Environmental Impact Assessment and Sustainability Assessment

Presentation to 1.133

"Concepts in Engineering Practice"

September 29, 2003

Susan Murcott

William Mulholland's life spanned the "Golden Age" of engineering, a time when emphasis was largely on the benefits of economic growth and large-scale projects were considered "heroic."

Orange County's Groundwater Replenishment System

What is the Groundwater Replenishment (GWR) System?

GWR is a new project (approved October 2002) of the Orange County Water District (OCWD) and Orange Country Sanitation District (OCSD) to purify, for reuse in groundwater recharge, highly treated wastewater that is currently discharged to the ocean via ocean outfalls.

Construction Required

- **High-tech, water purification system at existing site.**
- **13 mile pipeline from Fountain Valley to Anaheim**
- **New injection wells**

Advanced Water Treatment Plant

- High-tech, water purification system producing “ultra-pure,” high quality water
- Technology used in industry for years
  - Microfiltration – food, medicines
  - Reverse Osmosis – bottled water
  - Ultraviolet disinfection – for medical instruments
- Similar projects in VA, TX, AZ, FL, HI, Europe and elsewhere.

First Purification Step

Microfiltration (MF)

- **Microfiltration used since WW II, in blood dialysis**
- **Used in computer chip, food and pharmaceutical manufacturing**
- **Used to purify fruit juices & baby food**
- **Used to sterilize medicines that can’t be heated**
- **First used to treat water by Disneyworld in Orlando**
- **Excellent pre-treatment before reverse osmosis**

Second Purification Step

Reverse Osmosis (RO)

- **Technology used by bottled water companies**
- **Used in homes, boats, & by OCWD at Water Factory 21 since 1975**
- **Forces water under very high pressure thru many plastic sheets of membranes**
- **Demineralizes and purifies water**

Third Purification Step

Ultraviolet (UV) Disinfection plus H_2O_2

- **Proven technology – used to sterilize medical instruments**
- **Concentrated light & H_2O_2 creates an advanced oxidation reaction**
- **Appears to be effective against new, emerging contaminants (e.g. pharmaceuticals)**
- **Finally, recharge step is an additional natural barrier of filtration through the ground.**
- **“Multiple barrier” approach**

GWR Project Schedule

1994	**GWR research begins**
1999	**Environmental Impact Assessment (EIA) certified**
2001	**Design phase completion and approval by OCWD/OCSD**
2002	**Phase I construction begins**
2004	**Phase I operational. 70,000 af/yr**
2010	**Phase II operational. 95,000 af/yr**
2020	**Phase III operational. 120,000 af/yr**

Why Groundwater Recharge? What's the Need and Where does Orange County Water Come From?

Population Growth & Water Shortages

Orange County's current population of 2.3 M is predicted to increase to 2.8 M by 2020.

- Southern California: will add 7 million by 2020
- California: will add 15 million by 2020

  - CA will add current population of 8 western states!!!

ID, MT, OR, WY, AZ, NV, NM & UT

- Unless solutions are found, there will be water shortages by 2020
  - Orange County predicts shortages of 180,000 acre-feet per year
  - CA Department of Water Resources predicts shortages of 2-4 million acre-feet per year

One Acre-Foot (AF) of Water

- Enough water to cover a American football field to a depth of one foot
- 325,900 gallons (1,200 m3)
- Approximately enough water for two families (of 4) for one year
- Orange County total water demand (2002) = 500,000 af/yr

Where Does Orange County Get Water?

- IMPORTED
  - "State Water" from Sierra Nevada Mountains = from Owens River and Mono Lake
  - "State Water" from Northern California
  - Colorado River Water
- LOCAL
  - Santa Ana River
  - Groundwater

How Much Water Does Orange County Use?

- Current water demand = 500,000 af/yr
- Projected water demand by 2020 = 680,000 af/yr
- 40% = “State Water” + Colorado River Water
- 60% = Groundwater

Colorado River - shared with 7 Western states and Mexico

Colorado River is Divided Up

- 16.4 M af/yr = original calculation when the Colorado Water Compact was negotiated.
- 14 M af/yr = more accurate measurement
- 12 M af/yr = drought years (e.g.1930s)
- Total Allocation = 16.5 M acre-feet/year!!!
  - 7.5 M af/yr to upper basin states
  - 5.5 M af/yr to California,
  - 2.0 M af/yr to Nevada, and Arizona.
  - 1.5 M acre-feet to Mexico
- Bottom Line – all parties must use less Colorado River water in the future!

Orange County's Mix of Groundwater and Imported Water

- North Orange County uses mostly Groundwater provided by Orange County Water District
  - Basin under North-Central OC
  - Groundwater basin is a natural storage, filter and piping system
  - Useable: 1 million acre-feet of water
  - Filled by Santa Ana River & imported water
- South Orange County uses 98% "State Water" (Metropolitan Water District of SoCal (MET) & Municipal Water District OC)
  - Owens River/Mono Lake, Northern California & Colorado River

Imported Water Cutbacks are coming!!!

