Water COUNTS ACADEMY

WELCOME

Indio Water Authority
Your Water. Our Responsibility.

CITY OF COACHELLA
INCORPORATED 1946

MSWD
Mission Springs Water District

DESERT WATER

Myoma Dunes Water Co.

Water COUNTS ACADEMY

Thanks for dinner, Coachella Water Authority!

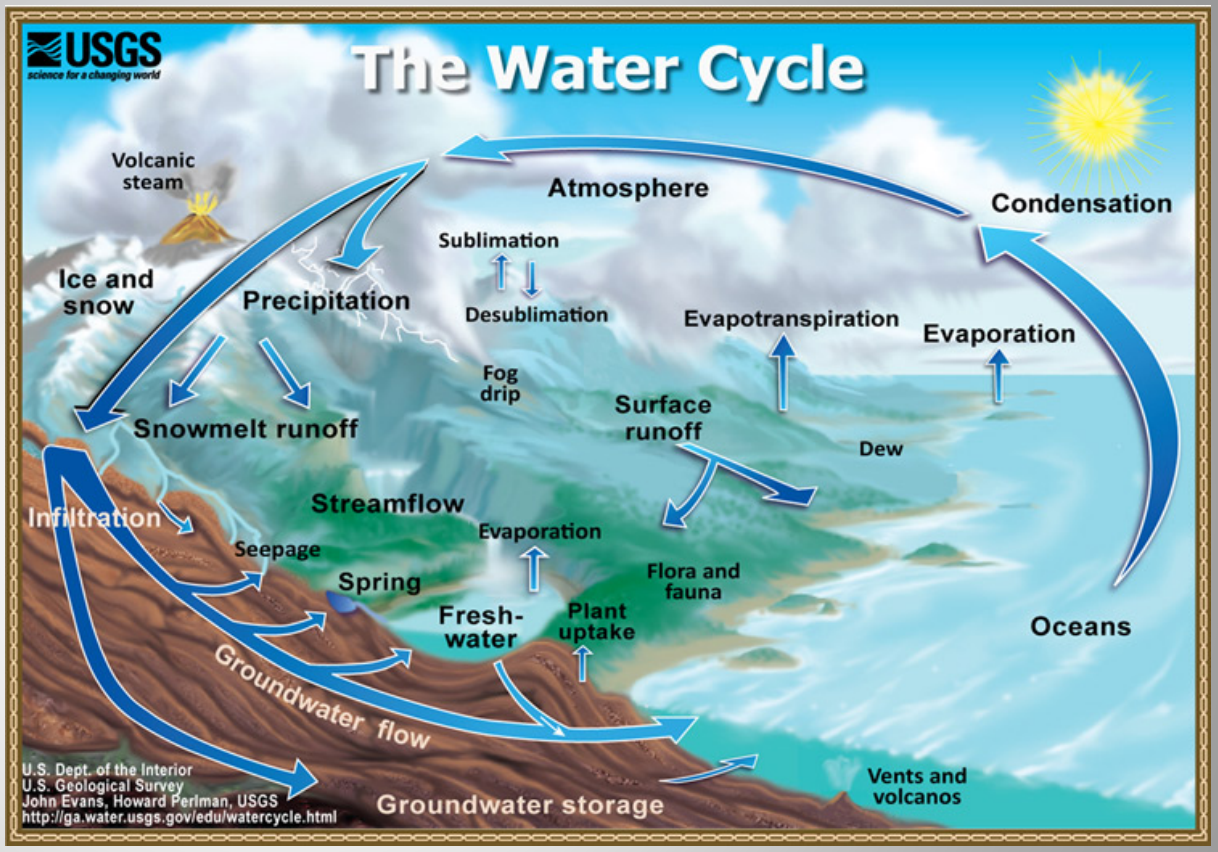
Providing Safe Drinking Water

Coachella Valley Water Counts Academy

February 20, 2018 Session

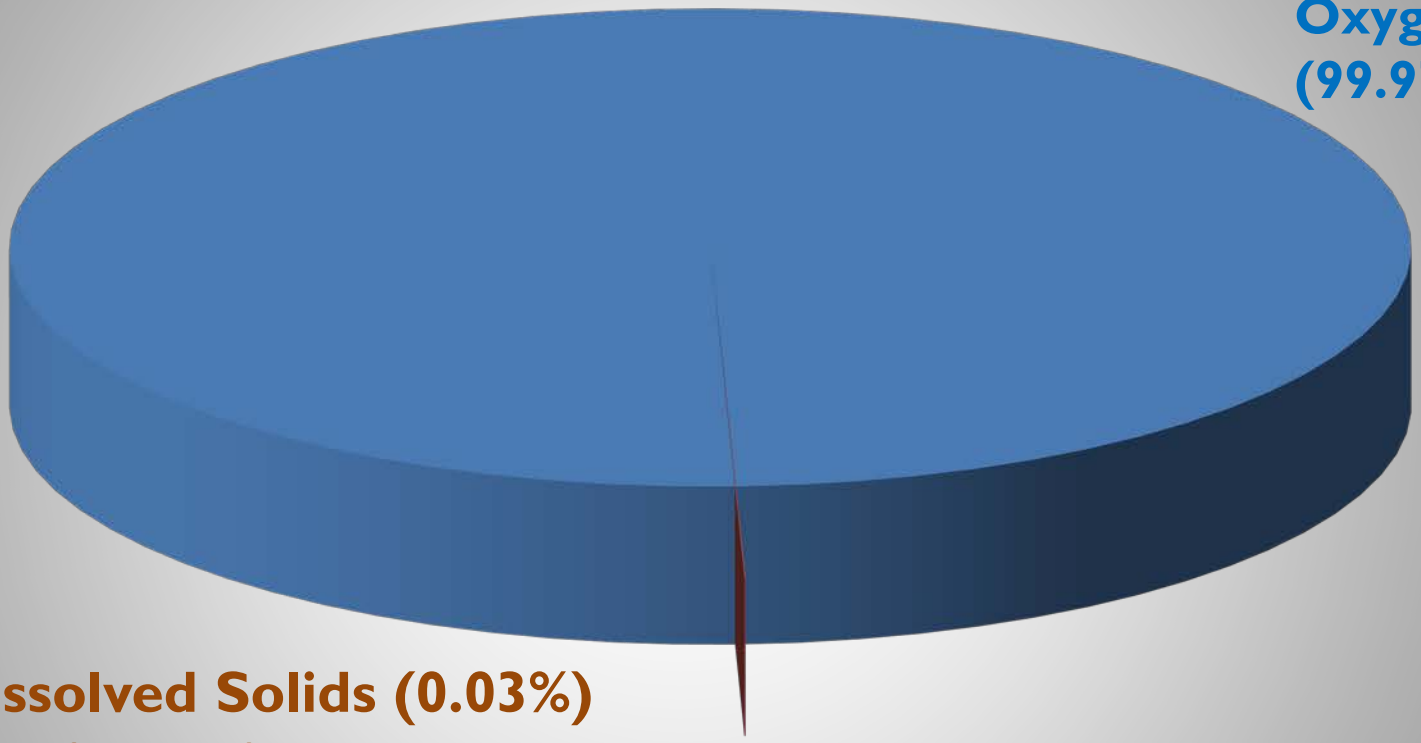
Water = "Universal Solvent"

Water Source	Dissolved Solids or Salinity (ppm)
Rain	<5
Melted snow	<30
Freshwater streams	100 – 1,500
Fresh groundwater	100 – 3,000
Brackish groundwater	2,000 – 35,000
Ocean	35,000
Salton Sea	60,000
Great Salt Lake	Up to 270,000
Dead Sea	340,000



"Contaminants" are any substance or matter in water

Tap Water Content



Total Dissolved Solids (0.03%)

0.0299% - Bicarbonate, calcium, magnesium, sulfate, sodium, chloride, nitrate, potassium & fluoride

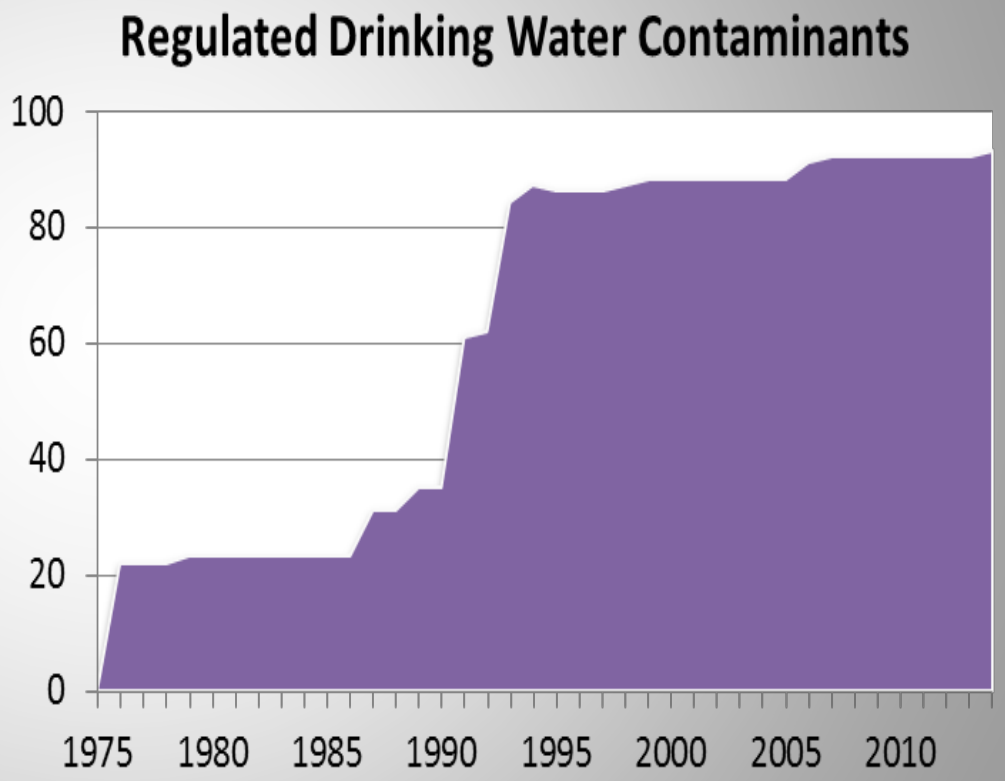
0.0001%: - Aluminum, arsenic, barium, copper, chromium, disinfection by-products, iron, lead, molybdenum, organic compounds, selenium, strontium, uranium & vanadium

