
USE OF AERIAL ELECTROMAGNETICS (AEM) AND ADVANCED RECYCLED WATER TO ACHIEVE SUSTAINABLE GROUNDWATER MANAGEMENT

NOVEMBER 7, 2019



**Marina Coast
Water District**


MCWD IS AN EXCLUSIVE GROUNDWATER SUSTAINABILITY AGENCY

- In both the 180/400 and the Monterey Subbasins
- GSA's have authority to implement projects and management actions through groundwater sustainability plans (GSPs)
- GSPs and use of recycled water are the two key elements of MCWD's water supply management


Legend


Groundwater Basin

 Monterey Subbasin (DWR 3-004.10)

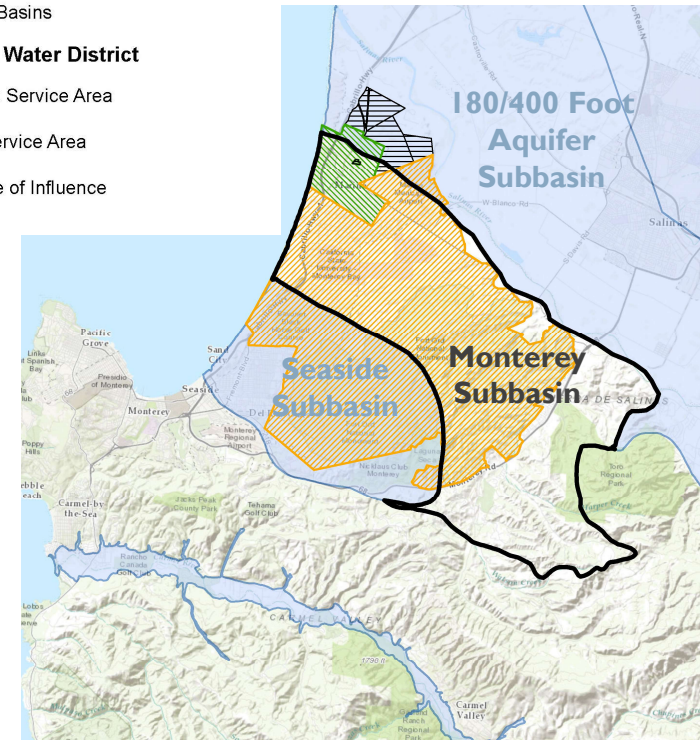
 Other Basins

Marina Coast Water District

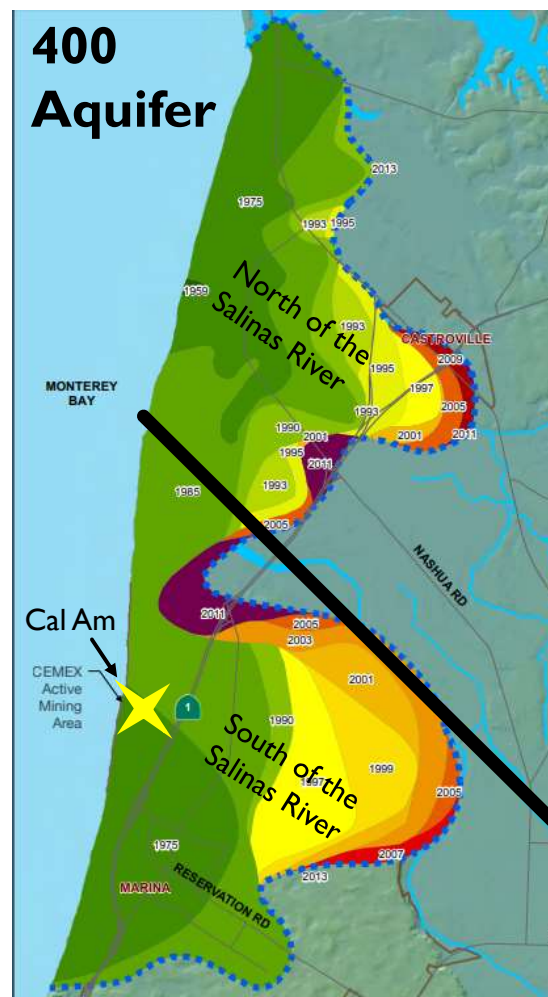
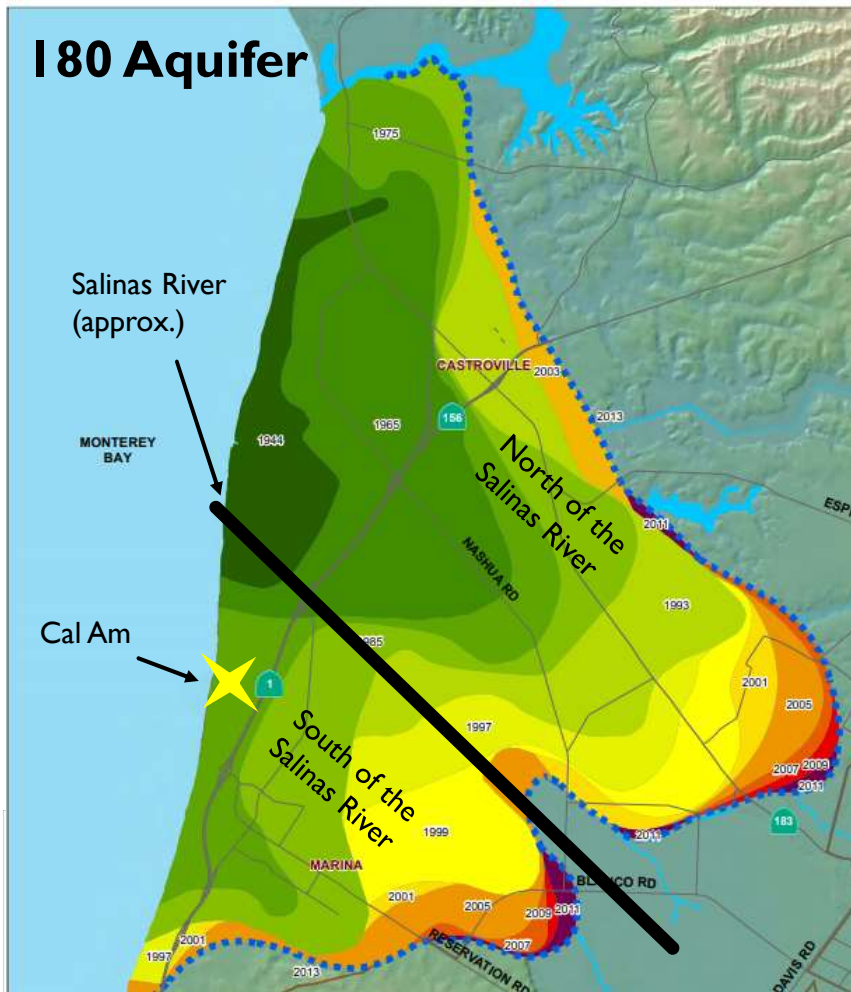
 Marina Service Area

 Ord Service Area

 Sphere of Influence



CURRENT BASELINE CONDITIONS?

