



Water Resources Advisory Committee | November 7, 2007

Engineering Analysis and Draft Report

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**



Project Goal

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

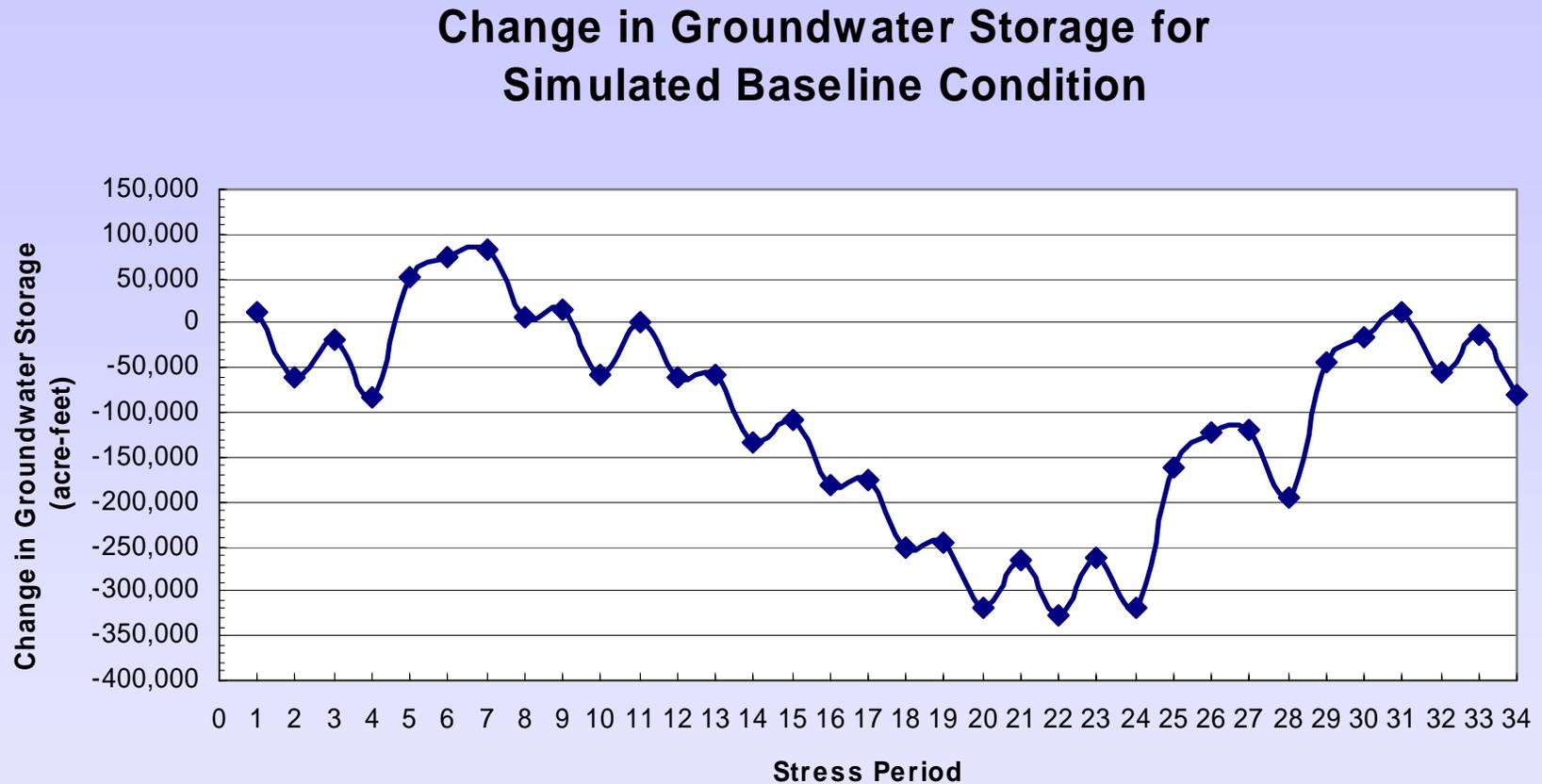
- Use existing groundwater model of the Paso Robles Groundwater Basin (as developed)
- The 17-year simulation period represents 1981-1997 historical period
- The simulation period is divided into 34 (6-month) stress periods which represent the growing season and the non-growing season



