine the feasibility of groundwater banking alternatives in the Paso Robles Groundwater Basin. This will be determined based on:

- Ability to utilize undelivered SWP supply
- Ability to store and recover water
- Ability to deliver banked water to end user
Project Approach

• Evaluate Technical Feasibility
  – Hydrogeologic Feasibility
  – Engineering Feasibility

• Identify Other Considerations
  – Environmental/Permitting Considerations
  – Groundwater Management/ Operations
  – Project Partners and Funding Opportunities
Hydrogeologic Feasibility

• Compare impacts of recharge or water banking operations to a Baseline Condition

1. Existing Groundwater Model

• Use existing groundwater model of the Paso Robles Groundwater Basin (as developed)

• The 17-year simulation period represents 1981-1997 historical period

• The simulation period is divided into 34 (6-month) stress periods which represent the growing season and the non-growing season
Hydrogeologic Feasibility (cont.)

• Compare impacts of recharge or water banking operations to a Baseline Condition

2. Three alternative locations
   • Shell Creek/Camatta Creek Recharge Area
   • Creston Recharge Area
   • Salinas River/Hwy 46 Recharge Area

3. Two project operational scenarios
   • Recharge Operations – Recharge Only
   • Water Banking Operations – Recharge and Recovery
Simulated Baseline Condition

Change in Groundwater Storage for Simulated Baseline Condition

- Buildout Condition from the Paso Robles Groundwater Model
- Each stress period represents 6-months
Alternative Locations

Alt 1 – Shell Creek/Camatta Creek Lower San Juan Creek Area

Alt 2 – Creston Recharge Area

Alt 3 – Salinas River / Hwy 46 Recharge Area
SLOC SWP Table A Allocation for Simulation Period (1981 to 1997)

Source: DWR, The State Water Project Delivery Reliability Report 2005
Cumulative Volume for Recharge and Water Banking Scenarios

- **Recharge Scenario @ 1,500 af/m Delivery Capacity**
- **Water Banking Scenario @ 1,500 af/m Delivery Capacity**
- **Baseline Scenario**

**Stress Period**

**Volume (acre-feet)**

- **Recharge Scenario (Recharge Only)**
- **Water Banking Scenario (Recharge and Recovery)**
- **Baseline Scenario (No Recharge or Recovery)**
Comparative Results of Recharge Alternatives

Change in Groundwater Storage

<table>
<thead>
<tr>
<th>Change in Groundwater Storage (acre-feet)</th>
<th>0</th>
<th>50,000</th>
<th>100,000</th>
<th>150,000</th>
<th>200,000</th>
<th>250,000</th>
<th>300,000</th>
<th>350,000</th>
<th>400,000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recharge Scenario 1a</td>
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<tr>
<td>Recharge Scenario 2a</td>
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<tr>
<td>Recharge Scenario 3a</td>
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<tr>
<td>Baseline Condition</td>
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</tr>
</tbody>
</table>

Stress Period

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34
Comparative Results of Water Banking Alternatives

Change in Groundwater Storage

-400,000 -350,000 -300,000 -250,000 -200,000 -150,000 -100,000 -50,000 0 50,000 100,000 150,000

Stress Period

Change in Groundwater Storage (acre-feet)

Baseline Condition
Banking Scenario 1b
Banking Scenario 2b
Banking Scenario 3b
## Summary of Hydrogeologic Feasibility

<table>
<thead>
<tr>
<th></th>
<th>Recharge Alternatives</th>
<th>Water Banking Alternatives</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Alt 1a</td>
<td>Alt 2a</td>
</tr>
<tr>
<td><strong>Change in Groundwater Storage</strong></td>
<td>131,400 af (81%)</td>
<td>45,900 af (29%)</td>
</tr>
<tr>
<td><strong>Recovered Water</strong></td>
<td>none</td>
<td>none</td>
</tr>
<tr>
<td><strong>Recharge Concerns</strong></td>
<td>Local flooding Impacts from groundwater levels</td>
<td>Large stream losses</td>
</tr>
<tr>
<td><strong>Recovery Concerns</strong></td>
<td>No Recovery Operations</td>
<td>No Recovery Operations</td>
</tr>
</tbody>
</table>

- Change in storage at end of 17-year simulation period.
- Actual changes in groundwater storage will be based on annual hydrologic conditions, project operations, project duration.
Engineering Evaluation

