

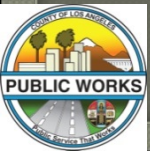
# THE SEAWATER BARRIERS

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## SEAWATER INTRUSION CONTROL IN THE CENTRAL AND WEST COAST GROUNDWATER BASINS

Presented by

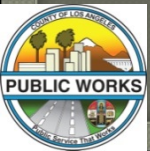
Eric Batman P.E.  
Water Resources Division  
Los Angeles County  
Department of Public Works



# Presentation Topics

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- Seawater barrier concept
- Facts about LA County's 3 seawater barriers
- Barrier operations
- Barrier maintenance
- Barrier effectiveness

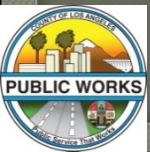




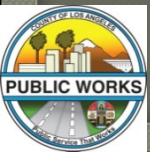
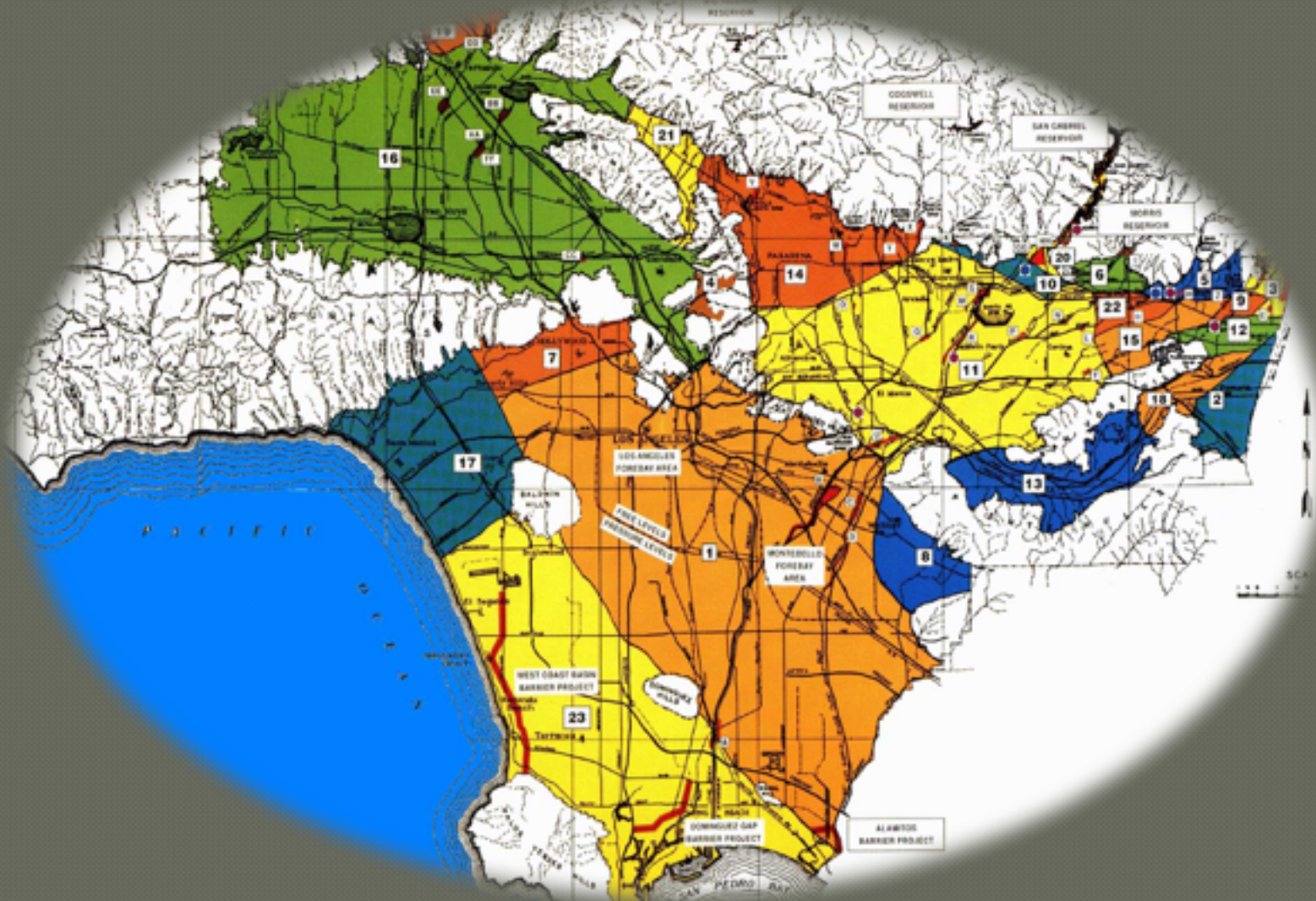
# A barrier of what?



