SAN DIEGO COUNTY WATER AUTHORITY
3211 Fifth Avenue
San Diego, California 92103

SPECIAL BOARD OF DIRECTORS MEETING

January 27, 1998

1:30 p.m.

1. Call to order
2. Salute to the flag
3. Roll call, Determination of a Quorum

4. Opportunity for members of the public to address the Board on matters on the agenda of this Special Board meeting.

5. Colorado River Hydrology and IID Water Transfer Reliability. Ali Sharoodi, Stetson Engineering

6. Water Conservation Methods and the Economics of IID Conservation. Peter Canessa, Agricultural Consultant

7. Removal of Agricultural Pollutants from Irrigation Runoff. J. Zuback, U.S. Filter

8. Presentation on Price Redetermination in the Proposed IID Agreement. Scott Slater, CWA Special Counsel

9. ADJOURNMENT

NOTE: All information or possible action items on the agenda of committees or the Board may be deliberated by and become subject to consideration and action by the Board.

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SDCWA Exh. 56

Costs and Methods of Water Conservation in Imperial Irrigation District

Peter Canessa

- Registered Agricultural Engineer in California
- MS Irrigation & Drainage Engineering
- Consultant since 1983
  - » Agricultural water and energy management
  - » Education (past Lecturer at Cal Poly, SLO)
  - » Microcomputer applications
- For San Diego County Water Authority
  - » Verify the 1996 IID Draft Water Requirements and Availability Study
  - » Identify most likely conservation methods and costs

Water Conservation in IID

Today...

- Identify three basic cost components of Agreement
- Discuss important issues affecting cost estimates
- Identify potential projects at District and farm level
  - » Briefly point out why some felt unimportant or not viable
- Summarize costs and yields of main conservation projects
  - » Lateral Interceptors (LI) at District level
  - » Tailwater Recovery Systems (TRS) at farm level

Components of Water Conservation Cost

- On-farm water conservation projects
- District level water conservation projects
- IID administration and accessory programs
  - » Risk fund for environmental and other "third-party" effects
  - » Compensation for lost hydropower and water sales
  - » Administration of program

Conservation Project Issues

- $ / Acre-Foot conserved
  - » Yield of conserved water for any project
  - » Dollar cost of the measure
- Thus,

  low cost / low yield = high cost / high yield

  ...other factors being equal(?)
  - » Risk and reliability
  - » External consequences
  - » Opportunity to implement (at system level)
  - » Expected participation (at farm level)

Conservation Project Issues

- **Only so much conservation available**
  - » **Evaporation**
  - » **Seepage**
  - » **Surface run-off to Salton Sea**
  - » **Excessive deep percolation**
- **Where can losses be reduced**
  - » **On-farm**
  - » **District**
  - » **Project**
    - main canal lining
    - buffering reservoirs

Conservation Project Issues

- How reliable and consistent is the project? That is, what affects year-to-year yields/costs?
  - » Management
  - » Maintenance
  - » Weather
  - » Crop
- What are the external consequences?
  - » To other conservation projects
  - » To the farmer
  - » To the District
  - » To the environment
  - » To third parties