• Disposition of the SLOC Table A Supply

• Comparative Project Cost Estimates for Recharge and Water Banking Alternatives

• Groundwater Management Considerations
### Disposition of SLOC Table A Supply

<table>
<thead>
<tr>
<th>Water Use</th>
<th>Annual Amount</th>
<th>Existing Condition 40-Year Total</th>
<th>Recharge Alternative 40-Year Total</th>
<th>Banking Alternative 40-Year Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>SLOC M&amp;I Contractors (1st priority)</td>
<td>4,830 af/yr</td>
<td>193,200 af</td>
<td>193,200 af</td>
<td>193,200 af</td>
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<tr>
<td>Drought Buffer (2nd priority)</td>
<td>3,617 af/yr</td>
<td>50,600 af</td>
<td>50,600 af</td>
<td>50,600 af</td>
</tr>
<tr>
<td>Recharge Operations (3rd priority)</td>
<td>Up to 18,000 af/yr</td>
<td>0 af</td>
<td>468,000 af</td>
<td>468,000 af</td>
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<tr>
<td>Excess Allocation</td>
<td>Up to 16,553 af/yr</td>
<td>756,200 af</td>
<td>288,200 af</td>
<td>288,200 af</td>
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<tr>
<td>TOTAL</td>
<td>25,000 af</td>
<td>1,000,000 af</td>
<td>1,000,000 af</td>
<td>1,000,000 af</td>
</tr>
<tr>
<td>Recovery Operations</td>
<td>Up to 18,000 af/yr</td>
<td>none</td>
<td>none</td>
<td>252,000 af</td>
</tr>
</tbody>
</table>

Based on Table A contract amount (25,000 af/yr).
Actual project deliveries will be dependent on annual hydrologic conditions and SWP delivery reliability.
Facility Requirements

- **Conveyance Facilities**
  - Conveyance Pipeline and Pumpstations

- **Recharge Facilities**
  - Recharge Basins and In-lieu Recharge Facilities

- **Recovery Facilities** *(water banking operations only)*
  - Wells and Collection Systems

- **O&M**
  - Annual costs to operate alternatives (includes power)
Comparison of Project Costs

Distribution of Costs for Recharge and Water Banking Alternatives Based on 40-Year Project Life

Project Cost ($M)

- Existing
- Alt 1a
- Alt 1b
- Alt 2a
- Alt 2b
- Alt 3a
- Alt 3b

Alternative

- $0.0
- $100.0
- $200.0
- $300.0
- $400.0
- $500.0
- $600.0
- $700.0
- $800.0

Project Costs

- $45.2
- $36.0
- $36.0
- $48.2
- $48.8
- $47.7
- $51.0

Project Facility and O&M Costs

- $21.6
- $21.6
- $21.6
- $21.6
- $21.6
- $21.6
- $21.6

M&I Contractors Fixed Costs

Excess Allocation Fixed Costs

Recharge Water Deliveries to PWTP

Recharge Water Fixed Costs

Water Banking O&M Costs

Capital Costs for Facilities
# 40-Year Total Project Cost Estimates

<table>
<thead>
<tr>
<th>Cost Component</th>
<th>Recharge Alternatives</th>
<th>Water Banking Alternatives</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Cost Range</td>
<td>Percent of Total Cost</td>
</tr>
<tr>
<td>Water Cost (Delivered to PPWTP)</td>
<td>$231.2 M</td>
<td>80 to 83 %</td>
</tr>
<tr>
<td>Capital Costs and O&amp;M Costs</td>
<td>$48.8 M to $58.2 M</td>
<td>17 to 20%</td>
</tr>
<tr>
<td>40 –Year Total Costs</td>
<td>$282 M to $289 M</td>
<td>100%</td>
</tr>
<tr>
<td>Unit Water Cost ($/acre-foot)</td>
<td>$600 to $620</td>
<td></td>
</tr>
</tbody>
</table>

Based on full Table A contract amount (25,000 af/yr). Actual project costs would reflect water availability and facility capacity and operations.
Comparison of Water Costs of Alternatives

Range of Costs for Recharge Alternatives
(About $600 to $620 per acre-foot)
Groundwater Banking Operational Considerations

• Groundwater Monitoring
  – Establish pre-project conditions
  – Monitor changes in groundwater levels and quality in response to project operations

• Groundwater Banking Operating Agreements
  – Identify all project participants
  – Establish goals and objectives of the project operations

• Groundwater Banking Operational Criteria
  – Ensure equity between land owners and banking partners
  – Manage recharge and recovery operations to minimize impacts
Groundwater Management Recommendations