All barriers are designed to stop something. The seawater barriers are designed to stop seawater from contaminating groundwater supplies.

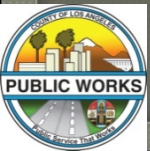


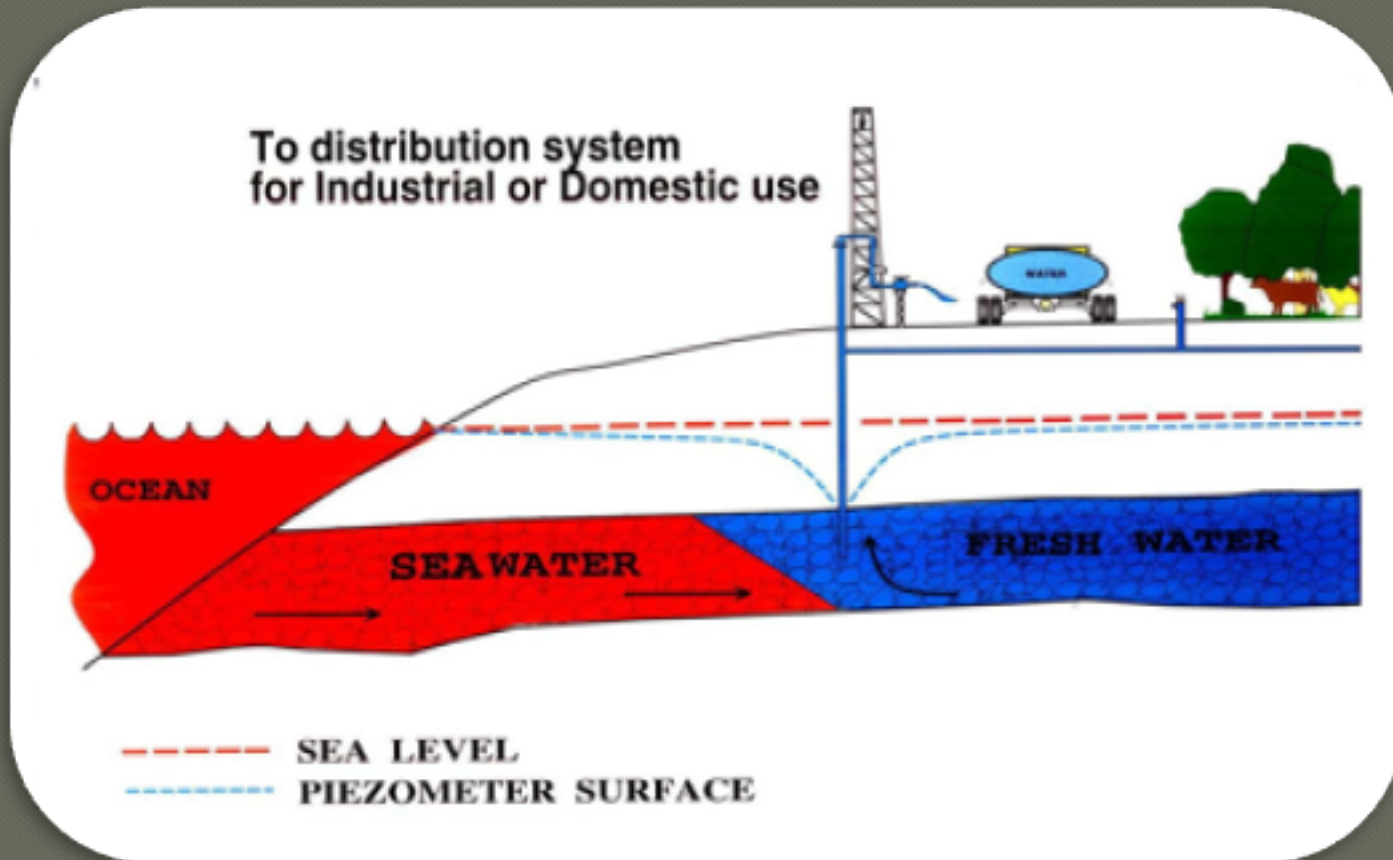
# Los Angeles County Groundwater Basins



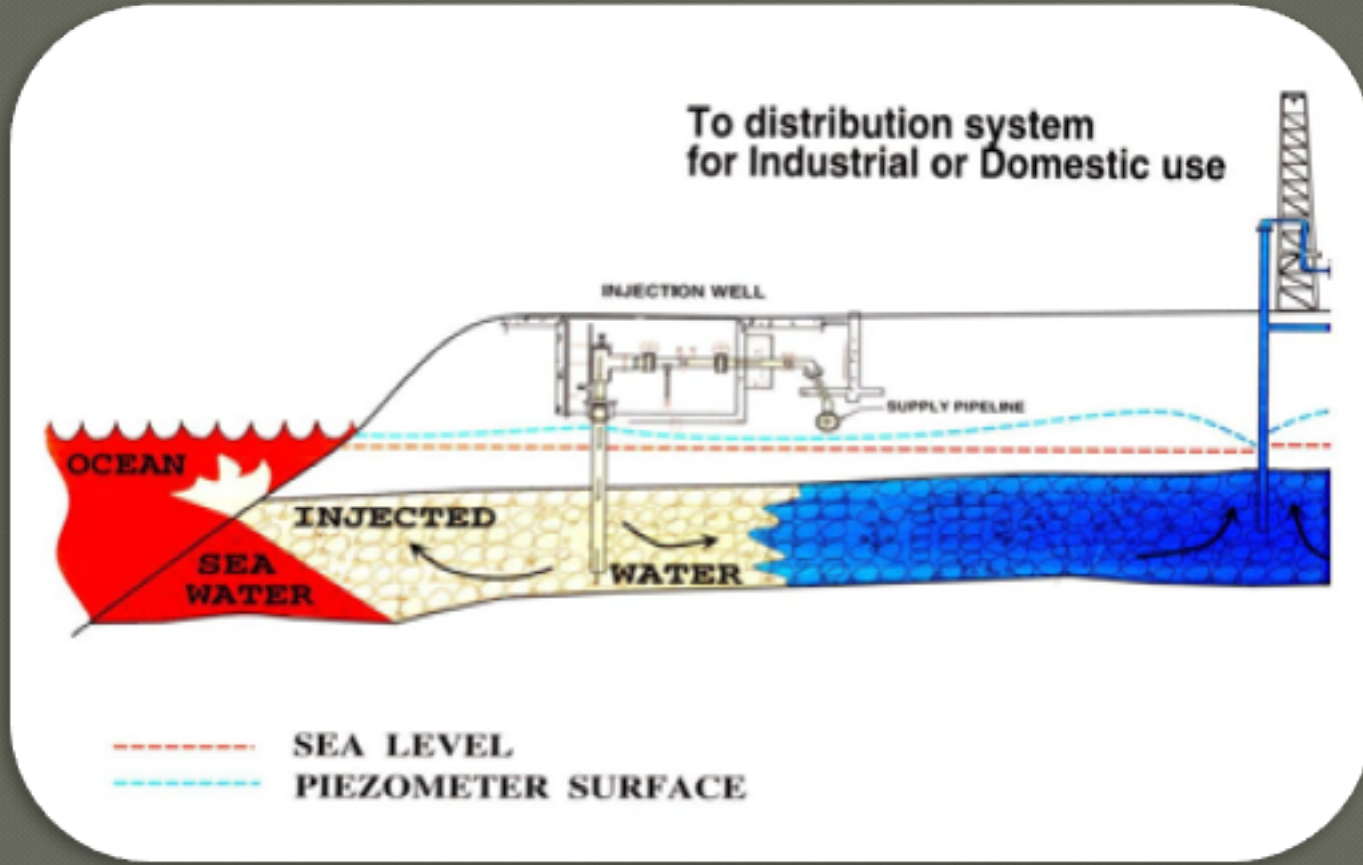
Seawater intrusion is always  
knocking on our door

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Heavy groundwater pumping resulted in seawater intrusion into coastal aquifers contaminating local water supplies



Fresh water injection at the seawater barrier reverses seawater intrusion and protects groundwater resources



# Barrier Facts - Origins

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## ○ West Coast Basin Barrier Project

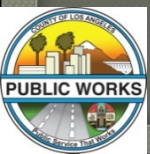
- Began construction in early 1950s
- 153 Injection / 302 Observation wells
- Protects West Coast Basin; Injects into 3 aquifers

## ○ Dominguez Gap Barrier Project

- Began construction in late 1960s
- 94 Injection / 224 Observation wells
- Protects West Coast Basin; Injects into 2 aquifers

## ○ Alamitos Barrier Project

- Began construction in early 1960s
- 43 Injection / 220 Observation wells
- Protects LA Central Basin & Orange County Basin
- Injects into 4 aquifers