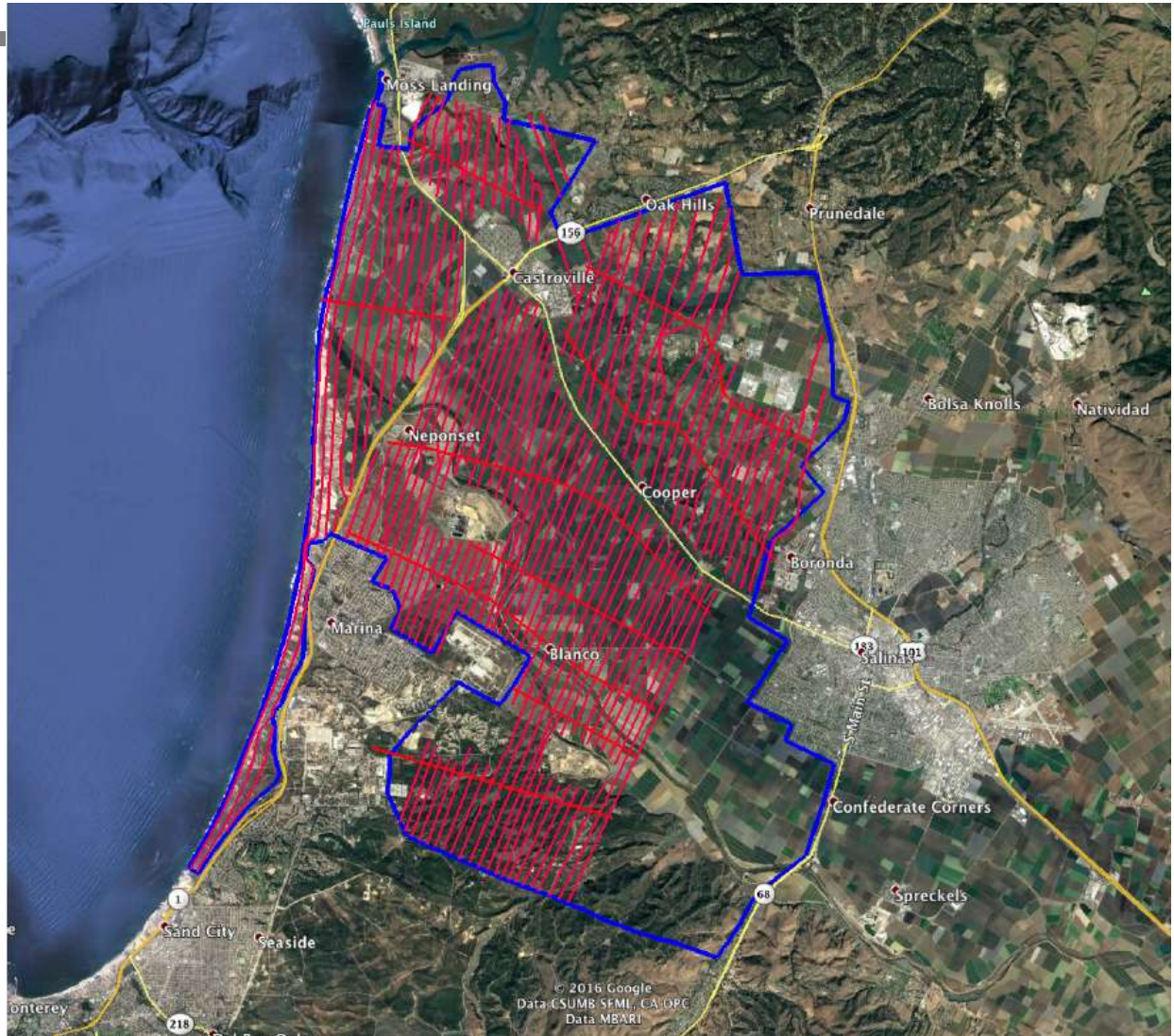


- These maps lack data south of the Salinas river
- Area of maps s/o Salinas river based heavily on extrapolation of data and data n/o the river
- Is Hydrogeology s/o Salinas river different than n/o the river?

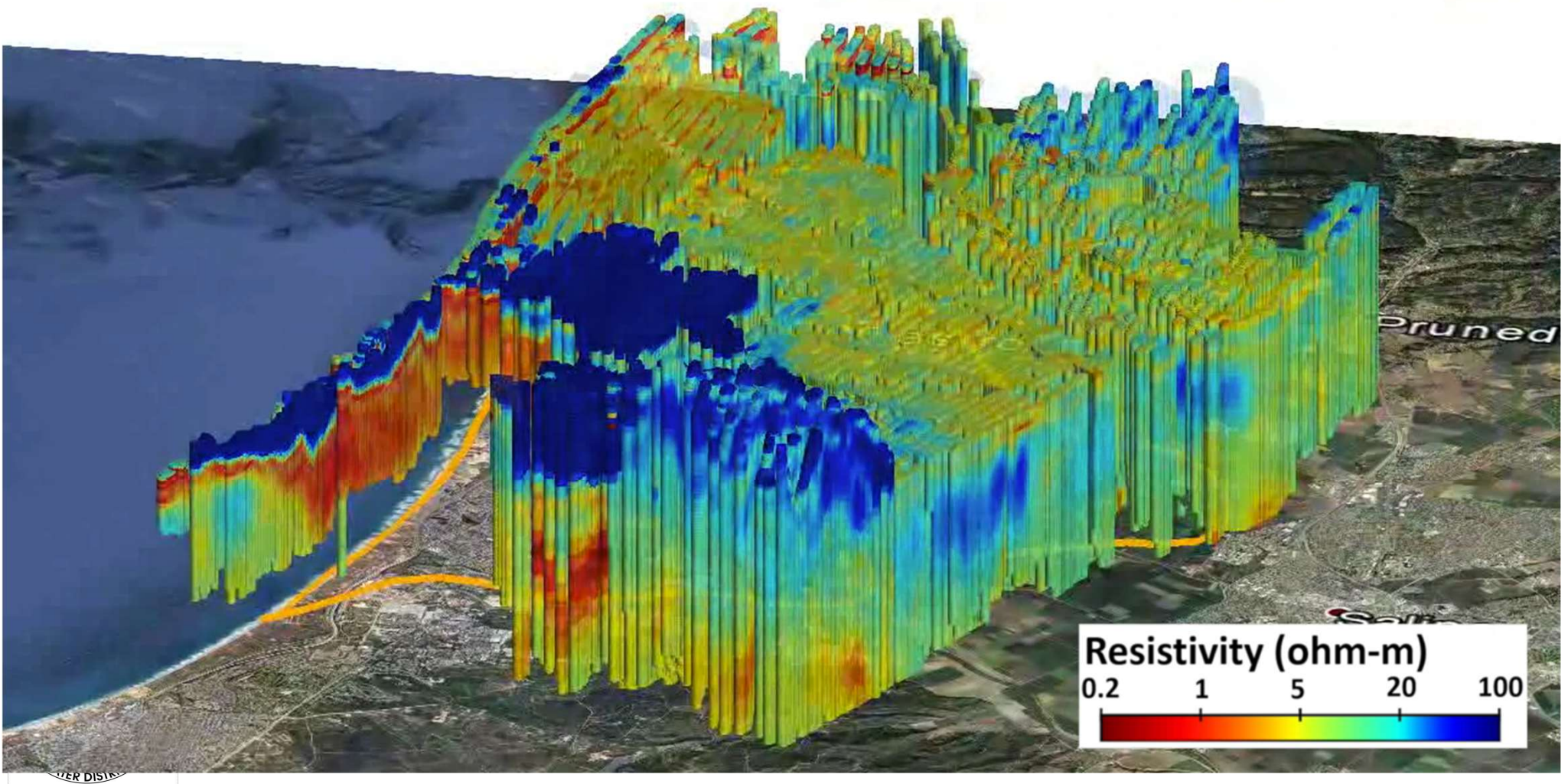
What is undisputed regarding the basin as a whole:

- Whatever Seawater Intrusion that is occurring is caused by over pumping
- Goal of sustainable groundwater management act (underway) is to address over pumping

