Replenishing Groundwater for Sustainability

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The Orange County Water District was formed by the State in 1933 to protect and manage Orange County's groundwater supplies.

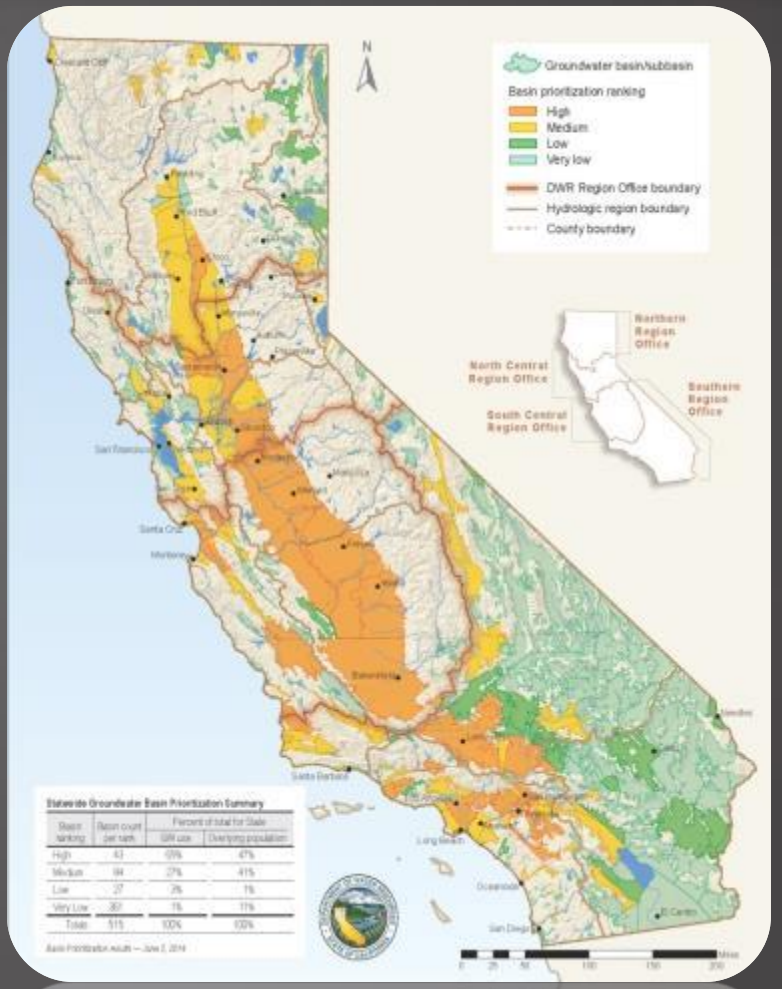
First Board of Directors

Why?

- Declining flow of Santa Ana River
- Basin overdraft
- Seawater intrusion
- Attempts by LA County to obtain water rights in Orange County

In 2014, California passed the Sustainable Groundwater Management Act (SGMA).

From left to right: CA State Board of Food and Agriculture President Craig McNamara, Driscoll's CEO Miles Reiter, Assembly Member Dickinson, Senate President pro Tem-elect Kevin de Leon, Senator Pavley, Nature Conservancy External Affairs Director Jay Ziegler, and ACWA Executive Director Timothy Quinn.



SGMA requires that all high- and medium-priority basins (yellow and orange) be managed sustainably (i.e., no undesirable results).

In the 1930s, there were multiple "undesirable results" in Orange County.

Lowering GW Levels

Yes

Degraded Quality

Shallow aquifer impacted by agricultural activity

Reduction of Storage

Basin in overdraft in 1905

Land Subsidence

No data

Seawater Intrusion

Noticed in 1925

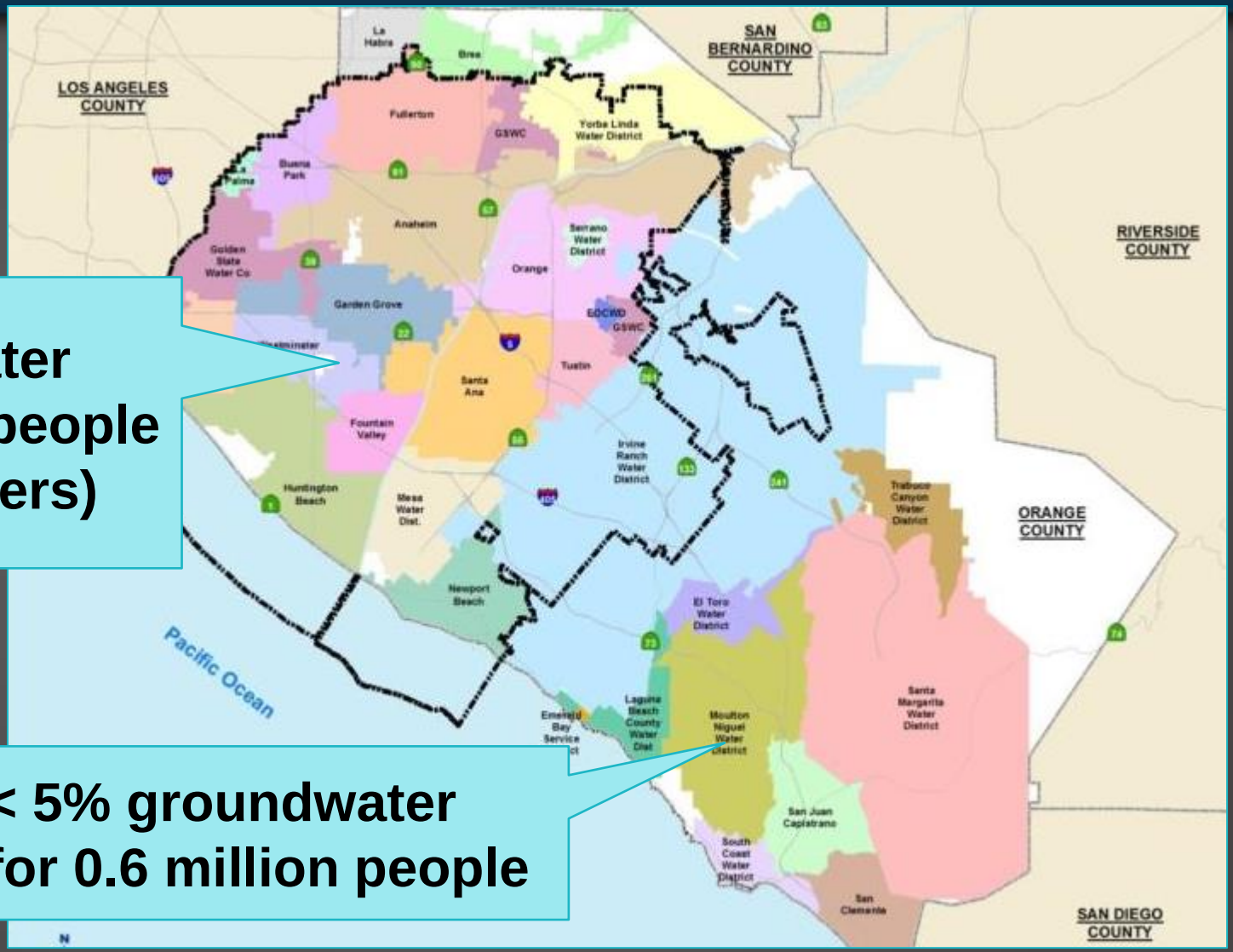
Surface Water Depletion

No data

1930 Population: Approximately 120,000

The Orange County groundwater basin lies at the base of the Santa Ana River watershed.

OCWD overlies the groundwater basin in the northern half of Orange County.



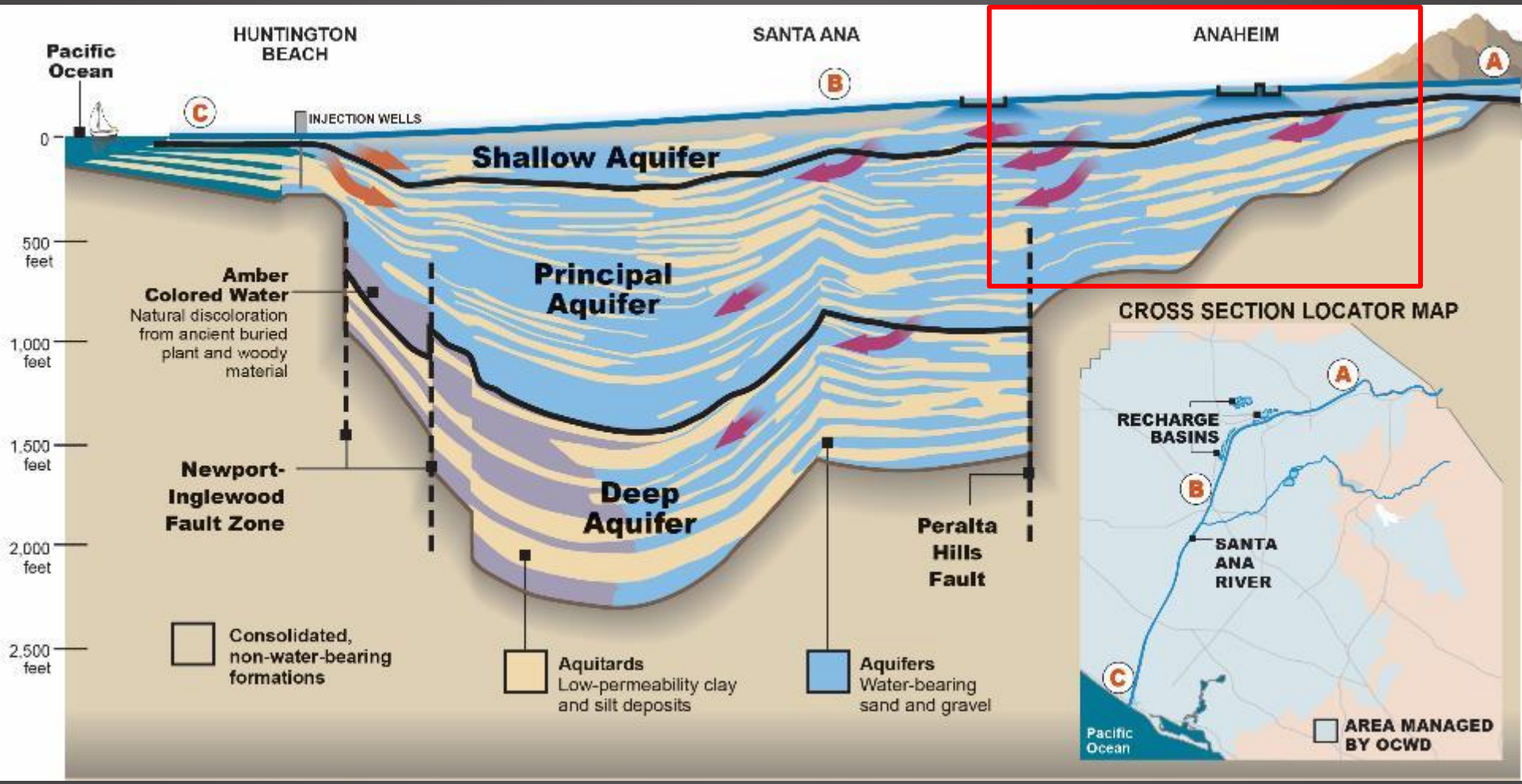
70% groundwater for 2.4 million people (19 water retailers)

< 5% groundwater for 0.6 million people

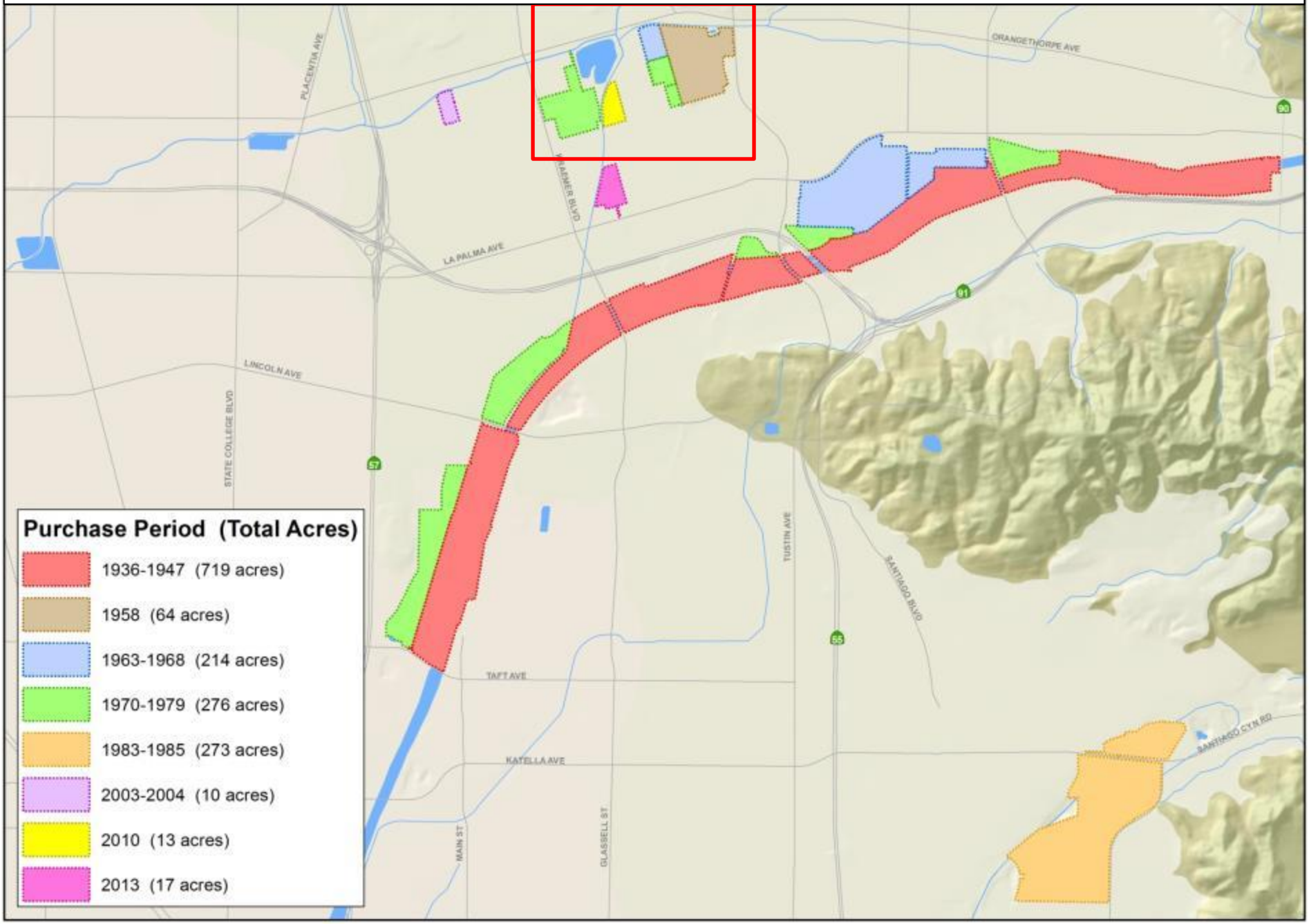
Recharge operations to capture and recharge Santa Ana River flows started in the early 1930s.

