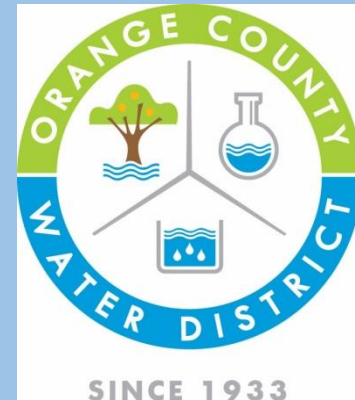


Water Quality Benefits of the Groundwater Replenishment System – Multi-State Salinity Summit

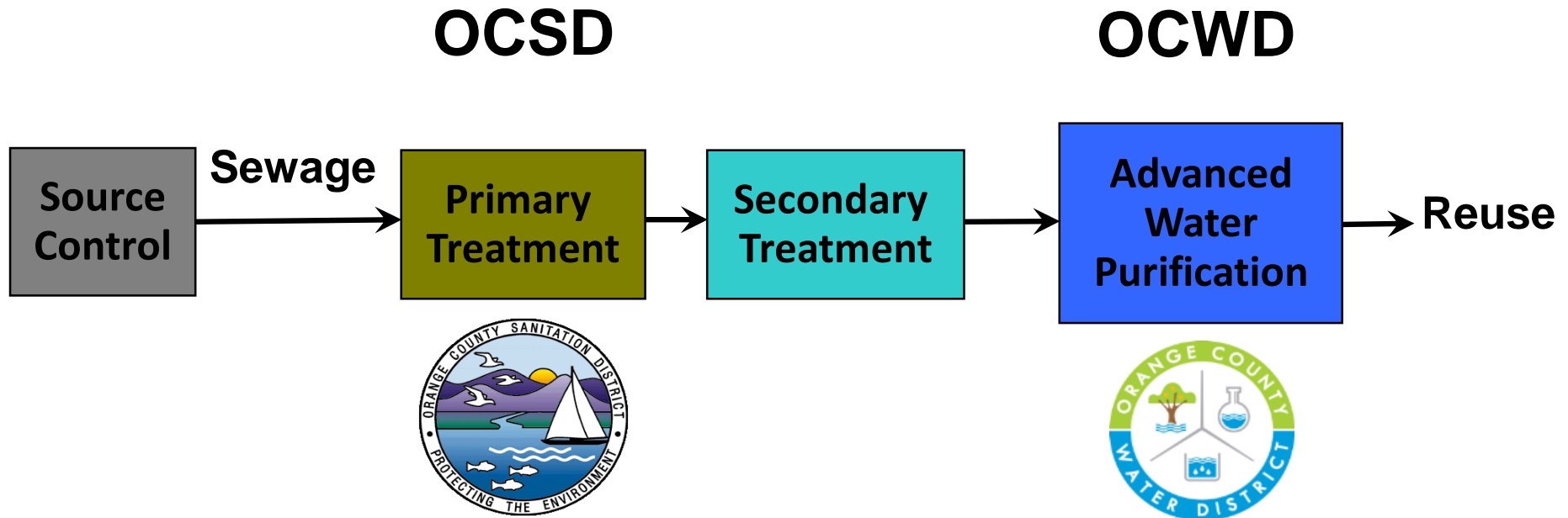
Greg D. Woodside, PG, CHg
Executive Director
of Planning & Natural Resources
Orange County Water District
gwoodside@ocwd.com

February 28, 2019





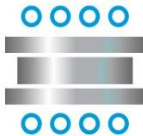
Agency Responsibilities





Microfiltration (MF)

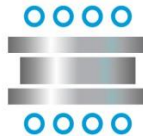
OCSD
Secondary
Effluent



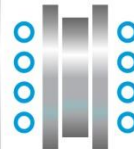
Backwash
Sent to OCSD



Reverse Osmosis (RO)



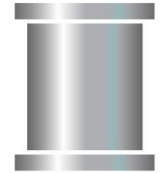
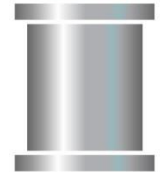
Brine Treated
in OCSD Outfall