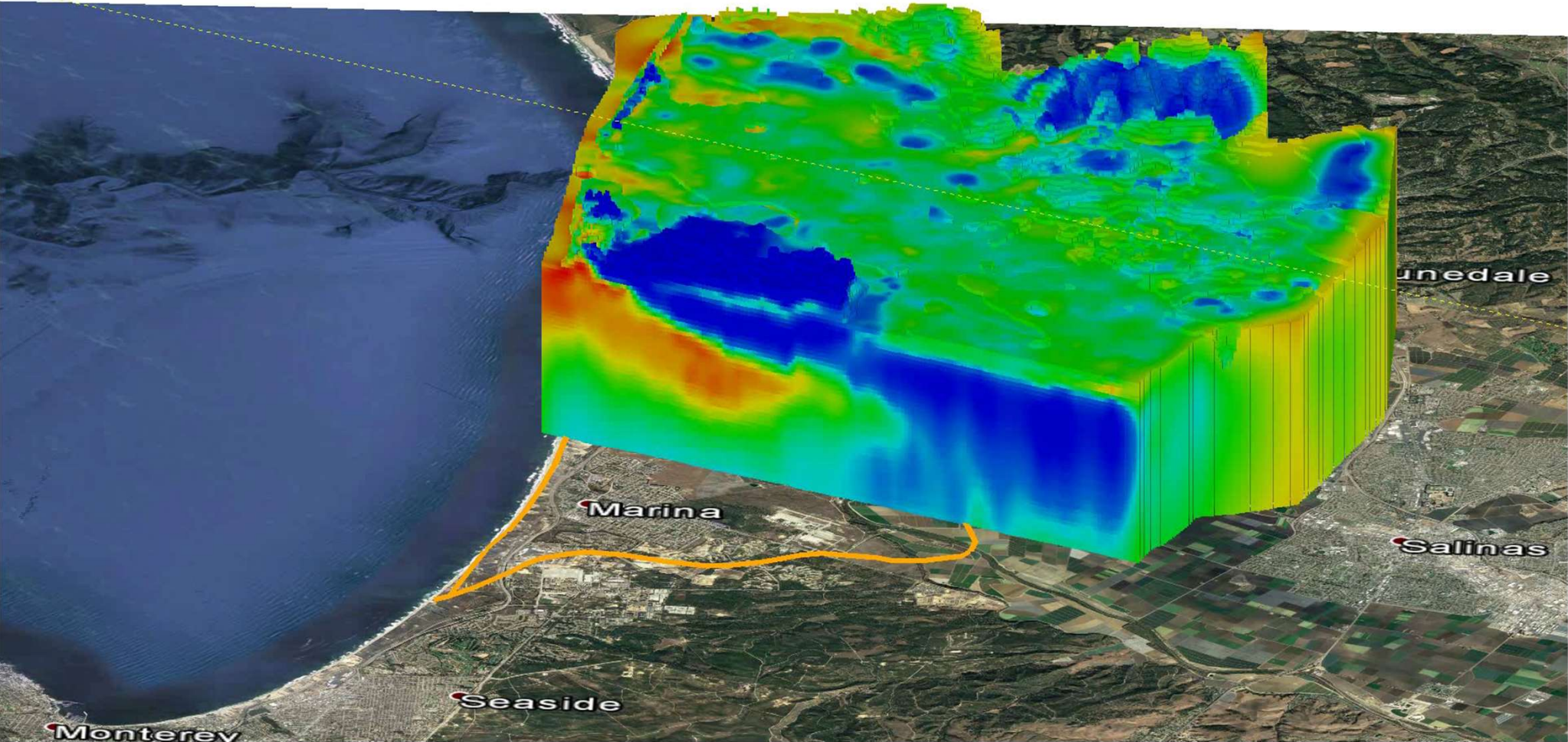
AERIAL ELECTROMAGNETIC SURVEY (AEM)



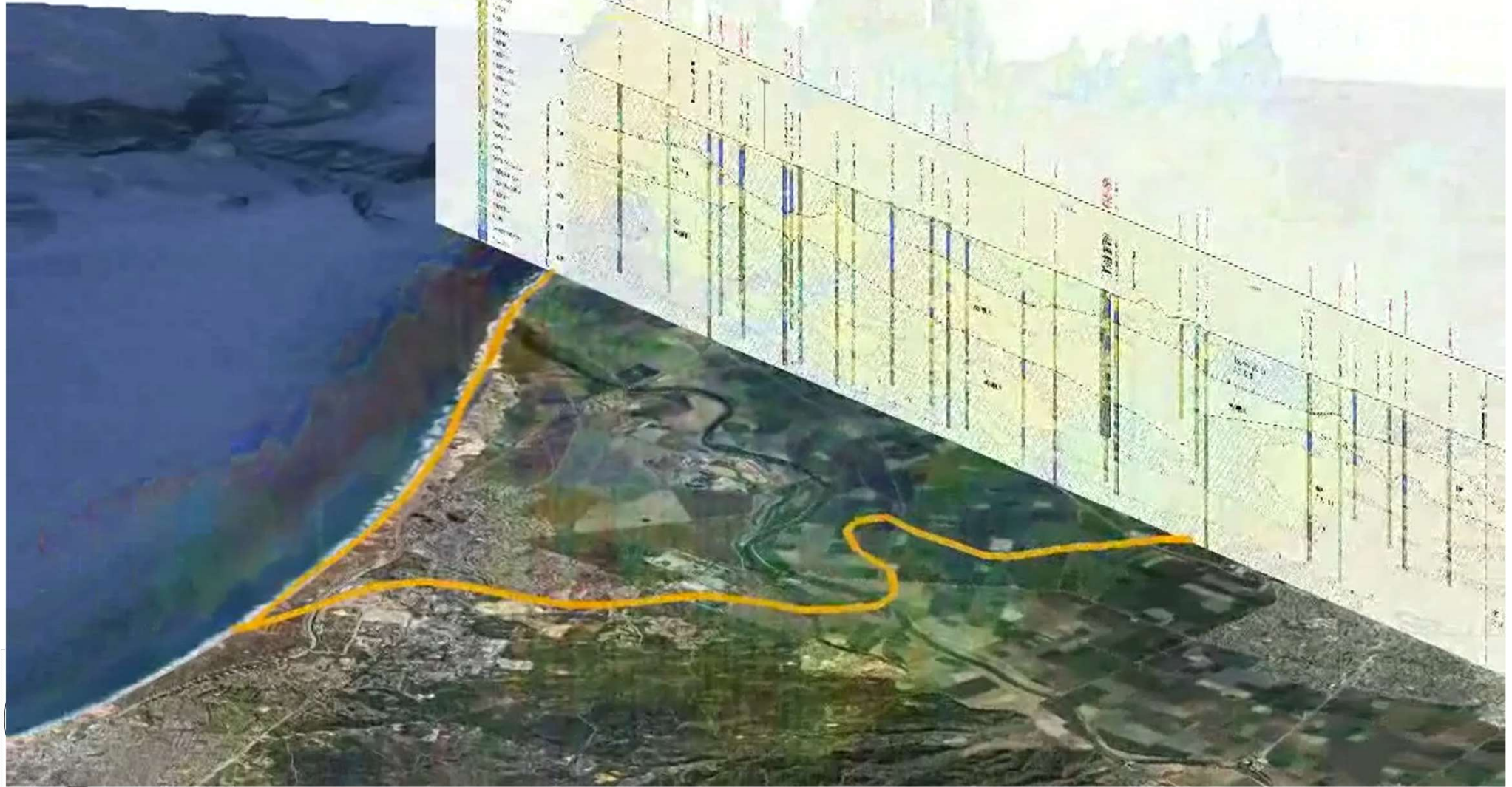
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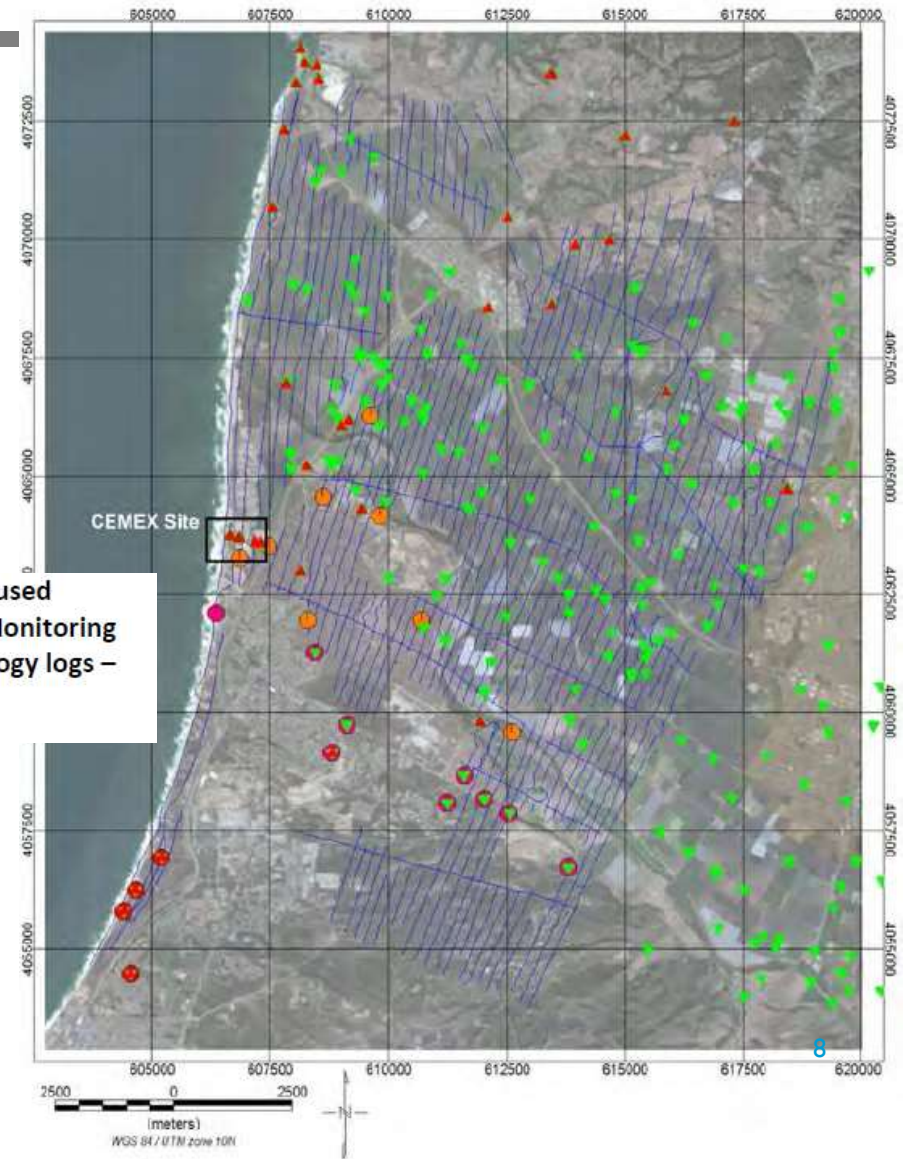