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
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- 3. **Two project operational scenarios**
 - Recharge Operations – Recharge Only
 - Water Banking Operations – Recharge and Recovery

Simulated Baseline Condition



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

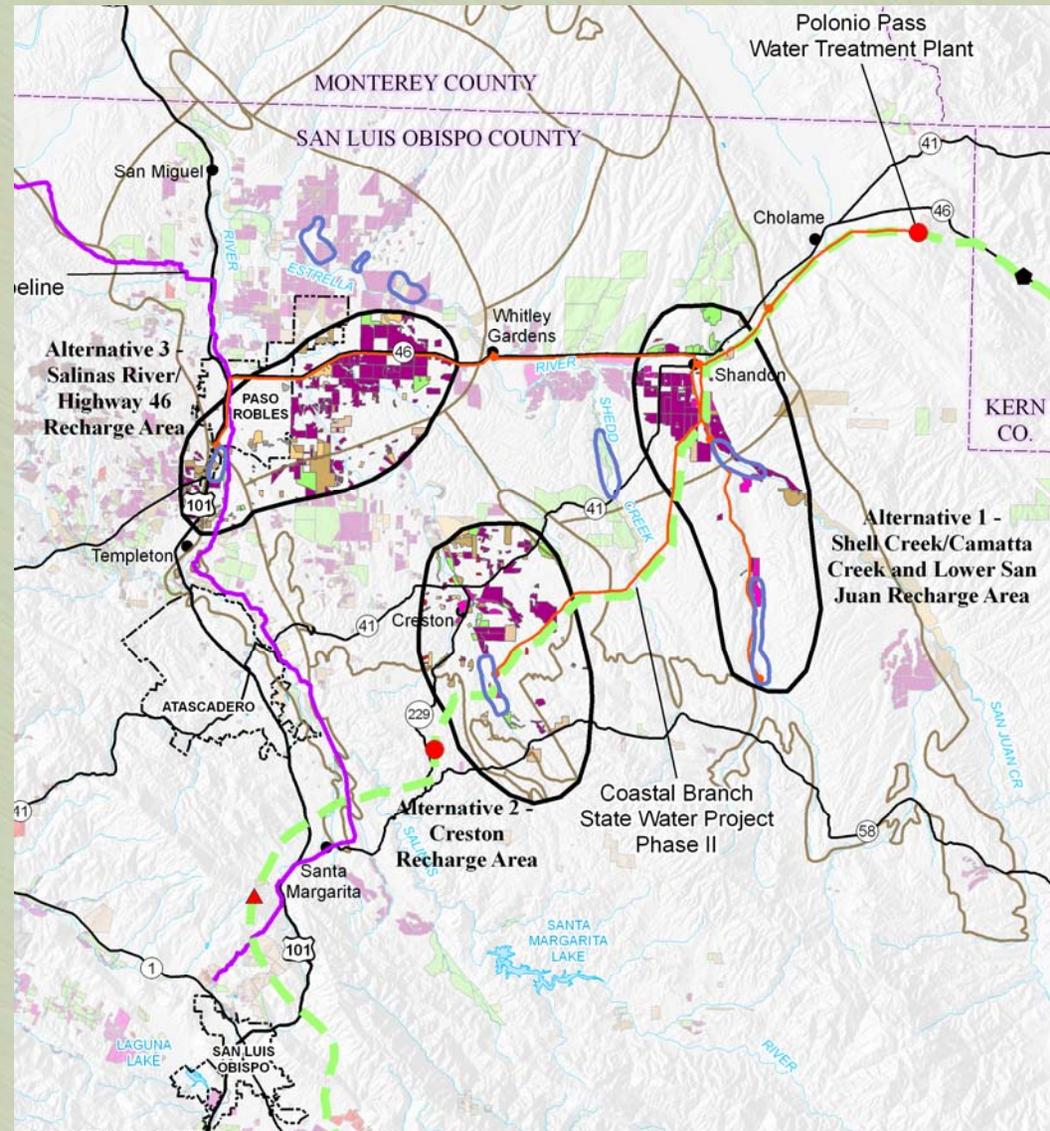


Alternative Locations

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

