# Preliminary Analysis
# Impact of Desalinated Seawater Use to IRWD's Recycled Water

Orange County Water District
March 8, 2016

IRVINE RANCH WATER DISTRICT

# Outline

- Background
- Desalinated Seawater Use
  - Inject to Talbert Barrier
  - Deliver In-Lieu of Groundwater Pumping
  - Focus on TDS although chlorides are a potential concern
- Summary
- Questions

# Background

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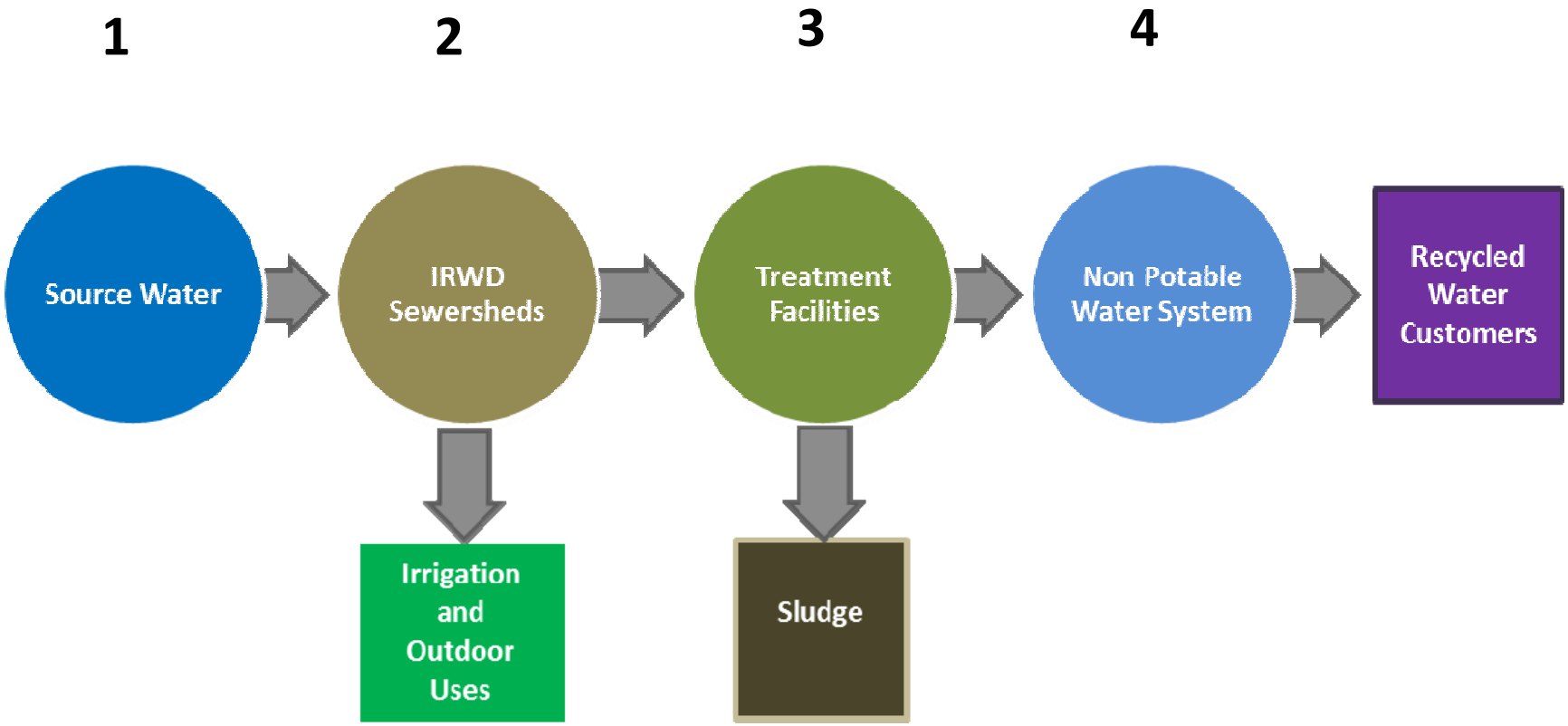
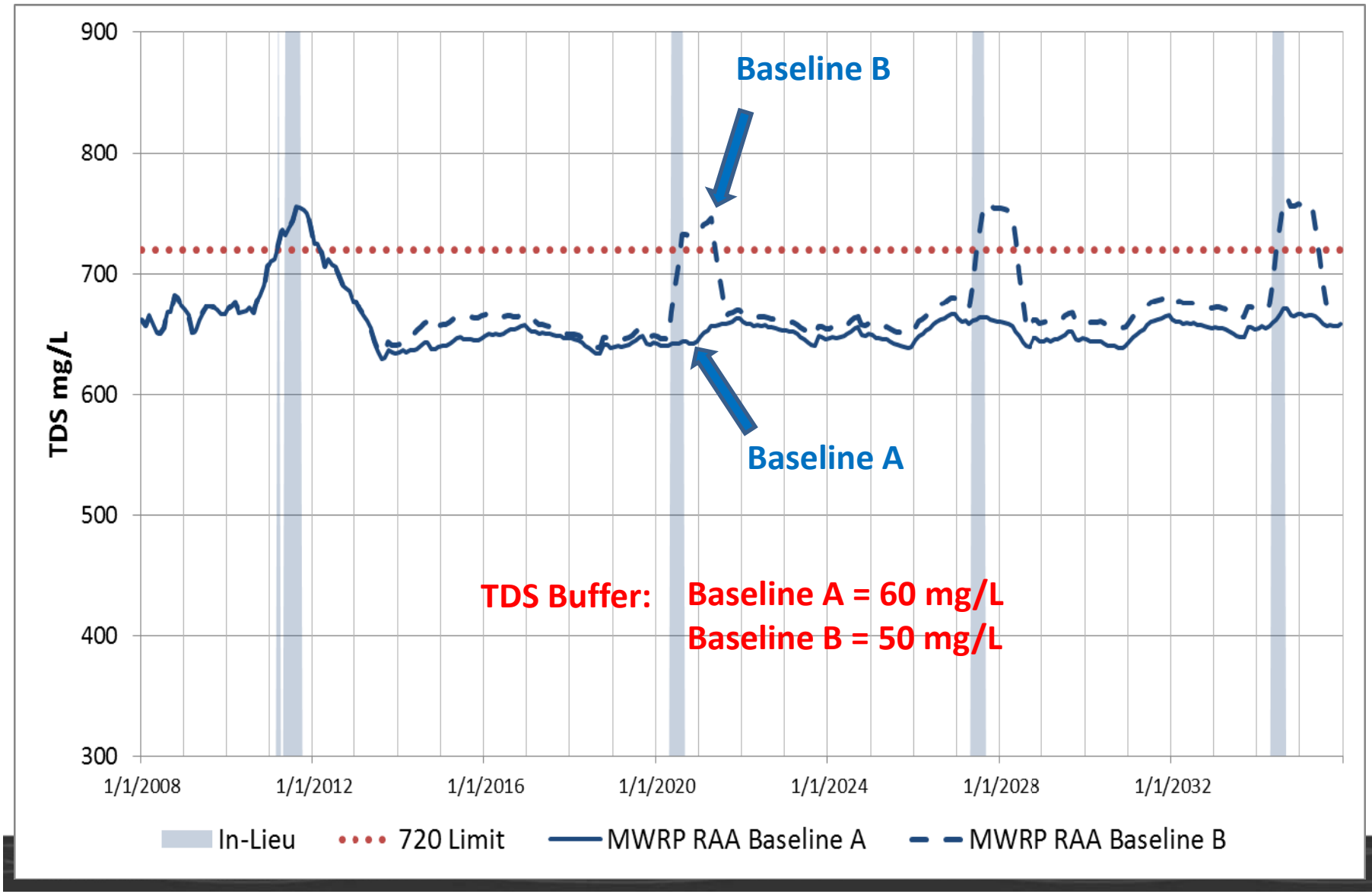
# Salt Balance Model Stages