Correlation chart for aquifers of the Los Angeles Coastal Plain

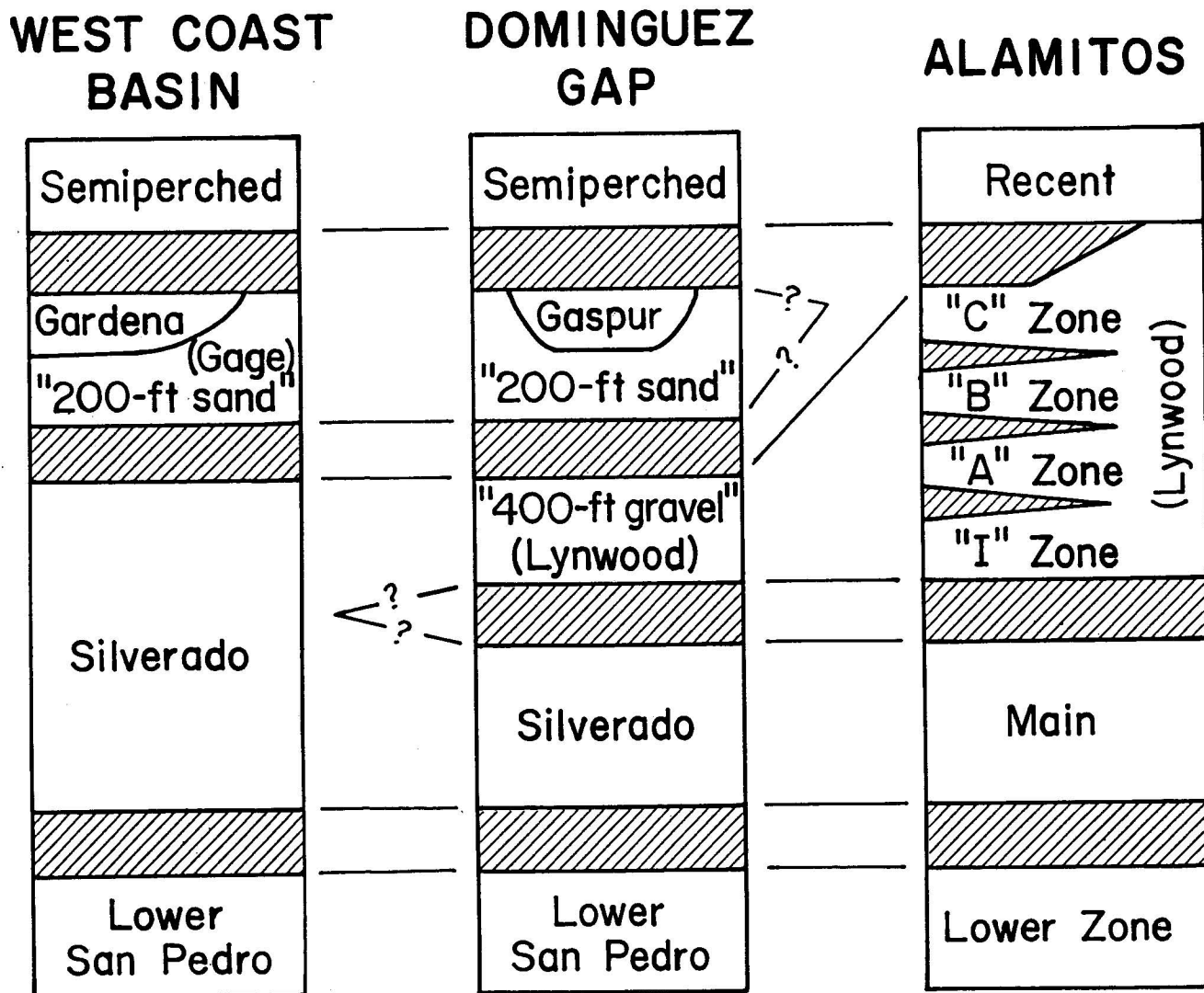
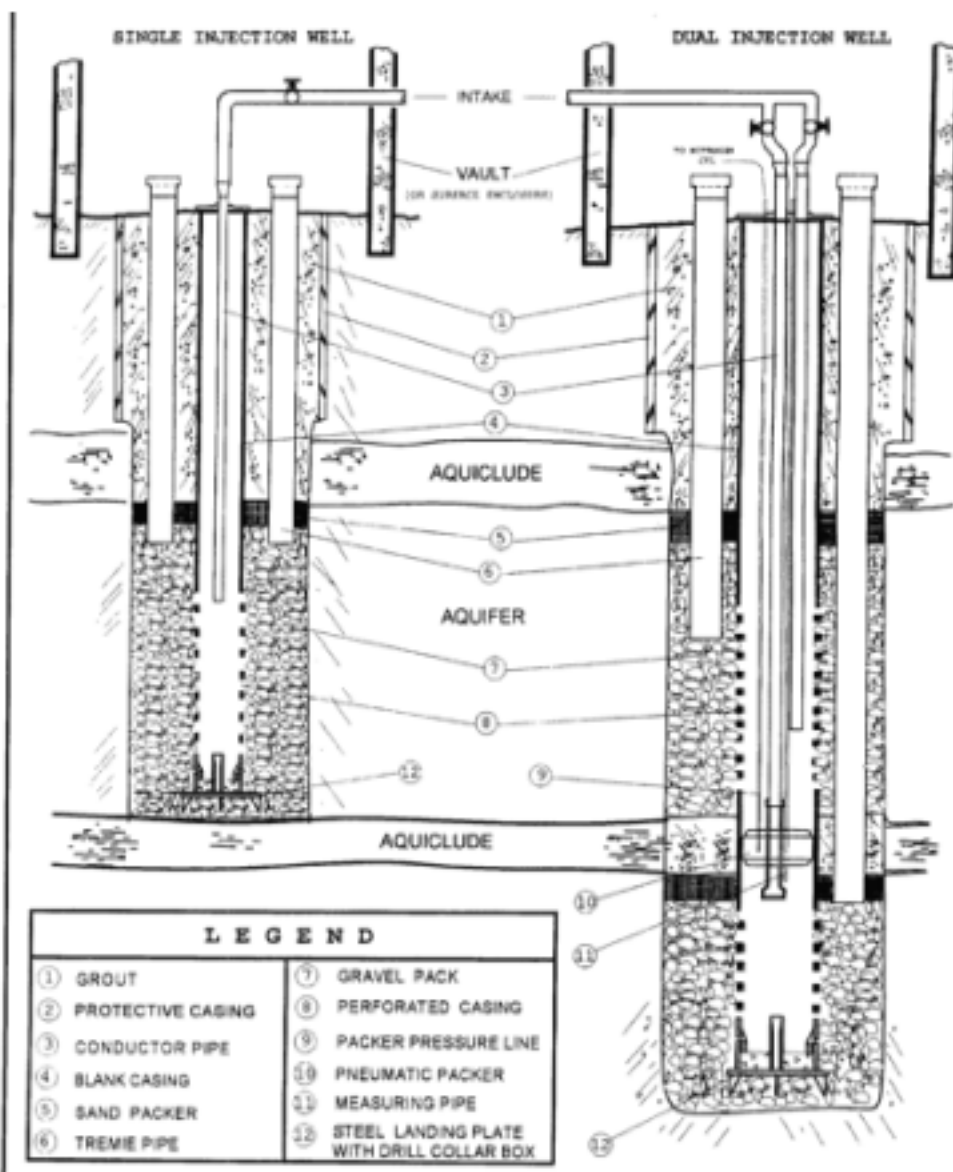