Conservation Project Issues

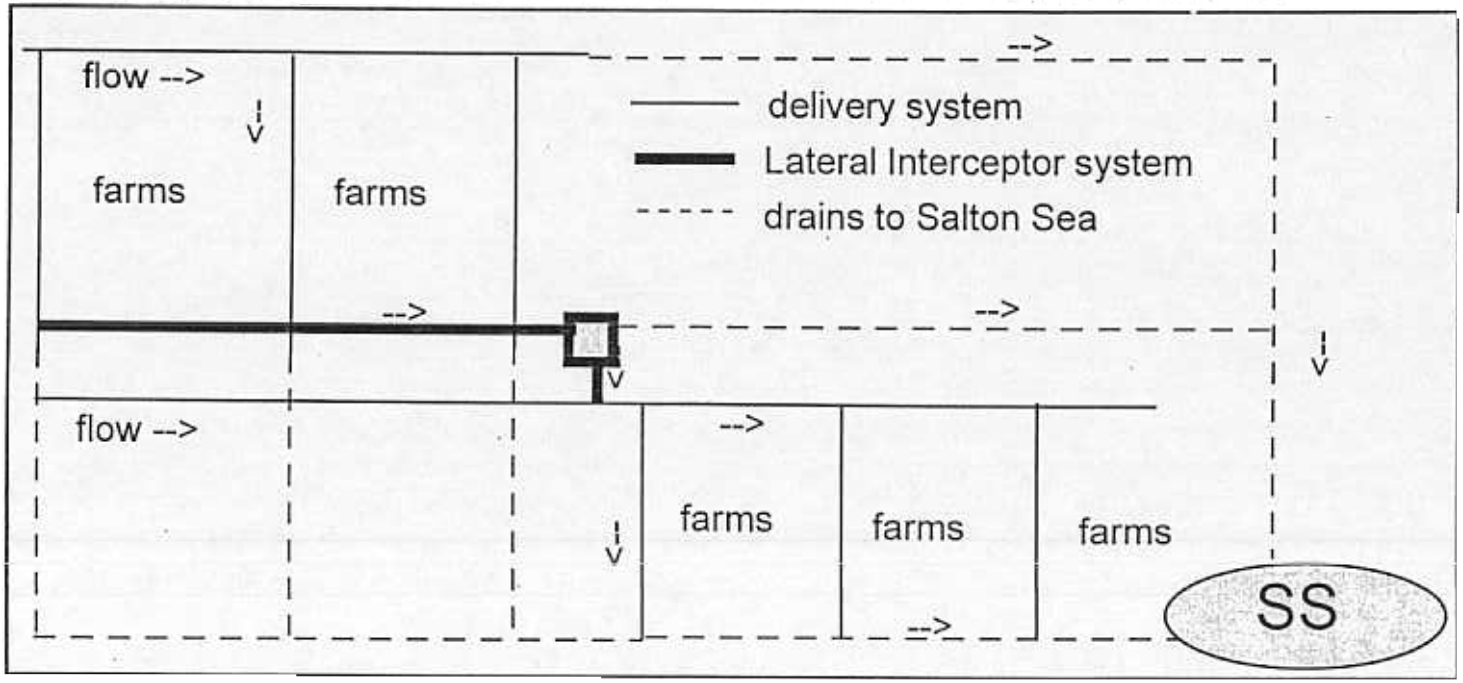
- 50,000 to 100,000 AF/year available at District level - thus, on-farm participation is required
- On-farm projects must consider...
  - » Tax consequences
  - » Financing requirements
  - » Required cropping flexibility
  - » Farm sizes and leasing patterns
  - » Different management abilities
  - » Different perceptions of risk
  - » Sociology - incentive for change

Potential District Level Projects

- Remaining lining, seepage prevention
  - » Minimal mileage of laterals left - high cost projects
  - » Picking up a lot of seepage now
- Remaining District reservoirs
  - » No cost/yield estimates in Draft Study
  - » Sites not identified in Draft Study
- Increased delivery/ordering flexibility
  - » Cost? (personnel, other required projects)
  - » Verification of yield?
  - » On-farm actions?
- Lateral Interceptors

Lateral Interceptors

- **District level tailwater recovery/re--use**
  - » **"Cross" lateral picks up lateral spill and shunts to reservoir**
  - » **Reservoir normally delivers to lower sub-system**
    - – if no capacity in the lower sub-system, spill anyway



Lateral Interceptors

- Projected yields/costs from 1993 reconnaissance level report by CH2M-Hill (included 20% contingency)
  - » Two configurations- high yield and low yield
- 15 projects projected to be built 2001 - 2008
  - » 1999 costs from $88/AF to $161/AF for individual projects
  - » Yield starting at 9,160 AF/yr ramping to 53,600 AF/yr
- Question as to individual cost/yield estimates
- Recent experience with 3 pilot projects
  - » Somewhat higher yield than projected with Plum-Oasis
  - » Somewhat higher costs also
- Lead time to get in place (need on-farm now)

On-Farm Projects

- Components of on-farm costs
  - » Direct cost (highly variable within any one project type)
  - » Management costs
  - » Risk and incentive

On-farm participation is an individual decision - thus, success (achieve desired participation) requires a program that provides compensation for perceived risk as well as direct and indirect costs