# Baselines A & B



# Inject Desalinated Seawater to Talbert Barrier

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# Approach

1. Estimate water supply blend to Dyer Road wells
2. Estimate travel time to Dyer Road wells
3. Estimate Dyer Road TDS
4. Use Salt Balance Model to estimate TDS of recycled water (1)

(1) Year 1 of operation is estimated to be 2013, Year 2 = 2014, …., Year 23=2035

# Water Supply Blend

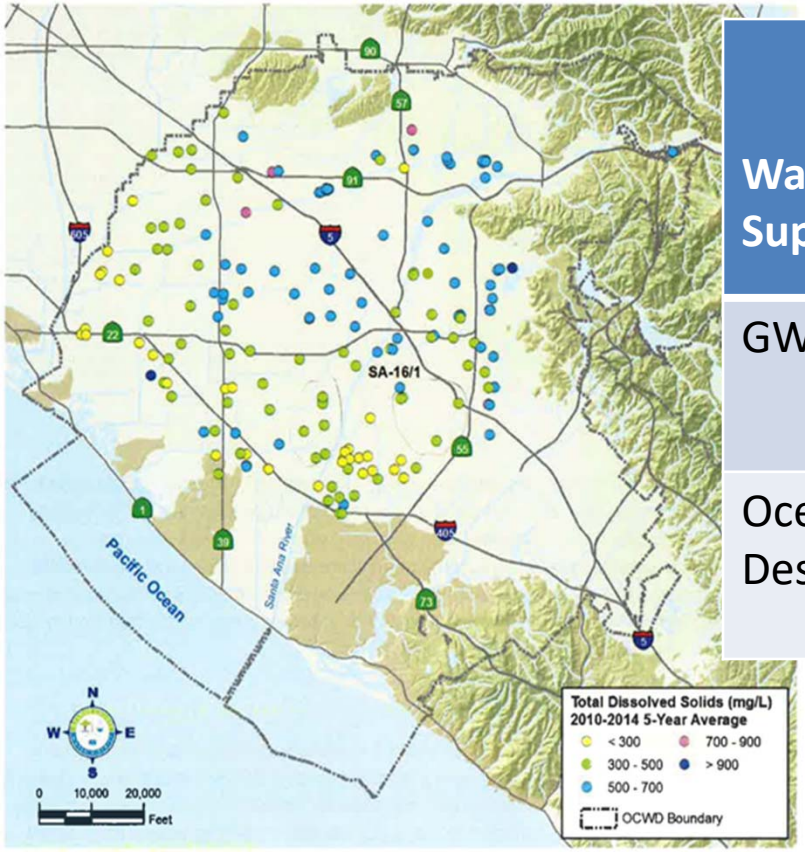



Figure 8-2: TDS in Groundwater Production Wells

| Water Supply | Talbert Injection (mg/L) | Regional Ground-water (mg/L) | Dyer Road (mg/L) (1) | Salt Load (M lbs/yr)(2) |
|---|---|---|---|---|
| GWRS | 60 | 452 | 256 | 2.7 |
| Ocean Desalinated | 350 | 452 | 401 | 16.0 |

(1) Estimated blend 50% Talbert Injection and 50% regional groundwater.
(2) Estimated salt load for a 15 MGD (16,800 af/yr) injection supply.