Ultraviolet Light (UV) with Hydrogen Peroxide

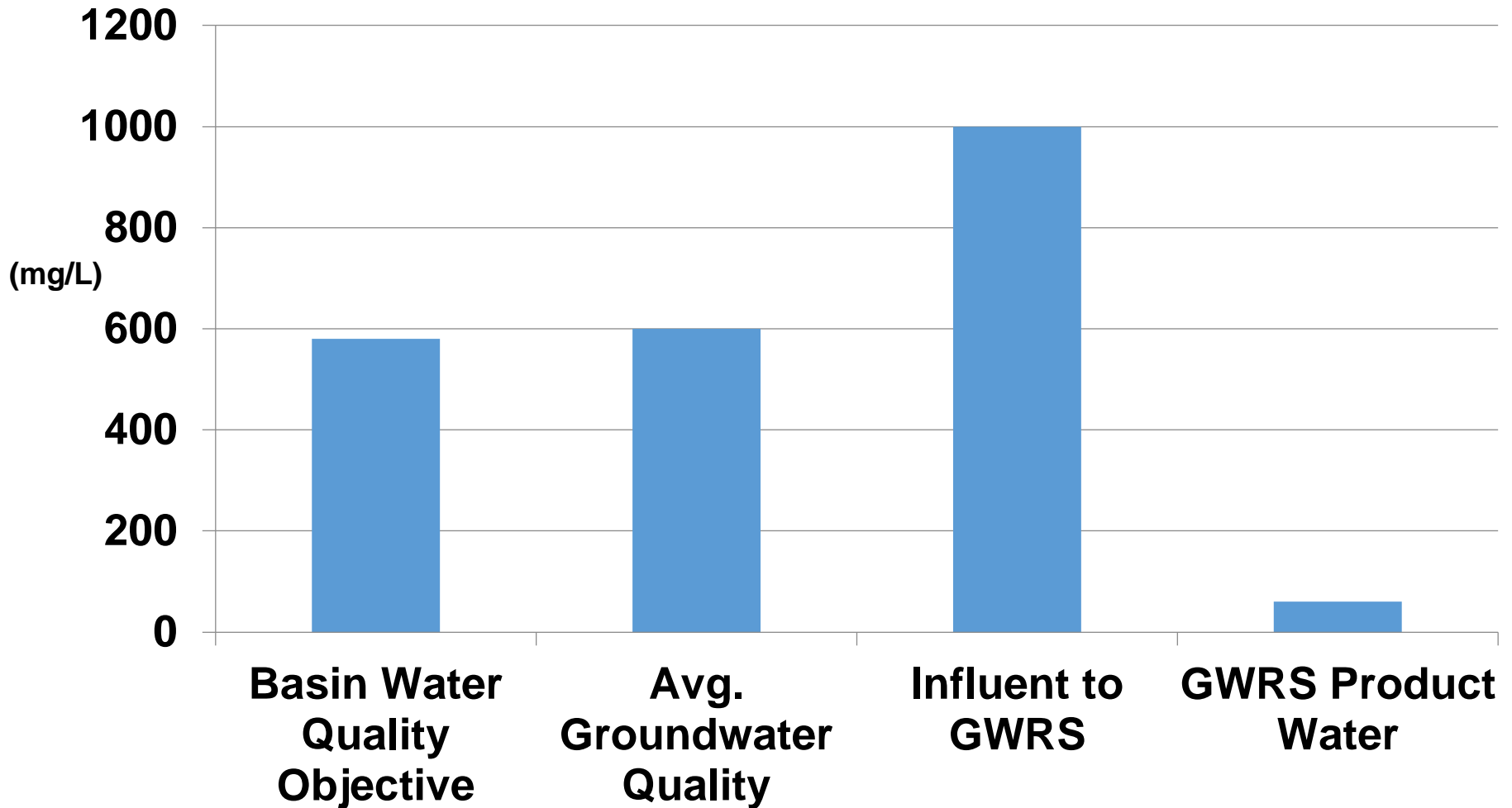


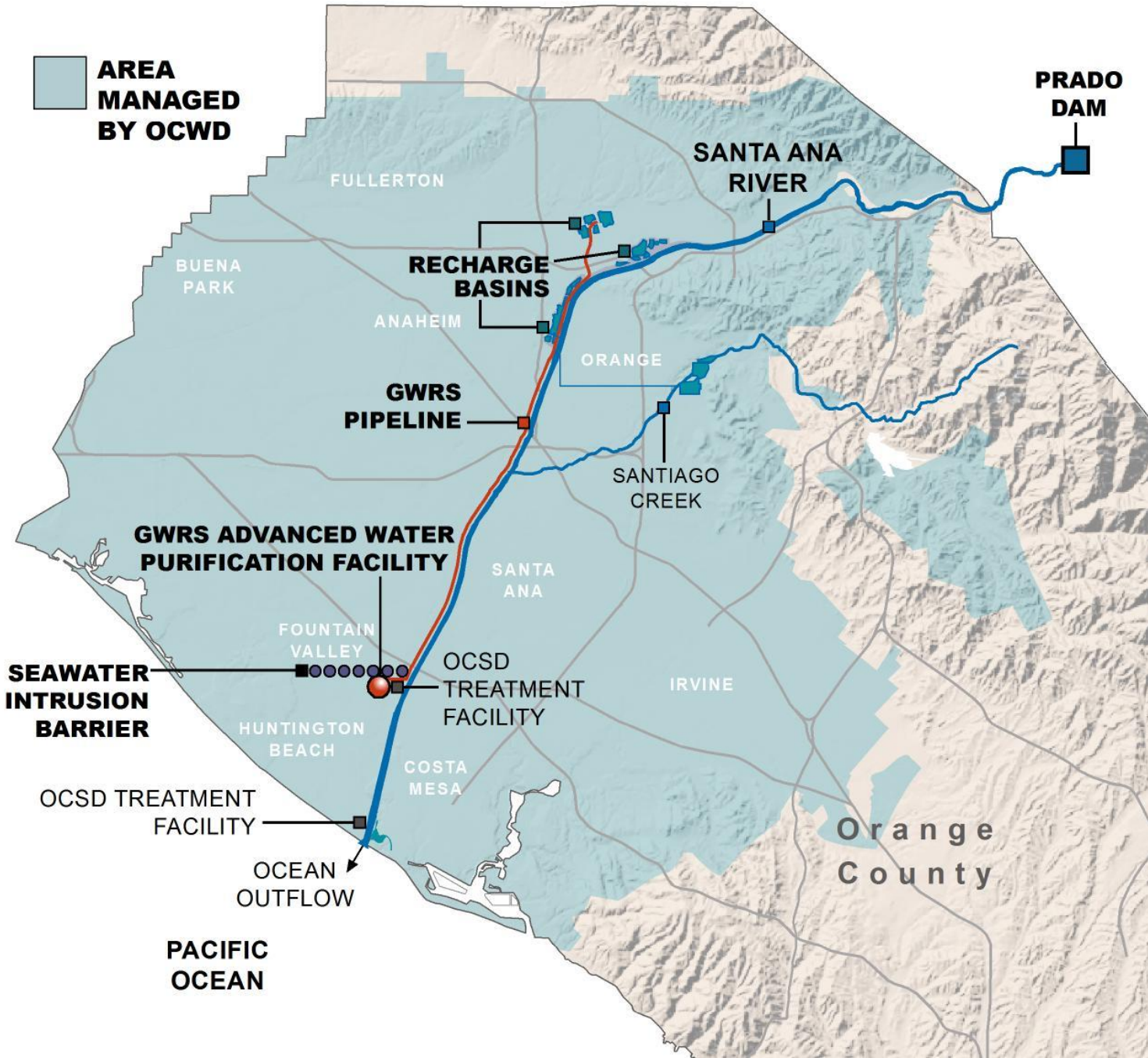
Seawater
Barrier
(36 well sites)