- State Water Reductions of Northern California Water
  - Expect loss of 25% or more of supply due to $8 Billion restoration SF-San Joaquin Bay Delta
- Colorado River Reductions
  - CA must cut from 5.5M to 4.4M af/yr by 2016 due to over-allocation demands
  - Colorado River has many threats from growth, environmental, Native American water rights, salinity, international & pollution fronts
- LA/Orange County must leave 10% more water in Mono Lake/Owens River to prevent dust particulate problem

Costs of Orange County's Water Options

Option	Cost ($/af)	Comment
Conservation		Trying, but can't do enough
Buy "State Water"	$500-$550*	May not be there
GWR System	$450- $500*	Yes!
Rehab Existing H2O Treatment Plant	$600	
Desalination	$800 - $2,000	Sister agencies choice
Satellite Wastewater Reclamation Plants	$3,000	Requires special costly piping
* Cost in 2007		

Benefits of GWR Plan

- More reliable water
  - Supports existing & new business & jobs
  - Provides water for recreation like golfing, horseback riding
  - Allows Orange County to maintain enviable lifestyle
- Higher water quality
  - Softer water
  - Longer appliance life
  - As good as bottled water
- Reuses scarce asset
  - Helps the environment
  - Saves energy
- Protects groundwater from seawater intrusion
- Ensures locally-controlled, low cost water
- Provides water diversity (like financial diversity)

Media Report (11/5/98) of GWR Benefits (as given in the EIR)

- Will create more than 100,000 acre-feet per year of new water for Orange County, enough for 200,000 families
- Project water will improve overall water quality of OC groundwater
- Completed project will have no significant adverse impacts on air quality, land or energy use, marine environment, endangered species or native habitat.
- Project water will use 50% less energy to produce compared to importing water from N. Calif or Co. River.
- Project will prevent future saltwater intrusion as more groundwater is pumped to meet Orange County needs.

Possible Disbenefits of the GWR Plan

- Ecologic? Contamination of the aquifer?
- Non-local effects? Aquifer extends beyond Orange County
- Population growth? Supports population growth/excess development
- Winners and losers? – Environmental justice issues? Future generations?

Limitations of Environmental Impact Report

- Does not address the fundamental non-sustainability of current groundwater withdrawal rates.

- Safe yield (without GWR)* = 274,000 af/yr
- Groundwater use (2002) = 300,000 af/yr
- Phase III recharge (2020) = 120,000 af/yr
- Projected g.water demand (2025) = 450,000 af/yr

- * Note 1: This number is the GWR EIR estimate (p.1-16). Safe yield is defined as "annual amount of water that is naturally and artificially recharged into the groundwater, minus any purchases of imported water for direct replenishment." J.Kennedy of OCWD gives 265,000 af/yr as the safe yield (9/03)
- * Note 2: If 100% of average annual rainfall (13" over 800 sq. km.) wound up in the aquifer, it would come to only 55,000 af/yr.

More Limitations of GWR Environmental Impact Report

- Does not consider low discount rates (valuing the future) or attempt whole life costing/total cost accounting, even though it does provide a range of water pricing options

- “Core” sustainability values of limiting population, water conservation, fossil aquifer protection, effects on future generations are absent from the discussion.

So… what to do ???

Evaluation, Decision-Making, Values

- “Evaluation is “the process of analyzing a # of plans or projects with a view to searching out comparative advantages and disadvantages and the act of setting down the findings in a logical framework.”
- “Evaluation is NOT decision-making.” [Decision-making is done by institutional players (government agencies); engineering and scientific experts; the democratic process/public, monied interests].
- “Evaluation is based on VALUES.”

(Ortolano, 1997)

- Different values are reflected in different assessment methodologies

Values: Utilitarianism, Environmentalism, Sustainability

- Utilitarianism
  - Efficiency: use of resources for the benefit of people living here, now.
  - Waste Prevention
- Environmentalism
  - Ecological (science-based): preserving the integrity of natural systems
  - Eco-centric View (ethics-based): rights of nature and non-human beings to exist and flourish.
- Sustainability
  - Equity: Intra and Inter-generational equity
  - Balancing economic, environmental and social dimensions

Environmental Values

- In the U.S., systematic efforts to protect and maintain environmental quality only began in the 1960s.
- Critics of CBA argued that environmental impacts of public works were not being accounted for in evaluation and decision-making, but rather, economic efficiency (e.g. utilitarian values) was the only decision criterion.

Global Environmental Crises

- Ozone Depletion
- Global Warming
- Biodiversity
- Etc.

… the 1992 Rio “Earth” Summit

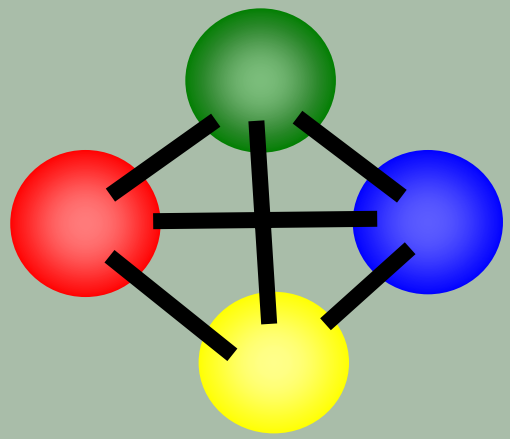
Sustainability Values

- Limits to Growth (1972)
- Our Common Future (1987)
- Globalization of environmental crisis: e.g. global warming, ozone depletion and biodiversity, etc.
- U.N. Summits on Environment and Development (Stockholm, 1972, Rio “Earth Summit” 1992, Johannesburg Summit 2002)

Like “democracy,” “freedom,” and other broad concepts, “sustainable development” means different things to different people.