Program Elements

- Research
- Contaminant monitoring
- Source water protection
- State and Federal regulations
- Water treatment
- Sanitary surveys
- Water system construction and OM&R
- Backflow prevention
- Water agency reporting

Drinking Water Regulations

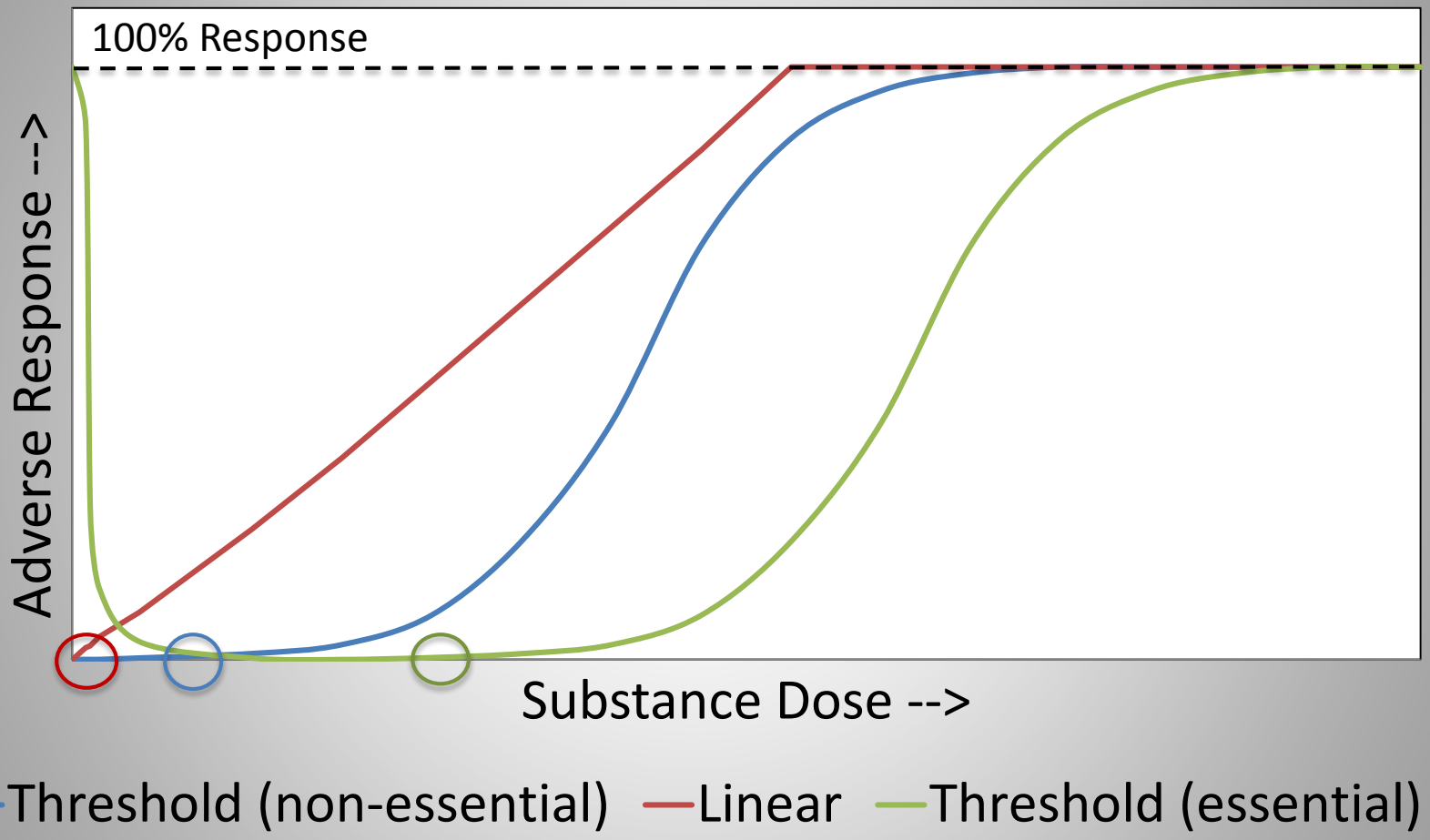
- Primary maximum contaminant levels
  - Enforceable (health)
- Secondary maximum contaminant levels
  - Non-enforceable (aesthetics)
- EPA establishes national standards
- States can establish more stringent standards



When EPA Regulates Contaminants

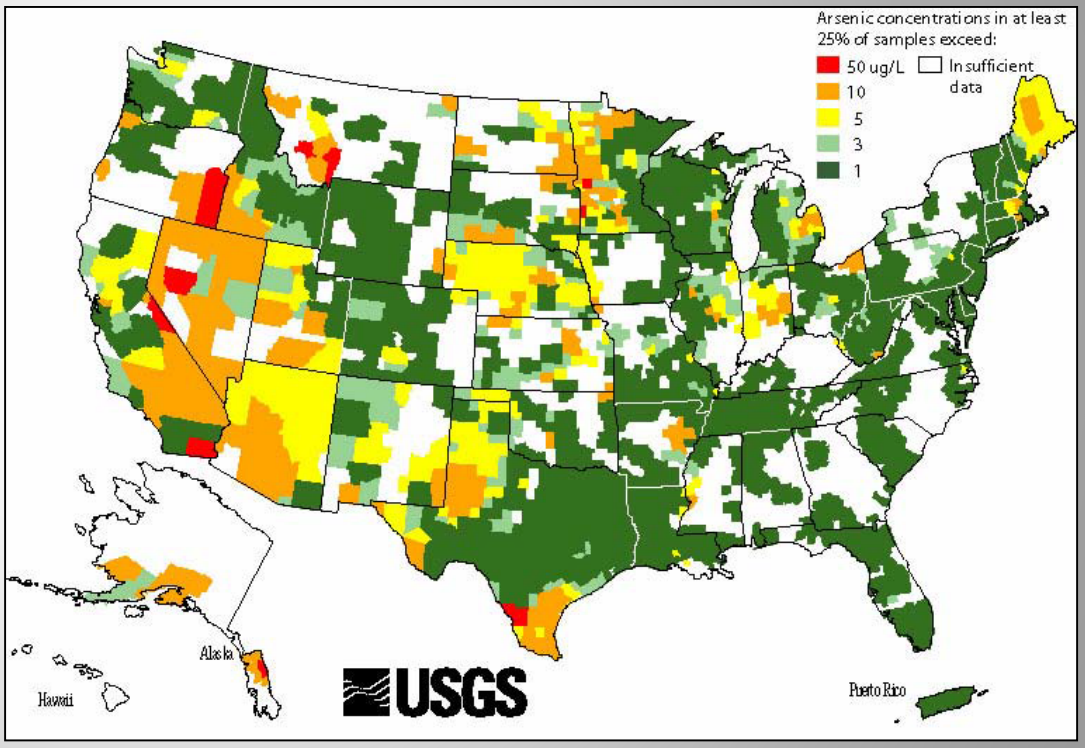
- Toxicity
  - May have adverse health affects
- Occurrence
  - Exists or likely exists enough at levels of concern
- Benefit
  - Meaningful opportunity for risk reduction
  - Technically & economically feasible

Predicting Dose Response



Contaminant Occurrence

- Contaminant Candidate Lists
- Analytical test methods
- Unregulated contaminant monitoring rules
- Water agency monitoring