# Travel Time

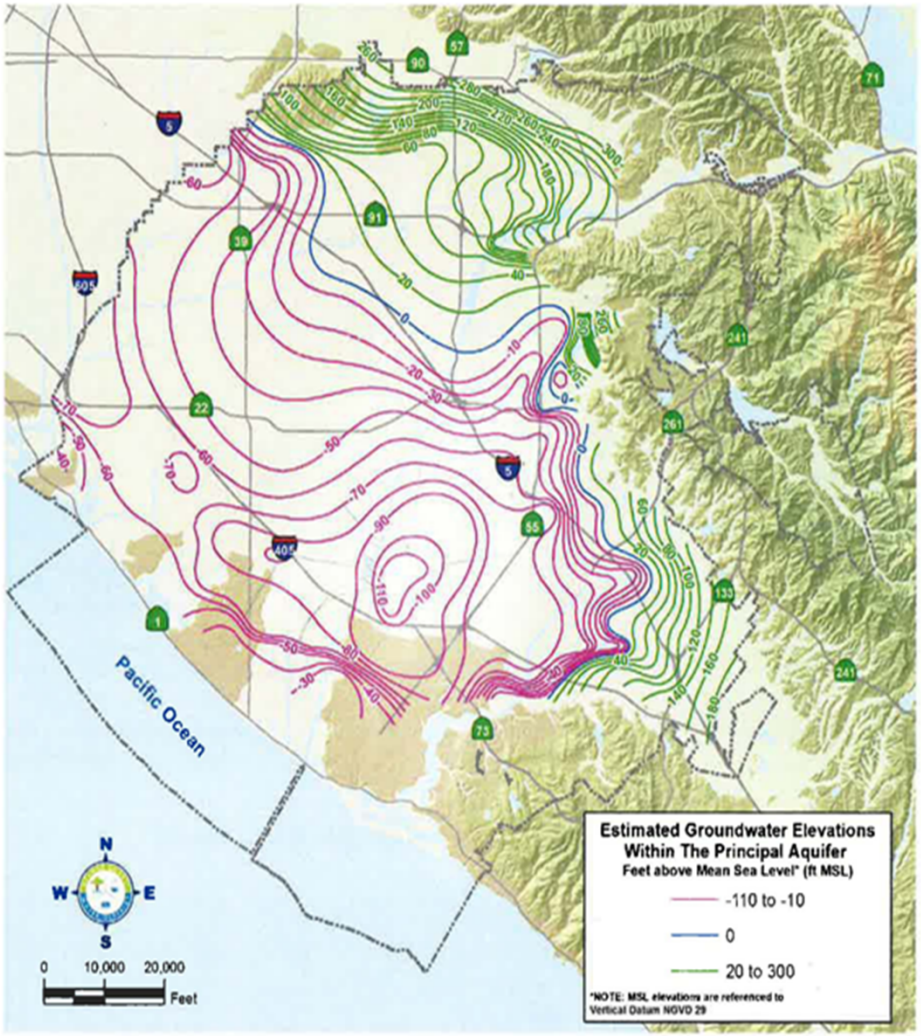


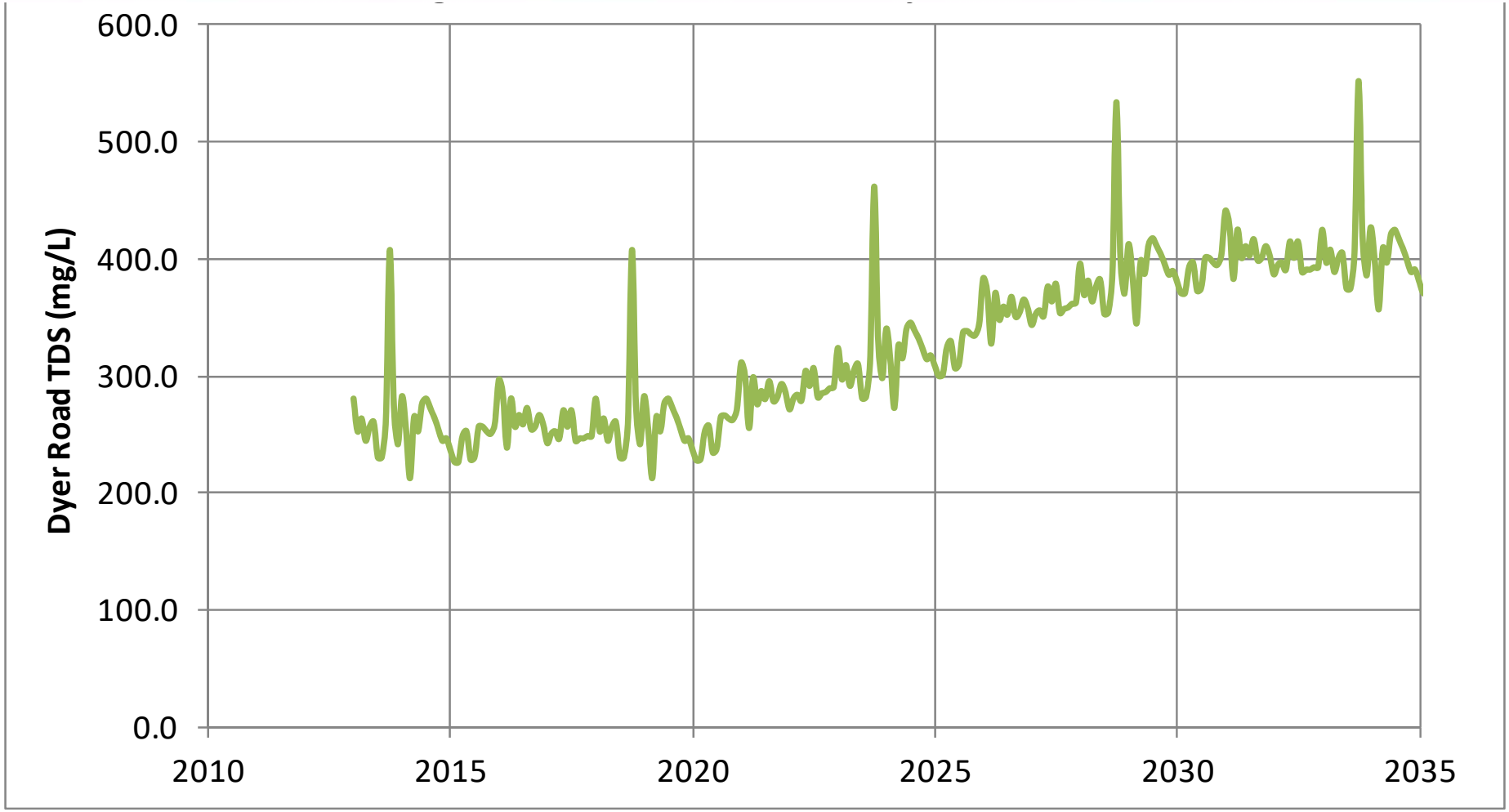

Figure 3-9: Groundwater Level Contour Map, June 2014

| Condition | Travel Time (years) |
|---|---|
| Advection (1) | 12 |
| Advection and Dispersion (2) | 6 |