AERIAL ELECTROMAGNETIC SURVEY (AEM)



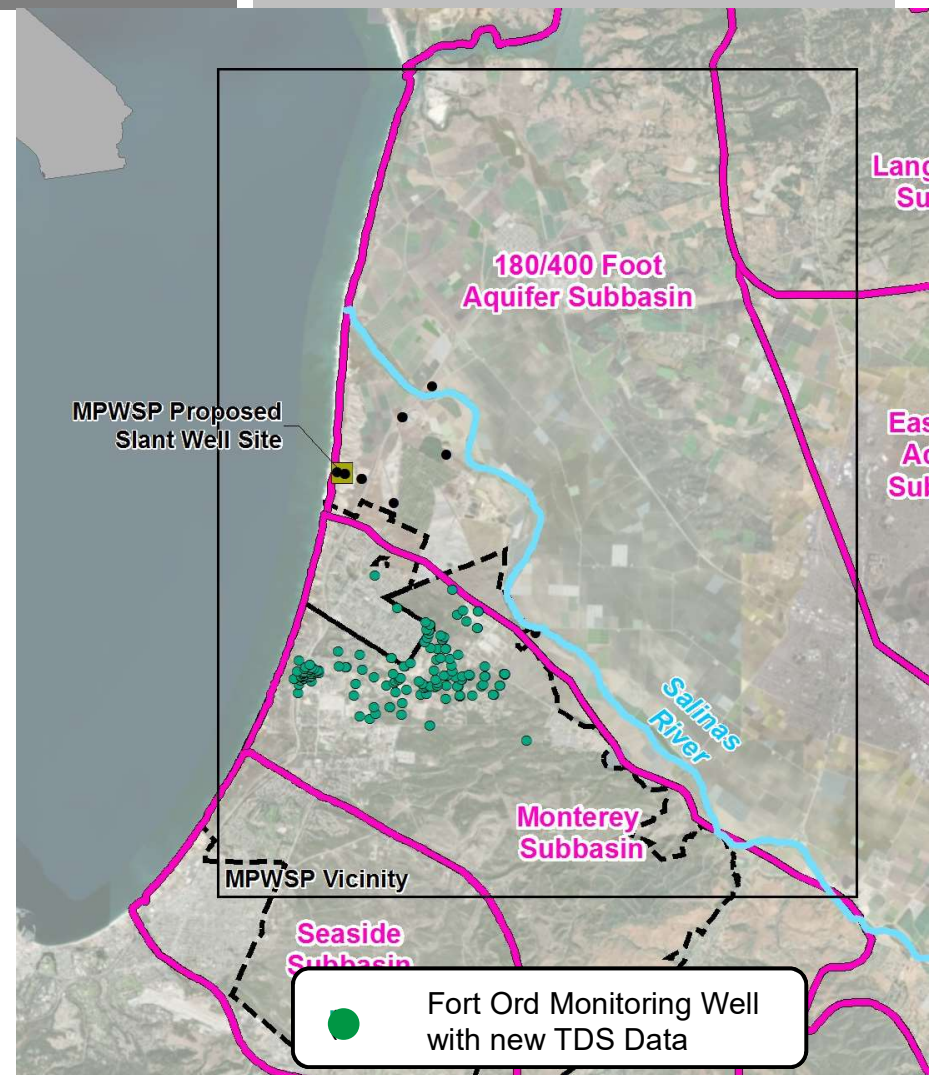
AERIAL ELECTROMAGNETIC SURVEY (AEM)

Figure 1. AGF Tech Memo "Figure 12. Map of locations of the 318 control points that will be used during the interpretation process of the AEM inversion results. Sentinel wells – red circles; Monitoring wells – orange circles; Production wells – pink circles; Geophysical logs – red triangles; Lithology logs – inverted green triangles."

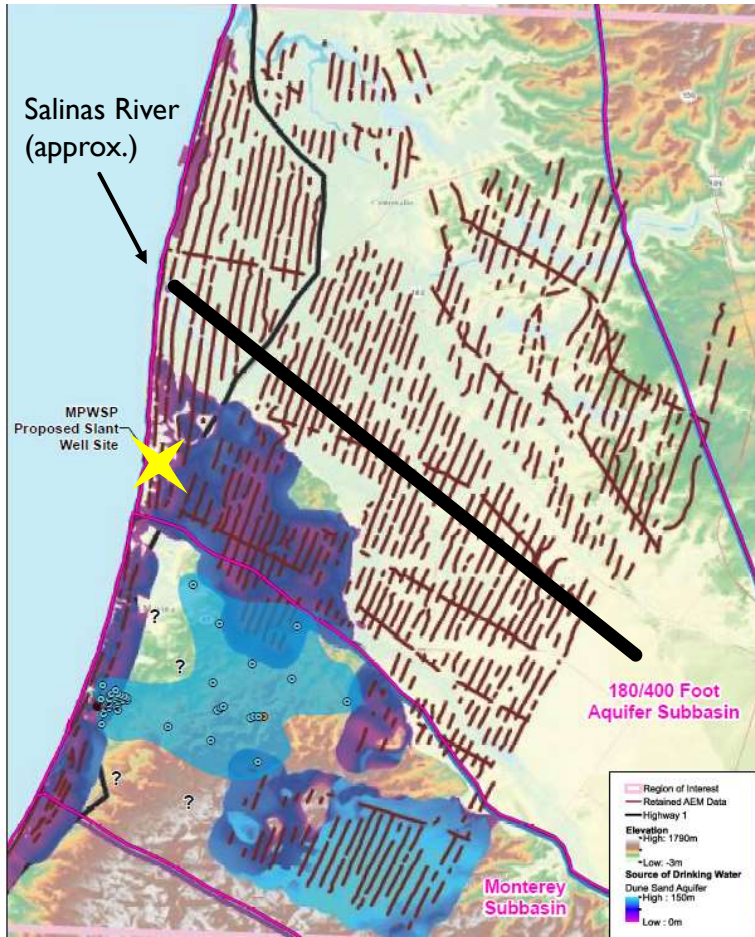


AERIAL ELECTROMAGNETIC SURVEY (AEM)