• Prepare Groundwater Management Plan
  – Provide framework for overall long-term groundwater management in the Basin which may include recharge or water banking operations
  – Required to pursue some funding opportunities

• Develop Monitoring Plan
  – Supports groundwater management planning and basin operations by monitoring changing conditions

• Install Dedicated Monitoring Wells to Fill Data Gaps
  – Improve understanding of basin, and monitoring changing conditions
Environmental and Permitting Considerations

• Key Environmental Issues
  – Agricultural Resources
  – Biological Resources
  – Cultural Resources
  – Land Use and Growth Inducing Effects

• Permitting Requirements
  – Federal Agencies (COE, NOAA, FWS)
  – State Agencies (Central Coast RWQCB, DFG)
  – Local Agencies (County of San Luis Obispo, City of Paso Robles, San Luis Obispo Air Pollution Control District)
Environmental Constraints

<table>
<thead>
<tr>
<th>Component/Alternative</th>
<th>Agricultural Resources</th>
<th>Biological Constraints</th>
<th>Cultural Resources</th>
<th>Land Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conveyance Pipeline</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Distribution Pipeline</td>
<td>2</td>
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<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Alternative 1 – Shell Creek</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Alt 2 – Huerhuero Creek</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Alt 3 – Salinas River</td>
<td>2</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
</tbody>
</table>

3 – **Major Constraint**: could be fatal flaw precluding site selection

2 – **Moderate Constraint**: may require additional regulatory or permitting time and effort, but site is suitable for proposed use

1 – **Minor Constraint**: this issue may need further evaluation in the CEQA context, but not likely to pose a regulatory difficulty
Conclusions – Alternative 1

• Appears to have adequate groundwater storage capacity to support groundwater recharge and recovery operations.

• Modeling suggests that more recharged water remains in storage compared to the other locations.

• This alternative is the closest to the source of imported water, so the capital and O&M costs are less than the other alternatives.

• Additional analysis is needed to optimize the project size to reduce losses and groundwater recovery impacts.

• There were no environmental or permitting issues identified as fatal flaws that preclude this project from being pursued.
Conclusions – Alternative 2

• Does not appear to have adequate groundwater storage capacity to support groundwater recharge and recovery operations of the scale evaluated

• Local aquifer conditions require more recovery wells than the other alternatives, increasing project costs

• This alternative is located further from the source of supply compared to Alternative 1

• Additional analysis is needed to optimize the project size to reduce losses and groundwater recovery impacts

• There were no environmental or permitting issues identified as fatal flaws that preclude this project from being pursued.
Conclusions – Alternative 3

• Appears to have adequate groundwater storage capacity to support groundwater recharge and recovery operations of the scale evaluated

• In-lieu recharge along Highway 46 may provide considerable recharge potential and may warrant additional analysis

• Direct recharge along Salinas River may prove problematic due to hydraulic connectivity between the river and alluvial deposits

• This alternative is located the farthest from the source of supply, increasing projects costs particularly for water banking operations

• There may be significant environmental or permitting issues associated with direct recharge near the Salinas River
Recommendations

• Compare study results with other water storage opportunities available to San Luis Obispo County

• Incorporate study results in County Resource Capacity Study

• Prepare preliminary engineering evaluation of most viable sites

• Conduct hydrogeologic field investigation

• Conduct pilot recharge tests
Recommendations (continued)

- Survey land owners to determine interest and willingness to participate in agricultural in-lieu recharge

- Complete salt balance on imported water

- Refine project description and project operations

- Refine/update existing groundwater model to evaluate recharge opportunities in more detail

- Identify and evaluate potential impacts to existing land and water use conditions
Section 1 - Introduction
- Provides project background, goals and approach

Section 2 – Project Setting
- Describes local agencies, available water supplies and existing infrastructure

Section 3 – Potential Water Banking Operations
- Describes water banking concepts and potential banking operations

Section 4 – Water Banking Alternatives
- Describes approach used to identify and select water banking alternatives
Section 5 – Hydrogeologic Evaluation
  – Describes modeling efforts and provides modeling results and hydrogeologic evaluation

Section 6 – Engineering Evaluation and Cost Estimate
  – Describes facility requirements and comparative costs for each alternative

Section 7 – Environmental and Permitting Considerations
  – Identifies environmental and permitting issues that may need to be addressed

Section 8 – Conclusions and Recommendations
  – Summarizes project results and provides recommendations for groundwater management including water banking opportunities
Next Steps

• Comments Due by November 21, 2007

• Final Report Due mid-December 2007
Questions ?