Groundwater Replenishment System

A Pure Solution to Orange County’s Water Needs
The GWRS is a Joint Project Between

- **OCWD** – To provide local water retailers with a reliable, adequate, high quality water supply at the lowest reasonable cost in an environmentally responsible manner

- **OCSD** – We protect public health and the environment by providing effective wastewater collection, treatment, and recycling
Population and Service Areas in North and Central Orange County

OCWD
2.3 million
(groundwater basin)

OCSD
2.5 million
Sources of Water for Orange County

- Groundwater is pumped from wells by producers (cities and water districts)
  - 65% of the water used in North and Central OC
  - Groundwater basin recharged by Santa Ana River, rainwater, imported and recycled water
Wastewater Reclamation Partnership Since 1972

Primary

Secondary

Sanitation District

Advanced Water Purification

Water District

Reuse

Enhanced Source Control in collections system
Why Did We Partner? Planning in the 1990’s

- OCSD:
  Defer the need for a new ocean outfall
Why Did We Partner? Planning in the 1990’s

- OCWD:
  
  Need more water:
  
  - larger intrusion barrier
  - 5-year drought 1987–92
  - population steadily increasing
  - imported water supply challenges
  - improve groundwater quality
Joint Governance Established for GWRS
Key Decisions

- 100% Reverse osmosis
- NWRI appointed advisory panel of expert scientists and engineers
- Extensive, proactive public outreach
- Close coordination at all levels
OCSD Focuses on Wastewater as a Resource

Master Planning:

- Collection system configuration maximizes flow to Reclamation Plant No. 1
- New capacity constructed at Reclamation Plant No. 1
- Hydraulic design for GWR System
- Accommodation of GWR System return flows
Treatment Plant No. 1
Secondary Projects

- Orange County Water District
- GWR System
- New Activated Sludge (P1-102)
- Rehabilitating Existing Activated Sludge (P1-82)
- New Trickling Filters (P1-76)

OCSD Reclamation Plant No. 1 Boundary
Santa Ana River
Treatment Plant No. 1
Secondary Projects
OCSD Focuses on Wastewater as a Resource

System Operations:

- Flow diversions
  - Good sewage to Plant No. 1
  - Brine waste out of Plant No.1
  - Storage in standby basins
- NDN conversion
  - Improved MF production
  - Lower effluent ammonia to ocean
  - Lower Nitrogen to GWRS
- Communication
Enhanced Source Control

- Title 22
  - Drinking and Recycled Water
- Pollutant Prioritization
  - Constituents of Emerging concern
- Chemical Inventory Program
  - Fire Department/CDPH/Toxic Release Inventories
- Geographic Information System
  - Flow Trace from Treatment Plant to Source
- Public Outreach
Enhanced Source Control

- Pharmaceutical Program
  - No Drugs Down the Drain
  - Pilot Project
  - Health Service Facilities
- Countywide Pollution Prevention Partnership Program
  - 22 Cities
  - Public Outreach
- Commercial Sector Program
  - Cleaners and Degreasers
  - Coatings
  - Coloring Agents and Dyes
Ramping Up Water Reclamation: Less Water to Ocean Outfall

Million Gallons per Day to Ocean
Mike Markus
OCWD, General Manager
OCWD, formed in 1933, is responsible for managing and protecting the Orange County groundwater basin.

OCWD encompasses 229,000 acres (925 km²) in the lower watershed of the Santa Ana River (SAR).

Orange County groundwater basin provides water for over 2.4 million people.
Operational Recharge Facilities

Prado Dam

Groundwater Replenishment System

Santa Ana River Facilities
Water Supply Sources to Recharge the Groundwater Basin (308,000 afy)

- SAR Stormflows 50,000
- SAR Baseflows 102,000
- Natural Incidental Recharge 60,000
- MWD Untreated Full Service Water - 20,000
- Other - 4,000
- GWRS - 72,000
Santa Ana River Watershed
1,100 acres of recharge facilities
~ 250,000 afy of recharge into groundwater basin
Why Do We Need The GWRS?

- Extended drought
- Imported water shortages
  - Colorado River losses
  - State Water Project losses
  - Environmental restrictions
  - Potential levee failures
- Local Projects lessen dependency on outside sources

San Luis Reservoir before and now. Gov. Schwarzenegger declares emergency.
What Is The GWRS?