On-Farm Projects

- On-farm reservoirs (buffer supply and demand)
  - » No firm yield estimates or experience
  - » Indicated cost relatively high
- Linear sprinkler machines (increased control)
  - » Cost and applicability (only 3 machines in place now)
  - » Infrastructure for maintenance
  - » Evaporation losses offset some gains
- Drip/trickle (increased control)
  - » Cost and applicability
  - » Management requirements
  - » In use now

On-Farm Projects

- Improved irrigation management
  - » Reliability and consistency questions
  - » Relatively high cost/acre (MWD last estimated at $233/AF)
- Modified crop rotation (NO FALLOWING!!)
  - » Verification of yield will be difficult
- Tailwater Recovery System (TRS)

Tailwater Recovery Systems - Advantages

- Mainline technology (in use throughout California and the world)
- Permanent or portable configurations
- Single or multiple field configurations
- Relatively simple maintenance and management

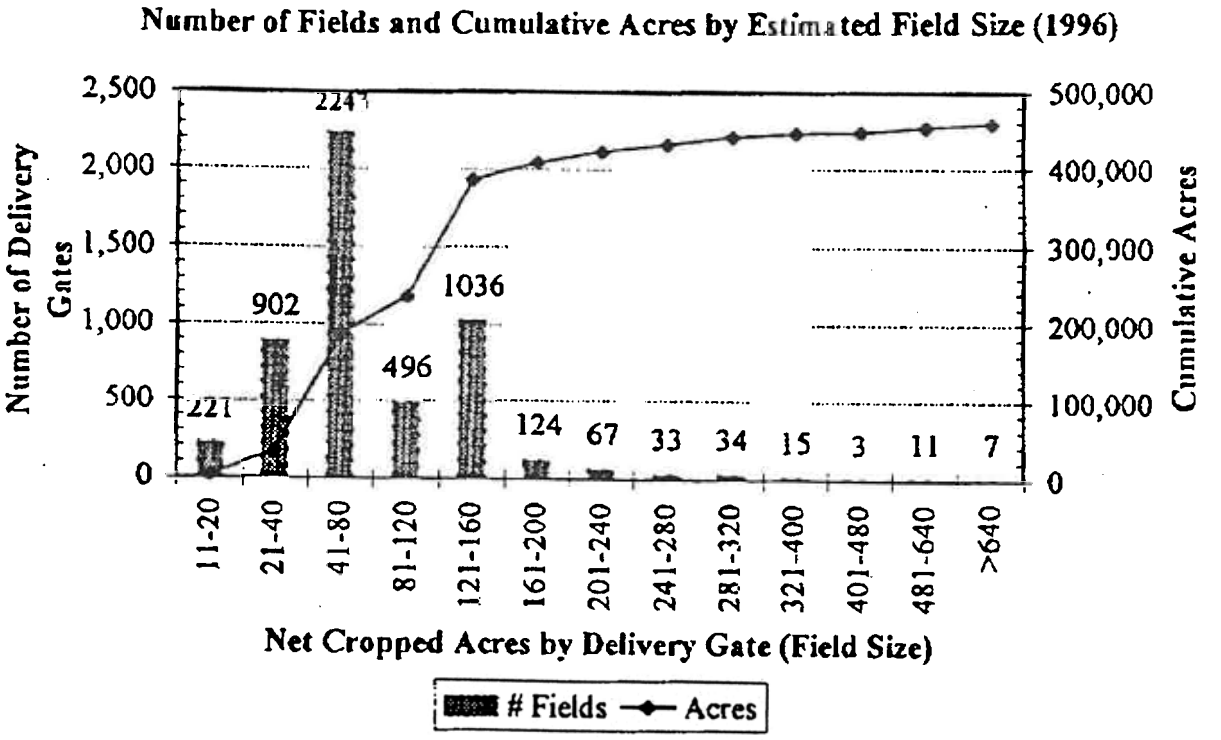
Tailwater Recovery Systems - Issues

- Consequential effects
  - » Increased deep percolation? (approximately 70% of tailwater considered conserved)
  - » Long-term salinity?
  - » Effect on crops from temperature, weeds, disease, chemicals?
- Power source
  - » Electricity versus the current power grid
  - » Diesel versus air quality
- Integration with leasing patterns
- System size/configuration
  - » Affects cost/acre
  - » Affects average yield estimates