Santa Ana River, Anaheim

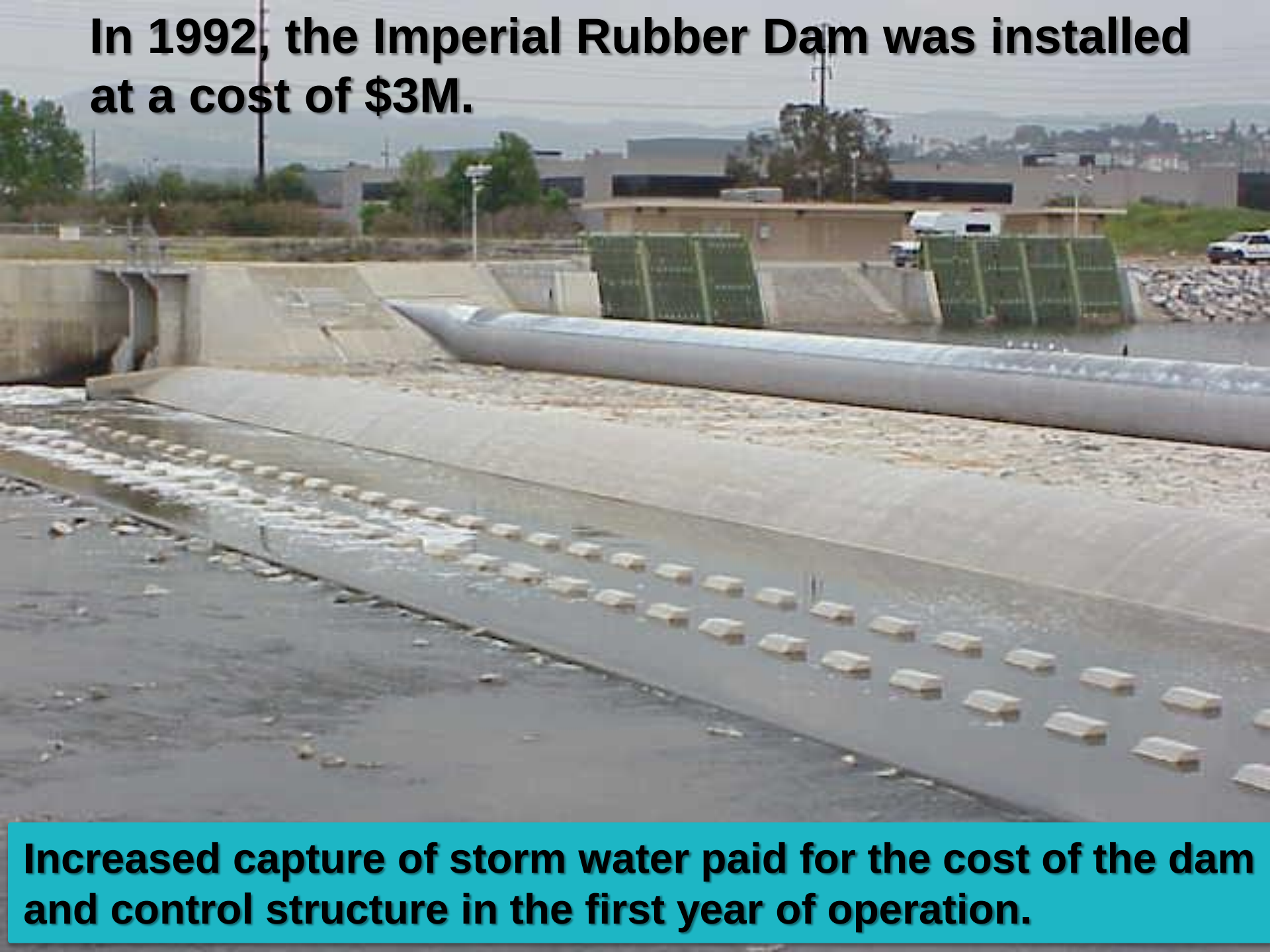
The groundwater basin is comprised of three major aquifer systems that are hydraulically interconnected.



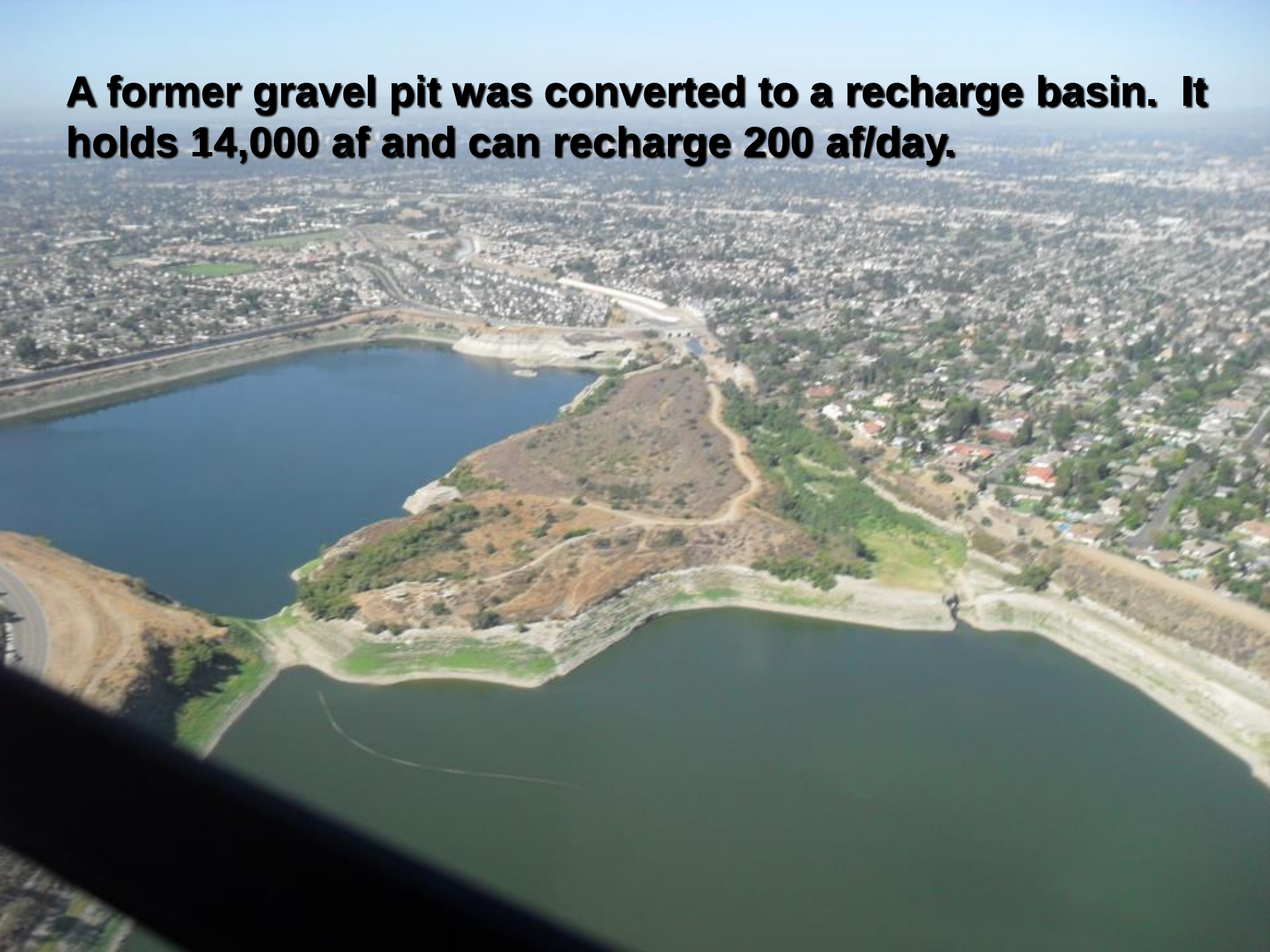
Since 1933, the District has purchased 1,590 acres for recharge.



Prior to the early 1990s, a large sand dike had to be constructed to divert water from the SAR.


In 1992, the Imperial Rubber Dam was installed at a cost of $3M.
Increased capture of storm water paid for the cost of the dam and control structure in the first year of operation.

The deep basins are able to recharge up to 100,000 acre-feet per year.


A former gravel pit was converted to a recharge basin. It holds 14,000 af and can recharge 200 af/day.

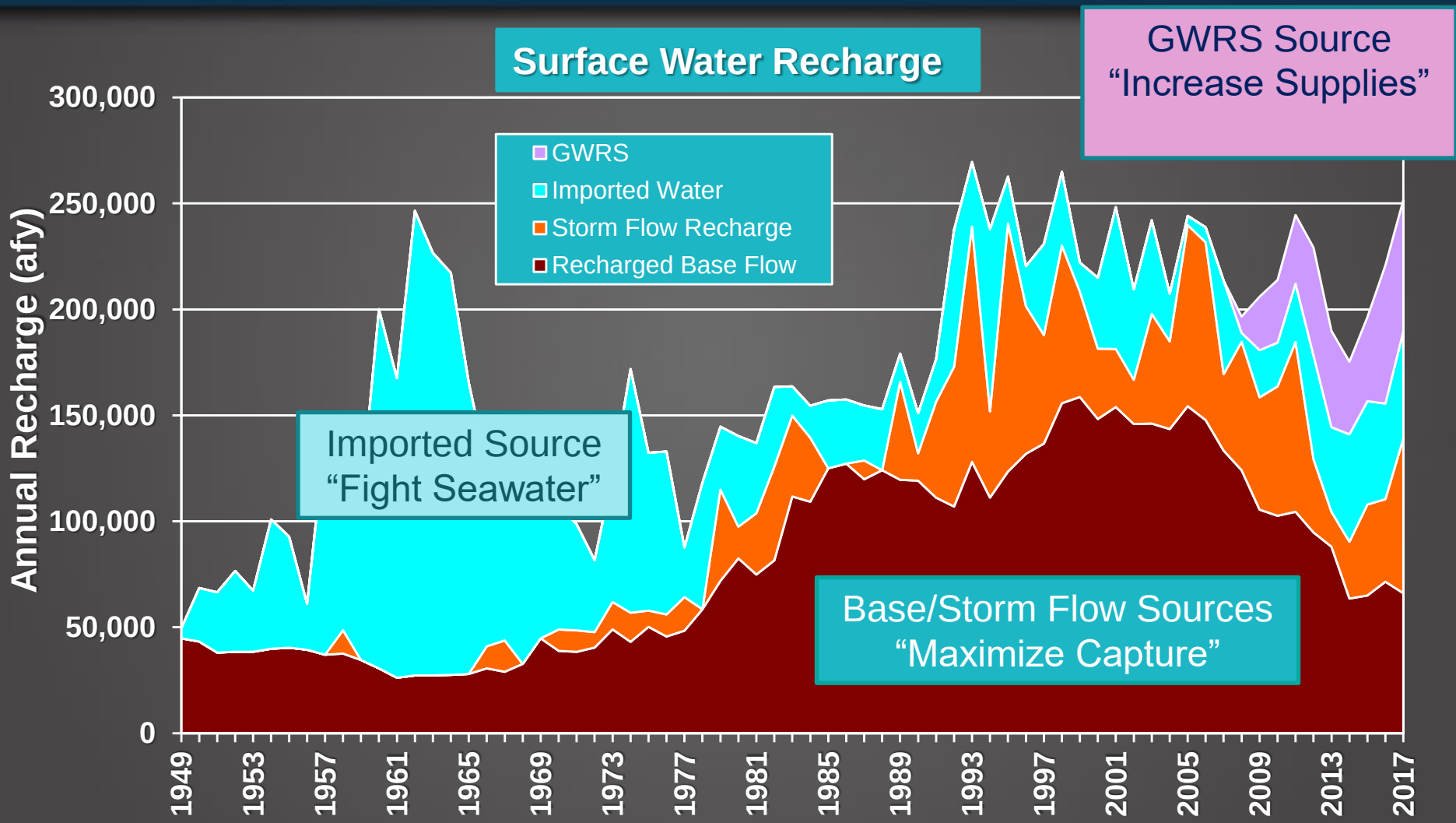
In addition to land, OCWD invested in staff and infrastructure to increase recharge efficiencies.