FIGURE 4

# Typical Injection Wells



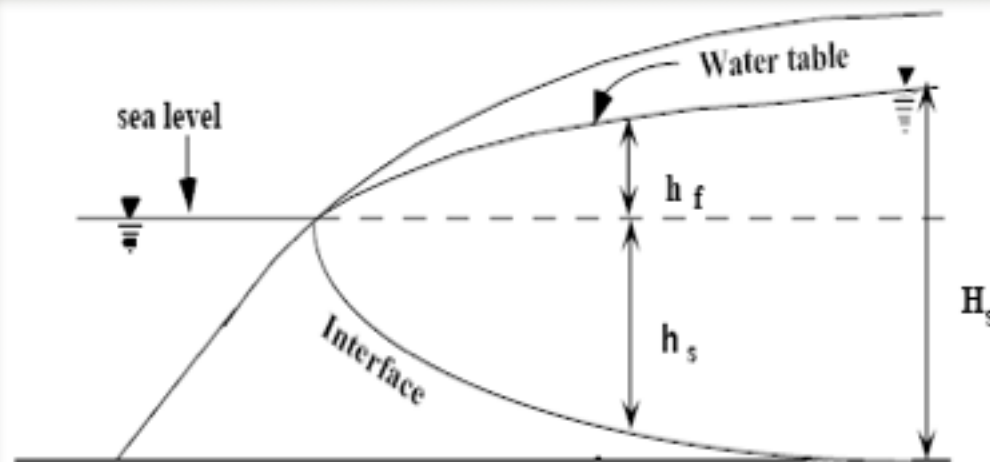
# Barrier Operating Protocol

## Minimum Groundwater Injection

### 1. Protective Elevations: Established based on Ghyben - Herzberg relationship.

For every 1 foot of fresh water above sea level, there are 40 feet of fresh water below sea level.

$$h_s = 40 * h_f$$



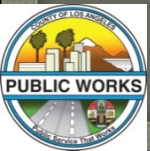
# Barrier Operating Protocol

## Maximum Groundwater Injection

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2. Casing Pressure: Established for every injection well based on thickness of aquitard and static ground water levels.

$$P_{\max} = \text{Density}_{\text{water}} * (\text{Aquifer Thickness} - \text{Depth}_{\text{static water level}})$$

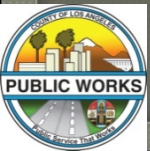


# Barrier Operating Protocol

## Additional Parameters

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3. Chloride Concentrations: In some cases, injection wells are operated to increase groundwater levels above theoretical protective elevations due to elevated chloride concentrations in observation wells.