Two of the most widely agreed on meanings of “sustainable development” are:

Balance: economic, social, environmental aspects



Equity…”meeting the needs of the present without compromising the ability of future generations to meet their own needs.”

- Our Common Future, 1987

Research at MIT led to this widely known 1972 book:

“The Limits To Growth”
Donella H. Meadows
Dennis L. Meadows
Jorgen Randers
William W. Behrens III
A Report for THE CLUB OR ROME’S Project on The Predicament of Mankind

The landmark study of “sustainable development”

“Our Common Future
The World Commission
On Environment and
Development”

1987

- Brundtland Report
- “Development that meets the needs of the present without compromising the ability of future generations to meet their own needs.”

World Summit on Sustainable Development Johannesburg 2002

Different values are reflected in different Assessment Methodologies for engineering project evaluation:

- Env. Impact Assessment
- Risk Assessment
- Climate Impact Assessment
- Social or Gender Assessment
- Stakeholder Analysis
- Computer Simulations
  - Systems Analysis
  - Linear Programming
  - Decision Analysis
- Industrial Ecology and Life Cycle Assessment
- Contingent Valuation
- Multi-objective/Multi-criteria Analysis
- Expert Opinion (e.g. Nat'l Academy studies, e.g. Delphi Method)
- Precautionary Principle
- Sustainability Assessment

Entire courses at MIT are devoted to certain of these methods

- Cost Benefit Analysis (Martland, 1.011)
- Engineering for Sustainability (LCA) (Connor/Adams, 1.962)
- Precautionary Approach (Ashford, ESD.137J)
- Environmental Impact and Risk Assessment (11.372)
- Industrial Ecology and Life Cycle Assessment (O'Rourke, 11.369J, ESD.123J)
- Negotiation (Susskind 11.256)

The rest of this lecture =

A whirlwind tour of

2 other assessment methodologies

(besides CBA)

Environmental Impact Assessment

and

Sustainability Assessment

1969 National Environmental Policy Act

- During the 1960s, many people felt that public works, such as drained wetlands, dammed or diverted rivers, were degrading the quality of the environment.
- NEPA was the first national legislation in the world to demand that all federal agencies integrate environmental concerns into its decision-making (and served as a model similar legislation around the world).
- NEPA required the preparation of an environmental impact statement (EIS) for all federal projects, such as dam-building by the Bureau of Reclamation or draining wetlands by the Army Corps of Engineers.
- NEPA was an extremely progressive piece of legislation for its time, foreshadowing the sustainable development concerns of the 1980s and 1990s. It indicated that each generation has a responsibility "as trustee of the environment for succeeding generations." In this respect it went beyond the utilitarian view of maximizing benefits for the greatest number NOW, for THIS generation, proposing instead a concern for "future generations."

Principle Parts of NEPA

- Declaration of national environmental policy (policy statement and gov’t responsibilities)
- All Federal Government Agencies shall
  - Utilize an interdisciplinary approach to planning
  - Develop procedures to give environmental factors “appropriate consideration” in decision-making
  - Prepare Environmental Impact Statements (EIS)
- Creation on the Council on Environmental Quality

Section 102(2)(B) instructs federal agencies to:

- Identify and develop methods and procedures … which will insure that presently unquantified environmental amenities and values may be given appropriate consideration in decision-making along with economic and technical considerations.

Section 102(2)(C) requires federal agencies to:

- Prepare a “detailed statement” of environmental impacts for “major Federal actions significantly affecting the quality of the human environment.”

These developments led to the creation of EIA. The purpose of EIA was to take environment into account in engineering project assessment and decision-making. The strengths of EIA:

- Science/engineering based. Expert driven. Brings multi-disciplinary expertise to the project assessment process.
- Provides an essential supplement to previous economics-focused frameworks.
- Establishes an environmental baseline.
- Requires that the public be “consulted.”
- In Europe: EIA looks at project level; SEA looks at multiple projects and programs from a wider perspective.

NEPA and especially the EIA requirement has fundamentally modified the federal government decision-making process:

- Public Works: Federal decisions to build a public works project (e.g. dam construction by the U.S. Army Corps of Engineers) require an EIA.
- Federal Permits and Licenses: Decisions involving federal agencies granting permits or licenses (e.g. Nuclear Regulatory Commissions decision to give a utility a license to construct a nuclear power plant) require an EIA.
- Federal Grants: Decision to construct interstate highways with federal grants require an EIA

Components of Env.Impact Statement

- Statement of purpose
- Scoping
- Alternatives, including proposed action
- Environmental impact of each alternative
- Mitigation measures
- Consultation and coordination
- List of Preparers

Scoping

- Before initiating environmental studies, an agency determines scope of issues to be addressed in the EIS. If preliminary analysis determines that significant environmental impacts are likely, the appropriate agency must prepare an EIS. (For example, in the GWR, the appropriate agencies are the Orange County Water District, the Orange County Sanitation District and the Bureau of Reclamation).
- Agency identifies individual citizens, interest groups, institutions likely to be interested. Those parties are invited to participate in agency planning.
- Scoping also involves synchronizing environmental studies and decision-making timetable. Environmental analyses must be scheduled so that results can be used in choosing among alternatives.