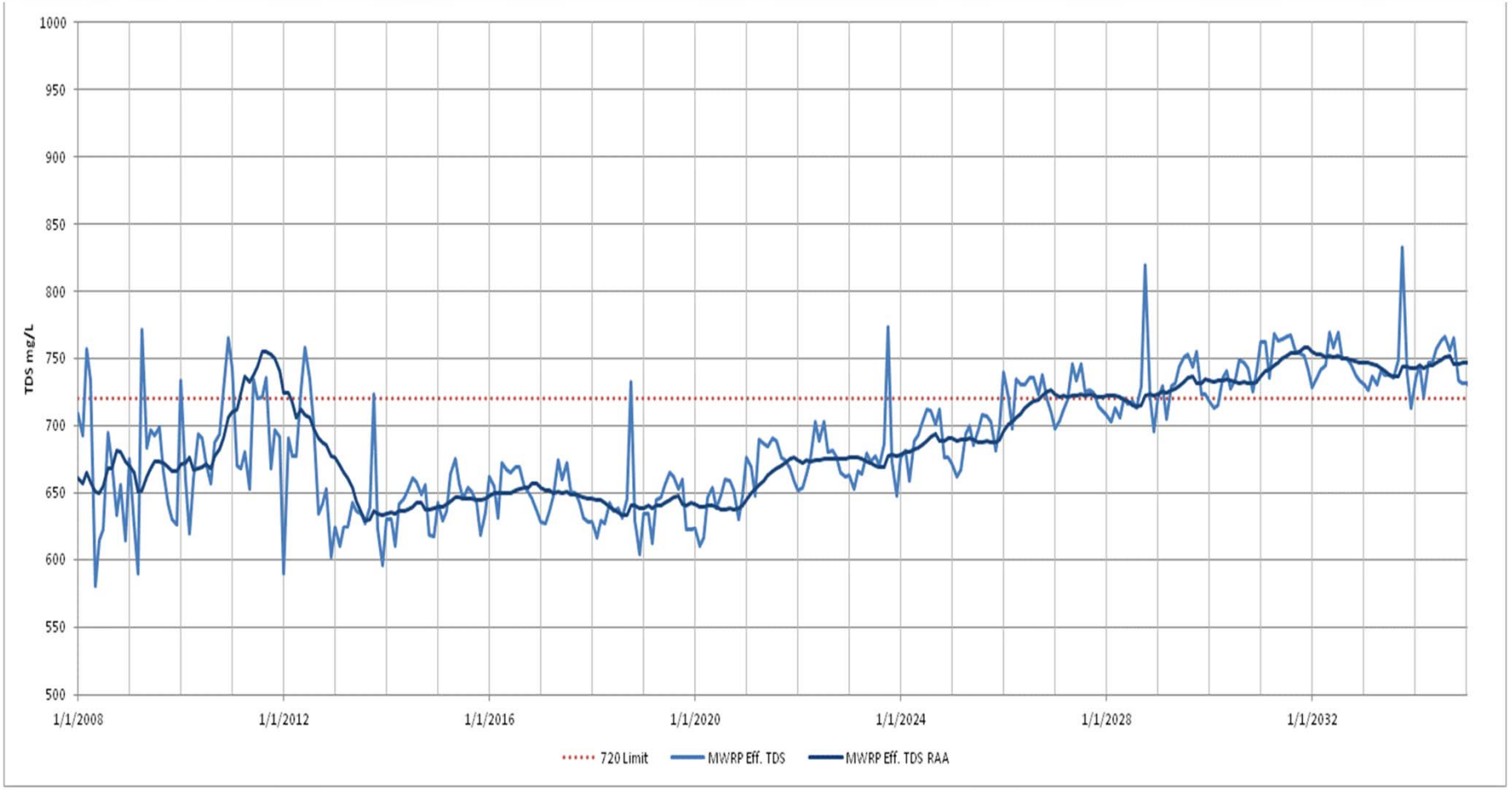
(1) Estimated using a hydraulic conductivity of 150 ft/day and a hydraulic gradient of 0.008 ft/ft Groundwater