# Barrier Facts – How much water is being injected?

- Injection rates vary from 0.05-1.5 cfs per well (22 - 673 gpm)
- WCBBP
  - Total 16,000 acre-feet per year
- DGBP
  - Total 8,000 acre-feet per year
- ABP
  - Total 6,000 acre-feet per year



# Barrier Facts - Injection Water Sources

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## ◉ Imported Water

- Delivered by Metropolitan Water District (MWD). Pressure regulating valves installed at each connection point (WB-28, WB-37, LB-07A).

## ◉ Recycled Water

### • Providers

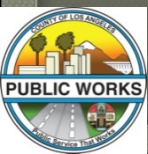
- WCBBP - West Basin MWD, starting June 1995
- DGBP – LA Water & Power, starting March 2006
- ABP – Water Replenishment District & Long Beach Water Department, starting Oct 2005
- State RWQCB authorizes 100% for WCBBP and ABP; working on 100% for DGBP



# Barrier Maintenance

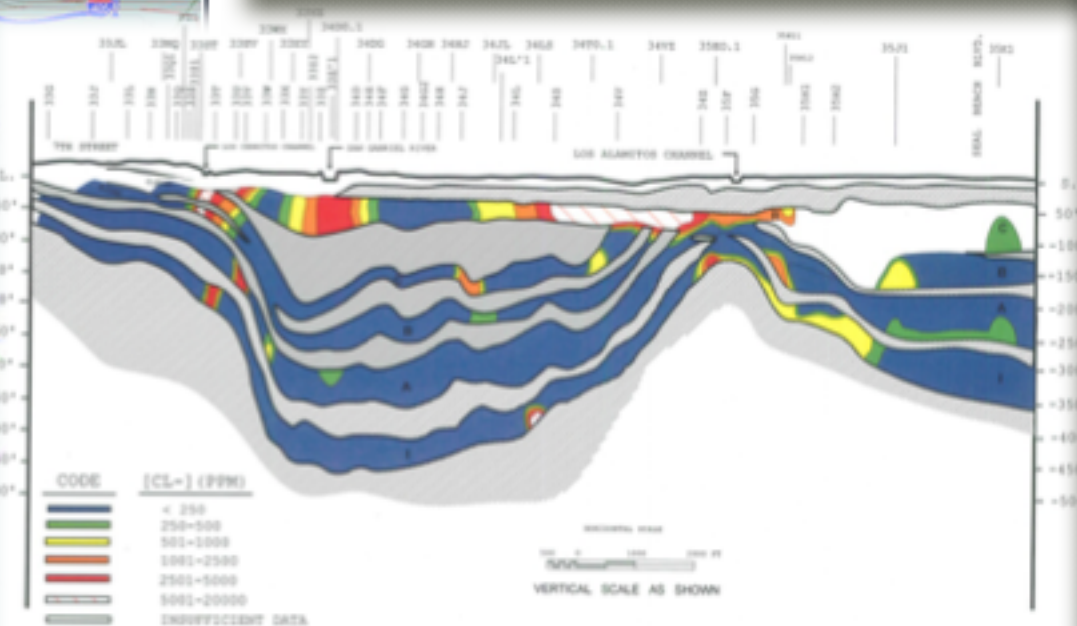
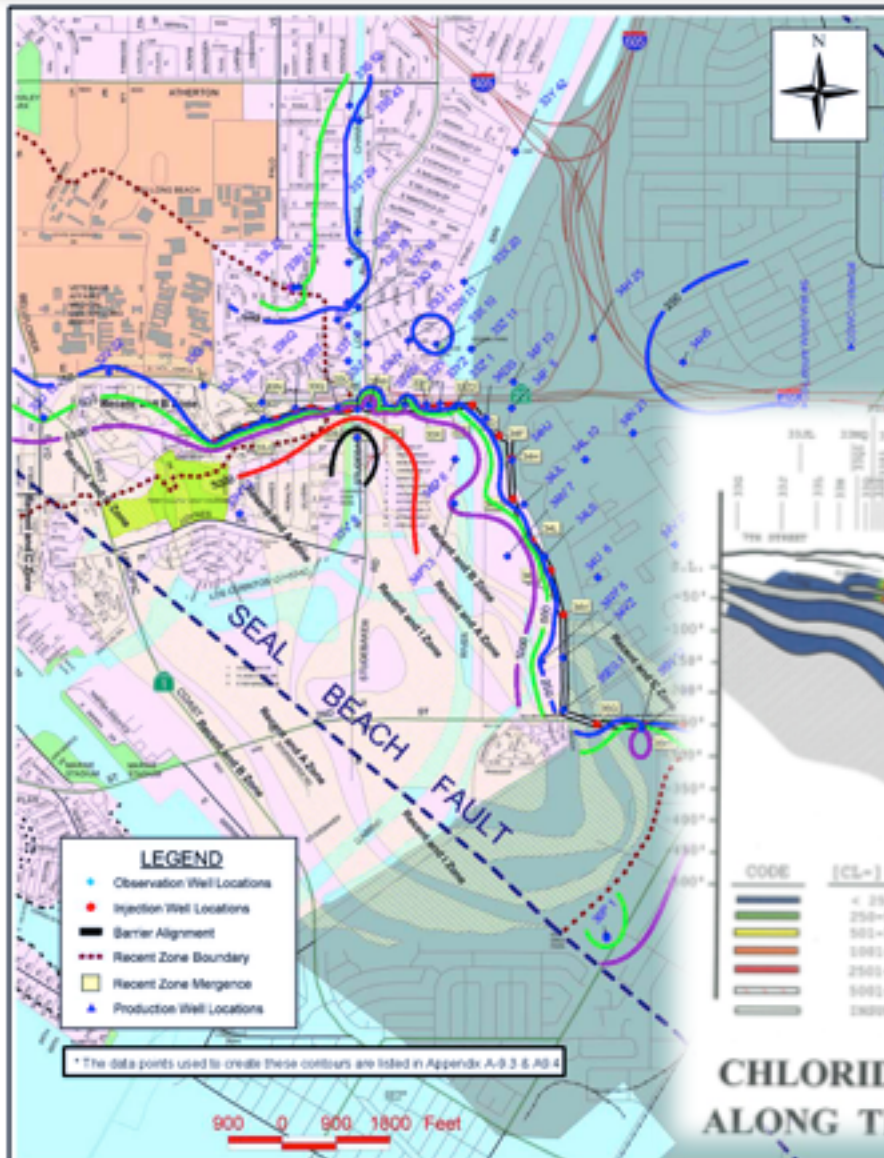
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- Well redevelopment is performed by in-house crews on all ABP and DGBP injection wells once every 2 years.
- Well redevelopment is performed by contractor on the WCBBP injection wells on an as-needed basis.
- Well “cleanouts” are performed on observation wells at all three barriers on an as-needed basis.