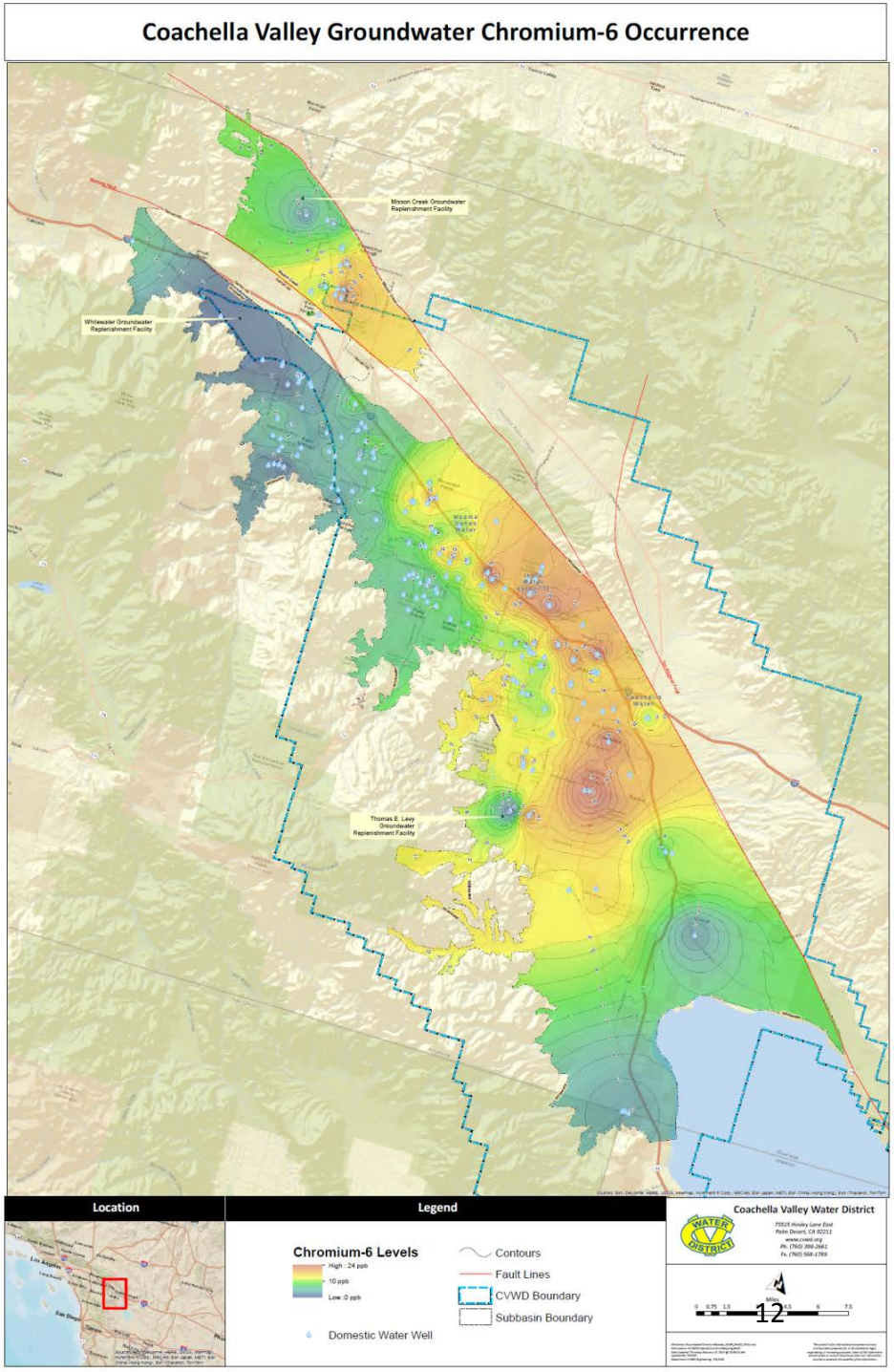


Regulatory Determination

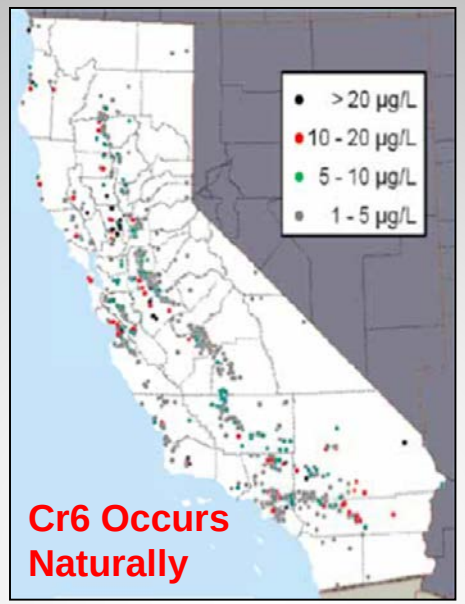
- Health risk reduction and cost analysis
  - Treatment technology costs
  - Qualitative and quantitative health benefits
- Set lowest feasible limit to maximize benefits
  - Best available technology
  - Must be economically feasible
- Provide 3-5 year compliance period

Chromium Background

- Abundant in earth's crust
- Chromium-3 (Cr+3) or chromium-6 (Cr+6) in water
  - Mostly Cr6 in groundwater
  - Need Cr3 to regulate blood sugar (nutrient in vitamins)
- Cr6 Sources in Water
  - Erosion of natural sediments
  - Isolated industrial sources
- Cr6 Health Concerns
  - Occupational carcinogen when inhaled
  - Possible carcinogen when ingested (rodent studies)



"Only in California"



SB 351 (2001)

NRDC
THE EARTH'S BEST DEFENSE

V.

CALIFORNIA REPUBLIC

April 15, 2014 Court Orders State to adopt Cr6 MCL at 0.010 mg/L **(10 ppb)**

SB 385 (2015)

June 1, 2017 Court Orders State to withdraw Cr6 MCL, perform economic feasibility analysis & set new MCL

MCL Withdrawn

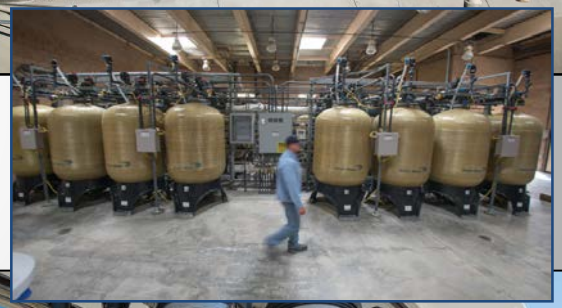
CMTA & Solano Co. Taxpayers

V.

CALIFORNIA REPUBLIC

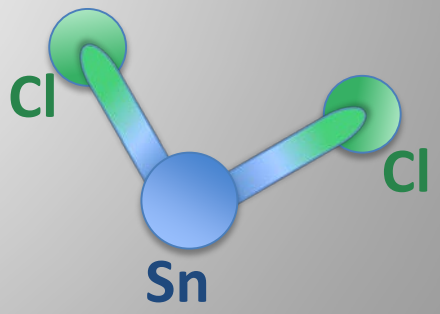
Water System Activity

- Vast majority of impacted systems on pause
- Handful continue operating plants
- Some finishing treatment studies
  - CVWD full-scale demonstration



Stannous Alternative

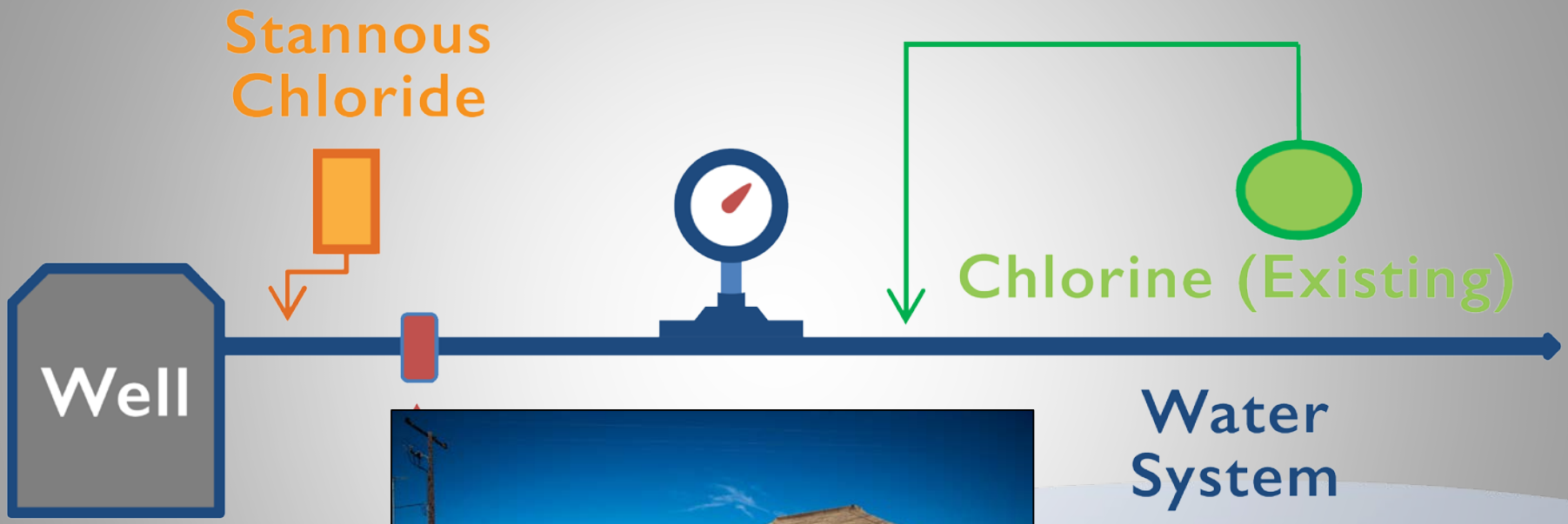
- Approved drinking water additive
  - Solution used to protect pipes
- Salt made of tin & chloride ($SnCl_2$)
- Antioxidant in consumer products
- Reduces Cr6 to Cr3
  - Faster and better than other reductants (e.g., iron, vitamin C)