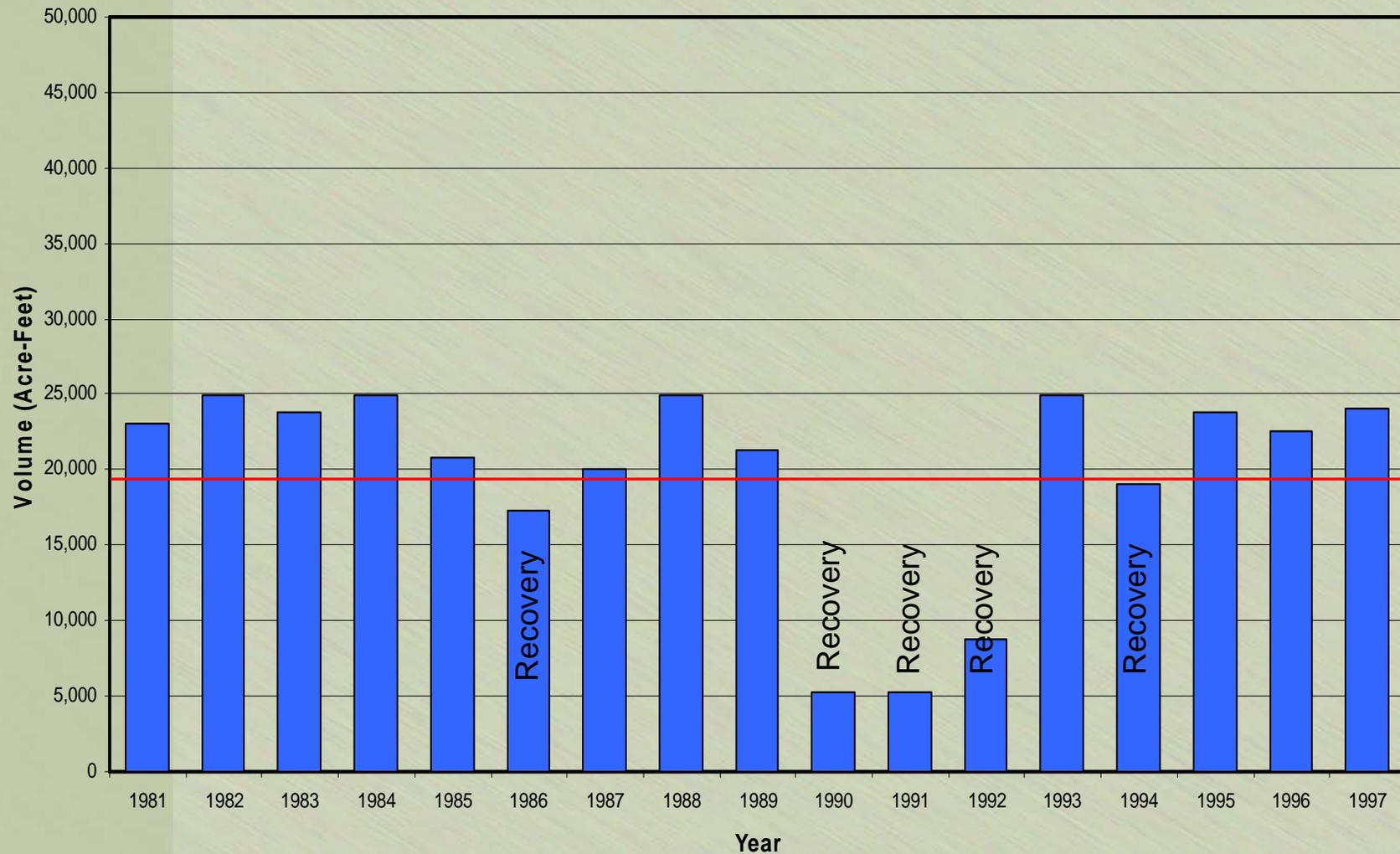
Alt 2 – Creston Recharge
Area

Alt 3 – Salinas River / Hwy 46
Recharge Area



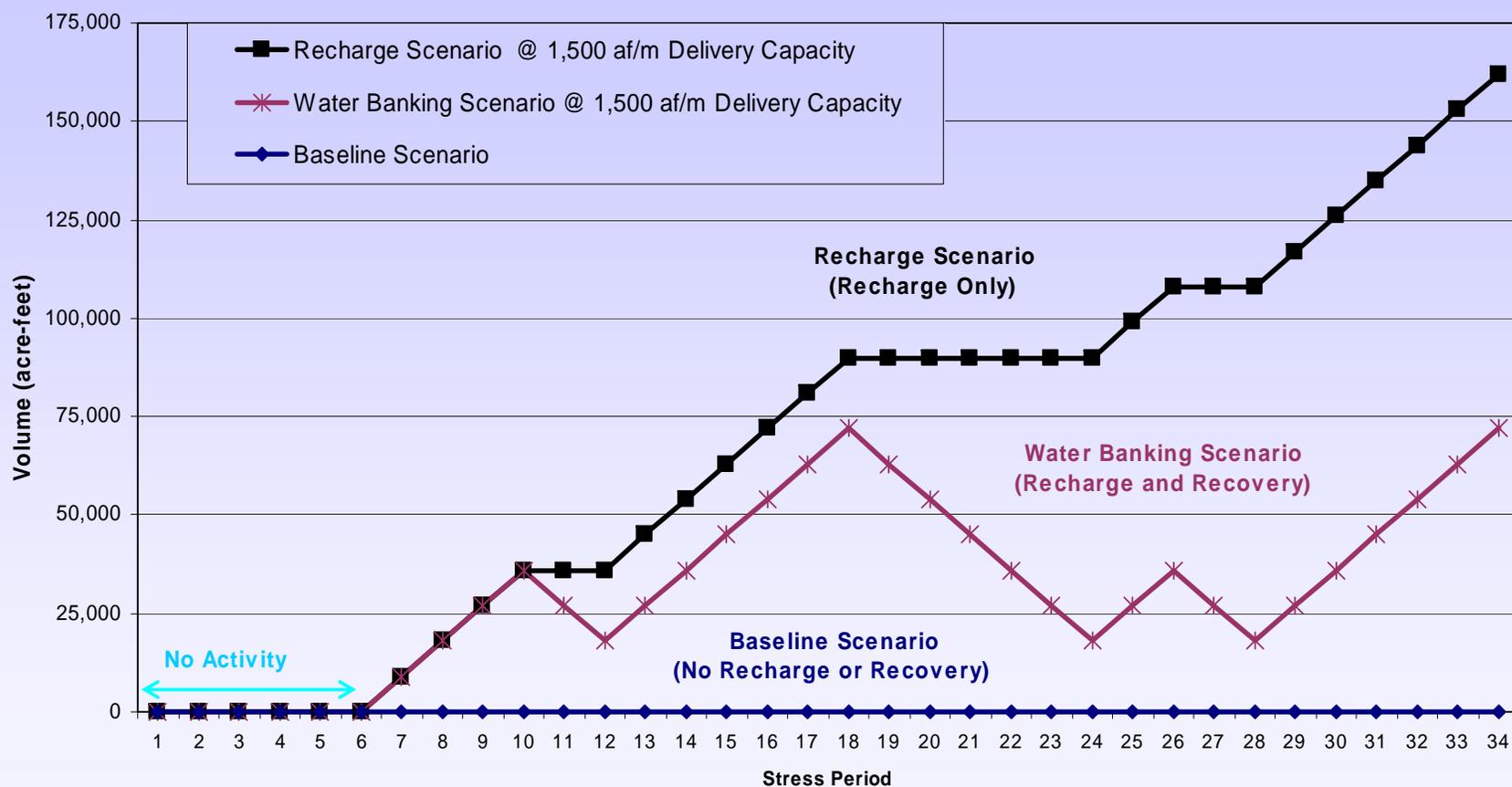


SLOC SWP Table A Allocation for Simulation Period (1981 to 1997)