(2) Advection and Dispersion estimated to be ½ Advective Flow

# Dyer Road TDS with Desalinated Seawater Injected to the Talbert Barrier



# Impact to IRWD's Recycled Water TDS with Desalinated Seawater Injected to Talbert Barrier (1)




(1) From IRWD's Salt Balance Model

# Deliver Desalinated Seawater In-Lieu of Groundwater Pumping

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# Approach

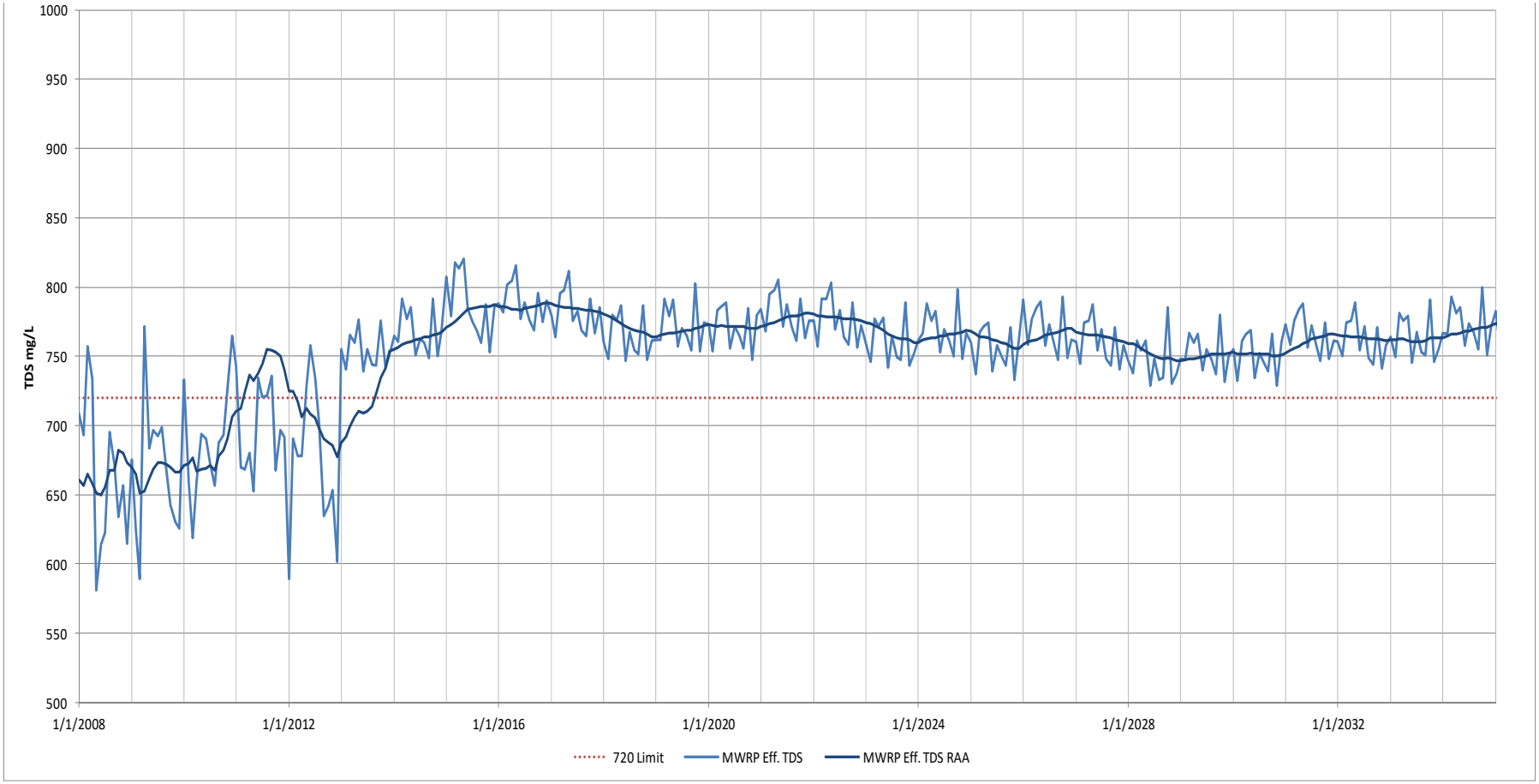
1. Deliver desalinated seawater to IRWD in-lieu of pumping groundwater
2. Use Salt Balance Model to estimate TDS of recycled water