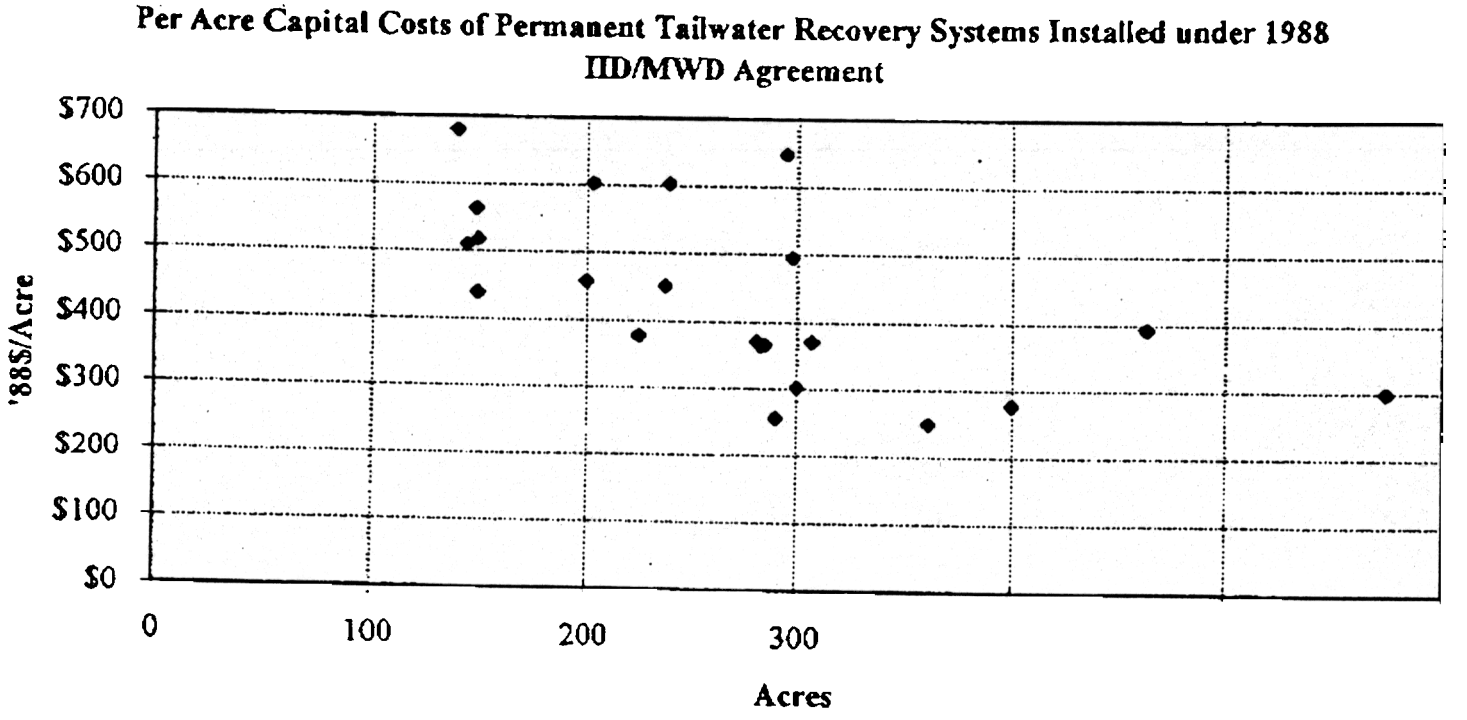
Tailwater Recovery System Configurations

- MWD/IID - 25 Systems in place
  - » 23 Permanent (272 acres average size)
  - » 2 portables (covering 828 acres)
- Cost of TRS installation related to acreage
- Conserved water not related to acreage
- Used "benchmark" systems for SDCWA/IID
  - » 80 and 120 acres due to field size distribution
  - » permanent and portable pump configurations for flexibility