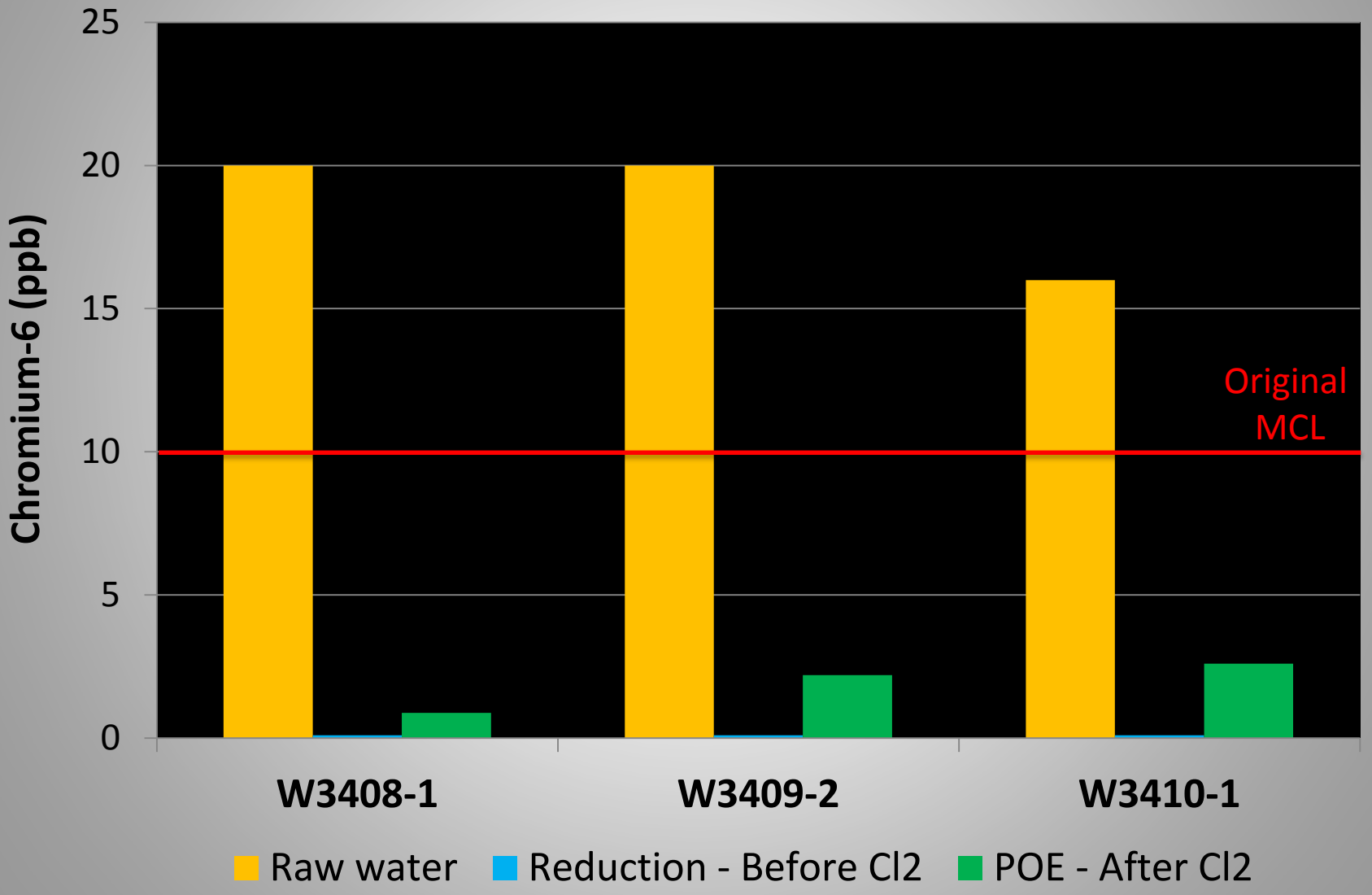
Sky Valley System Demonstration

- Sufficient Cr6 levels (16-20 ppb)
- Extended water System (15 miles)
- Only 3 active supply wells

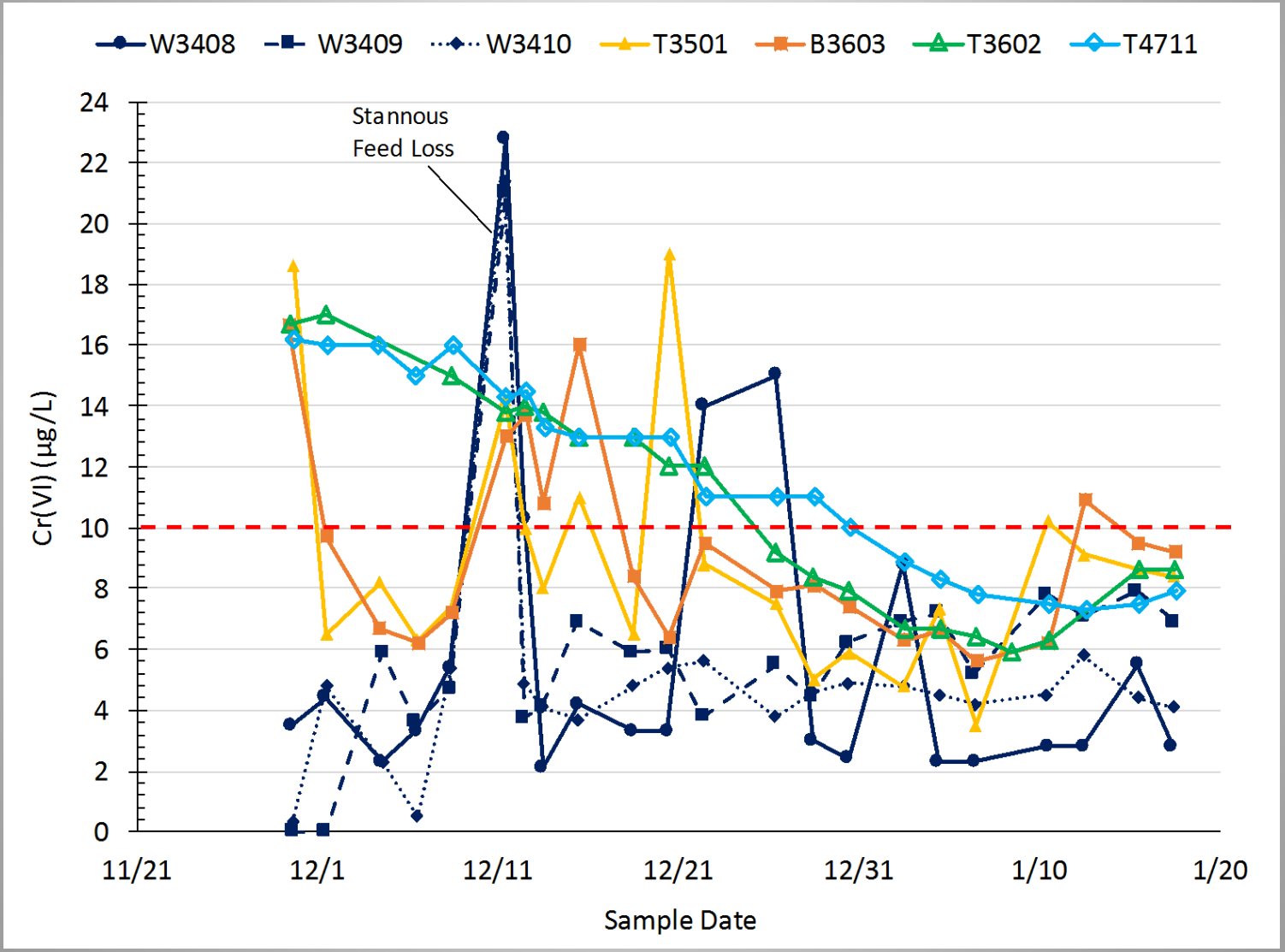
Stannous Demonstration Project



Cr6 Reduction Calibration Test



Demonstration Test Results



Benefits

- Cost effective
- No waste products
- No visual impacts
- Helps protect pipes
- Does not change taste, smell or look of water

What's Next

Complete demonstration report

State establishes new chromium-6 drinking water standard

Water COUNTS

Agencies are prepare to act

Questions?