Pump stations and pipelines

Heavy equipment

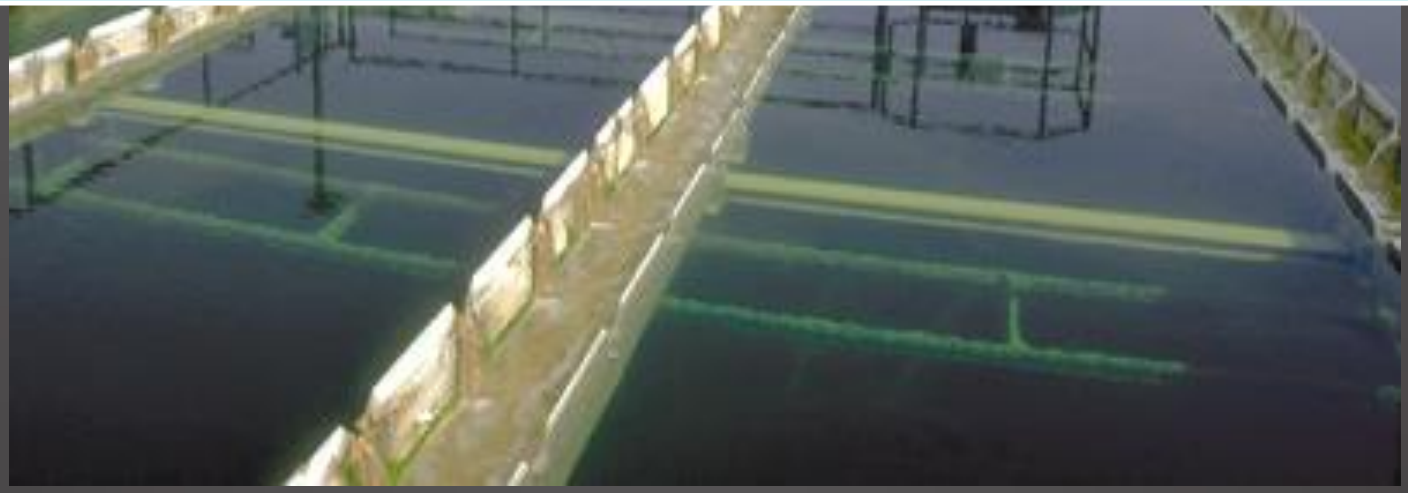
Recharge system operators, instrumentation, and SCADA system

OCWD has a diverse water portfolio with all sources playing different roles at different times.

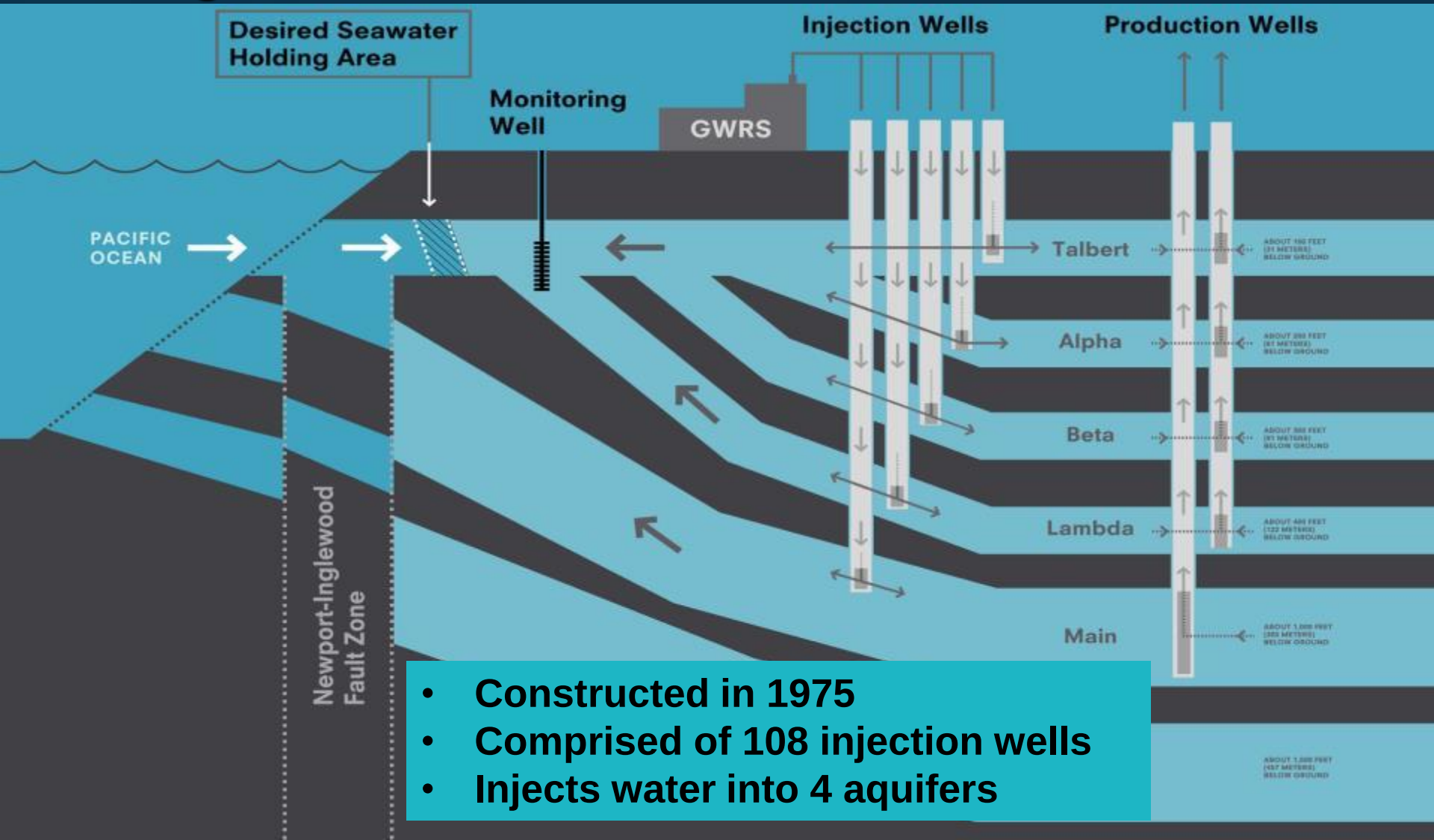


Water Factory 21 was constructed in 1975 to supply a seawater barrier with highly treated wastewater.

Imported water was less expensive, but OCWD proceeded with Water Factory 21 to prove out technology and ultimately develop a more reliable source of supply.



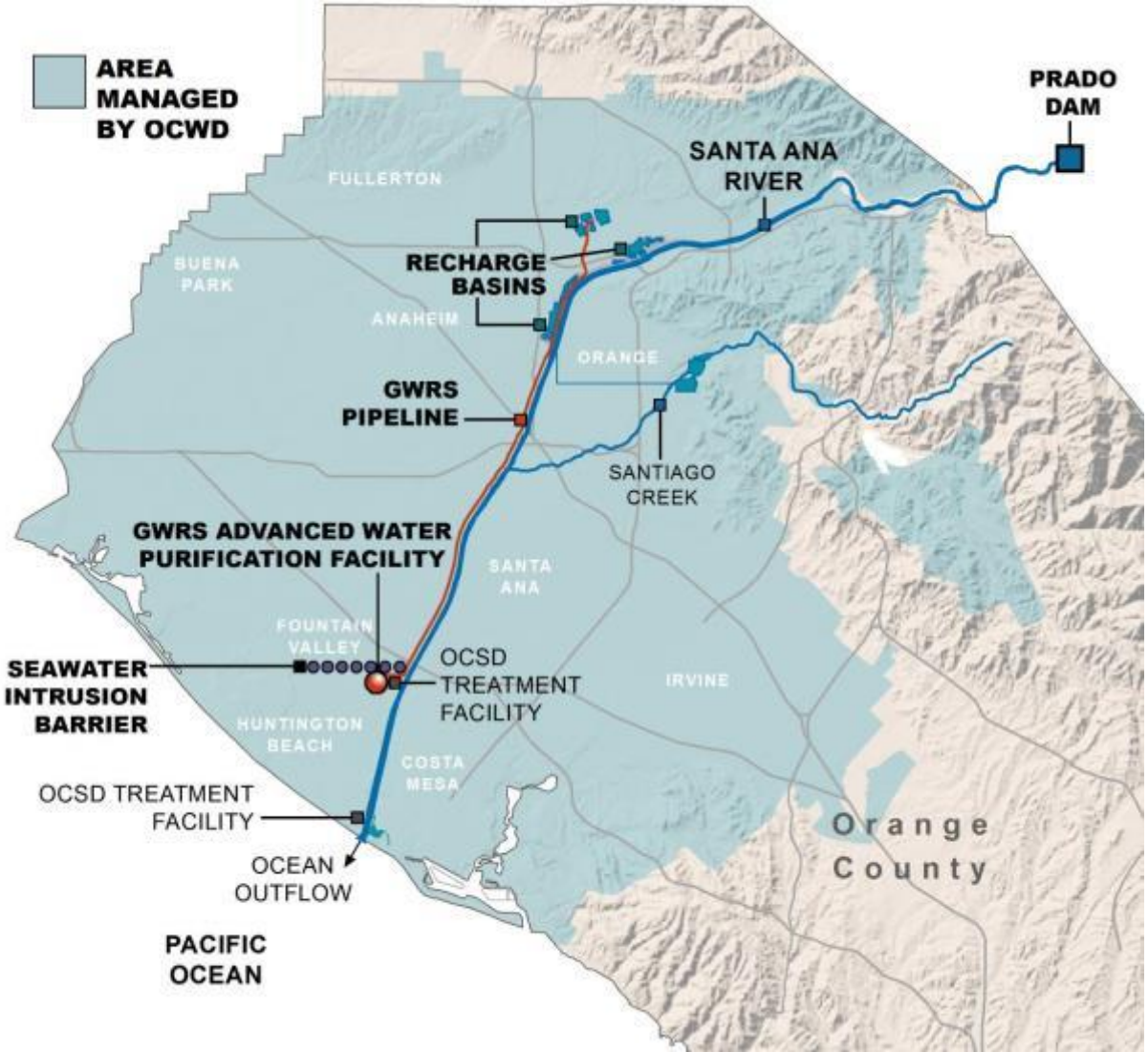
The Talbert Gap Seawater Intrusion Barrier was constructed to protect and maximize the use of basin storage.



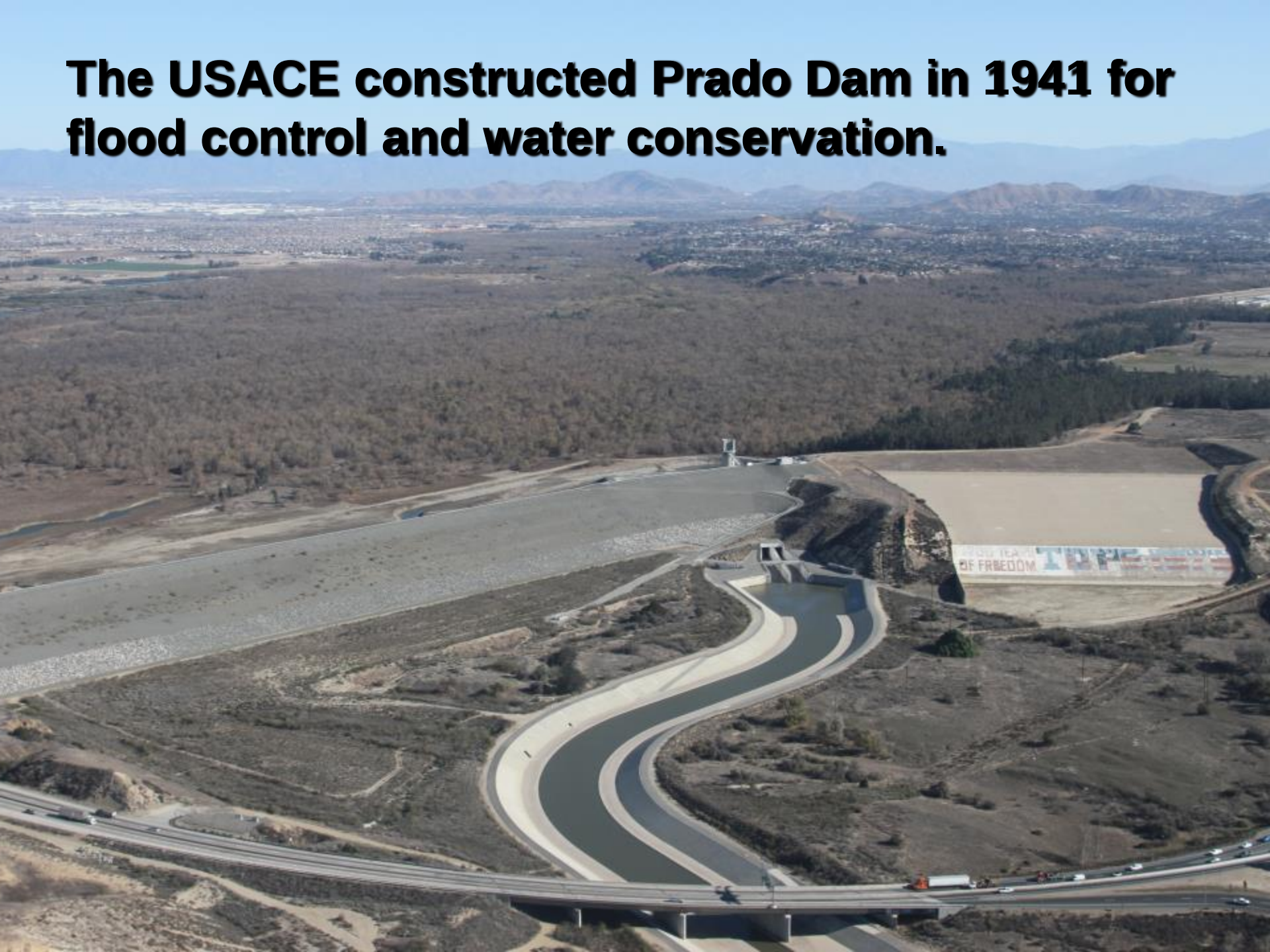
- Constructed in 1975
- Comprised of 108 injection wells
- Injects water into 4 aquifers

Water Factory 21 was replaced by GWRS in 2008 (being expanded to 130 MGD).