Environmental Impact of Each Alternative

- Discussion of all options considered;
- Discussion of no-action option;
- Identification of agency-preferred option;
- Mitigation.

Generic Limitations of EIA

- EIAs occur at the project level, not the policy or program level. Even at the project level, EIA is typically done after feasibility studies and preliminary decisions are made. The EIA then is an “add-on” to meet legal requirements, and serves largely to suggest mitigations for a project already selected, rather than an opportunity to come up with the optimal project.
- Environmental values which have not or cannot be monetized may fall through the cracks.
- Consultation with the public does not necessarily require a full inclusion of all relevant stakeholders.
- Social equity considerations are typically outside the scope of EIA.
- Although EIA occur before the project decision, they should also be used AFTER the decision to help ensure robust environmental monitoring and management throughout project life, but this is not done.

EIR of GWR System (11/5/98)

- “The GWR System was analyzed for all significant environmental issues, including: land use, geology, water resources, noise, public service impact, air quality, general hazards, biological, cultural and energy resources.”
- “Report found no significant negative impacts beyond temporary construction impacts, which could be mitigated.”

Limitation of the EIR of GWR: Groundwater supplies 60% - 70% of Orange County and the EIR defines **Safe Yield:**

- **Safe yield is the annual amount of water that is naturally and artificially recharged into the groundwater, including any purchases of imported water for direct replenishment.**
- **Safe yield is composed of captured Santa Ana River flows, seawater barrier injection water and incidental recharge.**

Safe Yield

- **“Pumping = recharge.” Allows water users to pump no more groundwater than is replenished naturally through precipitation and surface water recharge.**
- **However, nowadays, safe yield is considered a flawed concept.**

Overdraft

- **Currently in Orange County, supply and demand appear to be "balanced" through "overdraft" = over-pumping, and through importing "State Water" for recharge.**

- **Overdraft leads to land subsidence, lower well yields, water quality degradation, seawater intrusion and the drying up of rivers. It cannot continue indefinitely without damage and/or depletion of the resource.**

One principle of sustainable development of groundwater resources is **Sustainable Yield**

- **Sustainable yield of an aquifer must be considerably less than recharge if adequate amounts of water are to be available to sustain both the quantity and quality of streams, springs, wetlands and groundwater-dependent ecosystems. Otherwise, overdraft will eventually deplete the aquifer.**
- **Is sustainable yield being observed in the case in Orange County? No!**

Besides missing sustainable yield, the Orange County EIR appears to have missed some related issues:

- Ecosystem integrity;
- Population growth;
- “Extravagent” levels of water consumption;
- Intra and Inter-generational equity.

Could a different method -- one that addresses sustainable development -- do a better job at bringing these issues forward?

A Sustainability Assessment method, “7 Questions,” developed in the North American mining and minerals sectorm (with assistance from Rob Dies, MIT M.Eng ’03), will be shown, then applied to the Orange County Groundwater Replenishment System case.

“7 Questions,” in common with all Sustainable Assessment Methods, are very new and in the process of being applied and improved. It takes a “soft systems” as opposed to a “hard systems” approach.

- Hard systems may be simple or complex systems, but they lend themselves to logical, linear and quantitative reasoning.
- Soft systems involves complex systems that cannot be entirely and objectively defined.
- Values and environment affect soft systems.
- Soft systems typically involve people, values, natural systems and qualitative elements.
- The exact sequence of stages in the evaluation cannot be strictly maintained.
- Outcome is not one correct answer, a single technology or an optimal solution, but a continuous learning process.

Mining, Minerals & Sustainable Development North America

www.iisd.org/mmsd

World Business Council for Sustainable Development

Regional Partner: International Institute for Sustainable Development

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Chair, R. Anthony Hodge, PEng

Mining

Based on current mineral consumption, each North American will require over a lifetime about 800 pounds of lead and zinc, 1,500 pounds of copper, 3,600 pounds of aluminum, 14 tons of clays and salt, 16 tons of iron and over 600 tons of stone, sand, gravel and cement.

Natural Resources Canada: 1995

Source: Alistair MacDonald. Industry in Transition – A Profile of the North American Mining Sector. www.iisd.org/mmsd

Task

To develop a set of practical principles, criteria, and/or indicators that could be used to guide or test individual mining operations, existing or proposed, in terms of their compatibility with concepts of sustainability; and to suggest approaches or strategies for effectively implementing such a test/guideline

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This process led to the design of an assessment framework: "Seven Questions to Sustainability"

MMSD-NA Task 2 Group. www.iisd.org/mmsd

7 Questions to Sustainability

Sustainable Development Assessment Methodology "7 Questions"

- For each of 7 key themes, a question is posed.
- An "ideal" answer is offered
- Then a hierarchy of objectives, indicators and specific measurements are suggested
- The initial motivating question leads to progressively more detailed elements.
- This methodology can be tailored to the specific infrastructure sector project(s) and/or site specific conditions.