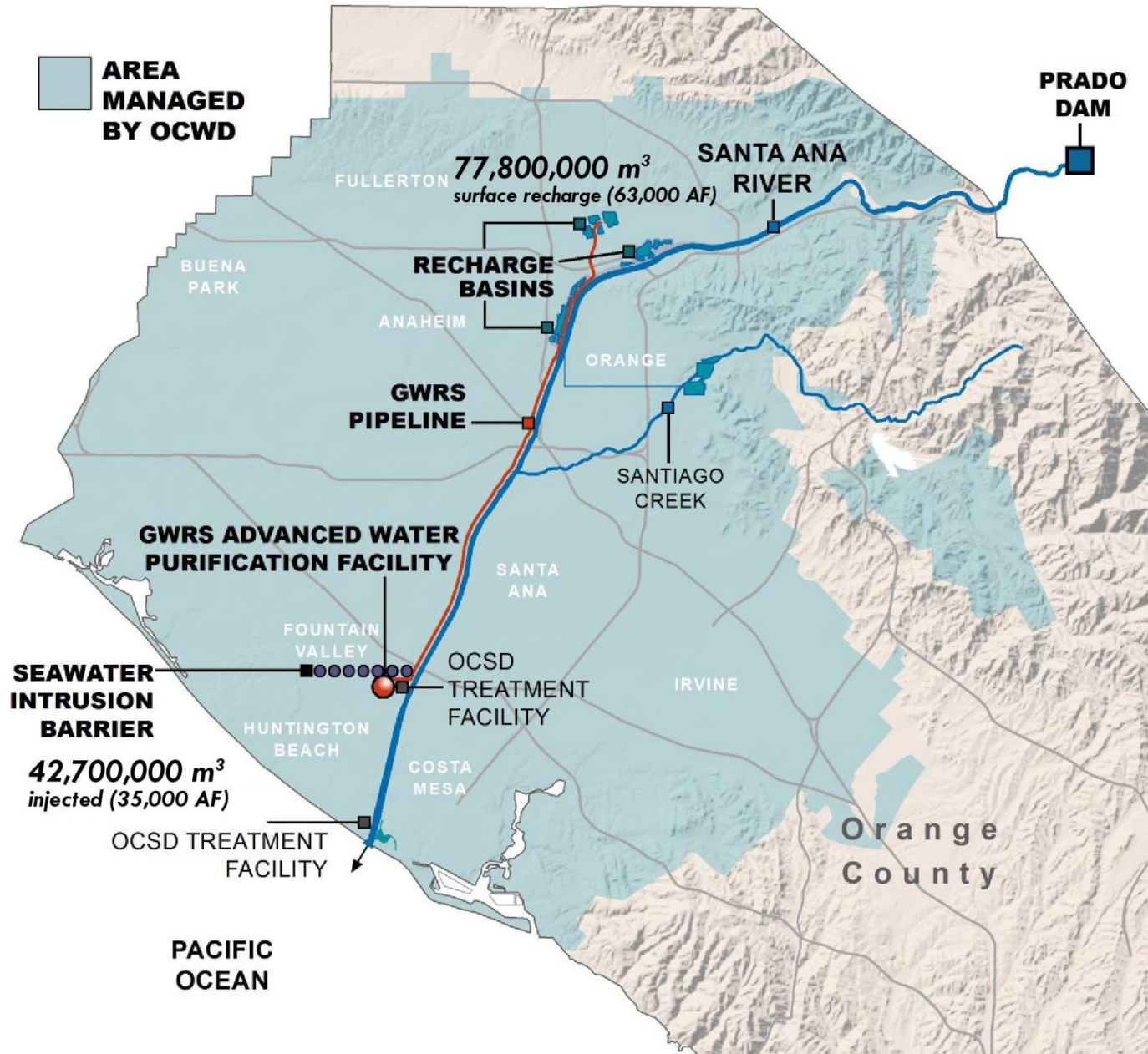
Recharge
Basins in
Anaheim

TDS Concentration of Groundwater and GWRS Purified Recycled Water





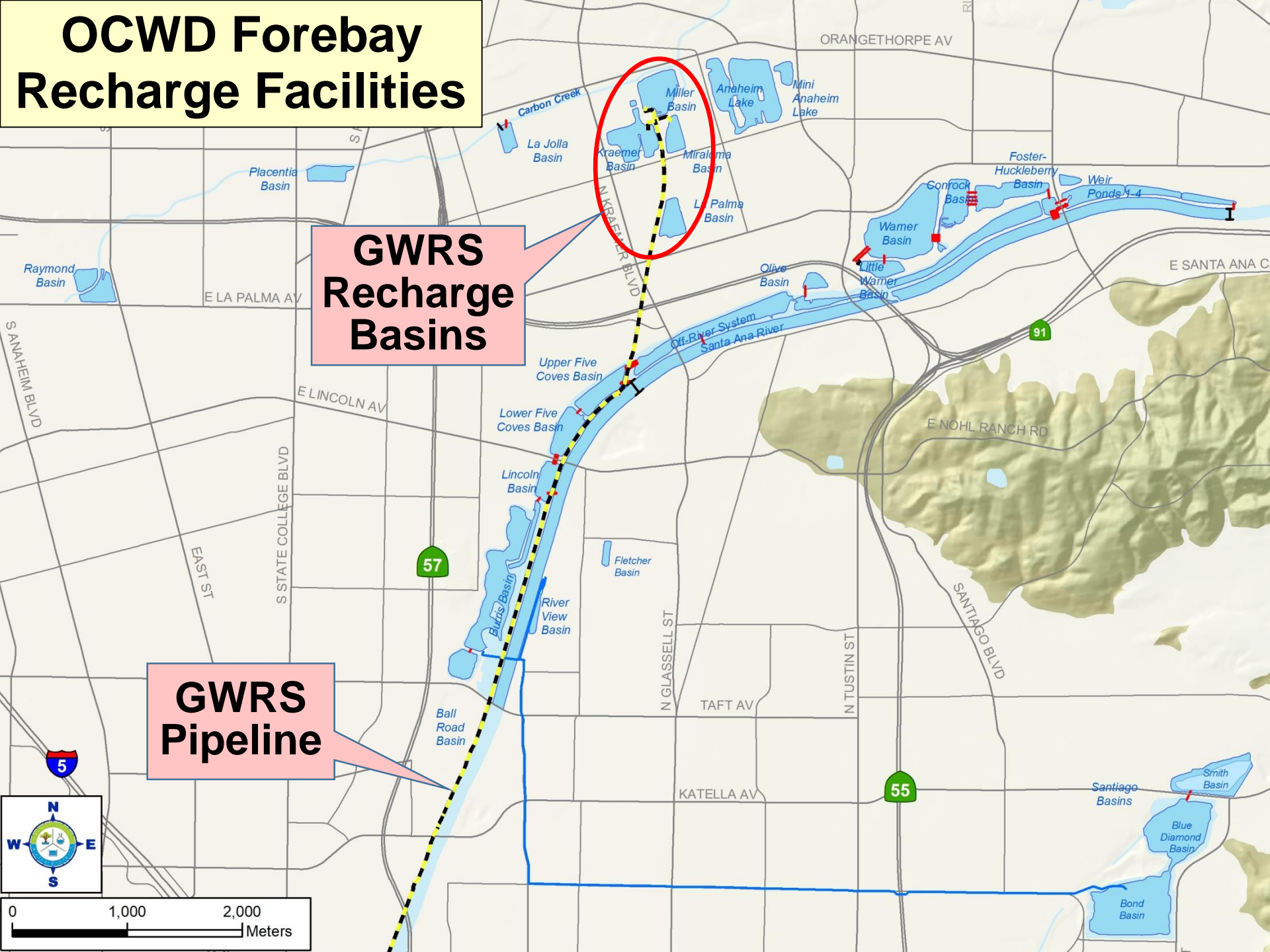
2016 Recycled Water Recharge Volumes



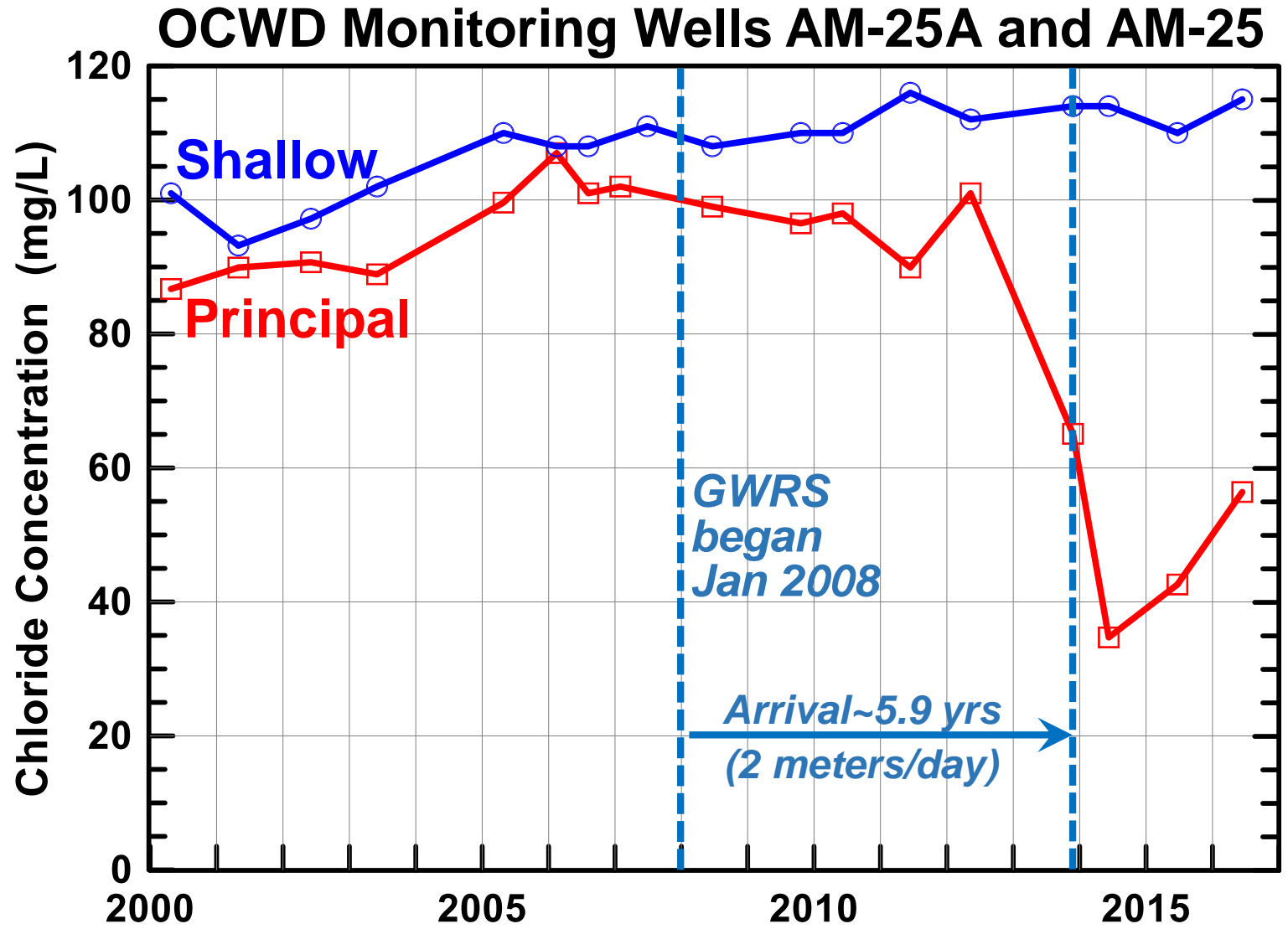
OCWD Forebay Recharge Facilities