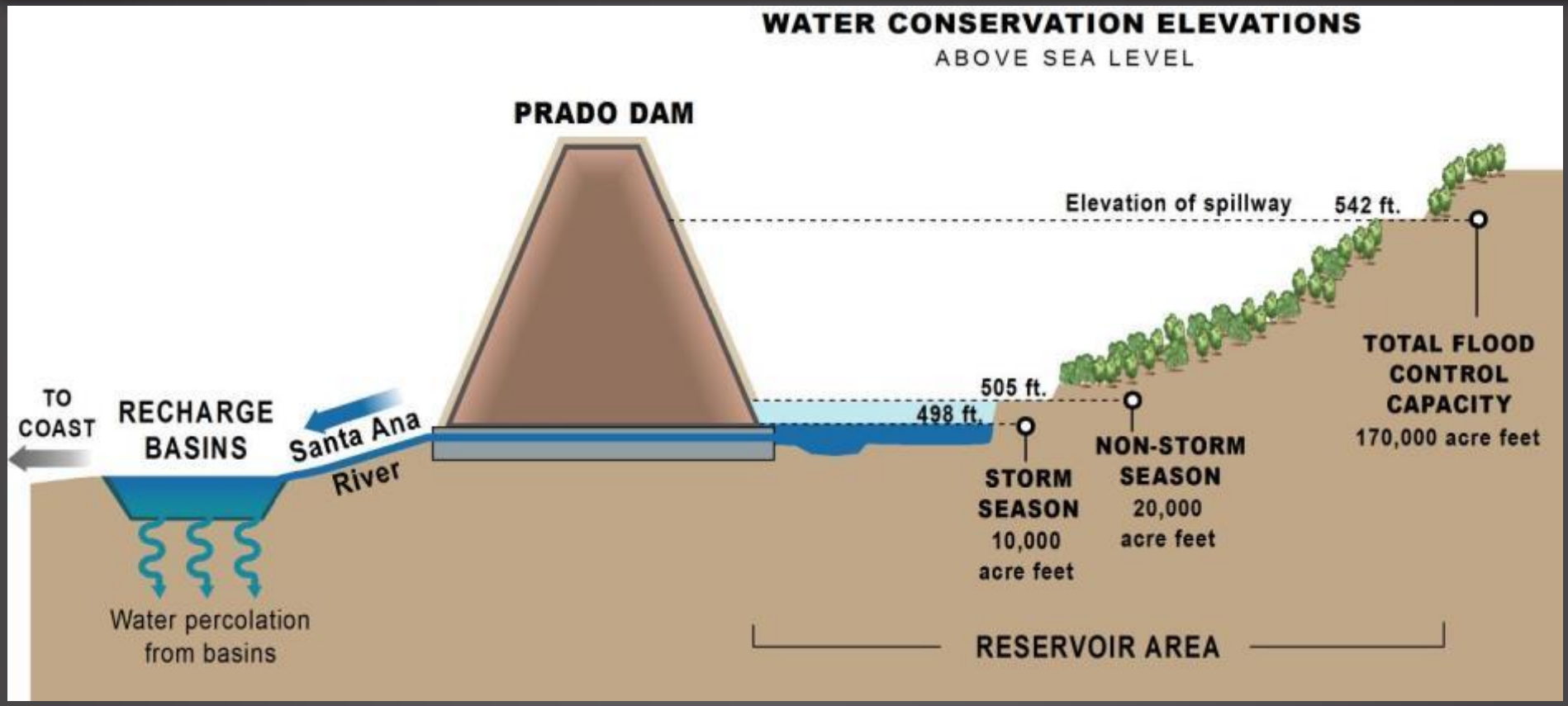
A 13-mile pipeline was constructed to link the treatment plant with the spreading basins.



The USACE constructed Prado Dam in 1941 for flood control and water conservation.

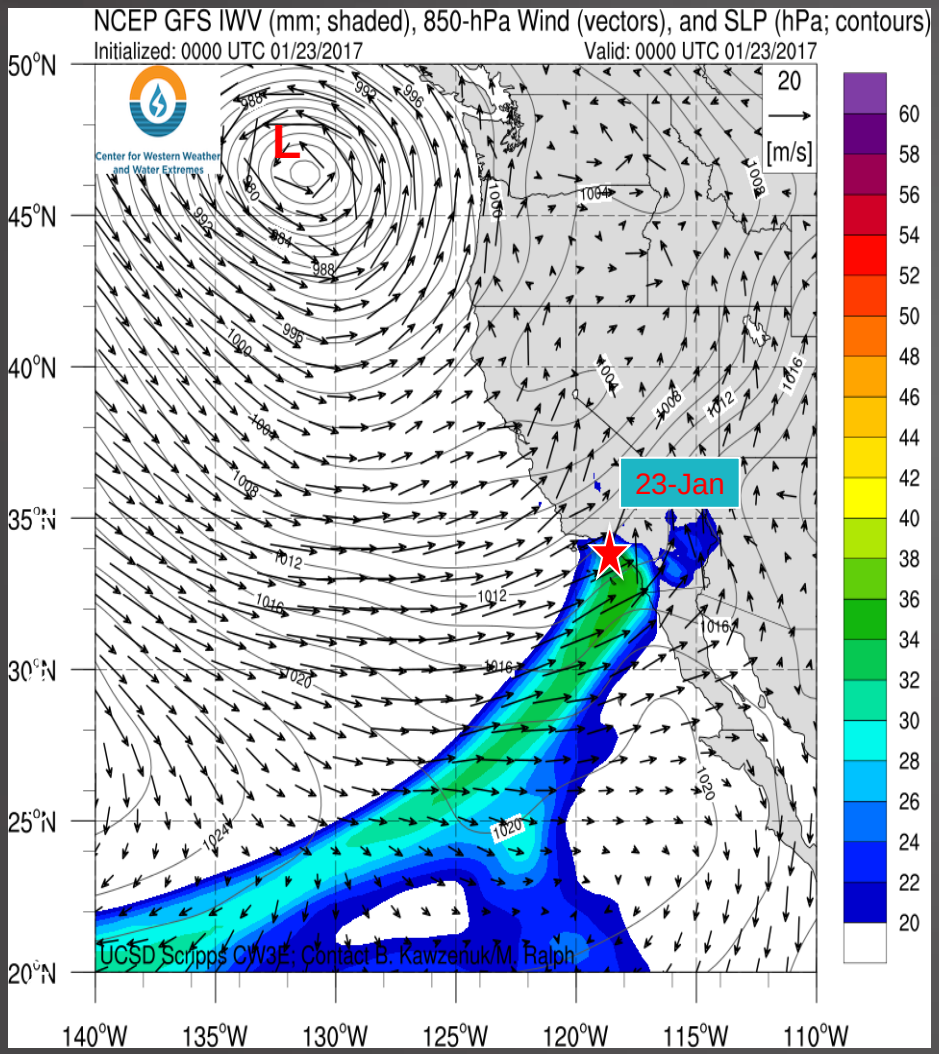


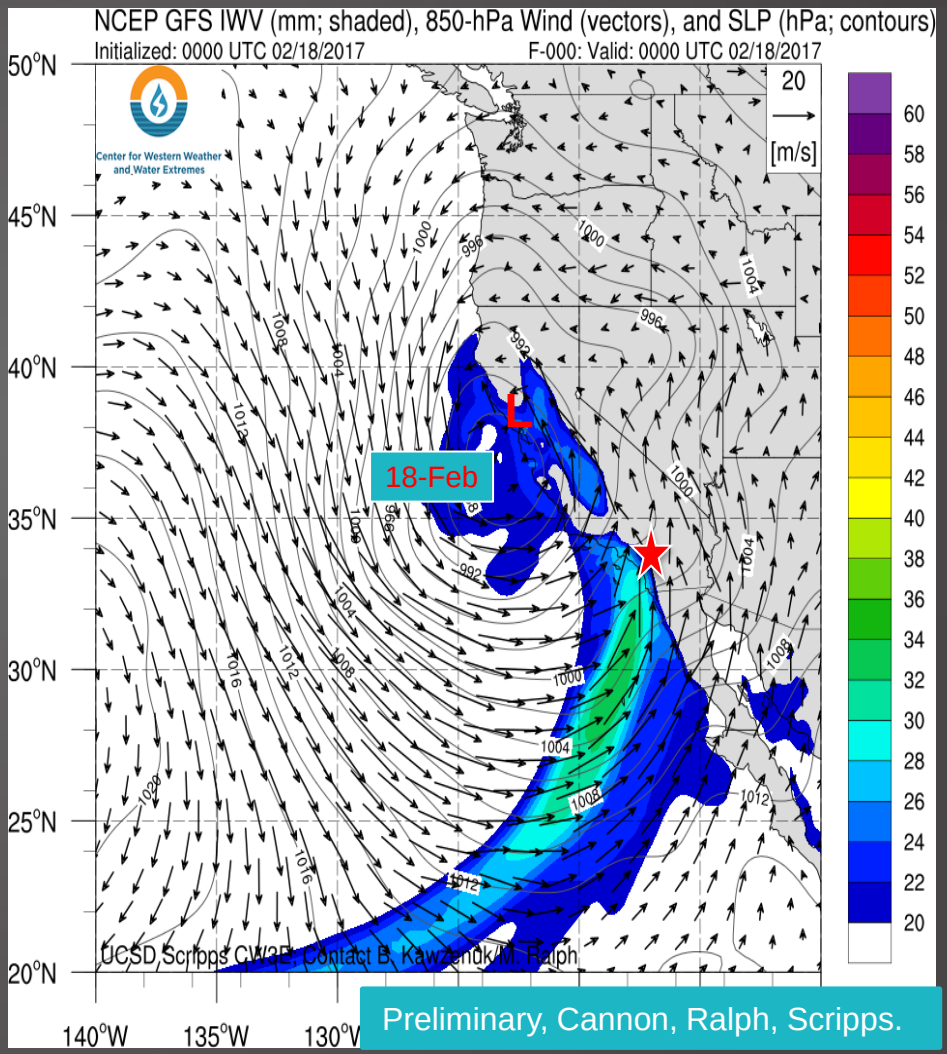
OCWD and the USACE cooperate to store and capture up to 20,000 af of storm water at a time.



The ACOE coordinates the release rate with OCWD to match the capacity of the recharge system.