# Barrier Effectiveness



Spring 2011

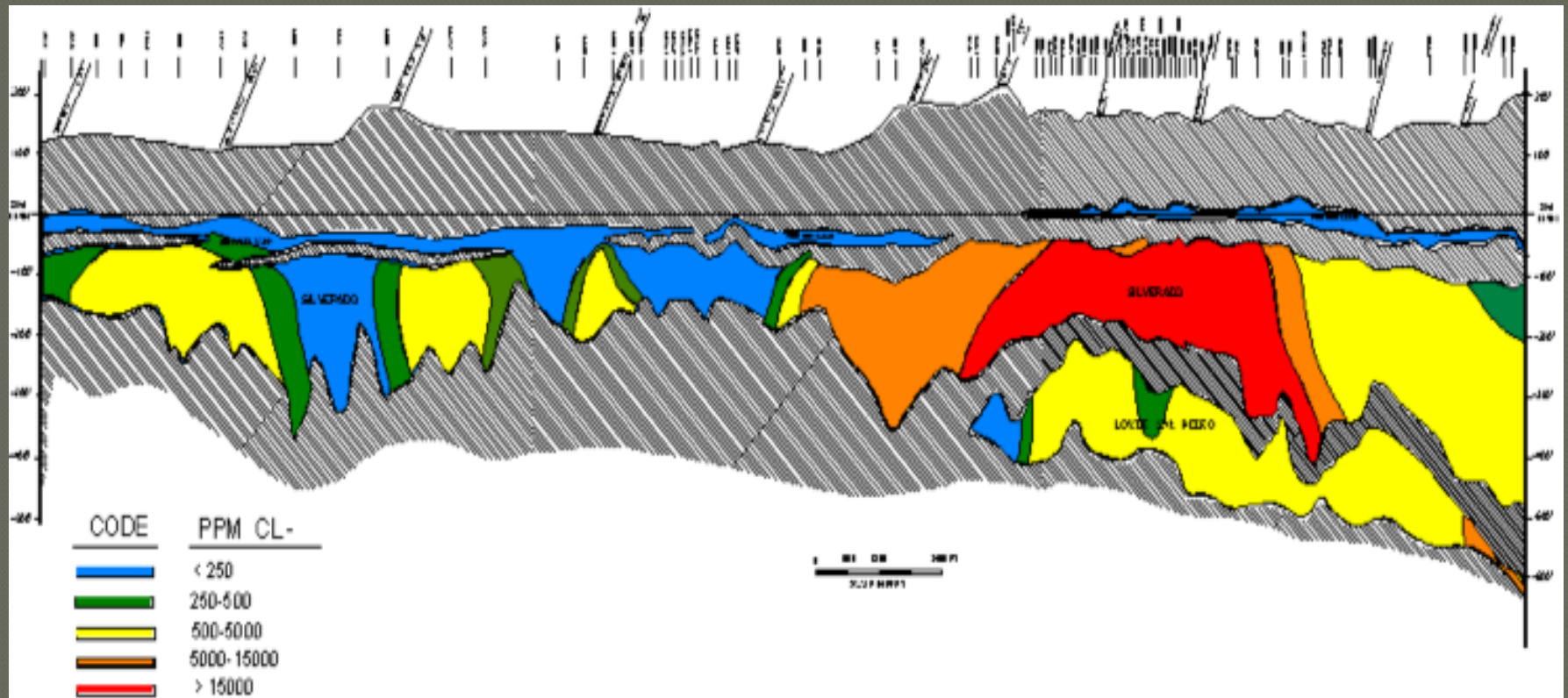
NOTE: The data points used to create this cross section are listed in the Appendix A-9.3, 7.3, 8.3, 9.3, 9.4, 10.3 & 10.4