GWRS Recharge Basins

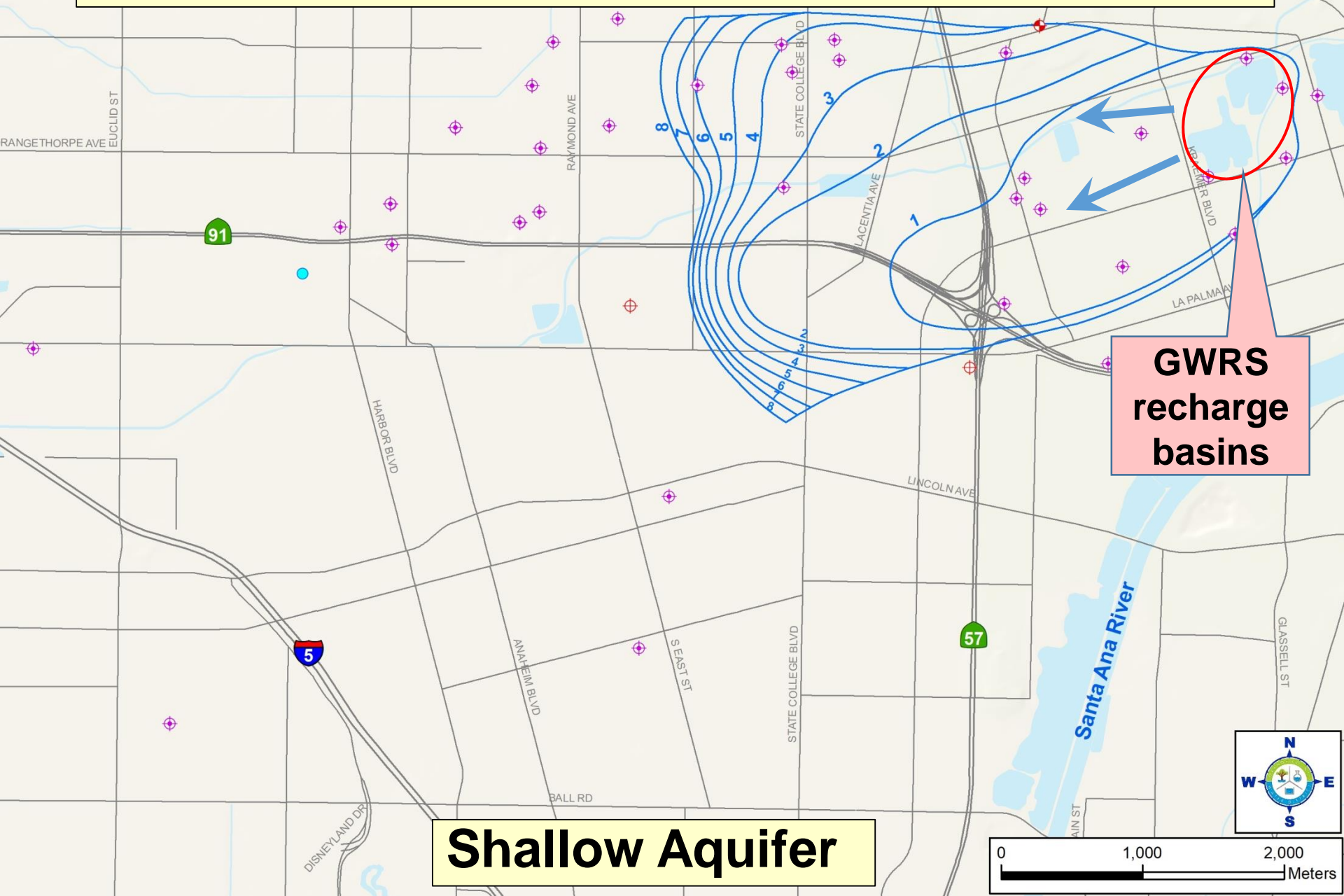
GWRS Pipeline



The low-TDS signal of GWRS water was tracked at downgradient wells by a noticeable drop in chloride.

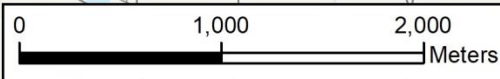


GWRs water migrates down from recharge basins and then migrates laterally.