Source: DWR, The State Water Project Delivery Reliability Report 2005

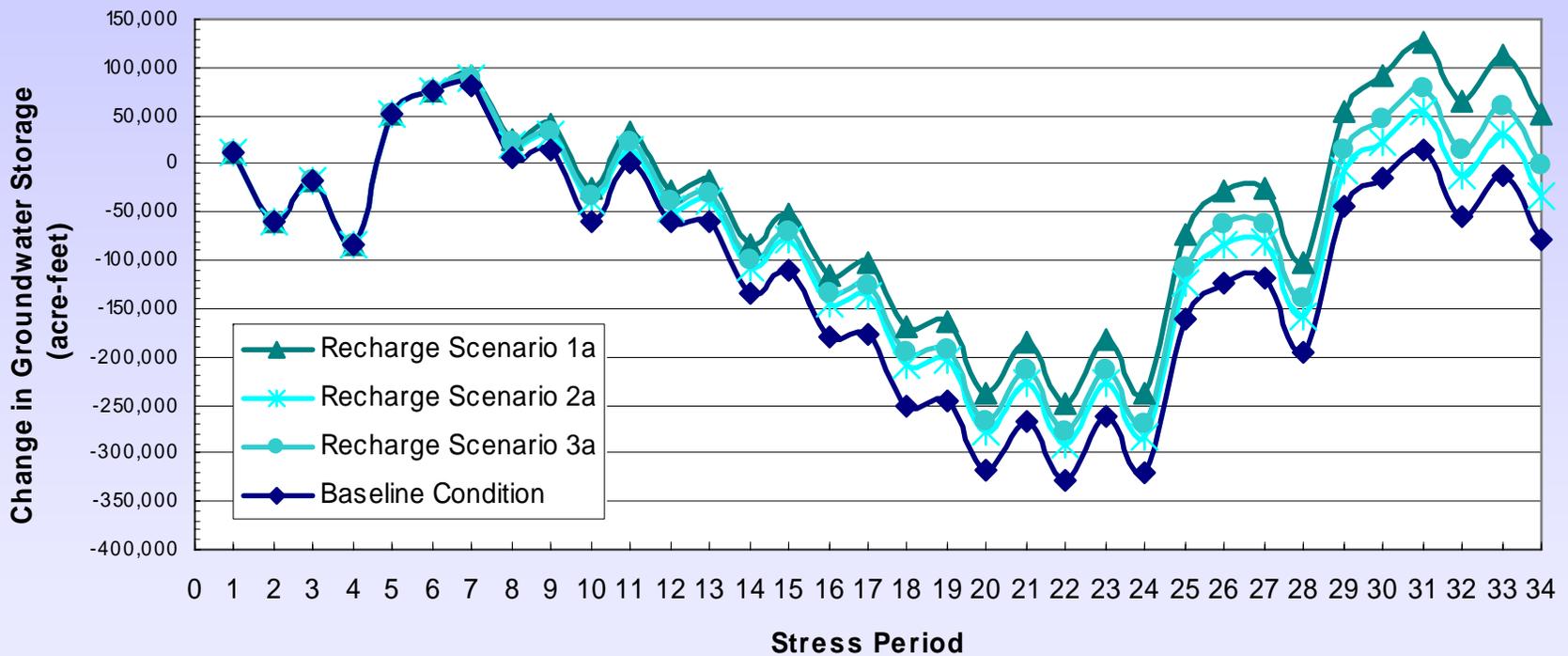
Cumulative Volume for Recharge and Water Banking Scenarios