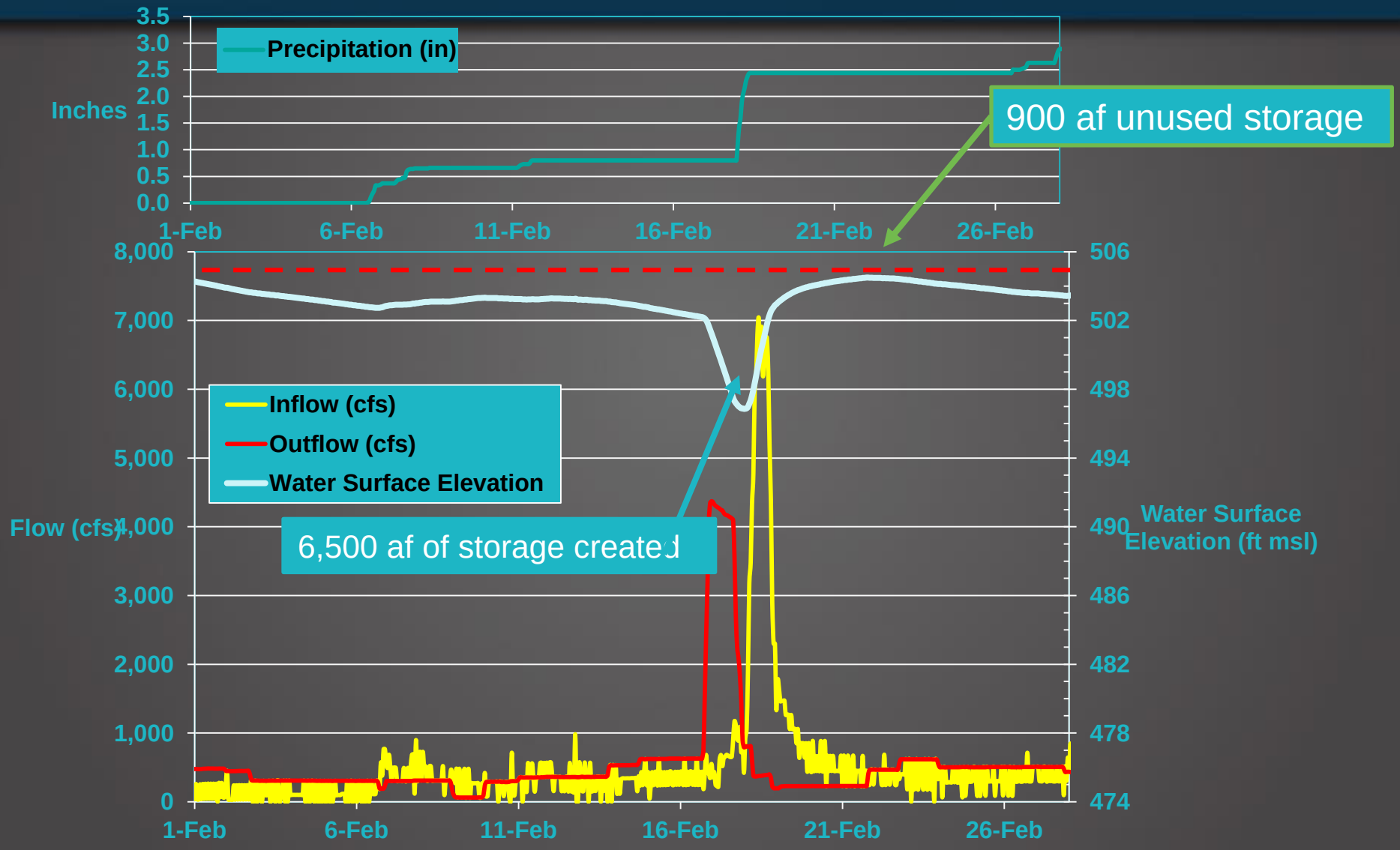
Atmospheric Rivers hit the Santa Ana River watershed in January and February 2017.



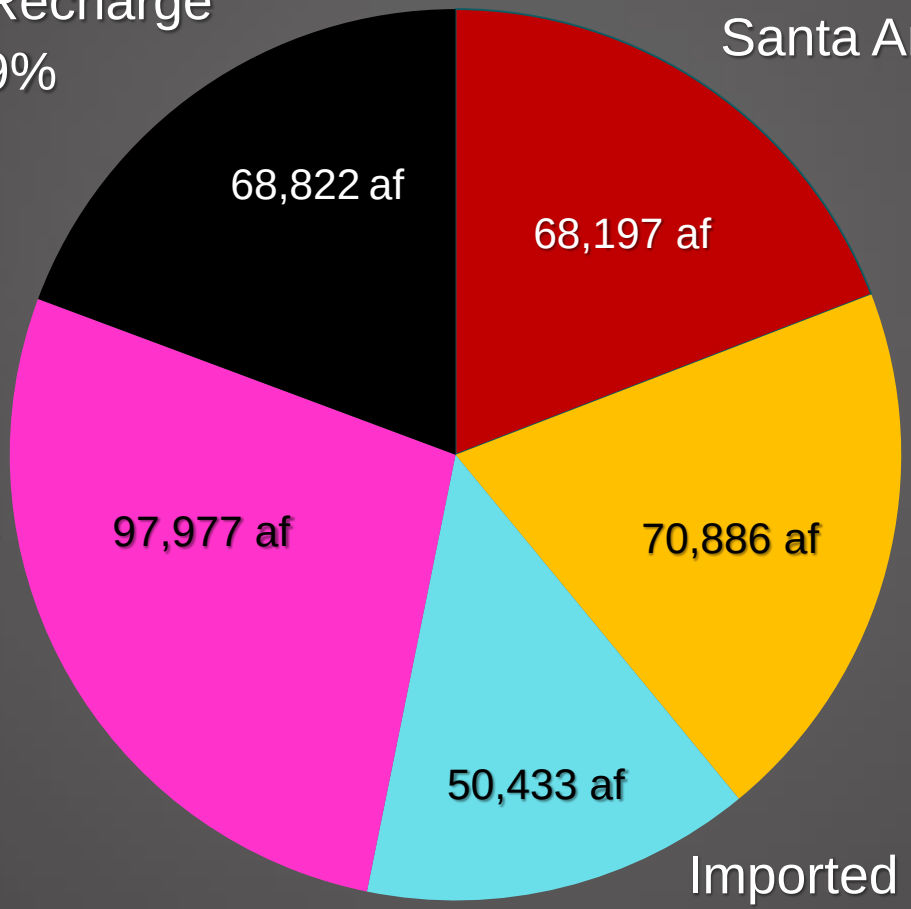


Preliminary, Cannon, Ralph, Scripps.

February 17-18 AR Storm

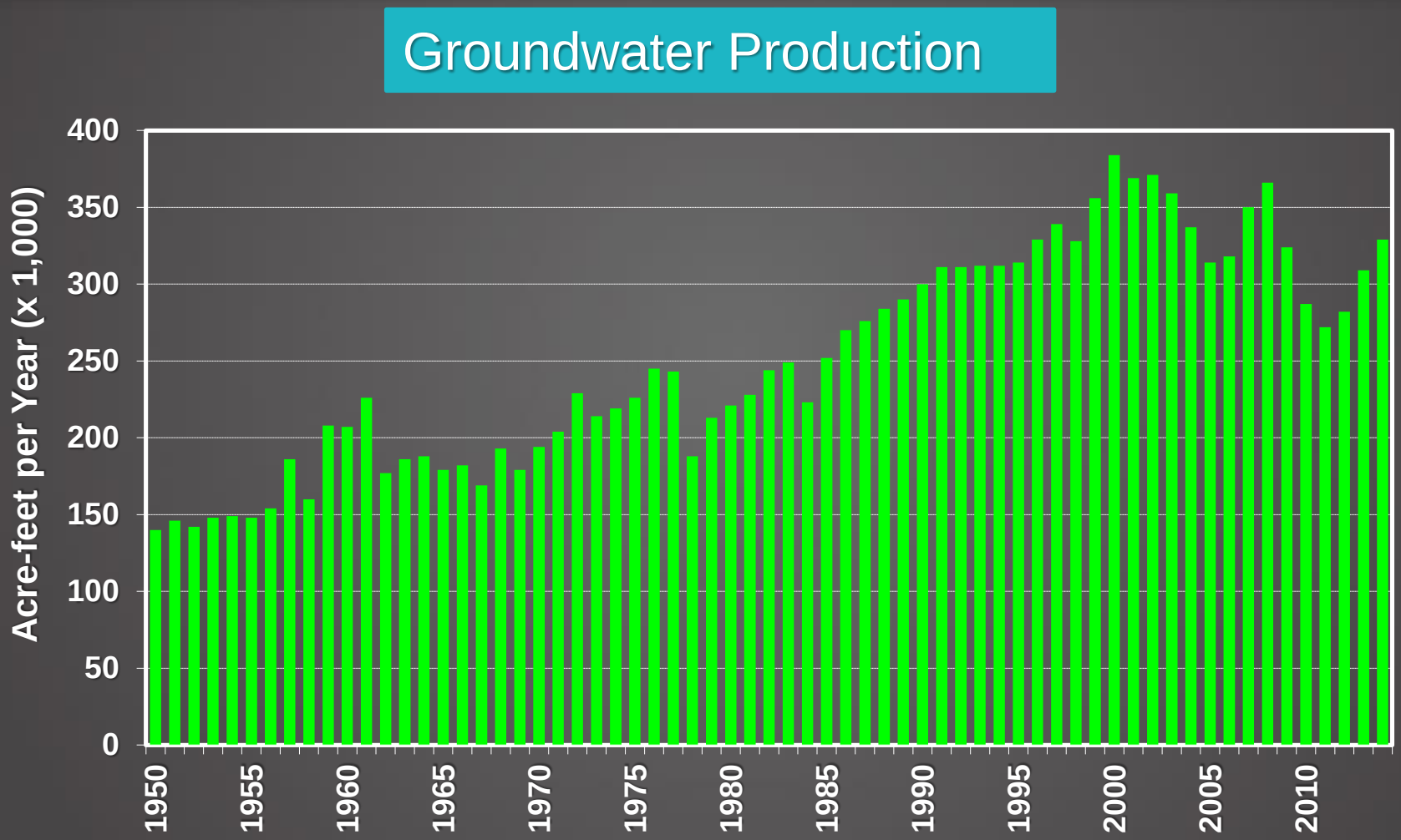


OCWD's recharge system supports increased basin pumping.