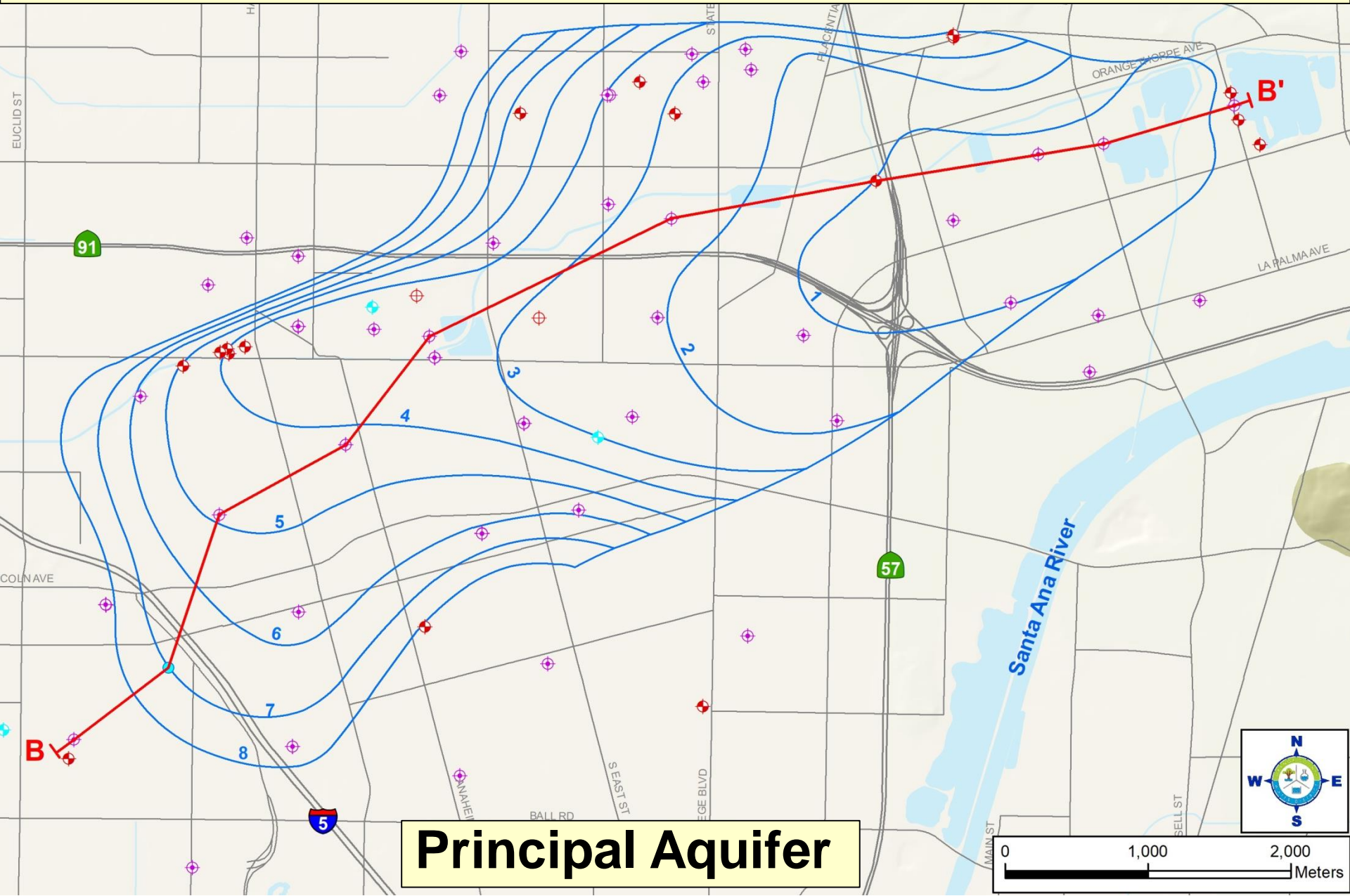


GWRs recharge basins

Shallow Aquifer

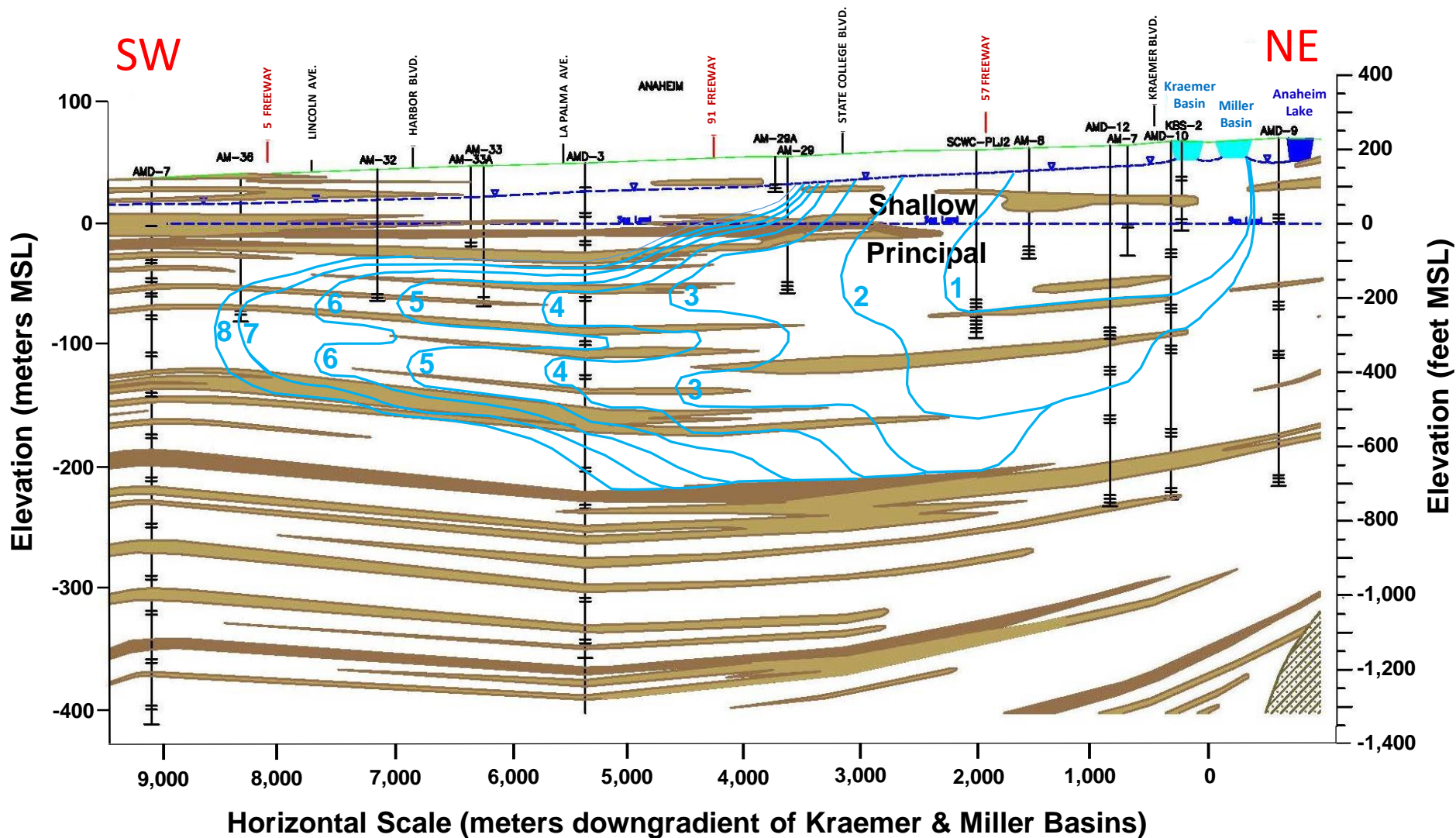


GWRS water migrates further downgradient in the Principal Aquifer due to pumping-induced gradients.