Broad-Based Program Must Include Participation by 80 to 120 Acre Parcels

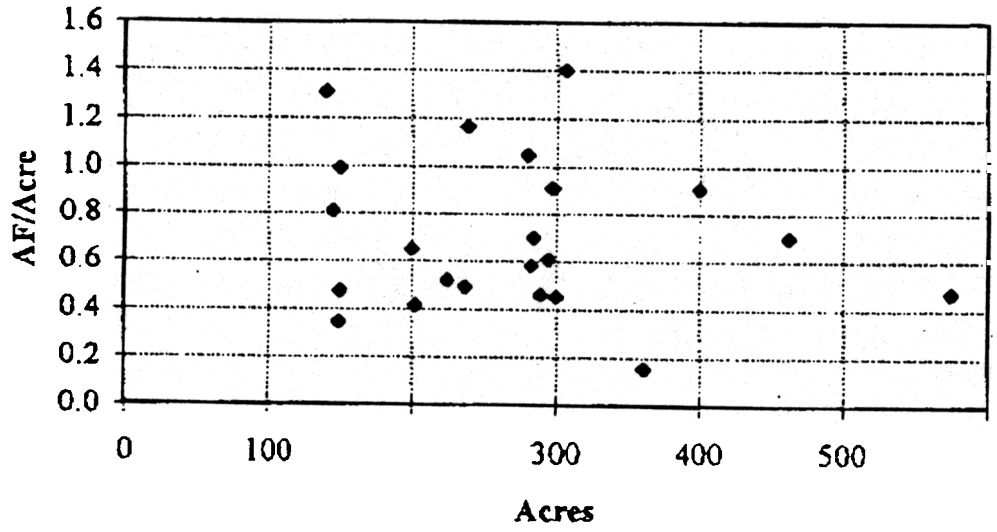


Field Size has Significant Impact on Capital Investment Per Acre



Variable Yield of Conserved Water

Yield of Conserved Water from Permanent Tailwater Recovery Systems Installed Under 1988 IID/MWD Agreement



Tailwater Recovery System Configurations

Cost Item	Permanent	Permanent	Portable
	80 Acres	120 Acres	80 Acres
Capital Investment			
Pond	$15,150	$18,425	$14,148
Pump	$19,500	$20,000	$ 2,500
Pipeline	$33,080	$43,640	$33,080
8% contingency	$ 5,418	$ 6,565	$ 3,978
Total	$73,148	$88,630	$53,706
$/Acre	$914/Ac	$739/Ac	$671/Ac
Annual O&M/Ac	$ 42/Ac	$ 38/Ac	$ 71/Ac

Pro-Forma Costs in '99 $
Tailwater Recovery Systems

- Annual costs include direct costs and O&M
- Costs amoritized over 45 years

System	Annual Cost/Ac	w/ Yield @ 0.5 AF/Ac	w/ Yield @ 0.65 AF/Ac	w/ Yield @ 0.8 AF/Ac
Permanent				
80 Acres	$103	$205/AF	$158/AF	$128/AF
120 Acres	$ 86	$172/AF	$132/AF	$108/AF
Port. 80 Acres	$110	$220/AF	$169/AF	$137/AF

In Summary

SDCWA/I D Agreeme nt

- Uti izes D tric eve and on farm ailwater recovery w th h gh co t/y e d var ab ty for nd v dua pro ect
- Ha sub a ntia y d fferen co from MWD/I D Agreement du e o the on farm partic pat on a nd nflation
- I primar y co t ba ed w h some mark t component for r k/ ncentive for on farm pro ec
- Very ik y o prov de var ab e return o farmer depend ng on the nd v dua operation

Declaration of Vernice Rae Hartman

I, Vernice Rae Hartman, declare that:

1. I am the Clerk of the Board for the San Diego County Water Authority, in San Diego, California. I hereby make this declaration in my official capacity on behalf of the San Diego County Water Authority.

2. I declare that the attached exhibit "SDCWA Board of Directors Meeting Agenda for January 27, 1998, 1:30 p.m., including Peter Canessa, Agricultural Consultant, Presentation" is a true and accurate copy which is retained in the files of the San Diego County Water Authority, in San Diego, California.

I certify under penalty of perjury under the laws of the State of California that the above statements are true.

Dated: This 22 day of May, 2002.

Vernice Rae Hartman

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