QUESTION 1: ENGAGEMENT

- Are engagement processes in place and working effectively?”
  - Stakeholders?
  - Informed voluntary consent?
  - Reporting and verification mechanisms?
  - Dispute resolution mechanisms?

QUESTION 2: PEOPLE

- Will people's well-being be maintained or improved?
  - This question addresses the effects of the infrastructure project construction or operation on people's well-being and on their communities.
  - Required data builds on traditional socio-economic impact assessment work as well as worker health and community population and health studies.

QUESTION 3: ENVIRONMENT

- Is the integrity of the environment assured over the long term?
  - This question addresses the infrastructure project's effect on ecosystem well-being

QUESTION 4: ECONOMY

- Is the economic viability of the infrastructure project or operation assured and will the community and broader economy be better off as a result?
  - This question addresses the economic condition of the proponents/owners/funders of the project and their relationship to adjacent communities and the larger economy.

QUESTION 5: TRADITIONAL AND NON-MARKET ACTIVITIES

- Are traditional and non-market activities in the community and surrounding area accounted for in a way that is acceptable to local people?
  - This question addresses the viability and success of non-market activities such as cultural, recreational, indigenous, bartering and volunteer activities that are typically omitted from economic studies.

QUESTION 6: INSTITUTIONAL ARRANGEMENTS AND GOVERNANCE

- Are laws, regulations, programs, capacities in place to address infrastructure project construction or operational consequences?
  - Capacity to address construction and operational consequences?
  - Efficiency and effectiveness of laws, voluntary programs, market incentives and cultural norms

QUESTION 7: OVERALL INTEGRATED ASSESSMENT AND CONTINUOUS LEARNING

- Considering the whole, will the net result be positive or negative?
- In the short and long term?
- Will there be periodic assessment?
- Are there mechanisms for continuous learning and improvement?

Alberta Genuine Progress Indicators

- 51 economic, social & environmental indicators (http://www.pembina.org/green/gpi)

IISD's Dashboard Project

- 46 indicators for over 100 countries (http://www.iisd.org/orgsd)

Fraser Basin Council Sustainability Indicators:

- 40 indicators being developed ranging from water consumption to newspaper circulation rates to crime rates to GHG's…

Applying “7 Questions” Methodology to the Groundwater Replenishment System

Orange County Water District
& Orange County Sanitation District
Orange County, California

Q1: ENGAGEMENT?

Broad-based Community Support

Environmental Groups:

Blue Planet Foundation
Groundwater Foundation
Mono Lake Committee
OC Audubon Society
Orange Coast Watch
Orange County CoastKeeper
Sierra Club of OC
Sisters of St. Joseph Honoring Women & Creation
Surfrider Foundation of Huntington Beach/LB Chapter

Health/Science and Education:

Anaheim Memorial Medical Center
Anaheim Union High School District
Chapman University, Dept. of Phys Sciences
Discovery Science Center
Fountain Valley Historical Society
Fountain Valley School District
Garden Grove Historical Society
Hoag Memorial Hospital Presbyterian
Huntington Beach City School District
National Water Research Institute
Newport Bay Hospital
North Orange County United Teachers
Orange County City Engineer's Association
Santa Ana Unified School District
Savanna School District
Sandra Smoley, R.N., Former Agency Secretary, California Health and Welfare Agency
Society of Women Engineers

Community Clubs

Anaheim Evening Lions
Anaheim Hi-12
Anaheim Host Lions
Anaheim Optimists
Brea Noon Lions
Brea Republican Women Federated
Costa Mesa-Orange Coast Breakfast Lions
Fountain Valley Woman's Club
Fullerton Host Lions Club
Garden Grove Evening Kiwanis
Garden Grove Host Lions Club
Garden Grove Republican Women Federated
Hispanic Business Women Assoc.
Huntington View Garden Club
Izaak Walton League
Kansas Club of Seal Beach/Leisure World
Kiwanis of Cypress
Kiwanis of Tustin
League of Women Voters of OC
Lido Isle Community Assoc.
Los Amigos of OC
Newport Harbor Exchange Club
North County Sertoma Club
Orange County Chapter of AARP
Orange Empire Sertoma
Retired Oil Men's Club
Rotary Clubs of Fullerton and Santa Ana North
Sertoma Club of Anaheim
Soroptimist International of Buena Park
Stanton Lions
Sunrise Exchange Club
Tustin Area Republican Women

Business Supporters

- Baywood Development Group
- Business Industry Assoc., OC
- Centex Homes
- Downtown Santa Ana Business Assoc.
- Hall & Foreman, Inc.
- Hearthside Homes
- John Laing Homes
- Orange County Business Council
- Orange County Taxpayers Assoc.
- Parsons Infrastructure & Tech. Group
- Rainbow Disposal
- Ramirez International
- R.J. Medrano & Associates
- The Robert Mayer Corporation
- Trammell Crow Company
- William Lyon Homes, Inc.
- WNC & Associates