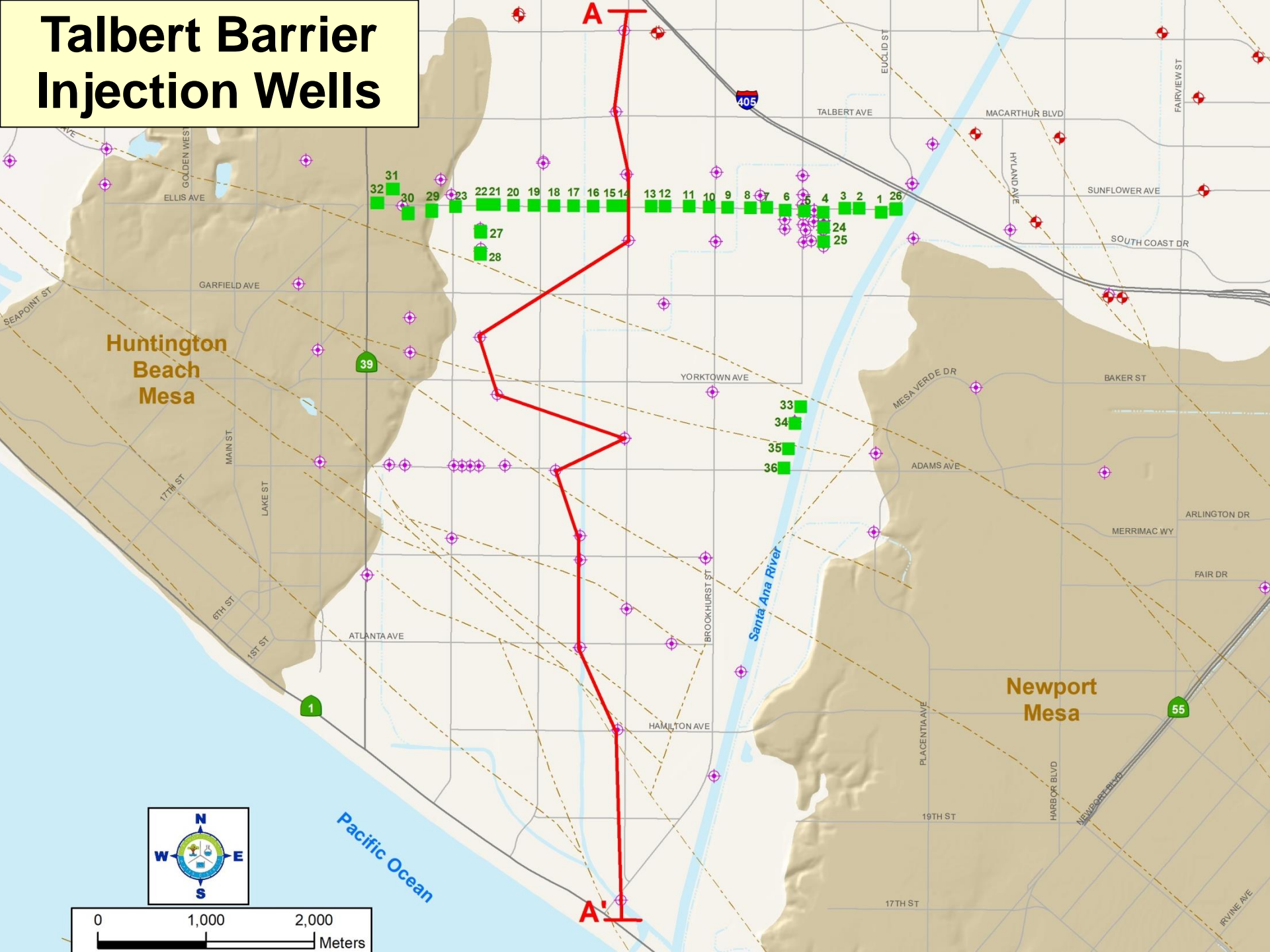


Principal Aquifer

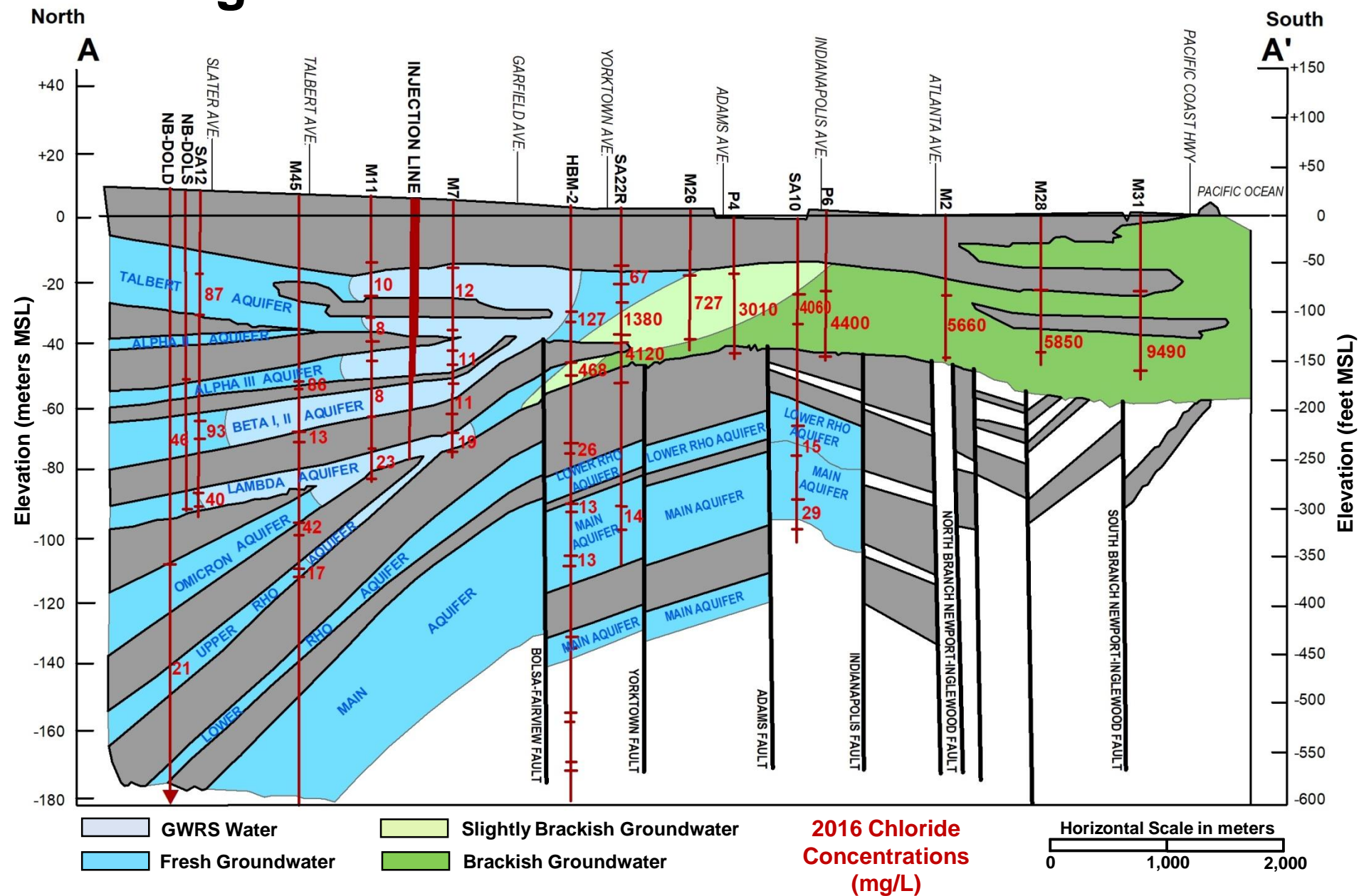
GWRS water migrated approx. 200 meters vertically and 8,000 meters laterally from 2008 to 2016