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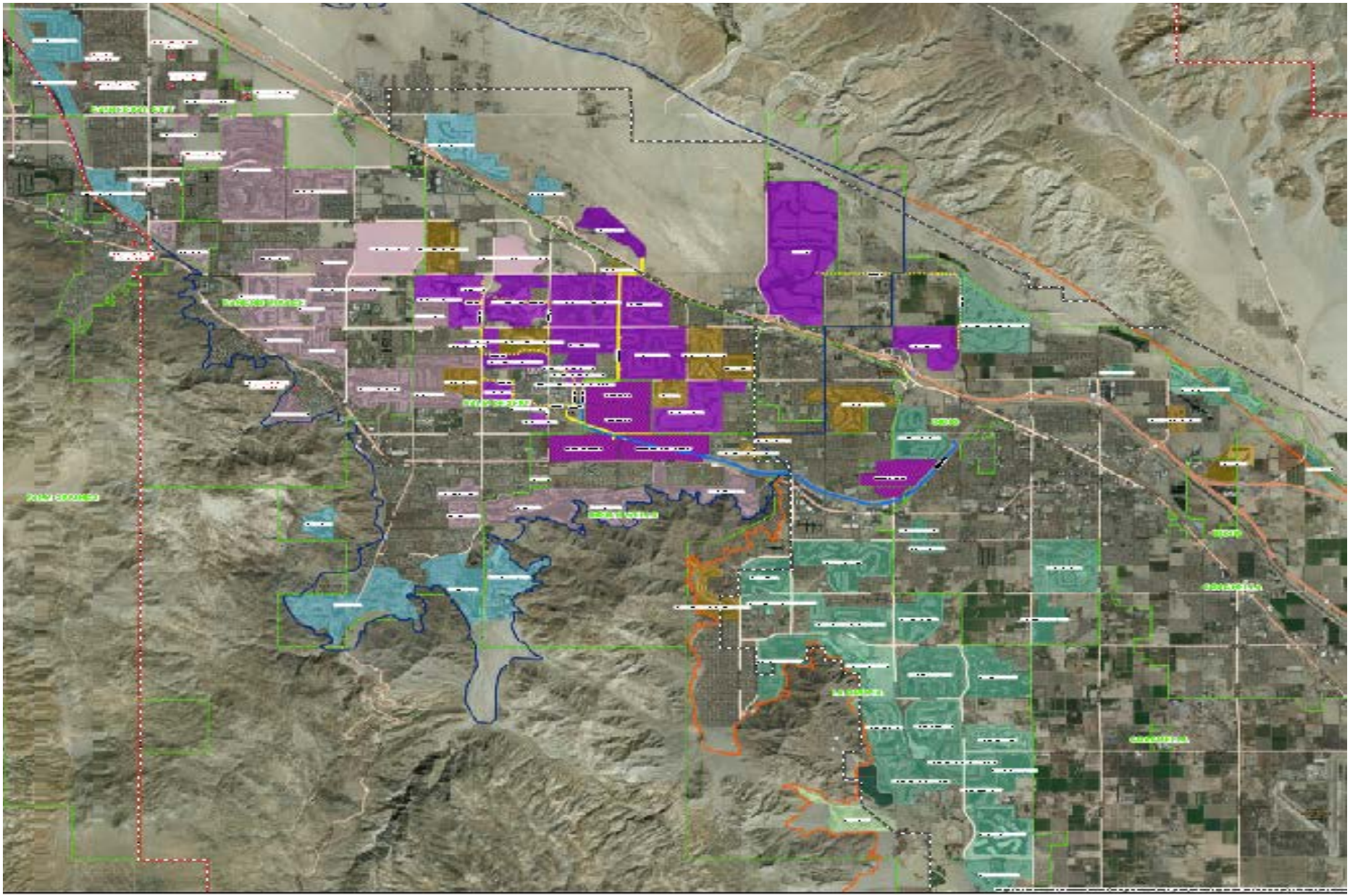
Director of Environmental Services
Coachella Valley Water District
760-398-2661, ext. 2286
sbigley@cvwd.org

Golf and Nonpotable Water in the Coachella Valley

First golf course in the valley…

…was the O'Donnell in 1926, second was Indian Palms (used to be Cochran-Odlum) in 1947, third Thunderbird 1951…

Now, there are 121 golf courses in the valley!



106 of the golf courses are within CVWD's boundaries.

Canal via Canal distribution system	30.5
Future Canal via Canal distribution system	5
Canal via Mid Valley Pipeline	6
Future Canal via Mid Valley Pipeline	17
Recycled water/canal	17.5
Future Recycled water/canal	17
Not planned for an Alternate Water Supply	13
Total Golf Courses:	106
Alternate Water Source:	54
Per Cent Using Alternate Water Source:	51%

Nonpotable Water

Types of nonpotable water for golf courses:

1. Canal Water
   -Mid-Valley Pipeline, and
   -Canal water distribution system.

2. Recycled Water
   -Water Reclamation Plant (WRP7 or WRP10),

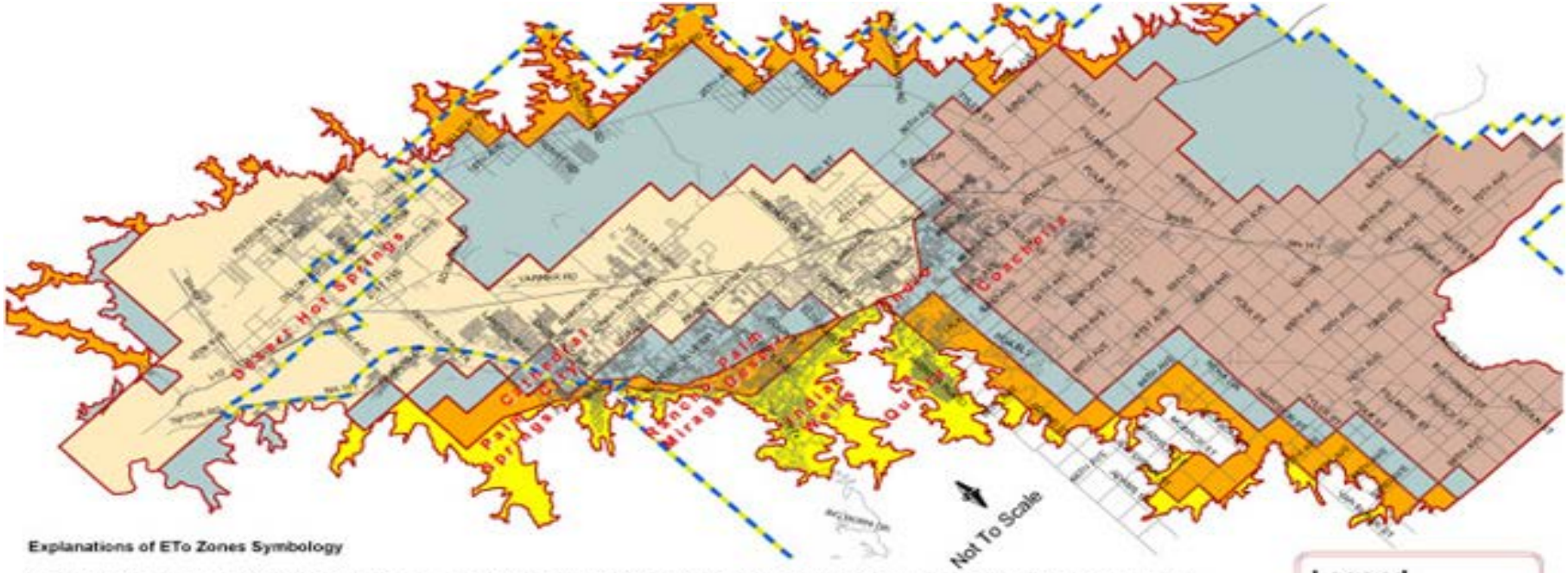
Nonpotable customers irrigate with water that is not deemed safe for drinking. They no longer relying primarily on the groundwater, our potable water source, for nonpotable purposes.

Other sources of golf course irrigation water:

- Groundwater
- Storm water

How much water is used by a golf course annually?

It depends primarily on the ETo zone, irrigated acreage and lake area. Anywhere from about 300 AF/Yr for our smaller courses in a protected area to about 1400 AF/Yr for our large courses in the windy areas. **Average of 935 AF/Yr**.



Explanations of ETo Zones Symbology

1. Zone #1: North-facing cove areas: Mountain shaded, sheltered from prevailing winds and higher elevations means lowest water consumption. Annual water consumption(ETo) = 57.01"

2. Zone #2: Transition zone area between the north-facing coves and the open desert or the south-facing cove areas of the north valley: The transition zones are somewhat sheltered from prevailing winds and with exposure to higher local humidity from irrigated landscapes means low water consumption. North valley coves are mountain shaded, sheltered from prevailing winds and higher elevations, but are south-facing and heat absorbing. Annual water consumption(ETo) = 66.82"

3. Zone #3: Upper valley open desert border zone, lower valley upper elevation zone or lower valley afternoon mountain shade zones with moderate prevailing winds and blowing sand. Annual water consumption(ETo) = 75.00"

4. Zone #4: Lower valley open desert agricultural zone with moderate prevailing winds and below sea level elevations. Annual water consumption(ETo) = 88.00"

5. Zone #5: Upper valley high wind and blowing sand zone. Annual water consumption = 93.90"

Average water use for a golf course

The average water use on a golf course is around 935 acft/yr.