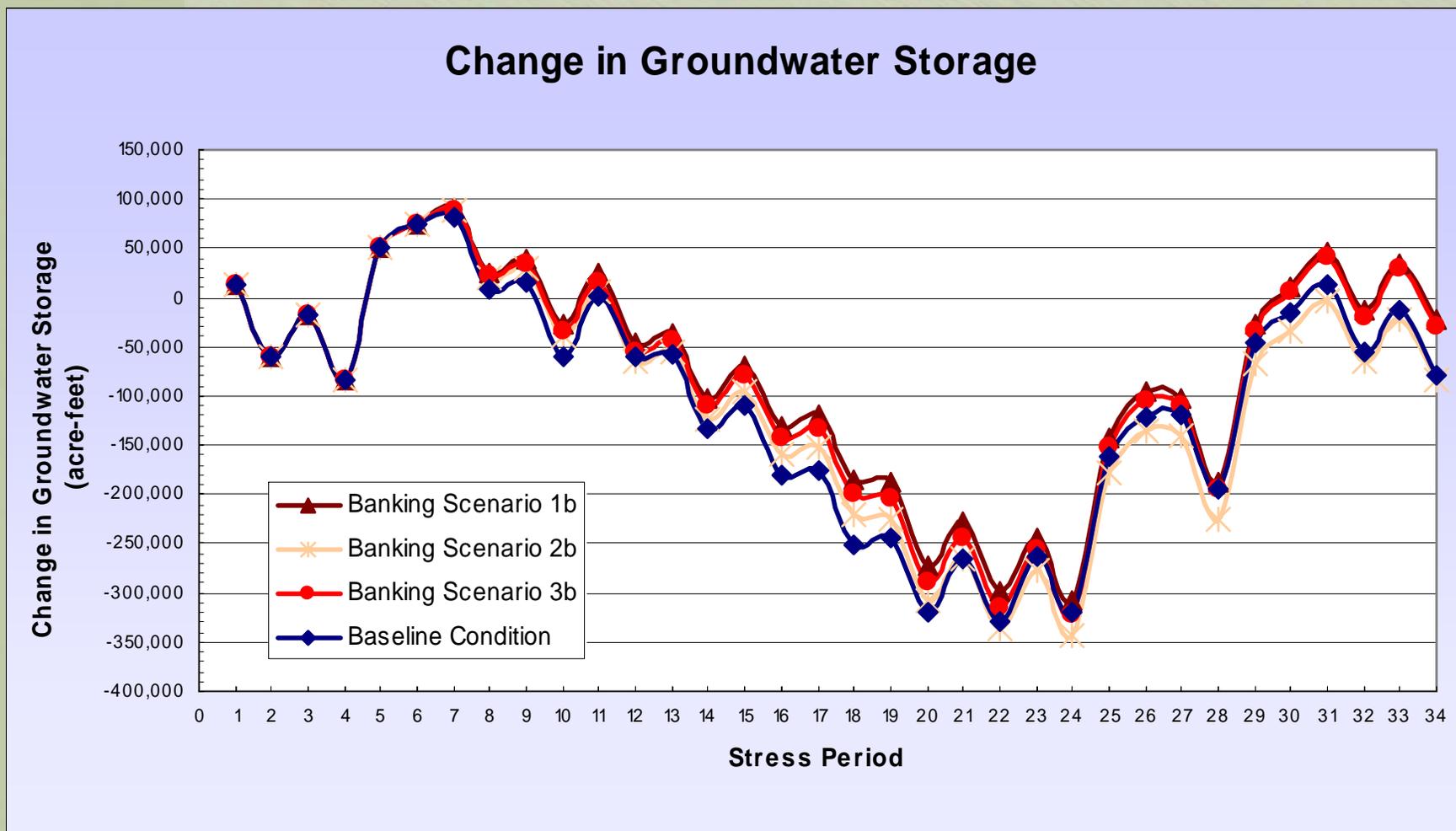
Comparative Results of Recharge Alternatives

Change in Groundwater Storage





Comparative Results of Water Banking Alternatives





Summary of Hydrogeologic Feasibility

	Recharge Alternatives			Water Banking Alternatives		
	Alt 1a	Alt 2a	Alt 3a	Alt 1b	Alt 2b	Alt 3b
Change in Groundwater Storage	131,400 af (81%)	45,900 af (29%)	78,000 af (48%)	55,900 af (35%)	-3,900 af (-2%)	49,700af (31%)
Recovered Water	none	none	none	90,000 af	90,000 af	90,000 af
Recharge Concerns	Local flooding Impacts from groundwater levels	Large stream losses	Recharge losses to Salinas River	Local flooding Impacts from groundwater levels	Large stream losses	Recharge losses to Salinas River
Recovery Concerns	No Recovery Operations	No Recovery Operations	No Recovery Operations	Localized recovery impacts	Significant recovery impacts	Impacts to Salinas River and M&I wells

- 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

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

Based on Table A contract amount (25,000 af/yr).

Actual project deliveries will be dependent on annual hydrologic conditions and SWP delivery reliability.