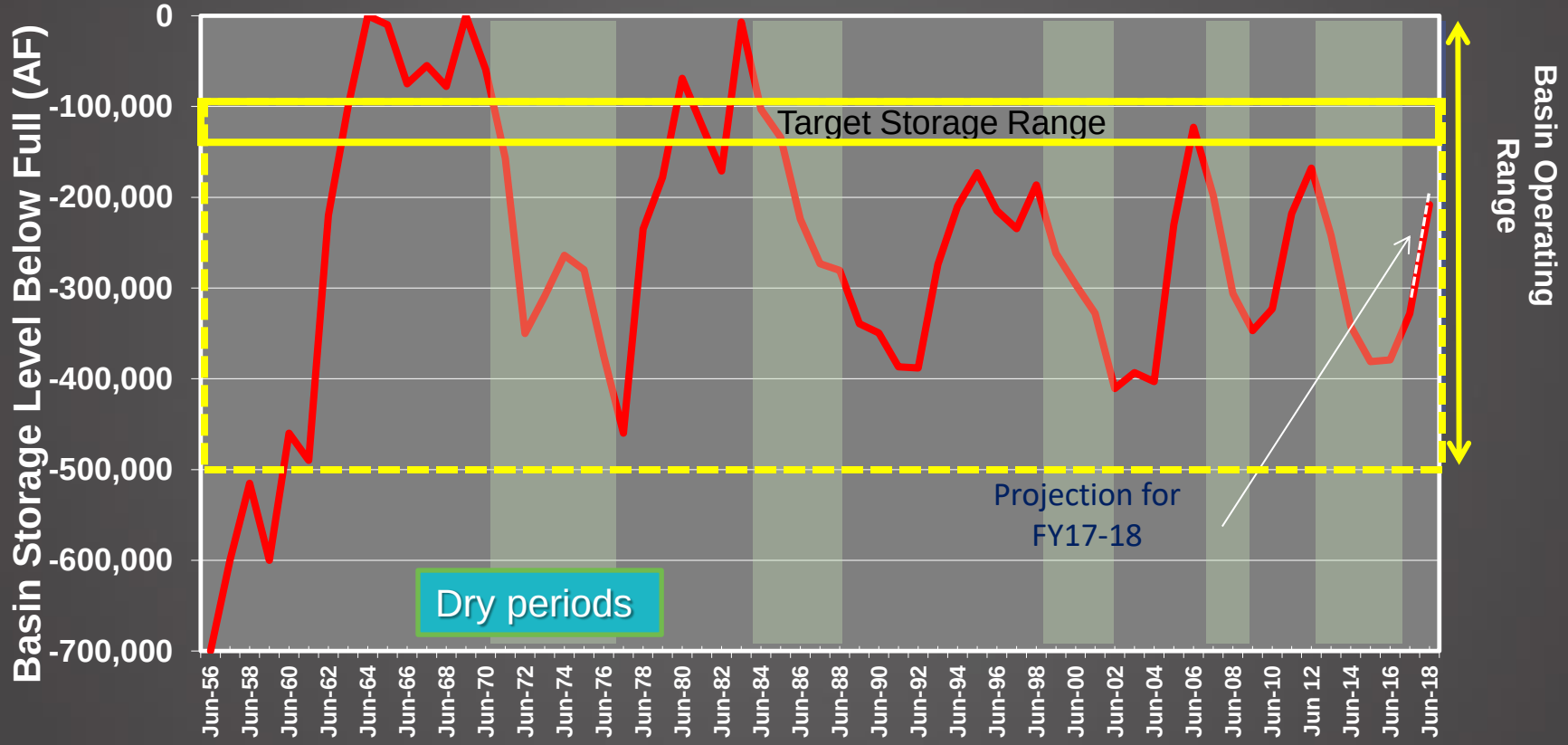


Total FY16-17 Recharge: 356,315 af

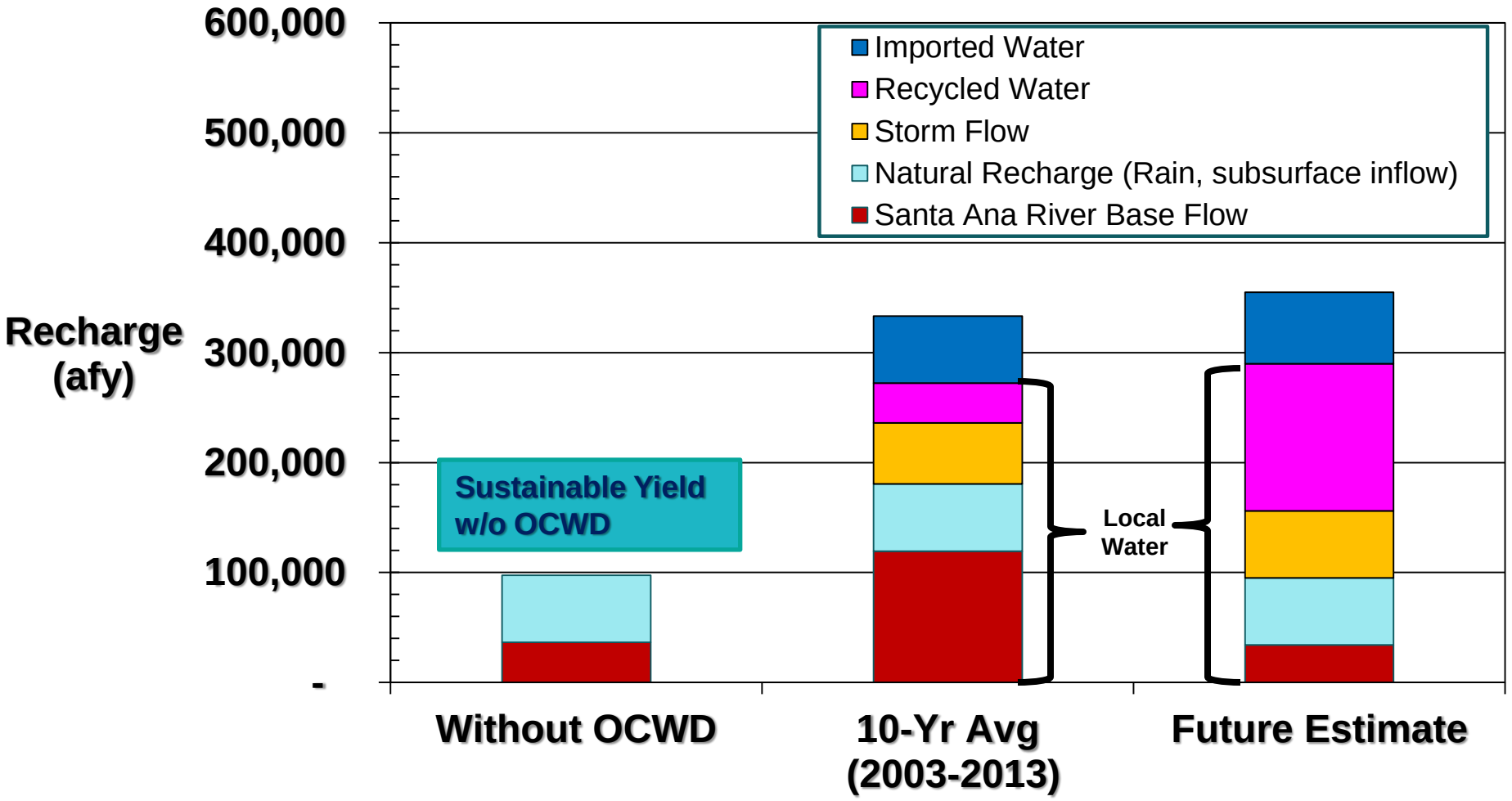
Demand for groundwater has more than doubled in last 60 years.



Annual basin recharge/pumping is balanced based on average hydrology. Storage rises and falls based on wet/dry conditions.



The recharge of local water sources has more than doubled the yield of the basin.



The OC Basin has been operated sustainably since the mid-1970s.

Lowering GW Levels

No

Degraded Quality

No. OCWD is cleaning up contamination.

Reduction of Storage

Storage operated within defined range.

Land Subsidence

No

Seawater Intrusion

Halted in 1975 with Talbert Barrier

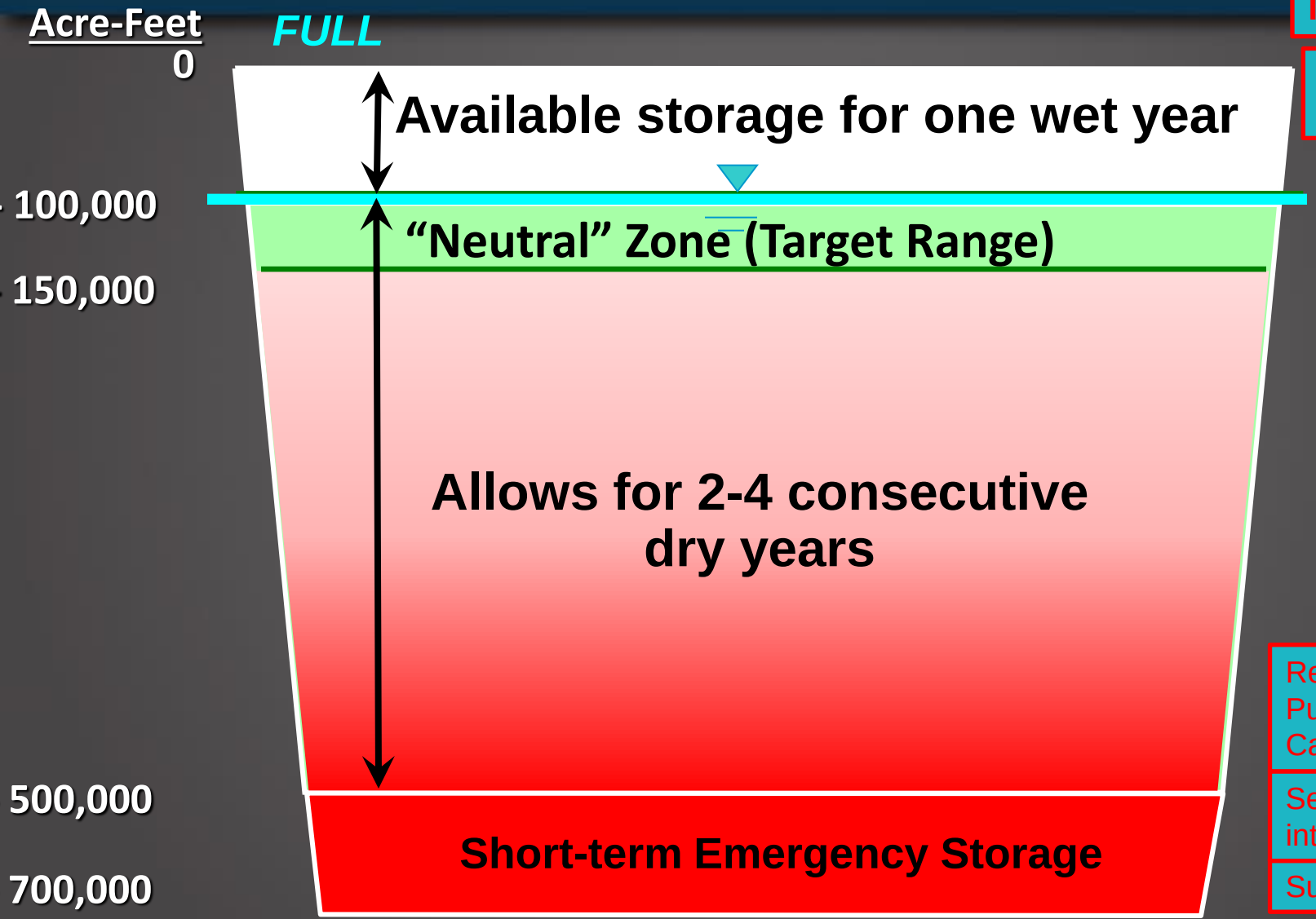
Surface Water Depletion

Not applicable

What allowed OCWD to achieve sustainability?

- Agency created with narrow mission and sufficient authorities to manage groundwater
- Supply-side orientation
- Willing to take risks (e.g., recycled water)
- Non-adjudicated basin
  - Collaborative approach. All treated equally and share in gains and pains
- Reliable revenue stream based on pumping
- Economic incentives used to manage pumping

Basin storage managed within limits to minimize potential adverse impacts.



Negative Impacts

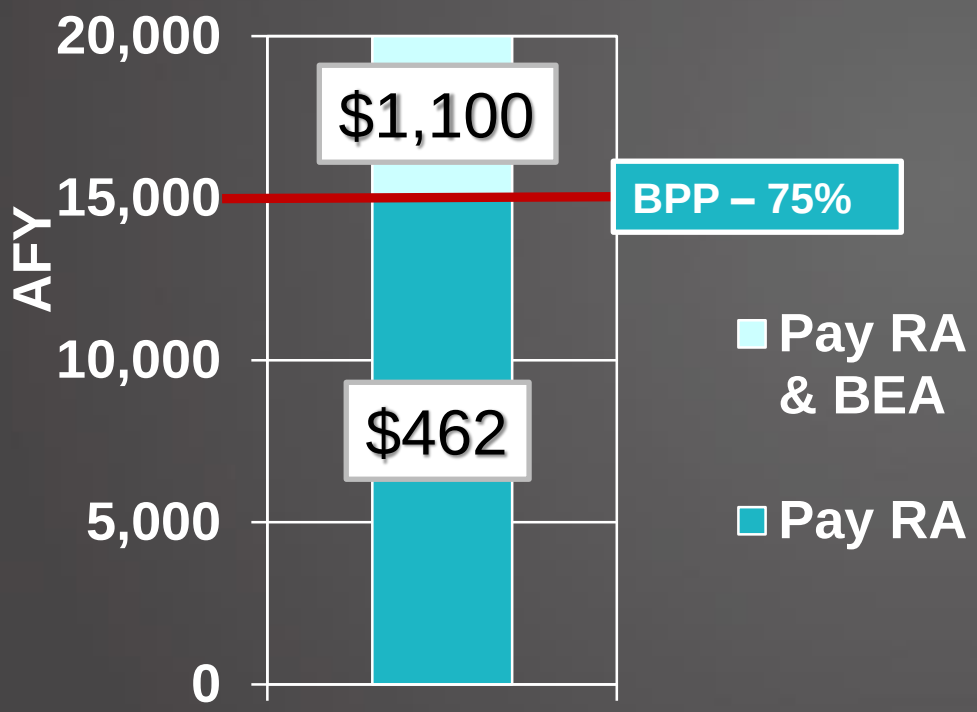
- Shallow groundwater
- Reduced Pumping Capacity
- Sea water intrusion
- Subsidence

OCWD has basin management triggers tied to basin storage conditions.

Basin Storage Conditions (acre-feet below full)	Basin Management Actions to Consider
Less than 100,000 af	Raise BPP
100,000 to 300,000 af	Maintain and/or raise BPP
300,000 to 350,000 af	Seek additional supplies to refill the basin and/or lower the BPP
Greater than 350,000 af	Seek additional supplies to refill the basin and lower the BPP

OCWD uses economic incentives to manage pumping.

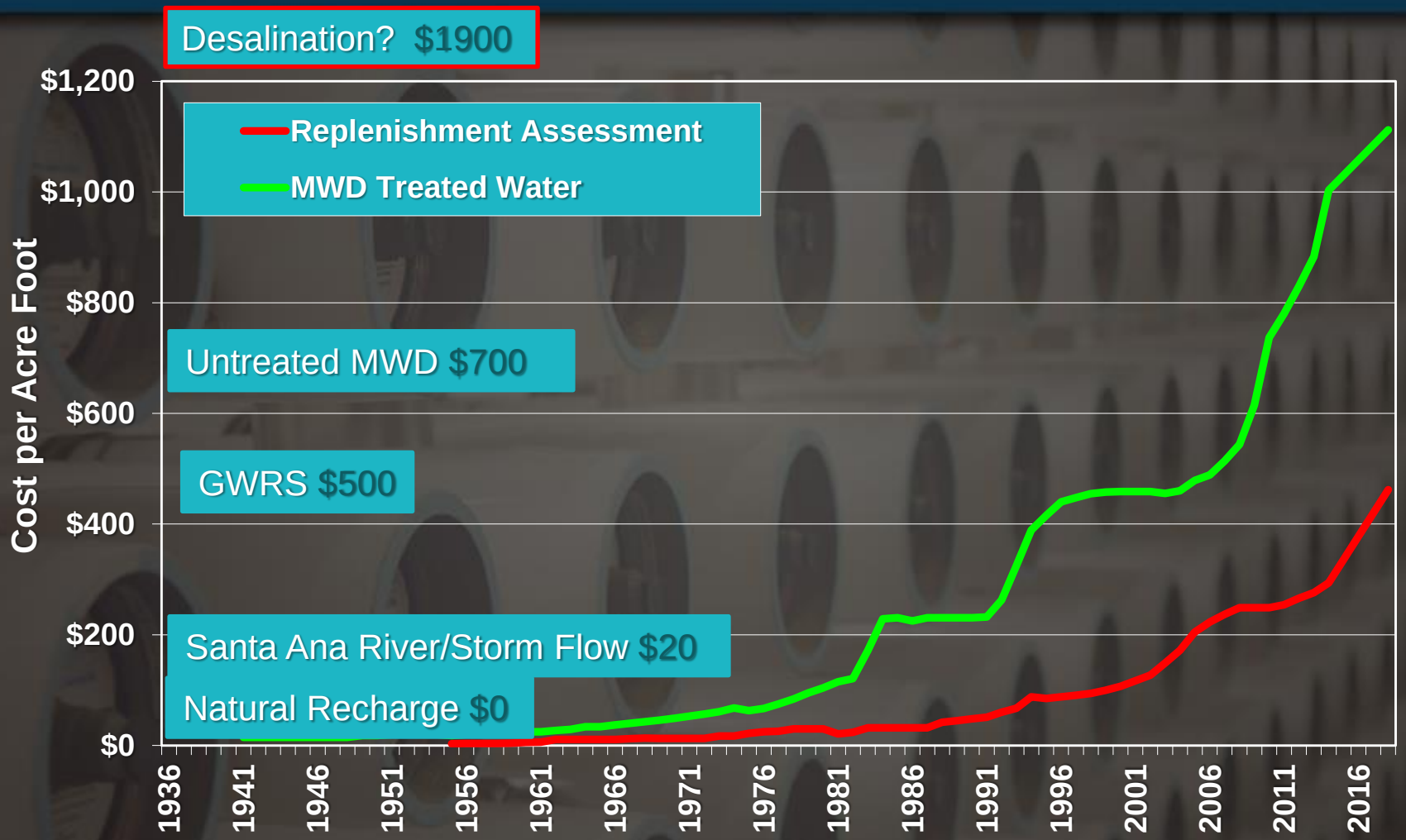
Example Water Utility with 20,000 afy of Total Water Demands



RA+BEA = Imported water cost

- Basin production percentage (BPP) = amount of total demand that can be met with groundwater
- Replenishment assessment (RA) = charge for groundwater below BPP
- Basin equity assessment (BEA) = additional charge for water pumped above BPP

High imported water costs makes local resources development attractive.