(1) Estimated blend 50% Talbert Injection and 50% Regional Groundwater

# Replace IRWD's Groundwater Supplies with Desalinated Seawater

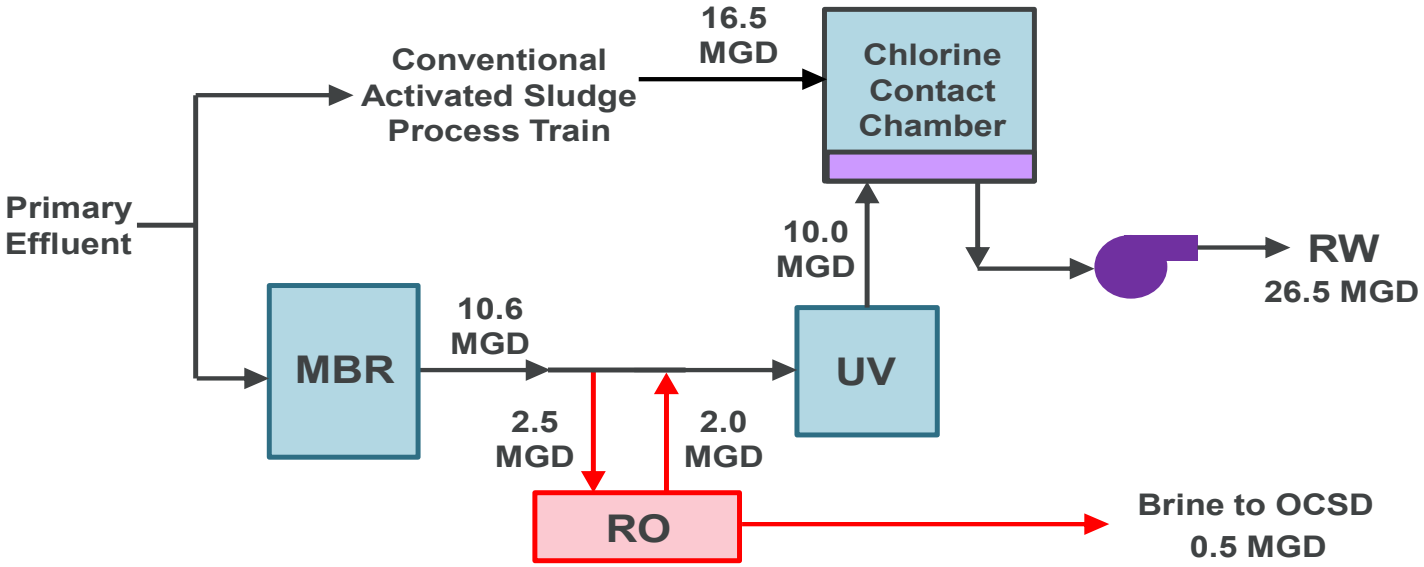
| Condition | Flow (af/yr) | TDS (mg/L) | Load (lbs/yr) |
|---|---|---|---|
| Existing (Dyer Road) | 28,000 | 256 | 19,500,000 |
| Potential – In-Lieu | 28,000 | 350 | 26,649,000 |

# Impact to IRWD's Recycled Water TDS with Delivery of Desalinated Seawater In-Lieu of Groundwater Pumping (1,2)




(1) At 28,000 af/yr
(2) From IRWD's Salt Balance Model

# Preliminary Cost Estimate to Remove 50 mg/L at Michelson Water Reclamation Plant




| Item | Cost |
|---|---|
| RO Capacity | 2.5 MGD |
| TDS Removed | 50 mg/L |
| Capital | $3,350,000 |
| O&M | $1,239,000 |
| Net Present Value (1) | $24,000,000 |

(1) Net Present Value for a 2.5 MGD RO facility for 20 years with a discount rate = 4.5% and an O&M inflation = 3.5%.

# Summary

- Significant impact to TDS
- Expect similar results for chlorides

| Alternative | TDS 2035 (mg/L) | RWQCB Limit (mg/L) | Change in Buffer (mg/L)(2) | RO Capacity to Restore Buffer (MGD) | NPV to Restore Buffer ($)(3) |
|---|---|---|---|---|---|
| Baseline A | 660 | 720 | NA | NA | NA |
| Inject Desalinated Seawater to Talbert Barrier | 745 | 720 | -85 | 4.25 | $41,000,000 |
| Delivery of Desalinated Seawater In-Lieu of Groundwater Pumping | 775 | 720 | -115 | 5.75 | $55,000,000 |

(1) Buffer = TDS 2035 (mg/L) – RWQCB Limit (mg/L)
(2) Buffer Change = Baseline A TDS 2035 – Alternative TDS (2035)
(3) Net Present Value for 20 years with a discount rate of 4.5% and an O&M inflation of 3%

# Next Steps

- Evaluate other water quality constituents
  - Chlorides
  - Other
- Engage OCWD in its system integration studies
- Other

# Questions