Alamos Barrier Project  
A Zone Chloride Concentration (mg/L) Contours: Spring 2011

A-9.1



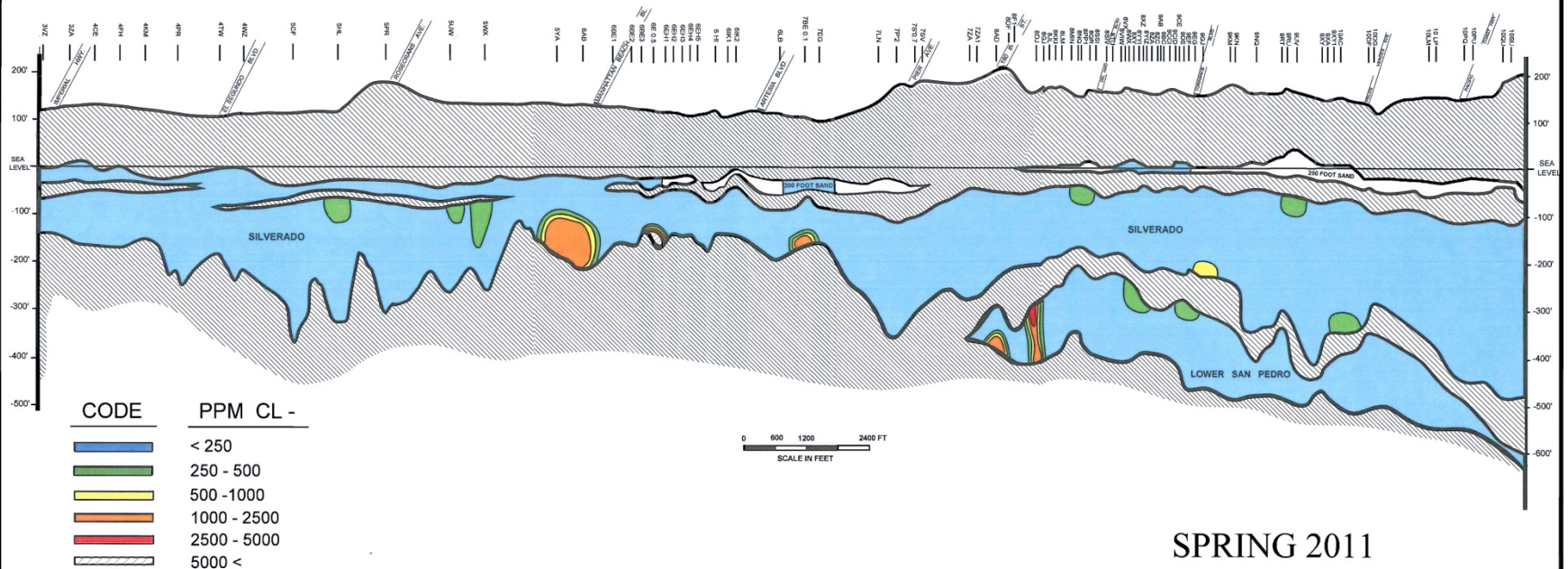
# Barrier Effectiveness - WCBBP: Cross-section BEFORE



CHLORIDE SECTION  
ALONG THE BARRIER

# Barrier Effectiveness - WCBBP: Cross-section AFTER

## CHLORIDE SECTION ALONG THE WEST COAST BASIN BARRIER PROJECT



# Questions?