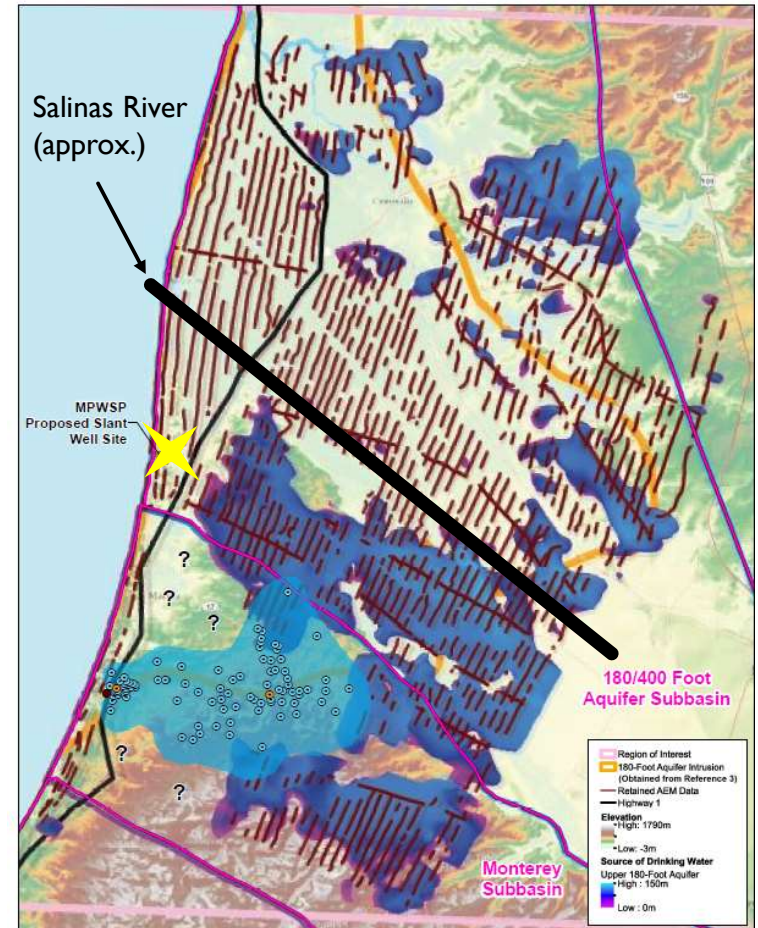
- Additional, new, TDS Data Collected on behalf of MCWD in December 2018 as part of SGMA
- Shows TDS in groundwater of <1,000 mg/L in Dune Sand Aquifer and Upper-180 Foot Aquifer
- Consistent with AEM data



AERIAL ELECTROMAGNETIC SURVEY (AEM)



Dune Sand Aquifer



Upper 180-ft Aquifer



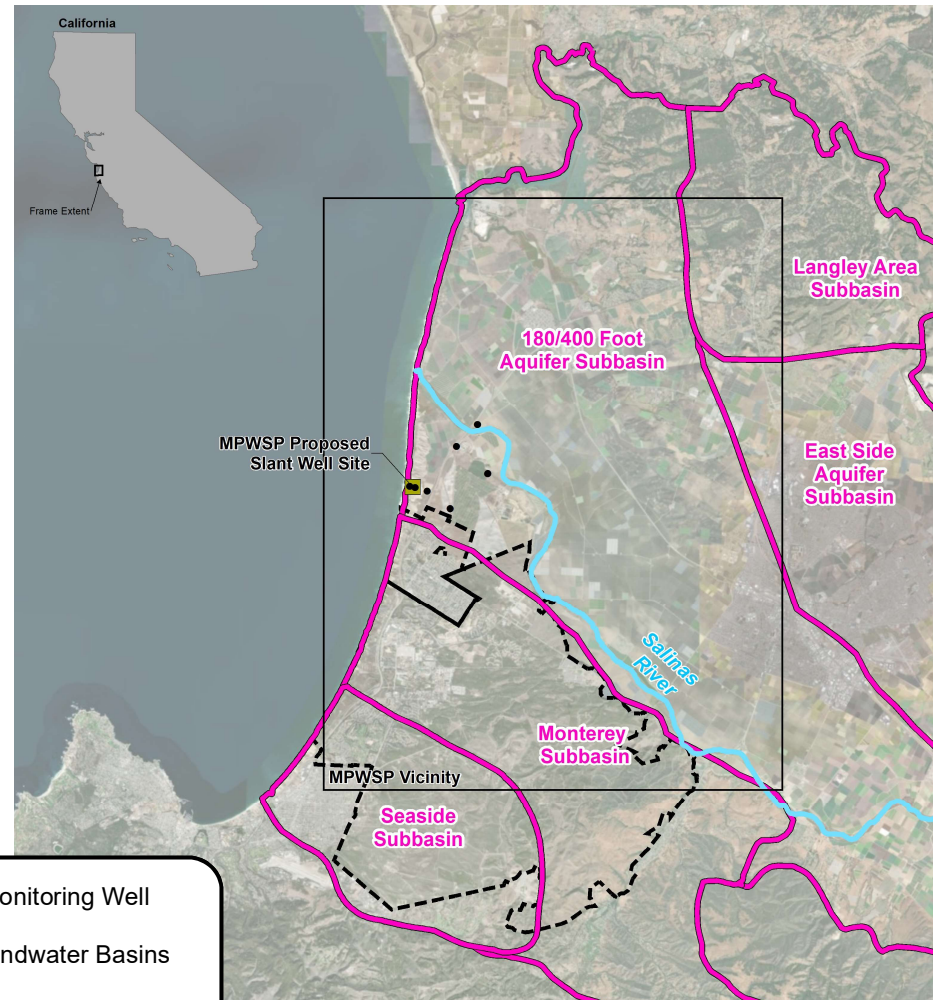
AERIAL ELECTROMAGNETIC SURVEY (AEM)

- Unique groundwater recharge conditions exist s/o Salinas River
- There is interconnectivity between the dunes, 180-ft, and 400-ft aquifers
- Dune sand aquifer important as both seawater barrier and for recharge of lower aquifers (avoid pumping it at the coast!)
- Significant sources of drinking water exist today, even following a historic drought
- Greatest challenge will be how to manage this dynamic basin through groundwater sustainability plans