Chambers of Commerce:

Greater Anaheim
Brea
Costa Mesa
Filipino
Fullerton
Garden Grove
Hispanic
Irvine
Los Alamitos
Newport Harbor
Orange
Placentia
Santa Ana
Stanton
Tustin
Vietnamese
West O.C. Legislative
Yorba Linda

Cities, Government, & Water Agencies

Cities:

Anaheim	Cypress	La Palma	Santa Monica	Westminster
Beverly Hills	Fountain Valley	Los Alamitos	Seal Beach	
Brea	Fullerton	Newport Beach	Stanton	
Buena Park	Huntington Beach	Placentia	Torrance	
Burbank	Irvine	San Fernando	Tustin	
Costa Mesa	La Habra	Santa Ana	Villa Park	

Government:

Senator Dianne Feinstein

Congressman Christopher Cox

Congressman Edward Royce

Congresswoman Loretta Sanchez

Former Congressman Ron Packard

State Senator Dick Ackerman

State Senator Ross Johnson

Former Illinois Senator Paul Simon

Assemblyman John Campbell

Assemblyman Lou Correa

Assemblyman Tom Harman

Orange County Board of Supervisors

Orange County Farm Bureau

Plus 34 Southern California water agencies & associations

Our Supporters Are People -- Fathers, Mothers & Grandparents Too -- Some You May Know

- Dr. **Harvey Collins**, former Chief, California Department of Health Services, Drinking Water Branch
- **Dianne Feinstein**, U.S. Senator
- **Loretta Sanchez**, U.S. Congresswoman
- **Lou Correa**, California Assemblyman
- Dr. **Jack Skinner**, M.D. and Environmentalist
- **Reed Royalty**, President, Orange County Taxpayers Association
- Dr. **Henry Vaux**, Professor, Environmental Science, University of California
- **Susan Seacrest**, President, The Groundwater Foundation
- **Stephanie Pacheco**, Sierra Club
- **Van Thai Tran**, Mayor Pro Tempore, City of Garden Grove
- **Bobby McDonald**, President, Black Chamber of Commerce
- **Theresa Arzate**, President, Hispanic Business Women Association
- Sister **Sharon Fritsch**, Sisters of St. Joseph of Orange
- **Ross Johnson**, California Senator
- **John Campbell**, California Assemblyman
- **Don Schultz**, Surfriders Foundation
- **Bob Seat**, President, Orange County Farm Bureau
- **Michael Stephens**, Hoag Memorial Hospital
- **Chip Prather**, President, Orange County Fire Chiefs Association
- **Manuel J. Ramirez**, President/CEO, Ramirez International
- **Joan Irvine Smith**

GWR System Endorsement List

34: Water Agencies and Associations

- American Water Works Association (AWWA)
- American Water Works Association/Cal-Nev Section (AWWA)
- California-American Water Company
- California Association of Sanitation Agencies
- California Water Environment Association
- Central Basin Municipal Water District
- Compton Municipal Services Water Department
- Costa Mesa Sanitary District
- East Orange County Water District
- Eastern Municipal Water District
- Foothill Municipal Water District
- Glendale Water & Power
- Inland Empire Utilities Agency
- Las Virgenes Municipal Water District
- Long Beach Water Department
- Los Angeles Department of Water and Power (LADWP)
- Mesa Consolidated Water District
- Metropolitan Water District of Southern California
- Moulton Niguel Water District
- Municipal Water District of Orange County
- Orange County Sanitation District
- Orange County Water District
- Pasadena Water and Power
- Santa Ana Watershed Project Authority
- Serrano Water District
- Southern California Alliance of Publicly Owned Treatment Works
- Southern California Water Alliance
- Southern California Water Committee
- Southern California Water Company
- Three Valleys Municipal Water District
- Upper San Gabriel Valley Municipal Water District
- West Basin Municipal Water District
- Western Municipal Water District
- Yorba Linda Water District

Q2: People?

Does GWR benefit the people of Orange County?

- Population growth in Orange County means more water is needed. GWR provides this.
- GWR enhances local control of water by reducing dependence on imported water
- But… will GWR mitigate against future water shortages or simply fend off the day of reckoning?

Public Opinion is Favorable regarding GWR System

Voter Input in 1997
60% believe don't have enough water for future
60% say reclaiming is a good way to go

Voter Input in 2002
73% believe future water will be a serious problem
87% support water reclamation

Water Quality and Public Health

- 6 years of full-scale system testing showed no viruses, bacteria, protozoa or other significant contaminants made it through the design system.
- Water Quality Study by several outside PhDs & water experts including a review by health agencies confirmed that water is safe.
- Water quality continually monitored by people and computers at multiple sites
- Project will have oversight by Dept. of Health Services, Environmental Protection Agency, Regional Water Quality Control Board.
- But… some people are worried about endrocrine disruptors, pharmaceuticals and other unknowns

Q3: ENVIRONMENT?

Does GWR benefit the environment?

- Reverse hardness/salinity levels in groundwater basin?
- Prevent seawater intrusion into aquifer?
- Use less energy than pumping imported water from Northern California?