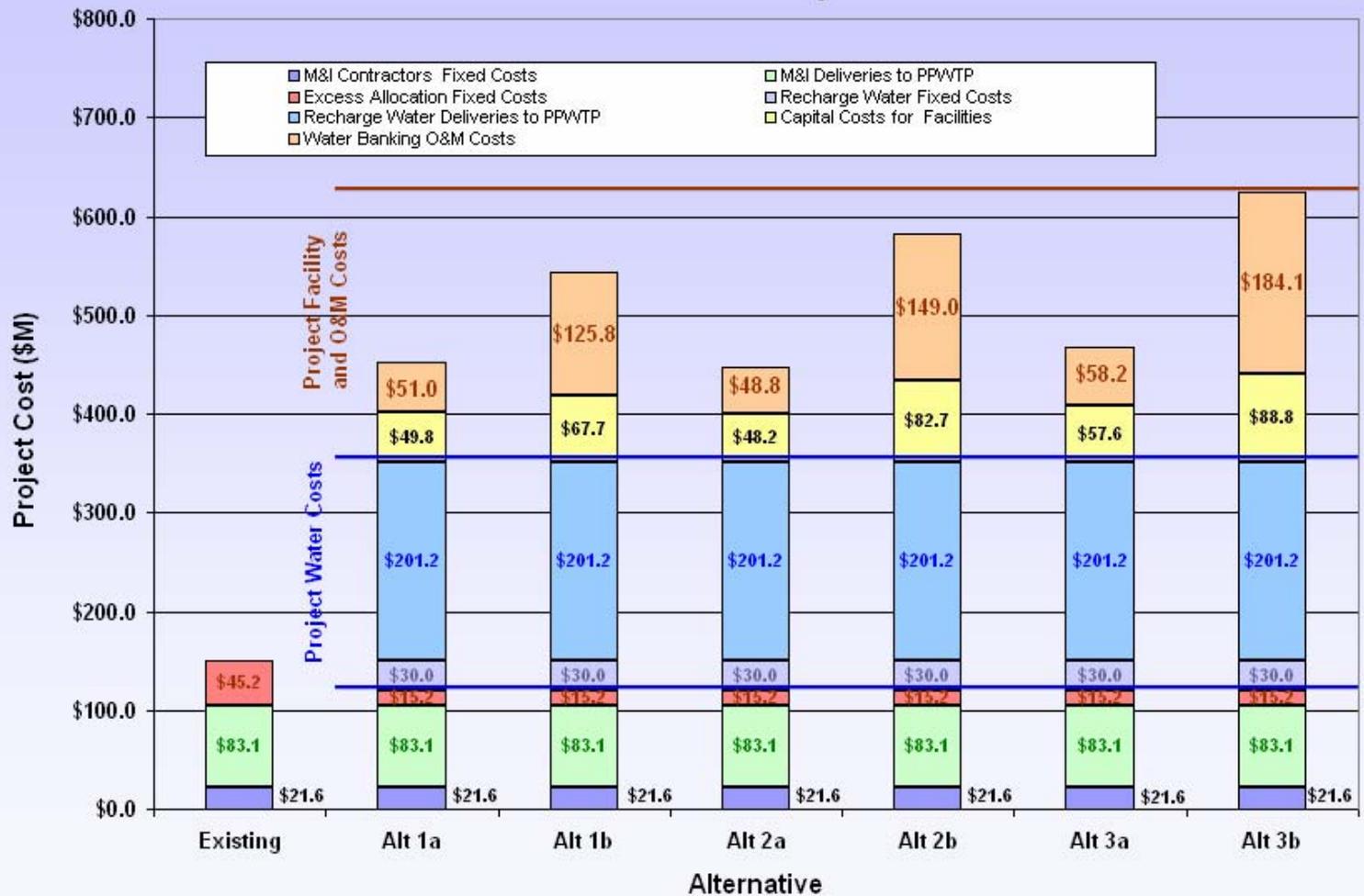


Facility Requirements

- **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**





40-Year Total Project Cost Estimates

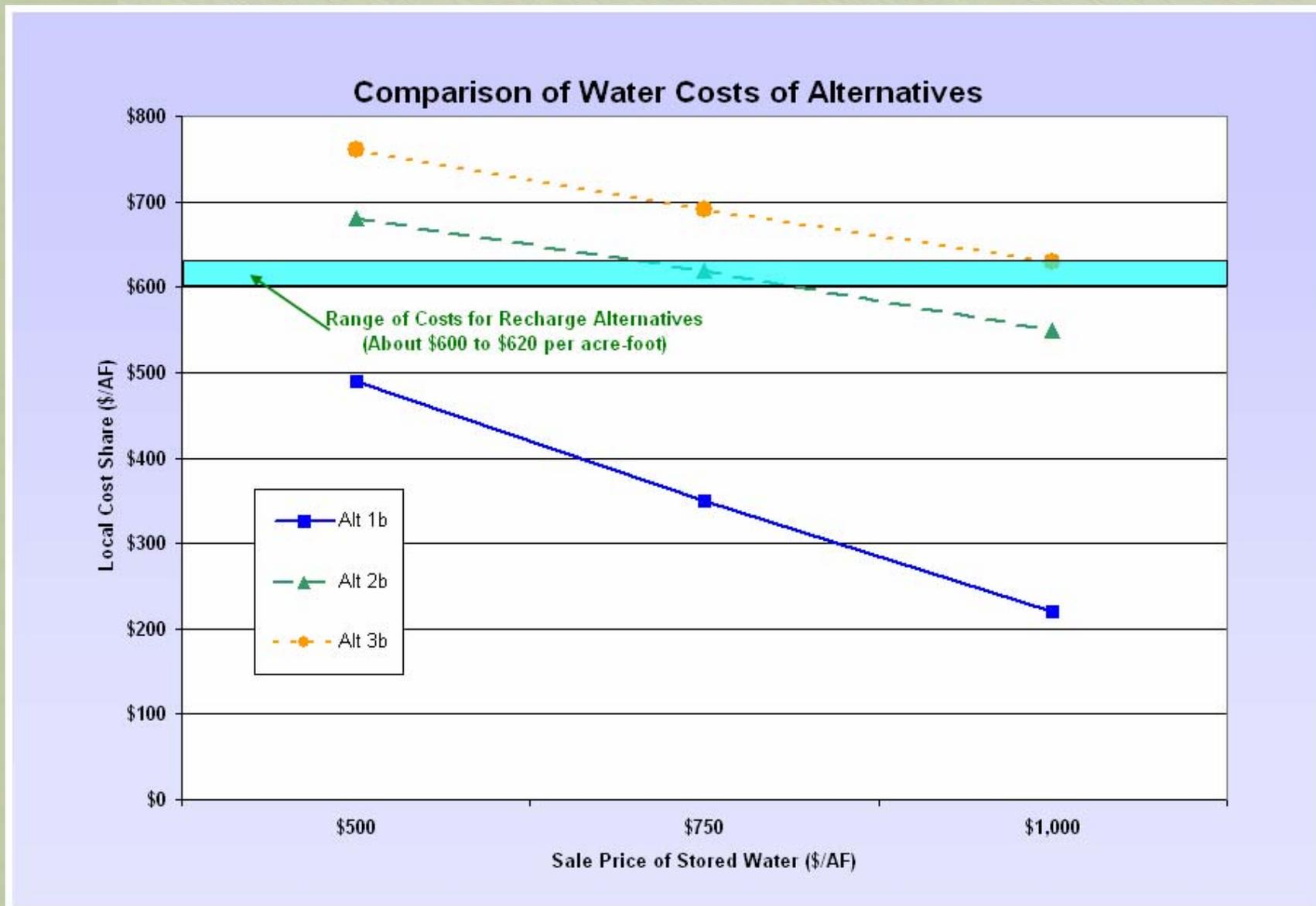
Cost Component	Recharge Alternatives		Water Banking Alternatives	
	Cost Range	Percent of Total Cost	Cost Range	Percent of Total Cost
Water Cost (Delivered to PPWTP)	\$231.2 M	80 to 83 %	\$231.2 M	56 to 65 %
Capital Costs and O&M Costs	\$48.8 M to \$58.2 M	17 to 20%	\$125.8 M to \$184.1 M	35 to 46 %
40 –Year Total Costs	\$282 M to \$289 M	100%	\$357 M to \$415 M	100%
Unit Water Cost (\$/acre-foot)	\$600 to \$620		\$760 to \$890	

Based on full Table A contract amount (25,000 af/yr).

Actual project costs would will reflect water availability and facility capacity and operations.



Comparison of Water Costs





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

Component/ Alternative	Agricultural Resources	Biological Constraints	Cultural Resources	Land Use
Conveyance Pipeline	2	2	2	1
Distribution Pipeline	2	2	2	1
Alternative 1 – Shell Creek	2	2	2	1
Alt 2 – Huerhuero Creek	2	2	2	1
Alt 3 – Salinas River	2	3	2	1

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



Draft Report

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



Draft Report (continued)

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 ?