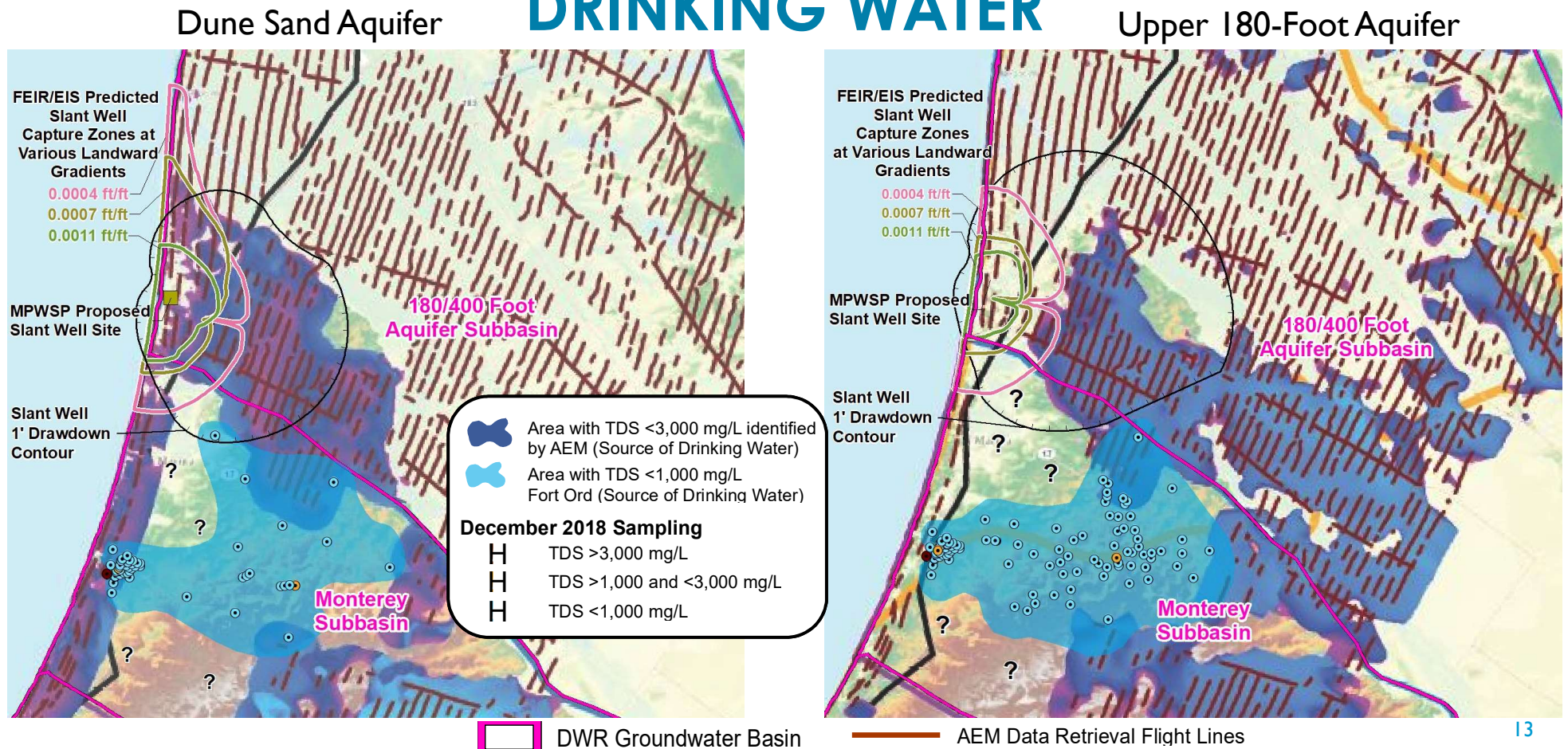


PROJECT

- Monterey Peninsula Water Supply Project (Project)
- Proposed Intake System = 7 subsurface slant wells at CEMEX sand mining site
- Slant wells are located within the 180/400 Foot Aquifer Subbasin
- Will extract 16,802 AFY of seawater/groundwater
- Will be screened through Dune Sand & 180 Foot Aquifers



FORT ORD & AEM STUDY DATA SHOW SOURCES OF DRINKING WATER



WHAT ARE THE IMPACTS TO LOSING GROUNDWATER?

Allocations			
Land Use Jurisdiction or Use Type	Potable Water AFY	Recycled Water AFY	Total Water AFY
City of Marina (Ord Community)	1,340.0	345.0	1,685.0
City of Monterey	65.0	0.0	65.0
City of Seaside	1,012.5	453.0	1,465.5
County of Monterey	720.0	134.0	854.0
CSUMB	1,035.0	87.0	1,122.0
Del Rey Oaks	242.5	280.0	522.5
State Parks and Rec.	44.5	0.0	44.5
U.S. Army	1,562.0	0.0	1,562.0
UCMBEST	230.0	60.0	290.0
Assumed Line Loss	348.5	68.0	416.5
TOTAL ALL (ORD)	6,600.0	1,427.0	8,027.0

The loss of this groundwater could result in a substantial increase in costs to find a replacement supply and storage facilities (est. \$54 million per year)



MCWD NEAR-TERM SUSTAINABLE SUPPLY PLAN

15-YEAR DEVELOPMENT (NEAR TERM DEVELOPMENT)

Target:

5,300 afy Total Demand,
both new and existing
(next 15 years)

Solution:

2,400 AFY recycled water
2,900 AFY groundwater
5,300 AFY Total Supply

Development Areas 1	Development Limits ¹		
	Residential	Office, Industrial, Commercial	Hotel
	(du) 2	(sf) 3	(rooms) 4
Campus Town Specific Plan	388	180,000	300
Cypress Knolls	712	0	0
Del Rey Oaks	691	400,000	550
Dunes Phase 1, 2, & 3	847	1,049,000	394
East Garrison	721	102,000	0
Main Gate	145	150,000	350
City of Monterey	0	937,800	0
Sea Haven	929	0	0
Seaside East	310	90,000	0
Seaside Resort	122	10,000	398
UC MBEST	240	1,090,000	0



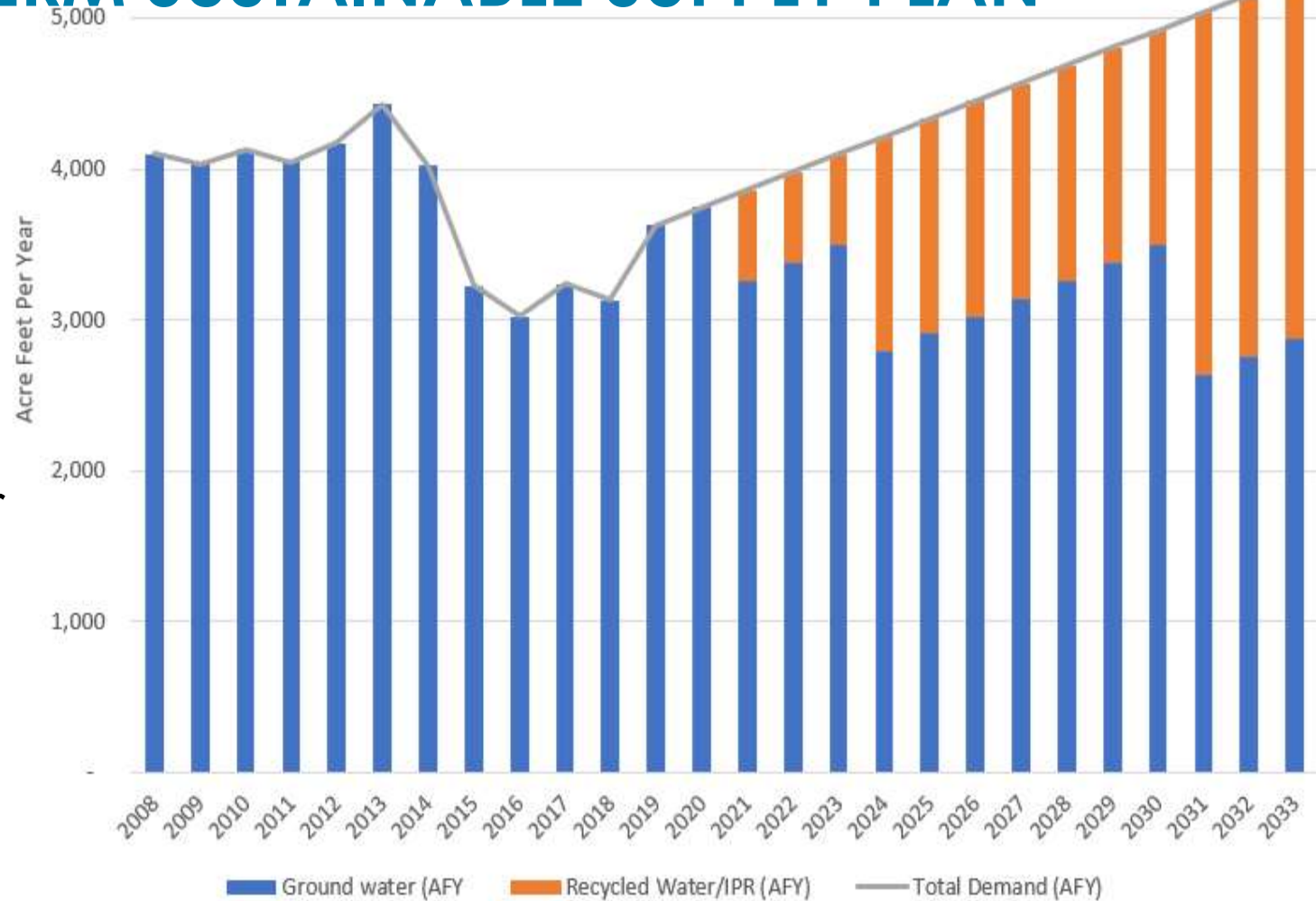
MCWD NEAR-TERM SUSTAINABLE SUPPLY PLAN

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5,300 AFY Total Demand,
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2,400 AFY recycled water
2,900 AFY groundwater
5,300 AFY Total Supply