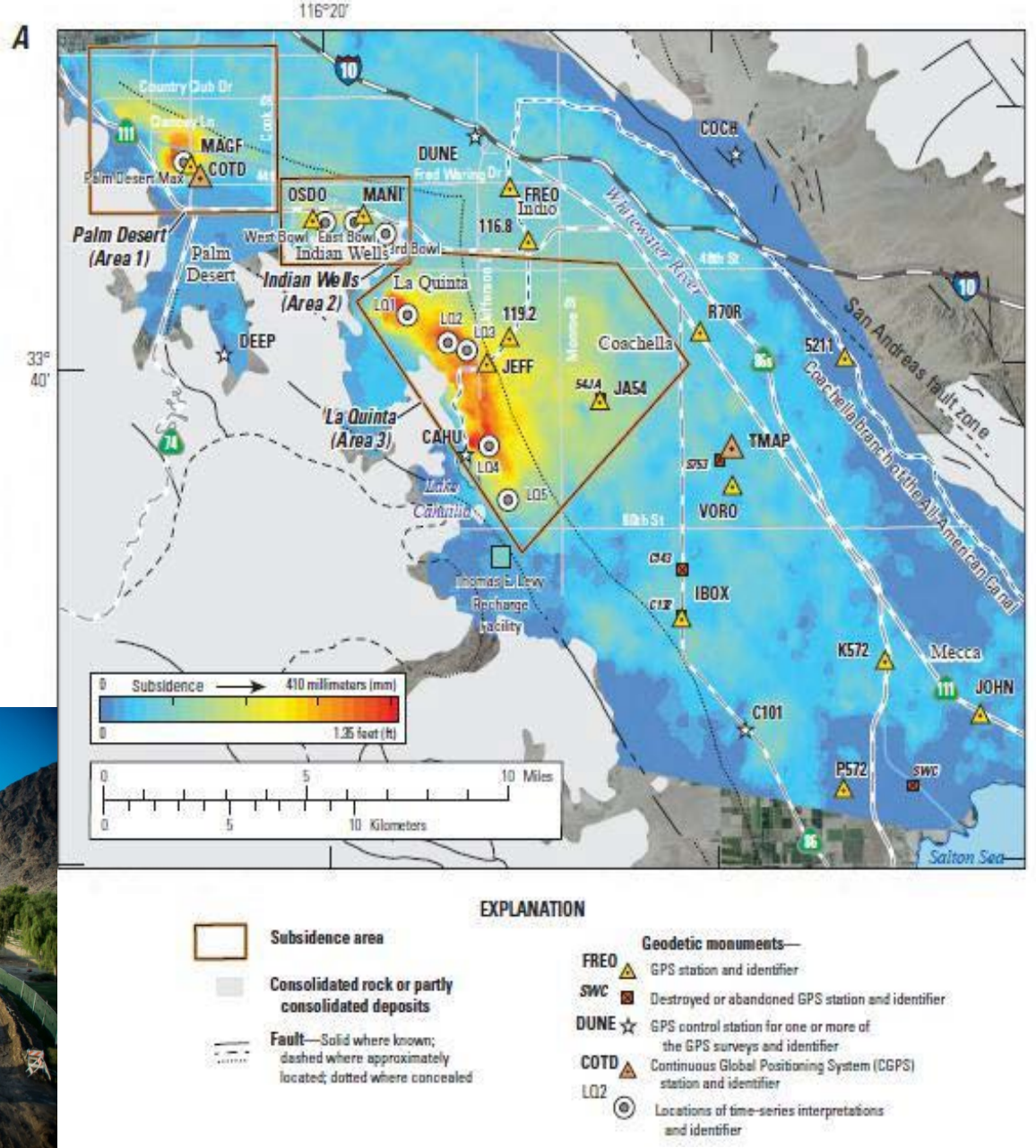
To make it easy, we round up to say that “a typical golf course uses 1000 acft per year”.

Golf Courses in the valley use up to 121,000 acft of water per year.

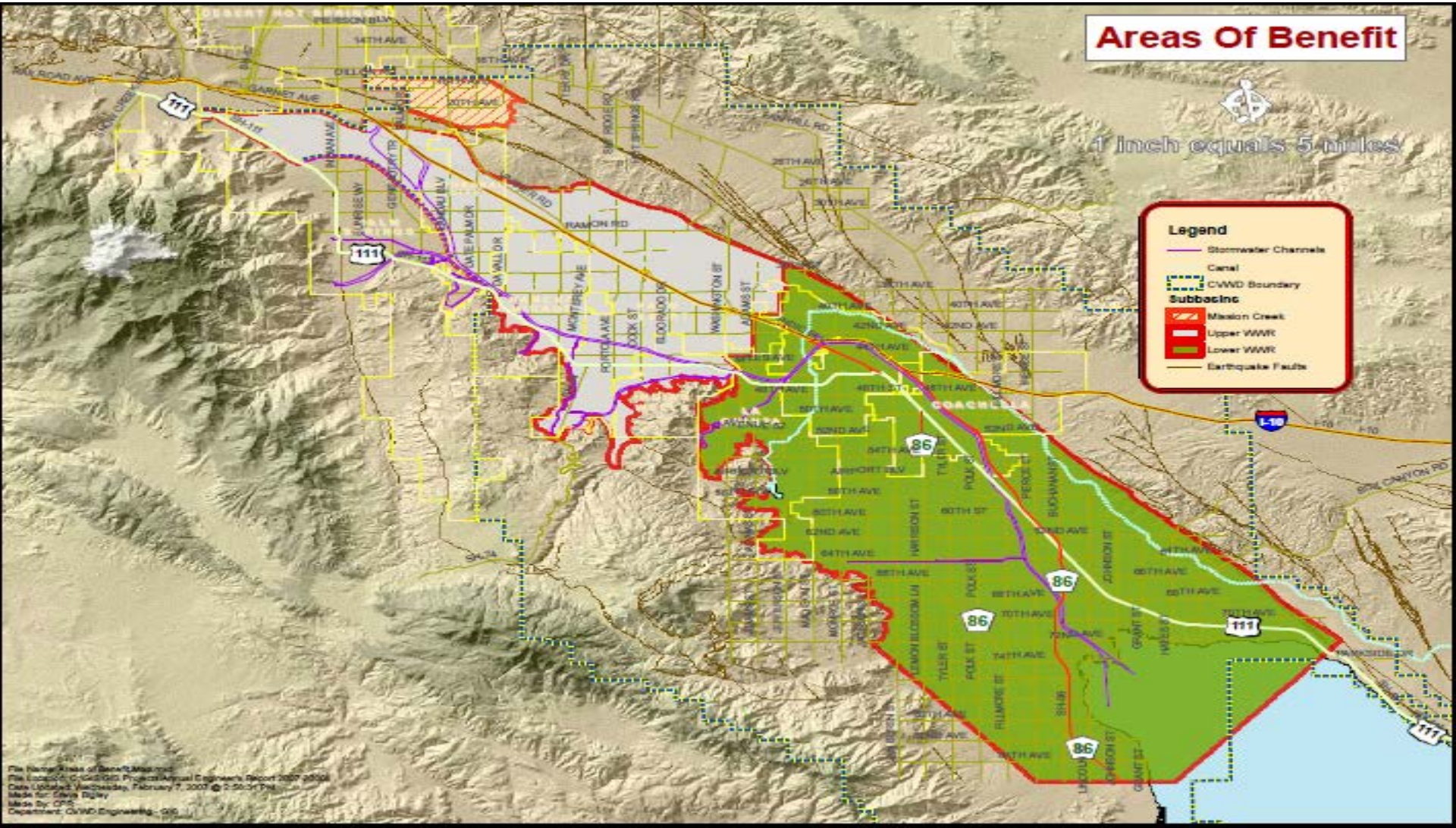
What's the big deal? Overdraft and subsidence.

Final USGS report published 2014.

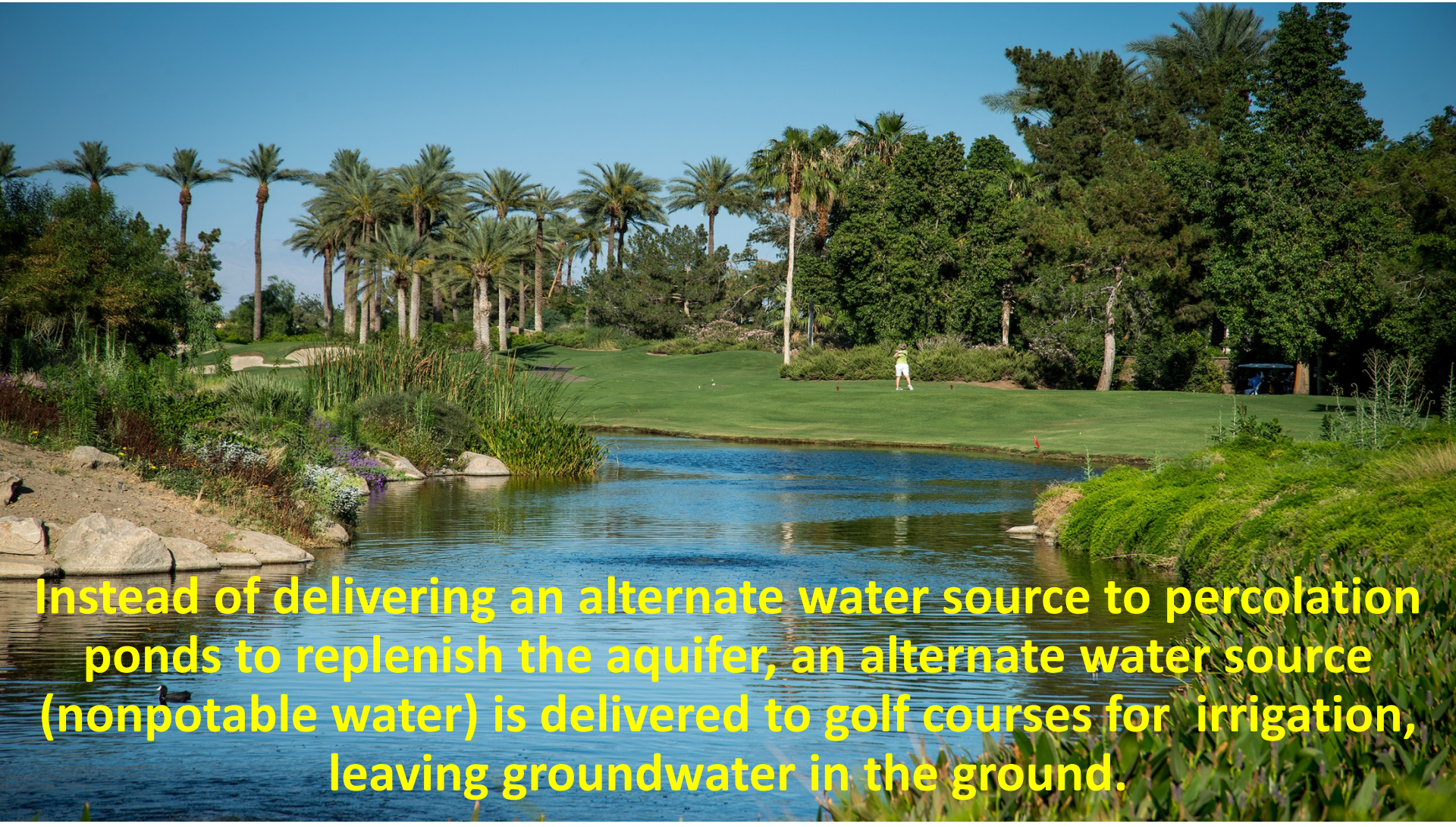
- CVWD and USGS study since 1996.
- Yellow and red show area of most subsidence.
- Up to 410mm (1.35ft)