Groundwater Increasing in Hardness and Salinity

- Santa Ana & Colorado Rivers bring minerals into groundwater basin— creates hard, saline water.
- Each year, more minerals go into the basin than come out—about 62,000 tons every year
  - Aiming for a drinking water goal of 500 mg/L for minerals
- Groundwater Replenishment System will produce “ultra-pure” water that will start to reverse salinity and mineral buildup in appliances and plumbing fixtures

Prevent Seawater Intrusion

- Groundwater basin is connected to ocean
- Since 1975, OCWD has been purifying small amounts of wastewater to drinking water quality & injecting into the ground.
- Each year, Orange County uses more groundwater. Therefore, even if they didn't do the GWR system, they MUST increase amount of water injected from 17,000 af/yr to 45,000 af/yr in order to prevent seawater intrusion.

Reduced Energy Use from Reduced Pumping

- By offsetting a portion of the State Water pumping costs, GWR project saves energy.
- 50% less energy (140 M kWh/yr savings)

Q4: Economy?

Infrastructure Needs

The OCSD must either build a new, expensive ocean outfall to discharge treated wastewater to the ocean or treat the wastewater to an even higher level and reuse it for groundwater recharge

GWR Reduces Water to Ocean and Saves Money

- By highly purifying the wastewater, GWR reduces discharge to ocean & saves $170 million that would have been spent on new outfall pipe.
- Instead, that money will be invested in GWR

GWR -- Capital Cost

		October 2002
Advanced Water Treatment Facility		$ 228.3 M
Conveyance Pipelines		75.2 M
Barrier Well & Pipeline		17.7 M
Administrative Costs		54.7 M
	TOTAL	$ 453.9 M

State and Federal Grants = Subsidy

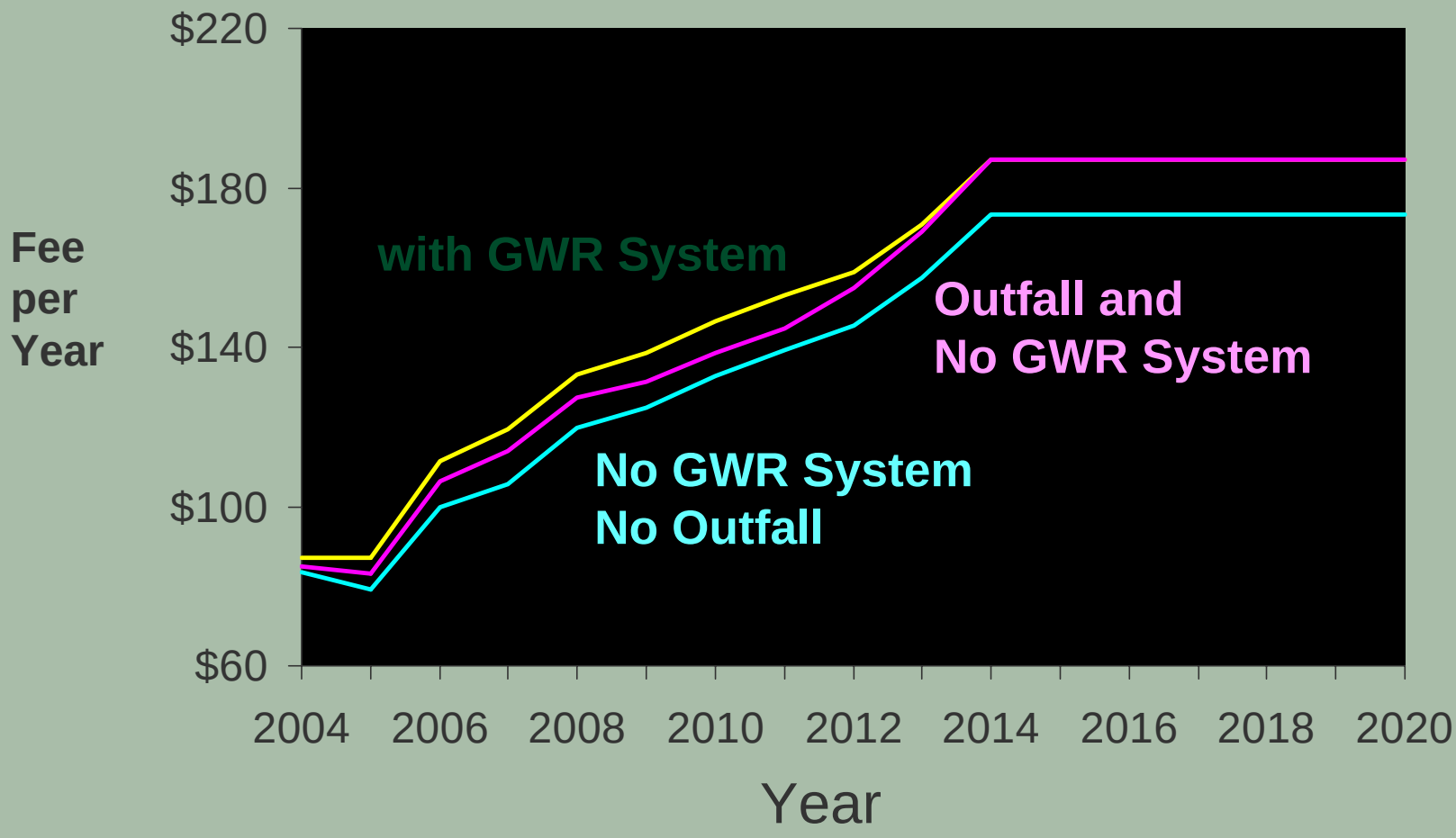
- OCWD/OCSD received $100 million in State & Federal Grants for GWR
- Reduces $450M capital cost -> $350M
- Costs shared 50/50 by water and wastewater agencies