OCWD continues to explore increasing local water supplies.

- Expand GWRS to 130 MGD
- Increased storm water capture at Prado Dam
- Increased storm water recharge
- Dry-year groundwater storage accounts in upper watershed
- Evaluating ocean desalination




Thank You!
Contact:
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714-378-3214

Closing thought.

- Two ways to bring a bring a basin into balance:
    1. Reduce pumping
    2. Increase supplies
- **Both have a cost.**
- In OCWD, if there is not enough groundwater, the cost of meeting demands is imported water ($1,100/af).
- What is the cost in your basin?

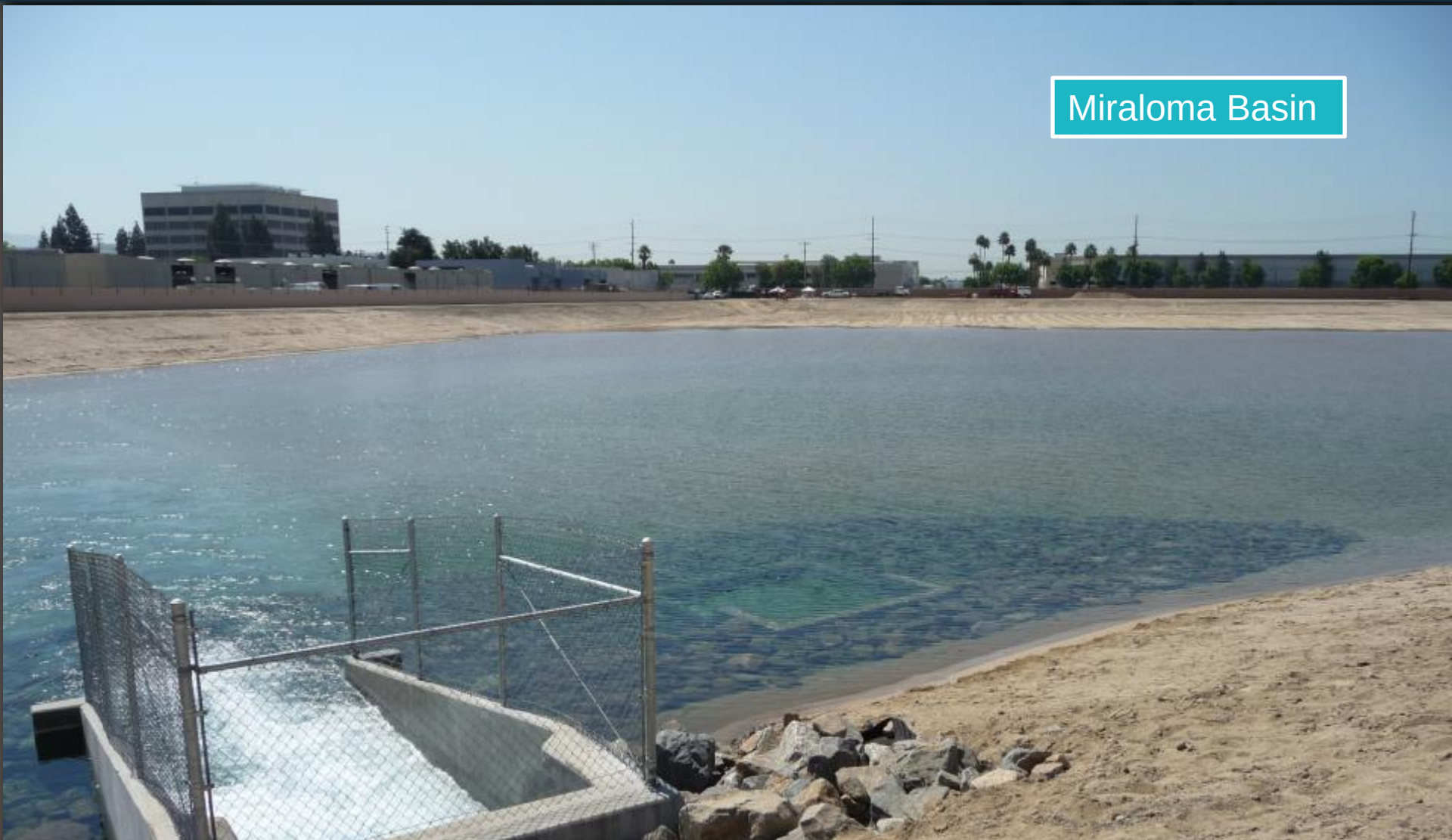
OCWD's statutory groundwater management authority is unique and effective.

- 10-member Board of Directors (7 elected; 3 appointed)
- Basin not adjudicated (no court-assigned pumping limitations)
- Pumping determined each year based on basin supplies and storage level
- Over-pumping controlled by economic disincentives (penalty fees)
- Pumping fee charged to pay for OCWD programs and activities

Fork in the Road (early 1970s): Import or Recycle?

- Seawater intrusion in Talbert Gap noted as far back as mid-1920s.
- Seawater barrier of multiple injection wells was needed.
- Imported water was inexpensive and readily available.
  - Legal issues created uncertainties with imported supplies (e.g., Az vs Ca, 1963)
- Recycled water was more expensive, but locally controlled.
  - Would take 30 yrs to perfect technology

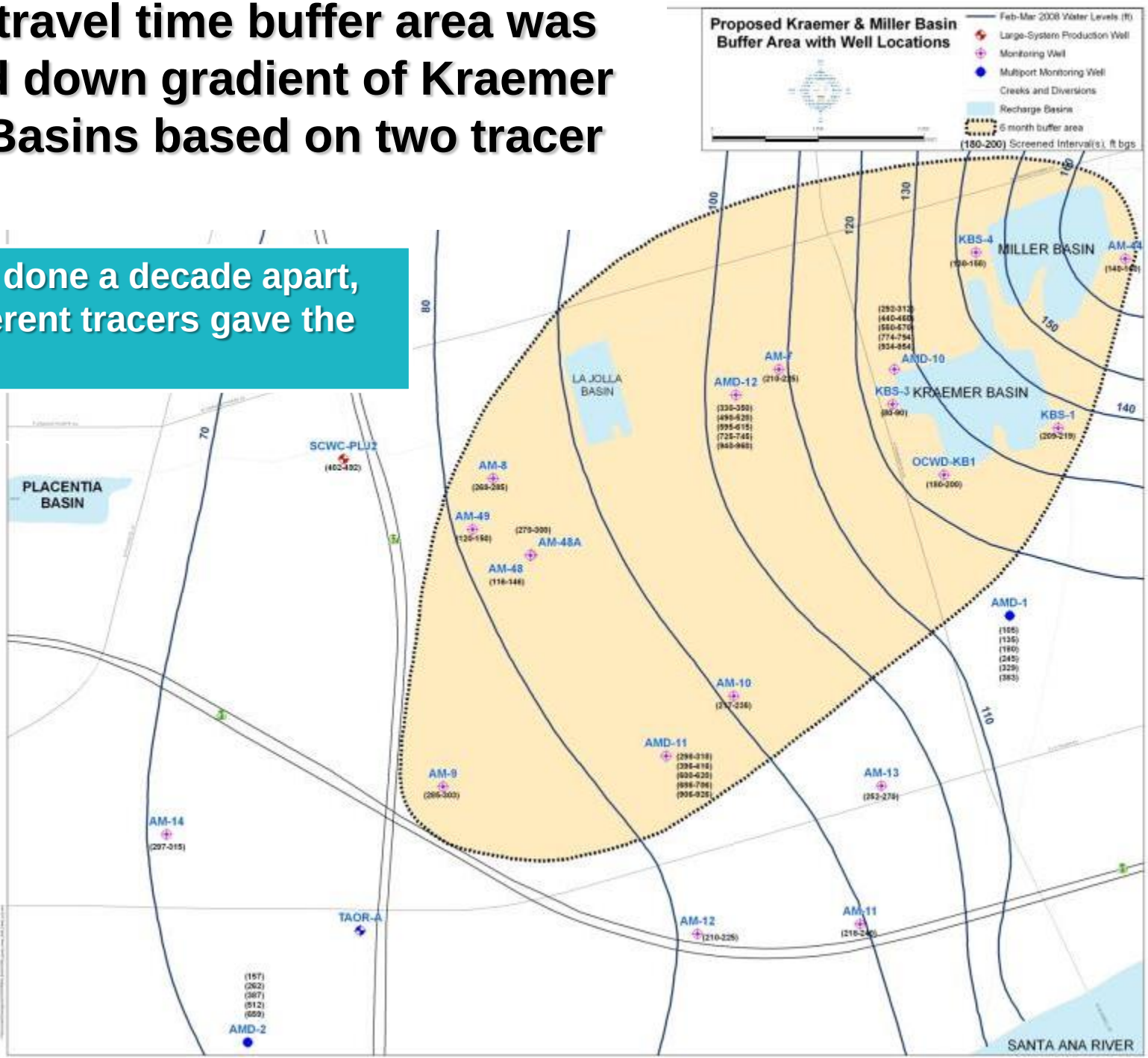
The bulk of the water is recharged in recharge basins.




LaPalma Basin

A 6-month travel time buffer area was established down gradient of Kraemer and Miller Basins based on two tracer studies.

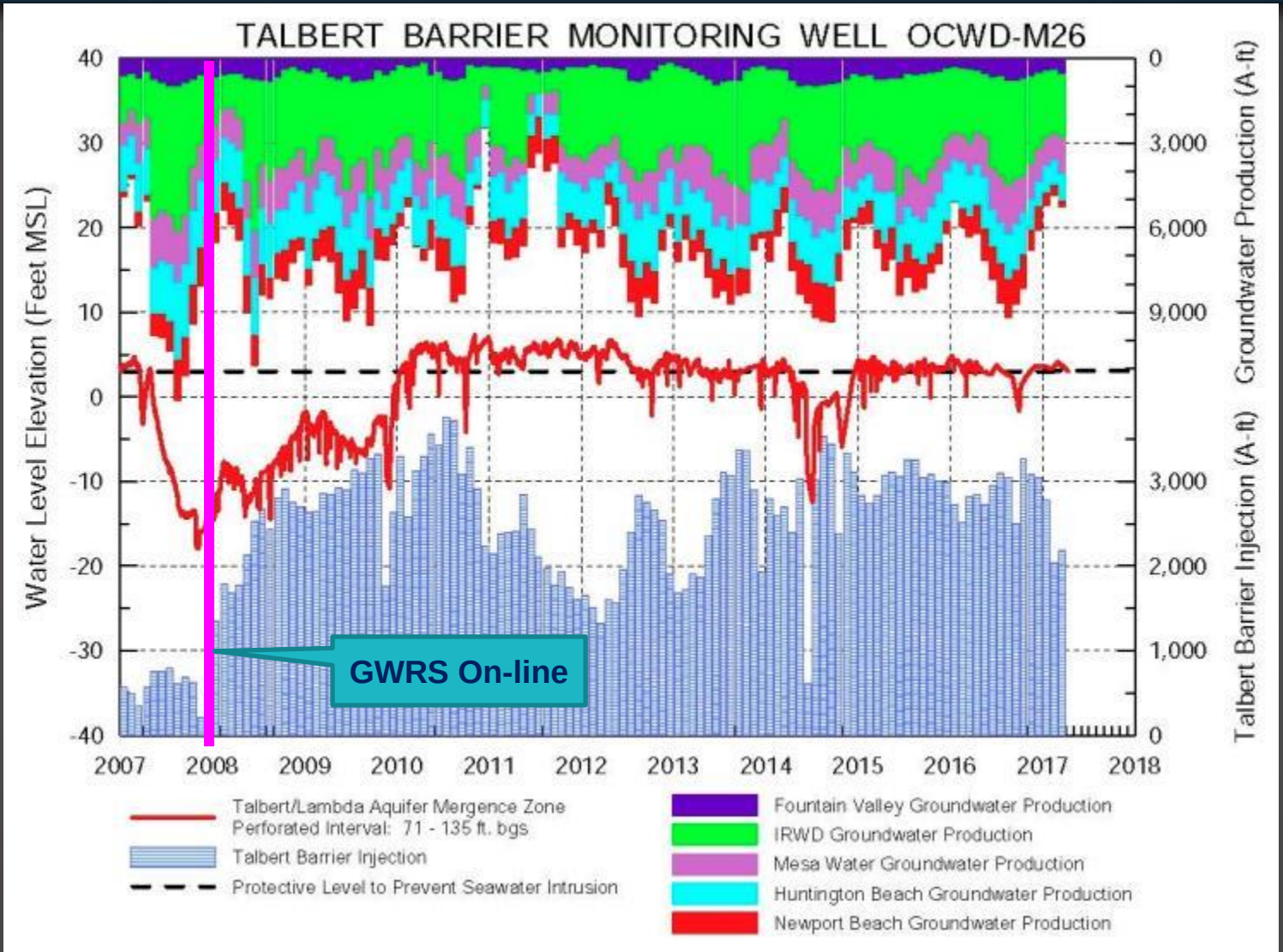
Tracer studies done a decade apart, using two different tracers gave the same result!