REGIONAL URBAN WATER AUGMENTATION PROGRAM (RUWAP)

“ADVANCED TREATED WATER”:

PHASE 1: 600 AFY (IN PROGRESS)

PHASE 2: 827 AFY (IN PROGRESS)

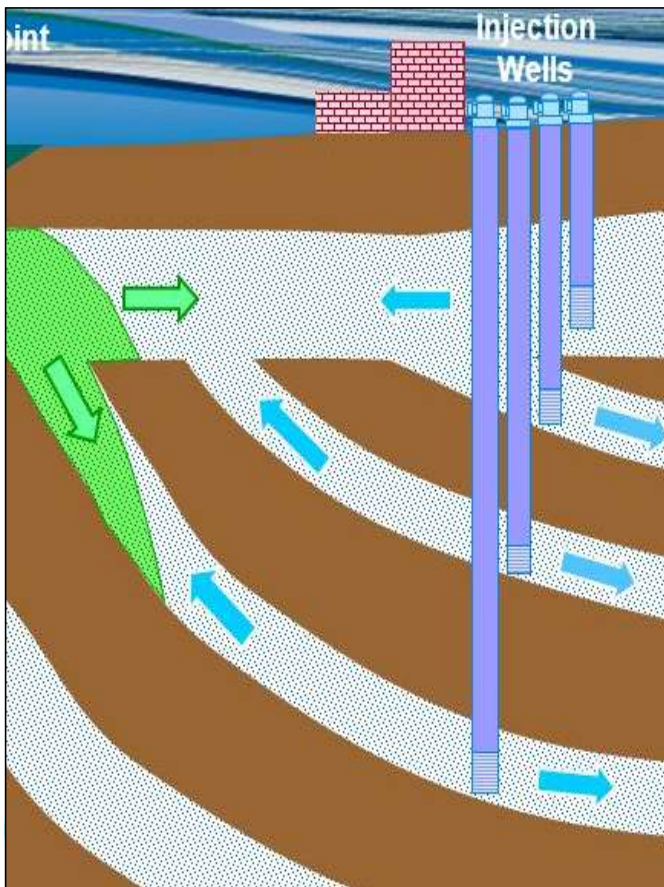
PHASE 3: 973 AFY (BEING STUDIED)

TOTAL: 2,400 AFY



REGIONAL URBAN WATER AUGMENTATION PROGRAM (RUWAP)

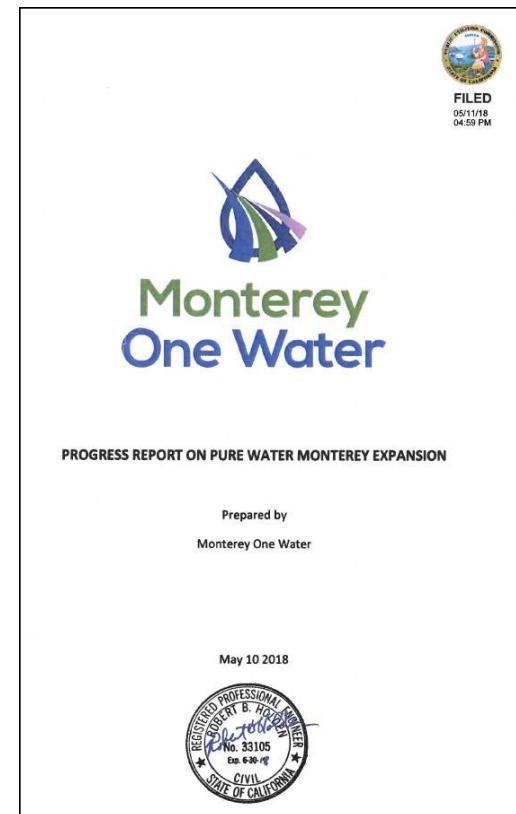
- 973 AFY for injection barrier and groundwater augmentation
- Adds supply and protects groundwater wells from seawater intrusion
- Being Studied (DWR grant funds)



Task	Anticipated Start	Anticipated End
Permitting		
CEQA Compliance	Mid 2020	Late 2021
SWRCB Permitting Process	Early 2021	Late 2024
RWQCB Permitting Process	Early 2021	Late 2024
Design and Construction		
Detailed Design	Mid 2021	Mid 2022
Bidding and Contracting	Mid 2022	Late 2022
Construction	Late 2022	Late 2024

CAN ADVANCED TREATED RECYCLED WATER ALSO BE USED AS AN ALTERNATIVE TO DESAL?

- Available supply to meet demand?
- Comparative Costs?
- Comparative impacts to groundwater?
- Comparative environmental impacts?



MONTEREY PENINSULA WATER MANAGEMENT DISTRICTS (MPWMD) EVALUATION

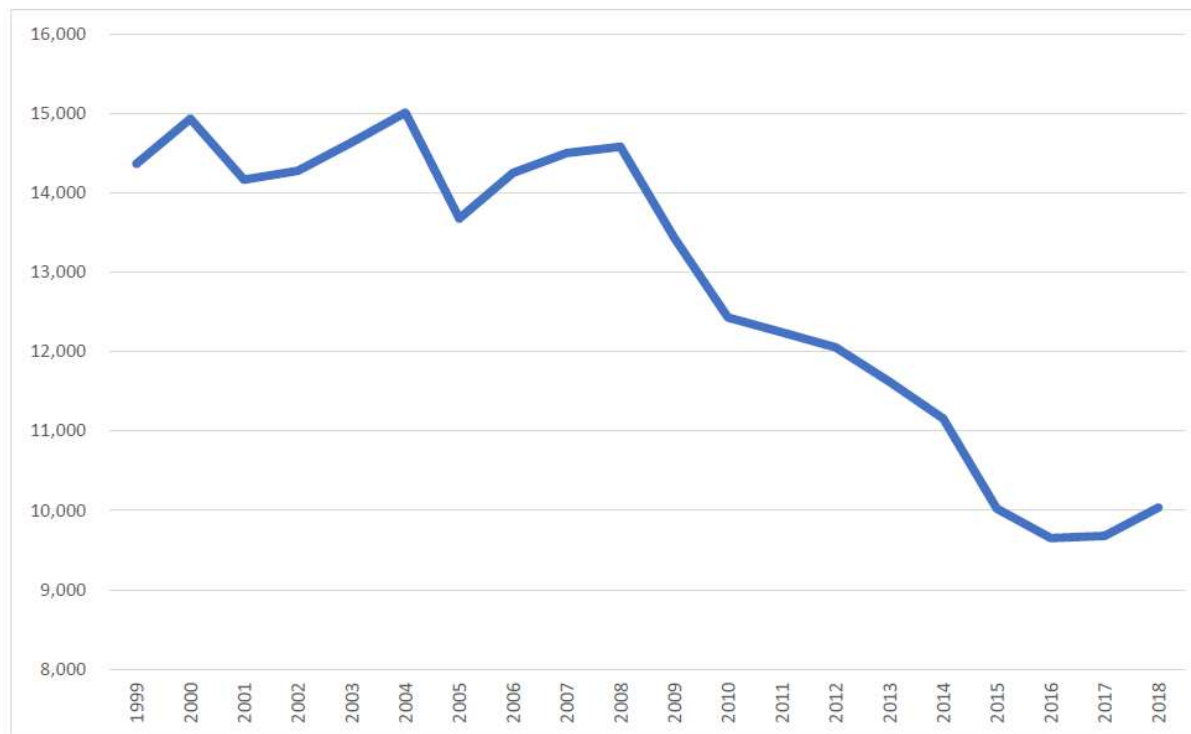
Table 1
Monterey Peninsula Available Supply
(Acre-Feet Annually)