EIR Alternatives to GWR

- Seawater barrier only project
  - 35,000 af /yr (seawater barrier) vs. 72,000 af /yr
  - $164 M vs. $450 M (GWR)
  - Federal and State grants at risk
- New outfall
  - $170 M (outfall) vs. $450 M (GWR)
  - Longer implementation schedule
- Do nothing (not an option because seawater intrusion from over-pumping cannot be ignored)

Projected Annual Residential User Fee

(OCSD sanitation costs only)



Q5: Traditional and Non-Market Activities?

Traditional and Non-Market Activities

- **Recreational activities on OCWD/OCSD river trails for walking, jogging, biking, horseback riding**
- **Sport fishing of stocked fish in several recharge basins (artificial lakes created from sand/gravel pits after mine closures).**
- **100 species of wildlife found on OCWD/OCSD land.**

Q6: Institutional Arrangements and Governance?

Basic Terms

- 35-year term
- Phase I facilities only
- OCWD gets 72,000 af/yr water supply
- OCSD gets 100 mgd of Peak Flow Relief
  - Wet weather events
  - Emergency treatment and maintenance

Governance of Planning, Design & Construction

- **Joint Coordination Committee (JCC) oversees construction.**
  - **Acquisition of land and permits**
  - **Preparation of plans and specs, contract documents**
- **OCWD Board approves budget and most contracts**
- **OCSD Board approves budget and largest contracts**
- **OCWD Board governs O&M of system facilities**
- **JCC meets annually to review and assess system operations**

Rules Behind the Agreement

1. OCSD must achieve effluent flow relief
2. OCWD must achieve a new water source
3. “Fence line” standard: OCSD treats sewage, OCWD recycles water
4. Assign cost to agency receiving benefit
5. Provide incentives for cooperative problem solving
6. Remember that the 2 agencies are essentially co-terminus and interdependent partners.
7. Continue to rely on time-tested institutional arrangements

Q7: Synthesis and Continuous Learning?

What Critics Have Said About Cost

It is a piece of gigantic folly that will cost taxpayers fifty million dollars, or more, increasing their taxes three times the present rate.

— *Evening News*, June 8, 1907
(Regarding the L.A. Aqueduct)

What Critics Have Said About Quality

"Government itself deliberately poisoning
the entire water supply
of the whole population."

— ***Herald*, August 20, 1914**
(Regarding L.A. Aqueduct)

What Critics Have Said About Need for Project

"No one I talked to in Orange County ever thought they'd live to see the need for the water..."

— Lee Martin, MWD (reminiscing about Colorado River Aqueduct)

What Critics Have Said About Governance & Management Responsibility

"If voters go ahead, they are taking a desperate plunge into the unknown and authorizing a blank check to irresponsibility."

— *San Francisco Chronicle*, October 29, 1960 (Regarding State Water Project)

“Perhaps the best way to understand this [GWR] project is to look at it from the perspective of the future – not the present. Think of how future generations will look back on this moment of time. When we look back at the LA aqueduct and the Colorado River Aqueduct, we describe them as visionary and extraordinary. I’m certain this project will be viewed in that same way.”

— OCWD Director, Jan Flory
October 16, 2002

Summary of “7 Questions” Applied to GWR Case Study

- “7 Questions” enables us to identify and support many dimensions of sustainability.
  - Stakeholder participation
  - Increased well-being in terms of provision of a certain quality and quantity of water
  - Recogizing the limits of imported water, takes a first step towards local sufficiency by trying to work from within constraints of local groundwater resources.
  - In terms of the alternatives presented, enables logical decisions towards protecting the environment, meeting human needs, energy conservation, economically sensible choices.

Strengths of “7 Questions” Sustainable Assessment Methodology

- Puts the “triple bottom line” at the center.
- Takes a “soft systems” as opposed to a “hard systems” approach recognizing that sustainability issues cannot be resolved in an expert-driven or solely quantitative way.
- Is specifically intended NOT to rank different elements and sum up the bottom line, hence an “open” approach.

Limitations of “7 Questions” Sustainability Assessment Methodology

- Complexity of issues might overwhelm the participants and simple answers might become the default decision.
- Can miss the forest for the trees. (e.g. target many “small” sustainabilities at the expense of “big picture” sustainability.
- “Soft” approach may be scientifically or legally challenged.

Based on the 3 value systems (utilitarianism, environmentalism, sustainability)
and 3 methods described (CBA, EIA, SA),
what values and methods do you recommend be used in project evaluation?

Acknowledgements

environment

society

economy

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environment

society

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