- New 70 MGD (265,000 m³/day) advanced water purification facility
- Takes sewer water that otherwise would be wasted to the ocean, purifies it to near distilled quality and then recharges it into the groundwater basin
- Provides a new 72,000 acre-feet (88,000,000 m³) per year source of water, which is enough water for over 500,000 people
- Operational since January 2008
Microfiltration System

- 86 MGD (325,500 m³/day) Siemens CMF-S Microfiltration System
- Tiny, straw like hollow fiber polypropylene membrane
- Removes bacteria, protozoa, and suspended solids
- 0.2 micron pore size
- In basin submersible system
Reverse Osmosis System

- 70 MGD (265,000 m³/day)
- 3 stage: 78-48-24 array
- Hydranautics ESPA-2 Membranes
- Recovery Rate: 85%
- Removes dissolved minerals, viruses, and organic compounds (incl. pharmaceuticals)
- Pressure range: 150 – 200 psi
Direct Photolysis/Advanced Oxidation

- 70 MGD (265,000 m³/day) Trojan UVPhox System
- Low Pressure – High Output lamp system
- Destroys trace organics
- Uses Hydrogen Peroxide to create an Advanced Oxidation Process
- After treatment, water is so pure we need to add minerals back - lime
Regulatory Oversight

- Regional Water Quality Control Board issues permits for recycling
- CA Department of Public Health regulates drinking water and establishes reclamation criteria
  - Treatment
  - TOC limit
  - Travel time
  - Blending
- No federal role regulating reuse
- CDPH hearing findings and recommendations incorporated into permit by Regional Board
Independent Advisory Panel

- Appointed by National Water Research Institute
- Leading experts in hydrogeology, chemistry, toxicology, microbiology, engineering, public health, public communications and environmental protection
- Review operations, monitoring and water quality
- Panel makes recommendations to OCWD and regulatory agencies to assure quality and reliability
GWRS Proven Reliability

- California Department of Public Health developed permit requirements
- Test for over 400 compounds with all results well below permit levels or at non-detection (ND) levels
  - 28 Volatile Organic Compounds – All ND
  - 39 Non-Volatile Synthetic Organic Compounds – All ND
  - 8 Disinfection By-Products – All ND
  - 10 Unregulated Chemicals – All but one ND, all below permit levels
  - 51 Priority Pollutants – All ND
  - 16 Endocrine Disrupting Chemicals and Pharmaceuticals – All ND
Project Funding and Timing

- Capital Cost: approximately $481 million
  - Split equally between OCWD and OCSD
- Expandable to 130 mgd
- Costs comparable to imported water
  - Project received $92 million in state and federal grants, and $4 million per year (21 year) operation and maintenance subsidy from Metropolitan Water District
  - Costs $480 per acre-ft ($850 per acre-ft without subsidies)
- Operational since January 2008
Benefits Of GWRS

- Creates a new water supply
- Reuses a wasted resource
- Expands the seawater barrier
- Increases water supply reliability
- Offsets imported water cutbacks
- Costs comparable to imported water
- Saves half the energy over imported water or desalinated seawater
- Improves quality of water in the basin
Public Outreach

- Many projects stopped by public and political opposition
- Outreach began early, over 10 years prior to start up
- Researched public concerns
- Face to face presentations
- Community leaders
- Measured effects of outreach
- Community support
- Outreach continues today, assisted by media interest
What’s Next?

- Expand the capacity of the plant to 100 mgd.
  - Bids were received July 18, 2011
  - Low bidder McCarthy - $115.1 million
  - Contract was awarded on September 7, 2011
  - Project completion scheduled for October 2014
- Project will produce 31,000 afy, which is enough water for nearly 250,000 people.
GWR System Site Expansion

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**Site Layout:**

- **Ellis Avenue**
- **Ward St**
- **OCWDMWDOC**
- **GAP**
- **LAB**
- **Demo Lab**
- **MF**
- **RO**
- **UV**
- **Lime Pumps**

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**Key Areas:**

- **MWDOC**
- **OCWD**
- **Pumps**
- **Demo Lab**
- **UV**

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**Legend:**

- **Ellis Avenue:**
- **Ward St:**
- **OCWDMWDOC:**
- **GAP:**
- **LAB:**
- **Demo Lab:**
- **MF:**
- **RO:**
- **UV:**
- **Lime Pumps:**
Expansion with Flow Equalization

Projected OCSD Flow and GWRS Feed

OCSD Available Flow 130 MGD

- 15 MG Deficit
- 17 MG Surplus
Flow Equalization Tanks

- Two – 7.5 million gallon tanks
- Diameter – 216 ft
- Height – 35 ft
Estimated Unit Cost of Existing GWRS with GWRS Expansion Project

“Melded Rate”

Existing GWRS FY10-11

- $480/af
- 66,100 afy

GWRS Expansion ($142.7 M)

- $579/af
- 31,000 afy

- $512/af

- Melded Rate
GWRS Aerial View
Groundwater Replenishment System
A Pure Solution to Orange County’s Water Needs

www.gwrsystem.com