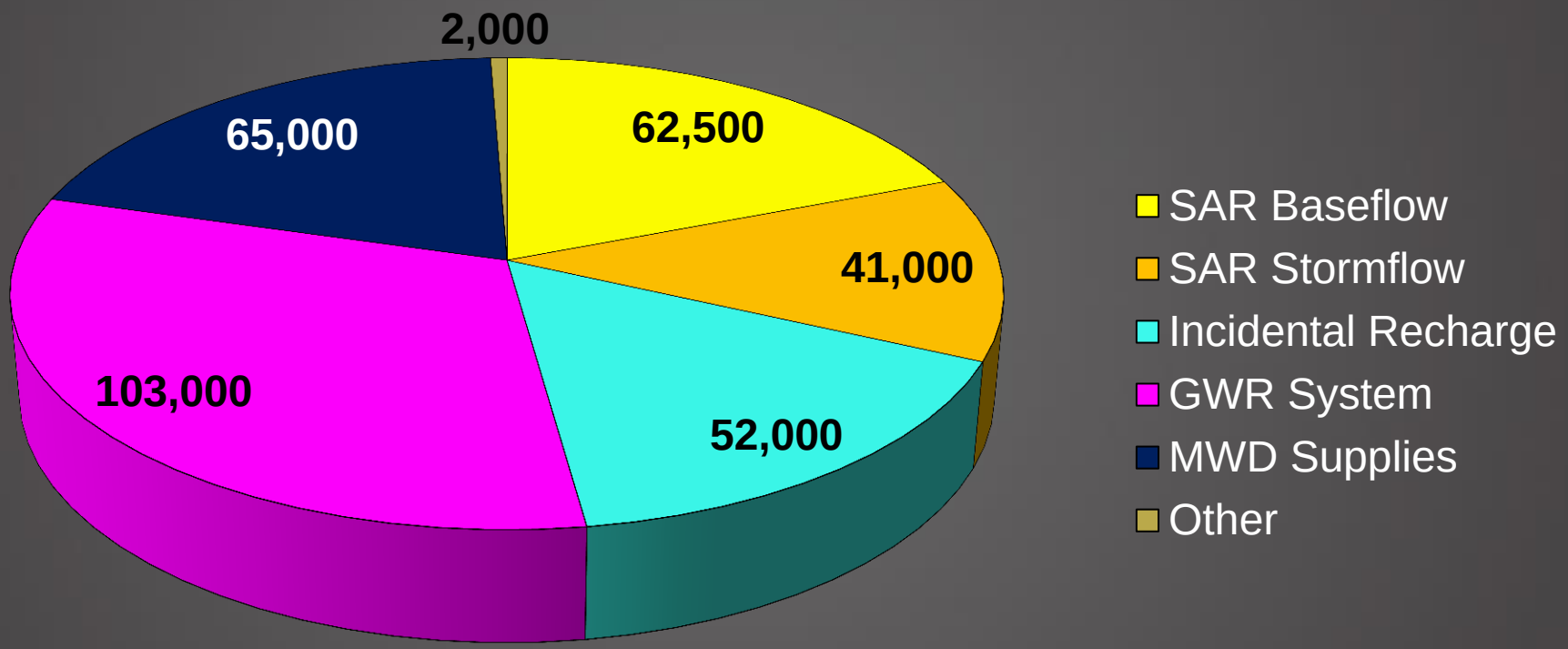
GWRS has improved basin conditions.

- Shifts salt balance into positive territory
  - Santa Ana River base flow: 600 mg/L
  - Imported Colorado River water: 650+ mg/L
  - GWRS: 70 mg/L
- Significantly reduced clogging
  - Barrier recharge increased
  - Surface recharge extremely high: 10 ft/day
- Maximizes performance of existing facilities and reduces need for future facilities

Additional, high quality supply has allowed the barrier to perform as intended.

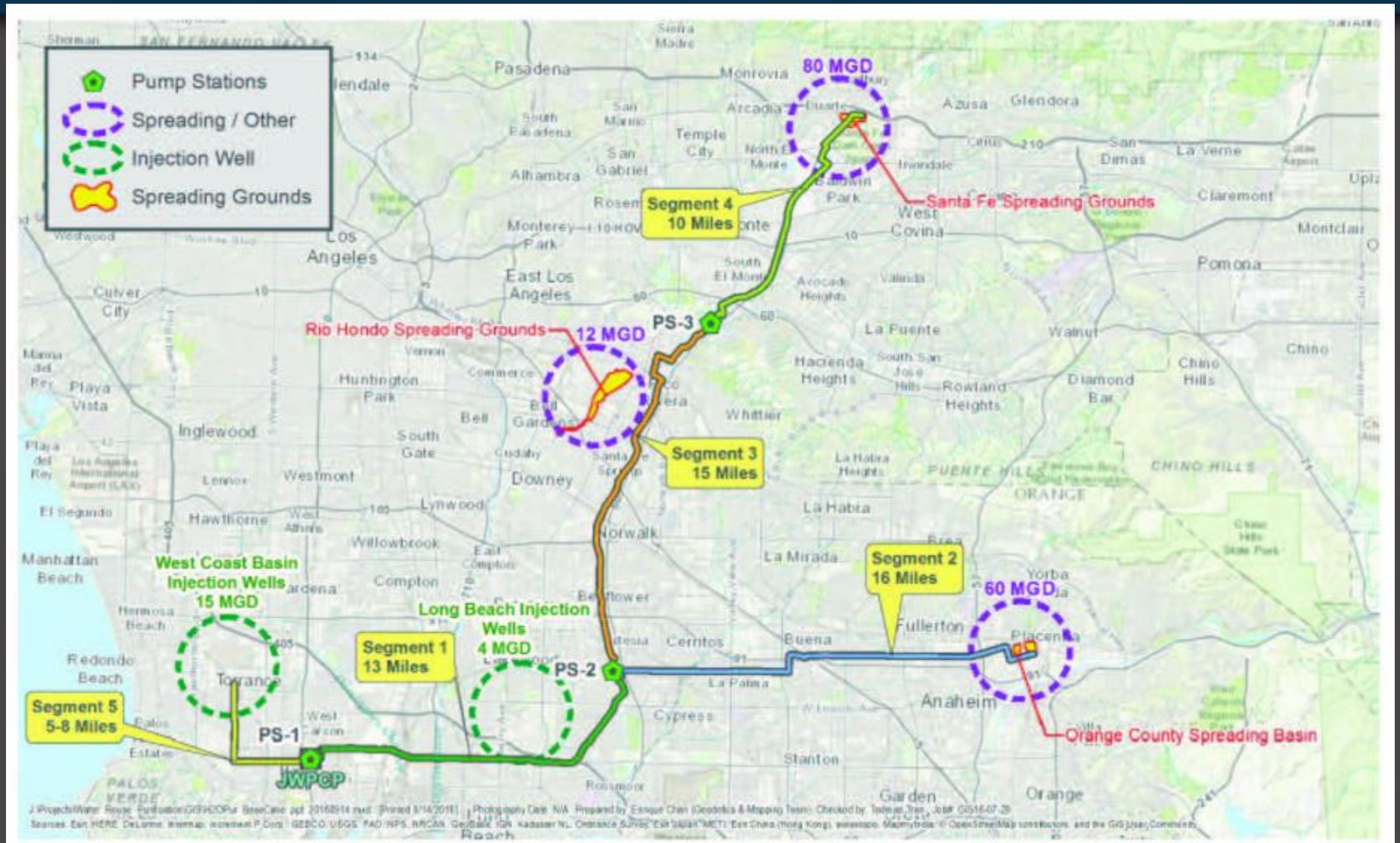


GWRS is expected to supply 32 percent of recharge to the basin in 2017-18.



80 percent of recharge water is local supply.

The Metropolitan Water District is assessing the feasibility of constructing a 150 MGD recycled water project.



Imported water is important to many parts of the state.

Los Angeles Aqueduct: 1913

Mokelumne Aqueduct: 1926

Hetch Hetchy Aqueduct: 1934

Central Valley Project: 1933

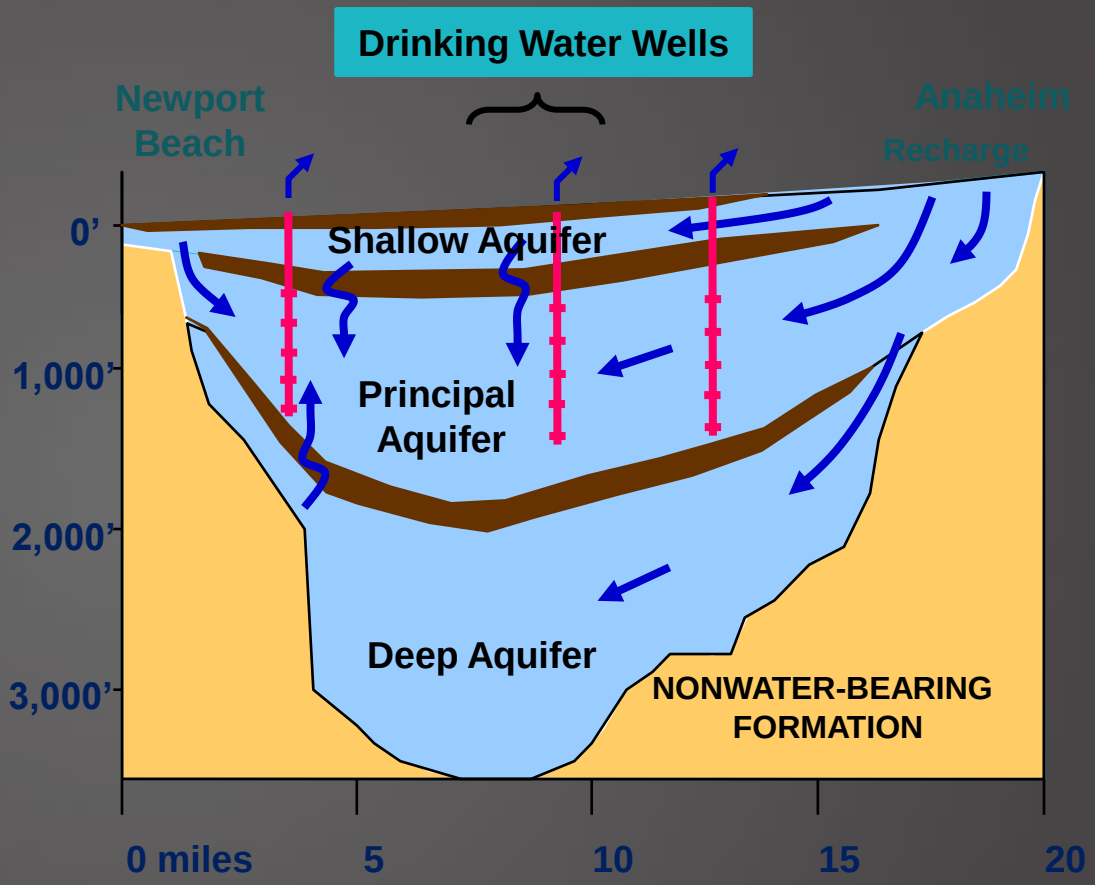
Colorado River Aqueduct: 1939

State Water Project: 1960


S.KELLEY
MOVE OVER...
DRINKING WATER FROM SEWAGE?

FROM TOILET TO TAP

Local groundwater supplies are less expensive than imported water supplies.



Imported:
Metropolitan Water District

$1,000 AF

Groundwater:
Orange County Water District

$402 AF*

*Excludes pumping costs.


Sand “T and L” levees are constructed in the Santa Ana River channel to spread the water in the channel.
Santa Ana River
Burris Basin
The T and L levees also provide nesting and roosting habitat for numerous types of water fowl.

OCWD has always taken a "supply-side" approach to groundwater management.

- Aggressively pursue opportunities to increase supply.
- Rejected adjudication as "philosophy of scarcity" and needless expense.