Supply Source	w/ Desalination	w/ PWM Expansion
MPWSP Desalination Plant	6,252	0
Pure Water Monterey	3,500	3,500
PWM Expansion	0	2,250
Carmel River	3,376	3,376
Seaside Basin	774	774
Aquifer Storage & Recovery (ASR)	1,300	1,300
Sand City Desalination Plant	94	94
Total Available Supply	15,296	11,294
Other Available Supplies	406	406
Total Available Supply w/Other	15,702	11,700



“NEW NORMAL” IN CALIFORNIA

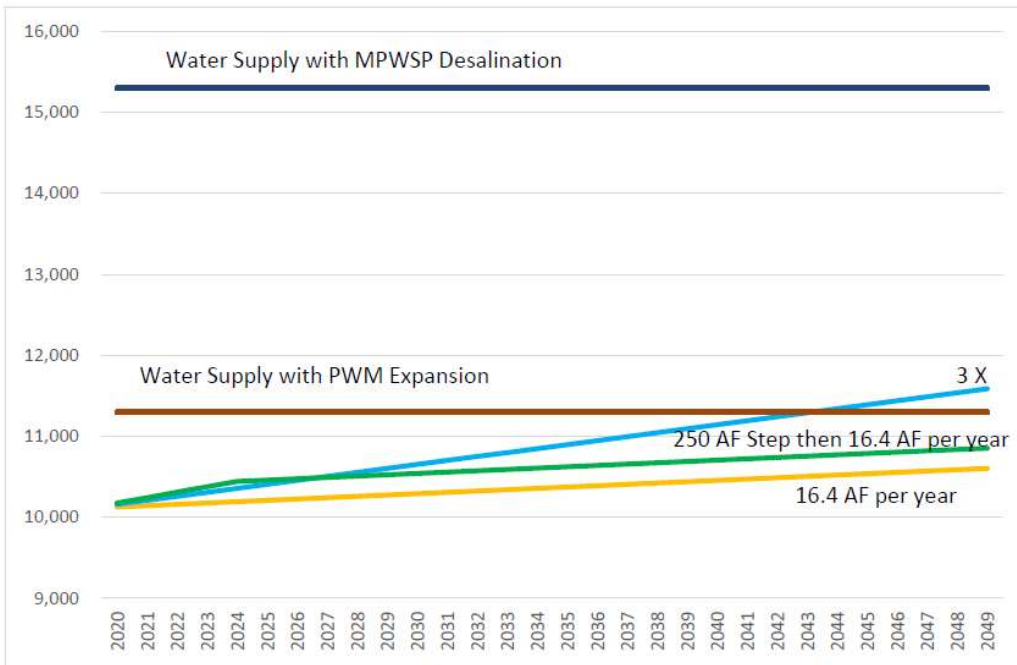
Annual Water Production for Customer Service (Demand)
Last 20 Years
(Acre-Feet)



Source: Monterey Peninsula Water Management District September 2019 Report, “Exhibit 9-A”



Market Absorption of Water Demand Compared to Water Supply
 Current Demand at 5-Year Average
 (Acre-Feet)



This chart shows that, assuming a starting current demand at the 5-year average, both water supply alternatives meet 30-year market absorption at the historical rate and 250 AF in the first 5 years on top of the historical rate, and Pure Water Monterey expansion is sufficient until 2043 at 3-times the historical absorption rate.

MPWMD'S EVALUATION OF SUPPLY/DEMAND FOR DESAL VS. PURE WATER MONTEREY EXPANSION



Source: Monterey Peninsula Water Management District September 2019 Report, "Exhibit 9-A"

MPWMD'S EVALUATION OF COSTS FOR DESAL VS. PURE WATER MONTEREY EXPANSION

Pure Water Monterey: \$1,976 per acre-foot²⁵
 PWM with Expansion: \$2,077 per acre-foot²⁵

Further, if the desalination plant capacity is not fully utilized, the cost per acre-foot rises due to the fixed costs, as shown below.

Production by Desal Plant – AF	<u>6,252</u>	<u>5,000</u>	<u>4,300</u>
Variable Cost (\$ Million)	7.8	6.2	5.4
Fixed Cost (\$ Million)	<u>30.3</u>	<u>30.3</u>	<u>30.3</u>
Total Annual Cost to Customer	38.1	36.5	35.7
Cost per Acre-Foot	\$6,094	\$7,308	\$8,294

These costs are to be paid for by the end users. Desal is at least 3x the cost of Pure Water Monterey Expansion.



Source: Monterey Peninsula Water Management District September 2019 Report, "Exhibit 9-A"

COSTS FOR DESAL ESCALATE WHEN CONSIDERING RETURN WATER AGREEMENT

ALL-IN COST PER ACRE FOOT OF DESALINATED WATER
UNDER VARIOUS RETURN WATER ASSUMPTIONS⁶

PLANT CAPACITY (MGD/AFY) ⁷	PLANNED OPERATION ⁸	PLANT PRODUCT WATER (AFY) ⁹	RETURN WATER AS % OF SOURCE WATER ^{10,11}	RETURN WATER AS % OF PRODUCT WATER ¹²	RETURN WATER (AFY) ¹³	WATER TO BE DELIVERED TO CAL-AM CUSTOMERS (AFY) ¹⁴	ALL-IN COST PER AF DELIVERED TO CAL-AM CUSTOMERS (ANNUALIZED COST/AFY) ¹⁵
6.4/7,167	86%	6,164	7 %	16.67 %	1,028	5,136	\$7,688/AF
6.4/7,167	86%	6,164	12%	28.56 %	1,760	4,404	\$8,410/AF
6.4/7,167	86%	6,164	16%	38.08 %	2,347	3,817	\$10,348/AF
6.4/7,167	86%	6,164	22%	52.36%	3,227	2,937	\$13,449/AF

Desal could be 6x the cost of Pure Water Monterey Expansion.



MPWMD'S CONCLUSIONS

Principal Conclusions

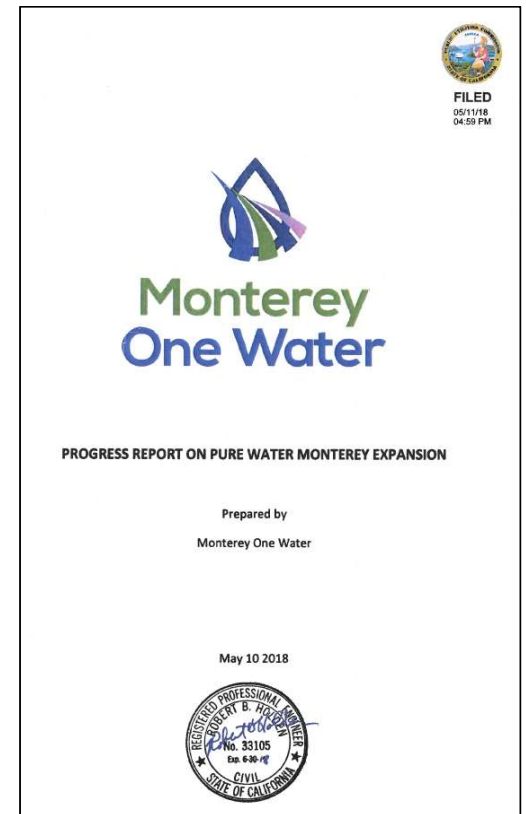
- Either supply option can meet the long-term needs of the Monterey Peninsula
- Either supply option is sufficient to lift the CDO
- The long-term needs of the Monterey Peninsula may be less than previously thought
- Several factors will contribute to pressure on decreasing per capita water use



Source: Monterey Peninsula Water Management District September 2019 Report, "Exhibit 9-A"

ADVANCED TREATED RECYCLED WATER IS AN ALTERNATIVE TO DESAL

- There is sufficient supply to meet demand
- Significantly less costly
- Doesn't threaten groundwater and sustainability efforts
- Environmentally Superior (didn't go into in this presentation)



QUESTIONS