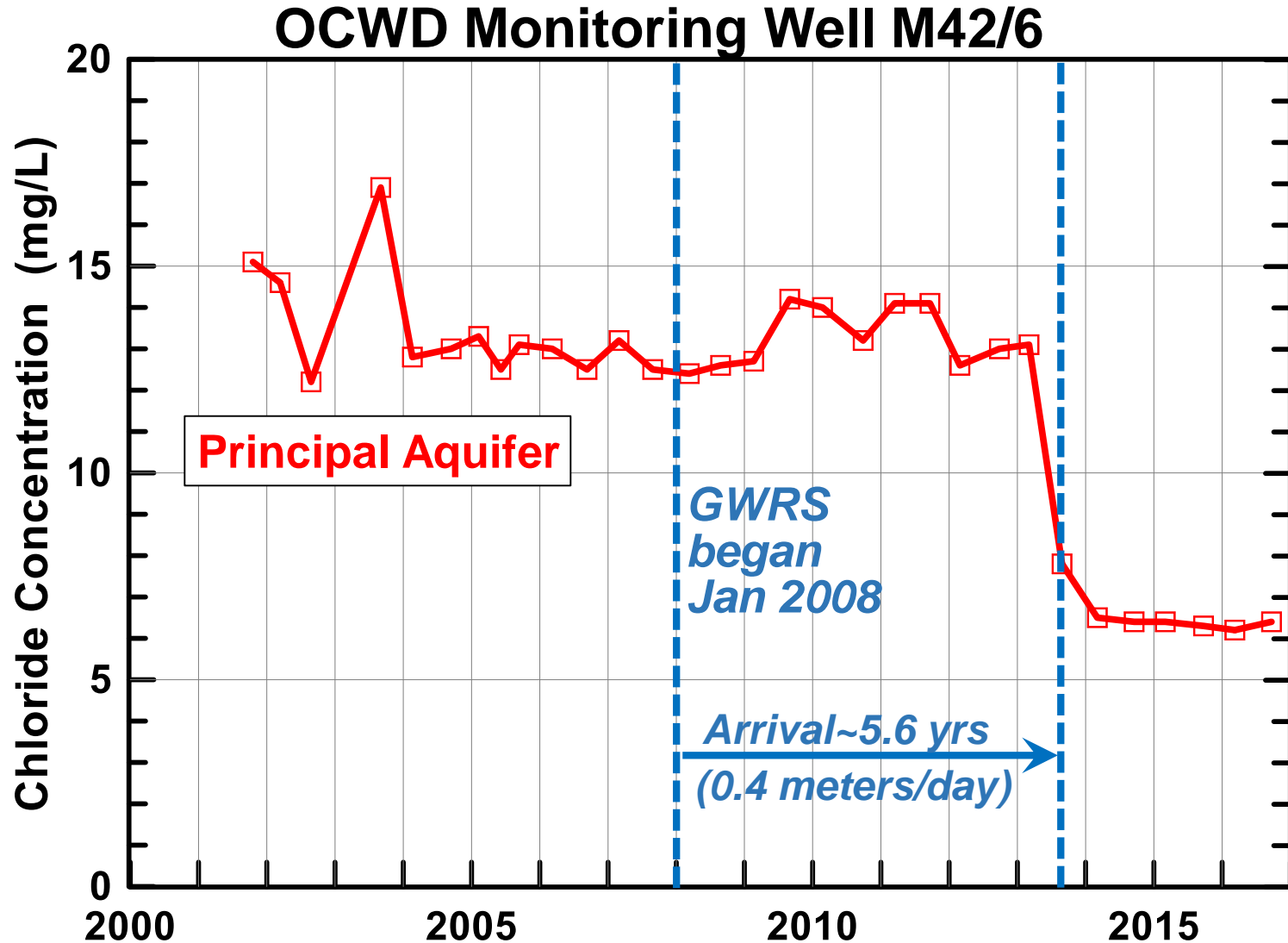
Talbert Barrier Injection Wells



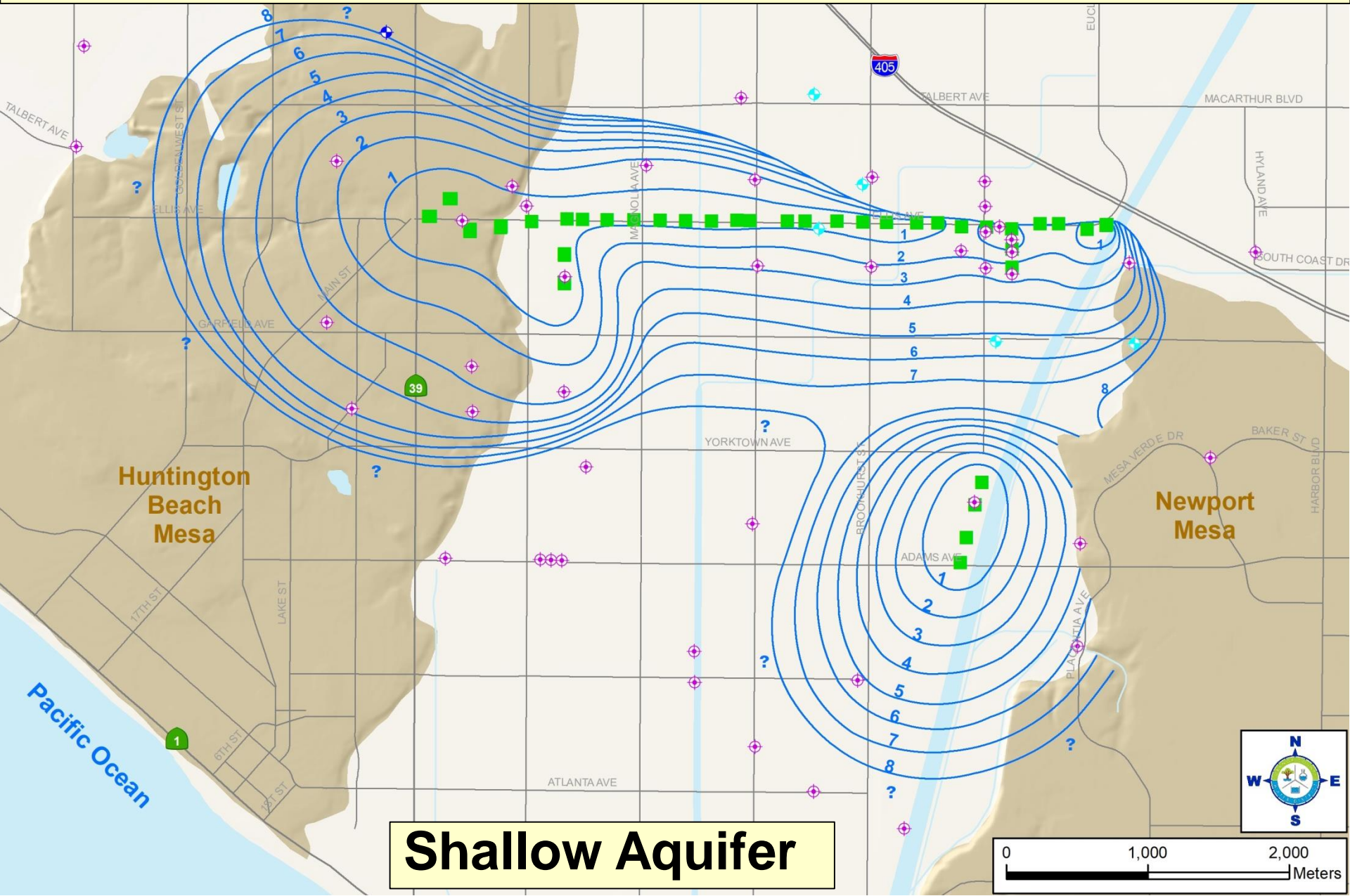
GWRS water injected at the Talbert Barrier migrates both landward and seaward.



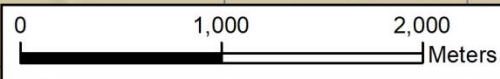
The GWRS signature decline in chloride was tracked in the Talbert Barrier area.



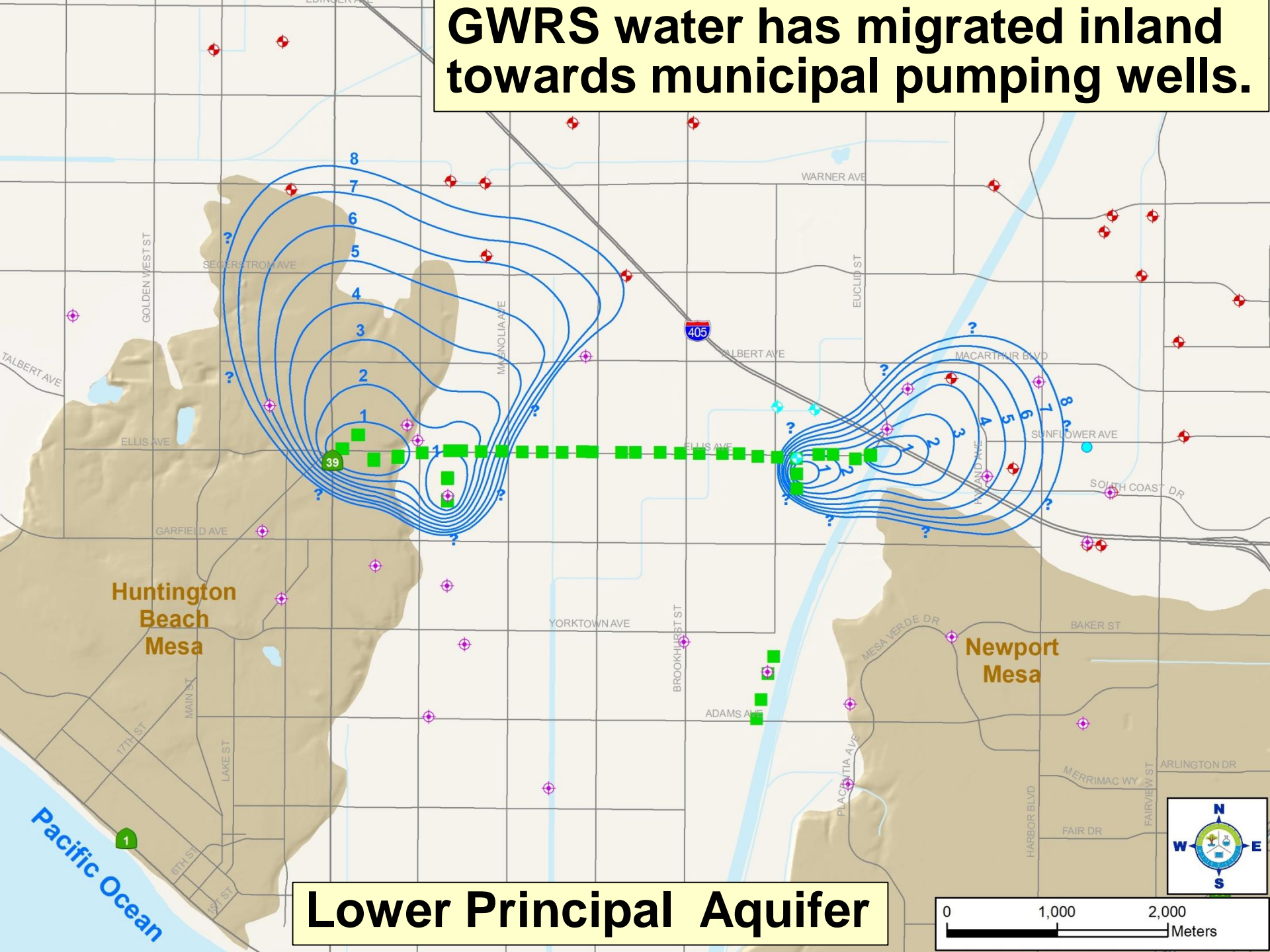
GWRS water migrated nearly 2,000 meters away from barrier from 2008 to 2016, pushing back intrusion.



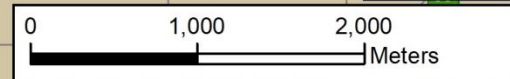
Shallow Aquifer



GWRS water has migrated inland towards municipal pumping wells.



Lower Principal Aquifer



Conclusions

- **GWRS water recharge has provided significant improvements in groundwater quality**
- **Area of aquifer receiving high quality water extends approx. 8,000 meters (25,000 feet) from recharge basins in Anaheim (as of end 2016)**
- **In Talbert Barrier area, high quality GWRS water has migrated approx. 2,000 meters (7,000 feet) both seaward and inland towards pumping wells (as of end 2016)**