To minimize and eliminate further overdraft, the aquifer has been replenished with imported water.



36 golf courses in the mid-valley available for in-lieu recharge opportunities.

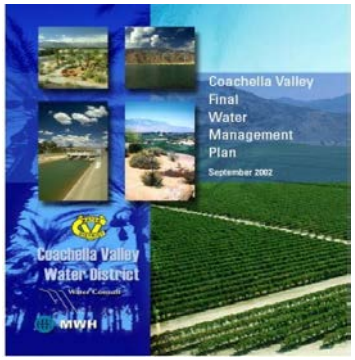


Instead of delivering an alternate water source to percolation ponds to replenish the aquifer, an alternate water source (nonpotable water) is delivered to golf courses for irrigation, leaving groundwater in the ground.

Coachella Valley Water Management Plan
(2002 and 2010 update and 2014 update)

The goal of the CVWMP is to reliably meet current and future water demands in a cost effective and sustainable manner.

1. Eliminate groundwater overdraft and its associated adverse impacts.
    - Storage Loss
    - Declining Groundwater Levels
    - Land Subsidence
    - Water Quality Degradation



2. Maximize conjunctive use opportunities (includes in-lieu recharge).
3. Minimize adverse economic impacts to Coachella Valley water customers.
4. Minimize environmental impacts.

CVWMP objectives for golf courses:

- Conservation with improved irrigation systems and techniques and technology. 10%.
- Utilize nonpotable water sources for golf courses. In-Lieu recharge projects.

Golf and Water Task Force

Mission Statement

To ensure a sustainable water supply for future generations, to meet if not exceed the goals of the Coachella Valley Water Management Plan, **to pursue all feasible water conservation measures, to promote and expedite the use of non-potable water**, and to educate Valley residents regarding the importance of pursuing these goals for the environmental and economic quality of life in the Coachella Valley.

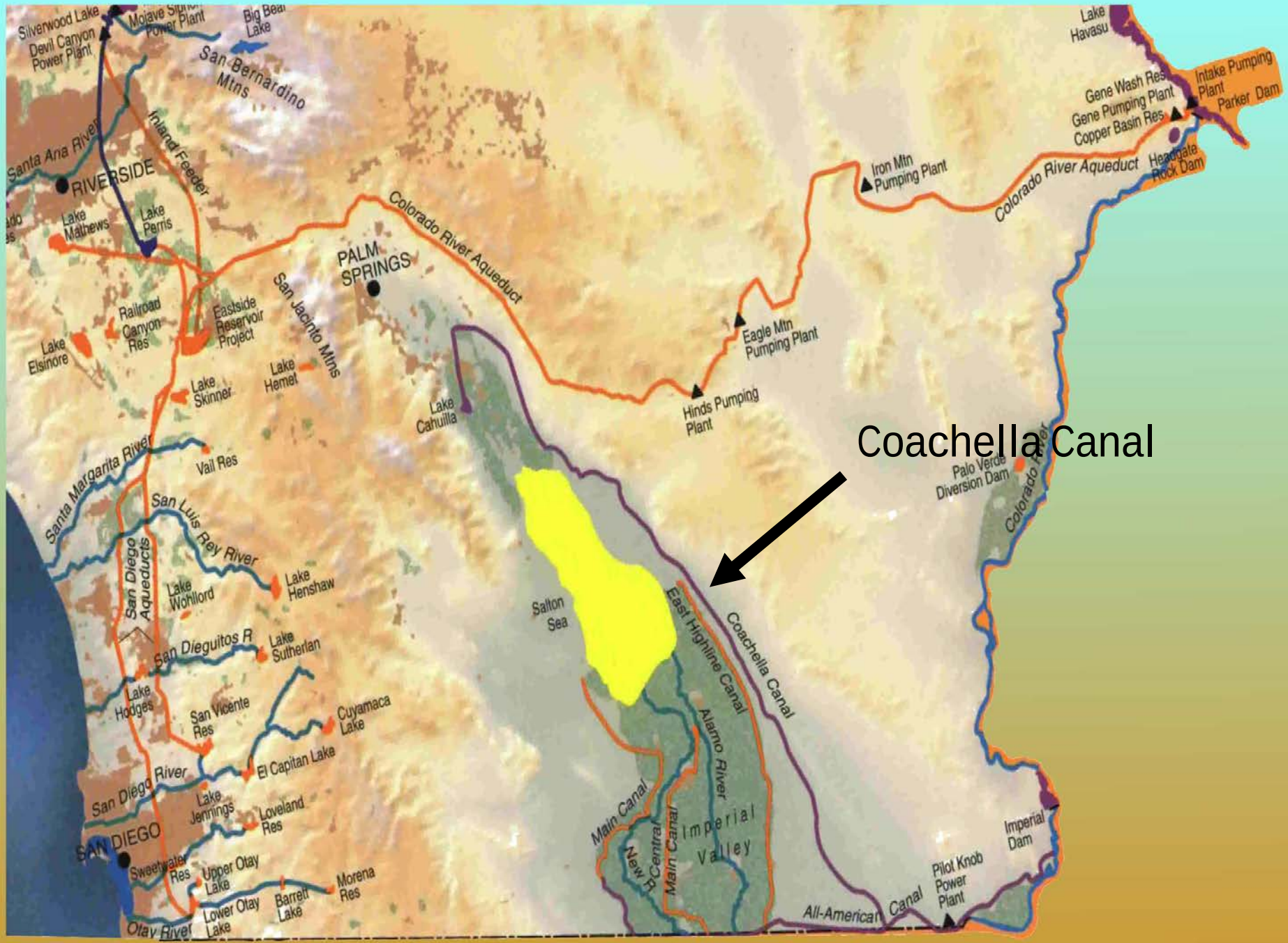
Nonpotable Water for golf courses

East Valley GC's to Colorado River water:

- Goal = 28,700 afy and in 2016 = 21,352 af

Mid Valley NPW connections:

- Goal = 52,000 afy and in 2016 = 19,769 af
  - NPW Master Plan underway

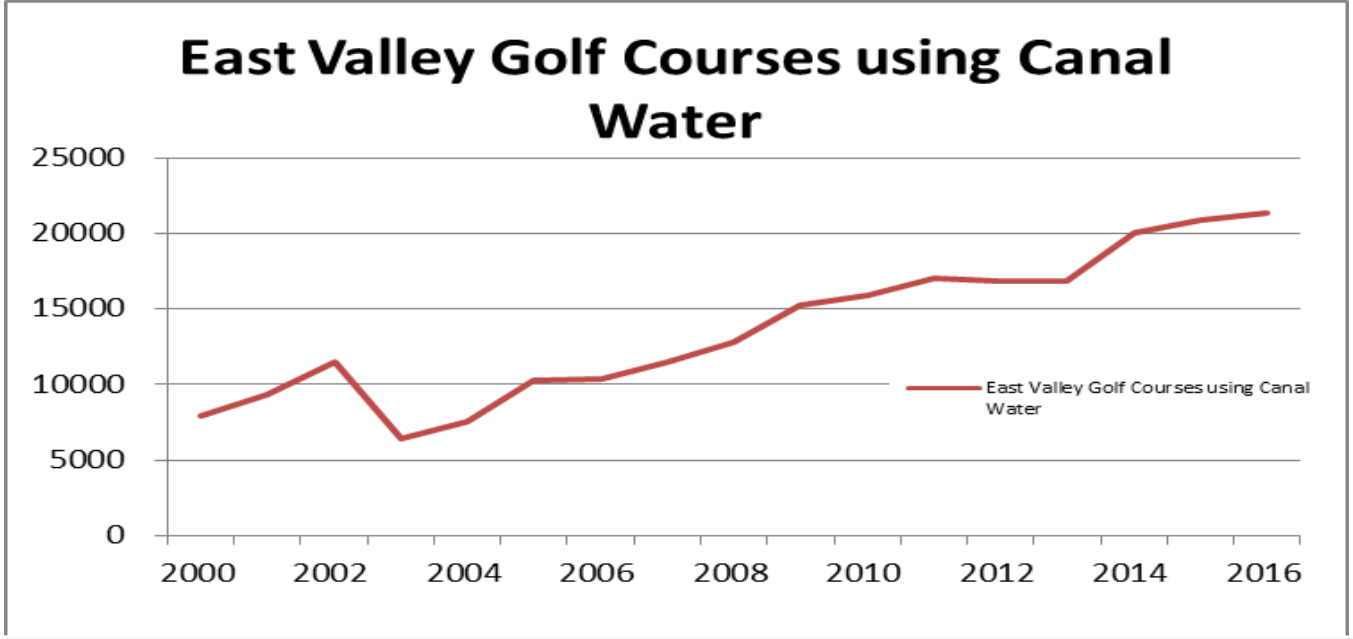

Coachella Canal
Silverwood Lake
Devil Canyon Power Plant
Mojave Siphon Power Plant
Big Bear Lake
San Bernardino Mtns
Santa Ana River
RIVERSIDE
Inland Feeder
Lake Mathews
Lake Perris
Colorado River Aqueduct
PALM SPRINGS
San Jacinto Mtns
Railroad Canyon Res
Eastside Reservoir Project
Lake Elsinore
Lake Skinner
Lake Hemet
Lake Cahuilla
Hinds Pumping Plant
Eagle Mtn Pumping Plant
Iron Mtn Pumping Plant
Lake Havasu
Gene Wash Res
Gene Pumping Plant
Copper Basin Res
Intake Pumping Plant
Parker Dam
Headgate Rock Dam
Vail Res
Santa Margarita River
San Luis Rey River
San Diego Aqueducts
Lake Wohlford
Lake Henshaw
San Dieguitos R
Lake Sutherlan
Lake Hodges
San Vicente Res
Cuyamaca Lake
El Capitan Lake
San Diego River
Lake Jennings
Loveland Res
SAN DIEGO
Sweetwater Res
Upper Otay Lake
Lower Otay Lake
Barrett Lake
Morena Res
Otay River
Salton Sea
East Highline Canal
Coachella Canal
Alamo River
Main Canal
New River
Main Canal
Imperial Valley
All-American Canal
Pilot Knob Power Plant
Imperial Dam
Palo Verde Diversion Dam
Colorado River

Conversion of golf courses to canal water

In the 2016, East Valley golf courses with access to canal water access, used 21, 352 acft which was 80 percent of demand.

Conversion to canal water by East Valley golf courses will reduce groundwater use by approximately 35,500 AFY. The 5 remaining conversions are expected to be completed by 2021.

Year	East Valley Golf Courses using Canal Water
2000	7884.1
2001	9335.6
2002	11540.6
2003	6385.1
2004	7511.3
2005	10290.3
2006	10395.7
2007	11469.7
2008	12805.9
2009	15282.9
2010	15927.8
2011	17076.7
2012	16873.2
2013	16828.6
2014	20053.5
2015	20883.2
2016	21351.8



New Connections :

1988	PGA West
1994	Indio Muni
1996	Plantation
1997	Traditions
1998	The Hills (Terra Lago)
1999	Heritage Palms
2000	The Palms
2001	Hideaway
2002	Trilogy, PGA West Weiskopf
2005	Silver Rock
2006	Outdoor Resort, PGA-Norman, Ranch La Quinta, Shadow Hills (front nine)
2007	Mountain View, Vineyards, Andalusia, Shadow Hills (back nine), Madison
2010	Indian Palms
2014	Indian Palms (2nd connection)
2016	La Quinta CC, La Quinta Resorts Dunes
2018	La Quinta Resorts Mountain

Recycled Water

- Recycled water has been a water supply source in the Valley since 1965 at Palm Desert Country Club. CVWD acquired this WRP in 1968.

- CVWD has 5 wastewater treatment plants, 2 that provide recycled water for golf course and landscape irrigation.

- CVWD delivers disinfected tertiary recycled water for golf course and landscape irrigation.

Municipal wastewater collected from homes and businesses that receives a high level of treatment at a water reclamation plant. It is monitored 24/7, water quality samples are collected and tested to ensure permit regulation limitations are met, so that it can safely be beneficially reused. It is no longer considered wastewater.


KIMAX
NO. 19000
1 LITER
KIMAX
NO. 19000
1 LITER
KIMAX
NO. 19000
1 LITER
INFLUENT
EFFLUENT
(RAW
SEWAGE)
SECONDARY
EFFLUENT
TERTIARY
EFFLUENT
(RECLAIM)
POTABLE
WATER
(DOMESTIC)


KROHNE

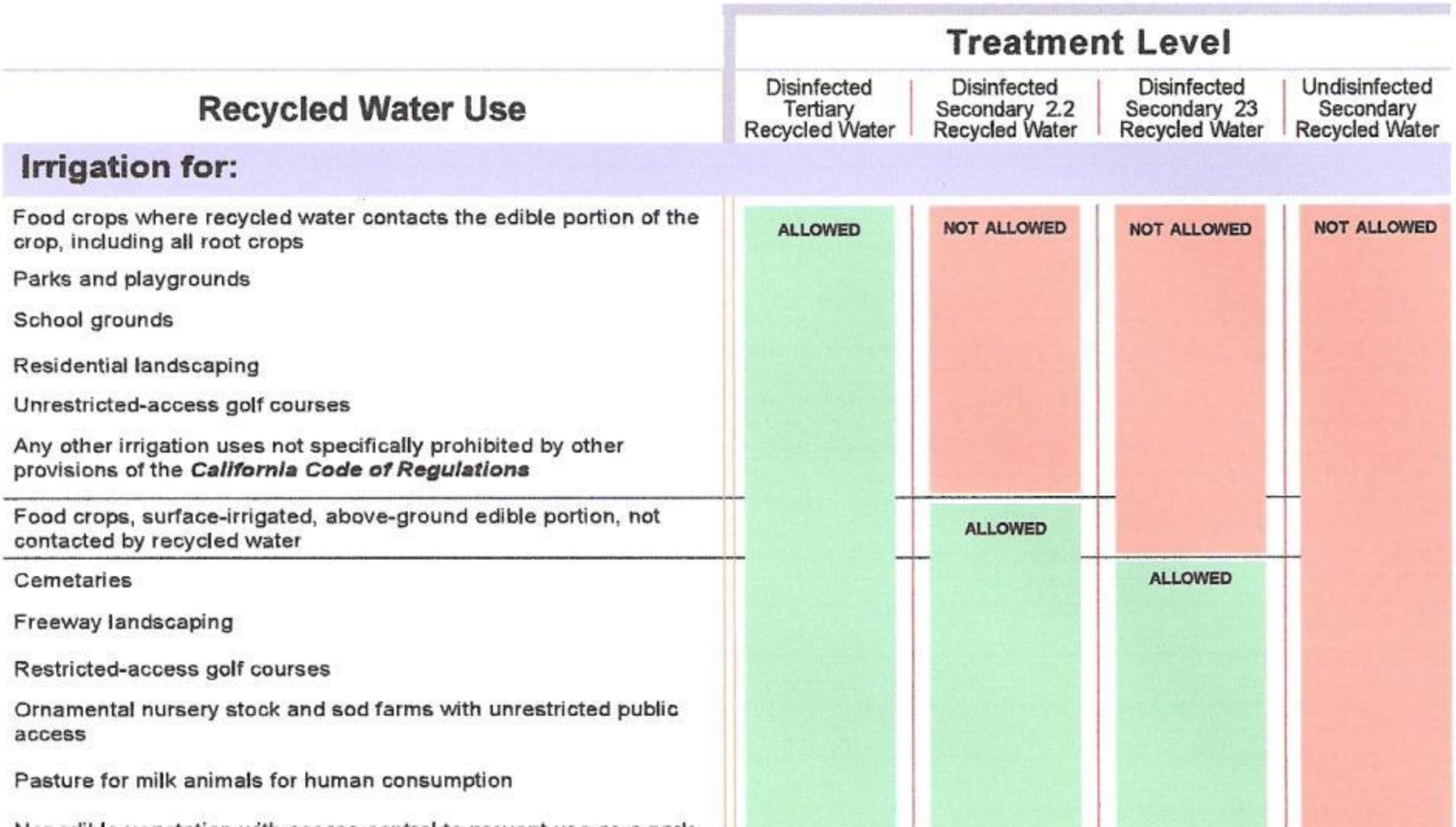
Why Do We Recycle Water in Coachella Valley?

- CVWD adopted and is implementing the CVWMP to eliminate overdraft, listed as source substitution for golf courses.
- Irrigating with Recycled water saves groundwater.
- Treatment technology can produce a safe recycled water for any given use.
- Recycled water is a reliable local water supply for irrigation.
- RW is economical—counting all of its benefits.
- Recycled water percolation is highly regulated and will soon require significant upgrades to the WRP treatment process, unless we find a home for it elsewhere…golf courses.
- More affordable to connect golf courses to recycled water than to complete these significant upgrades at the WRP.

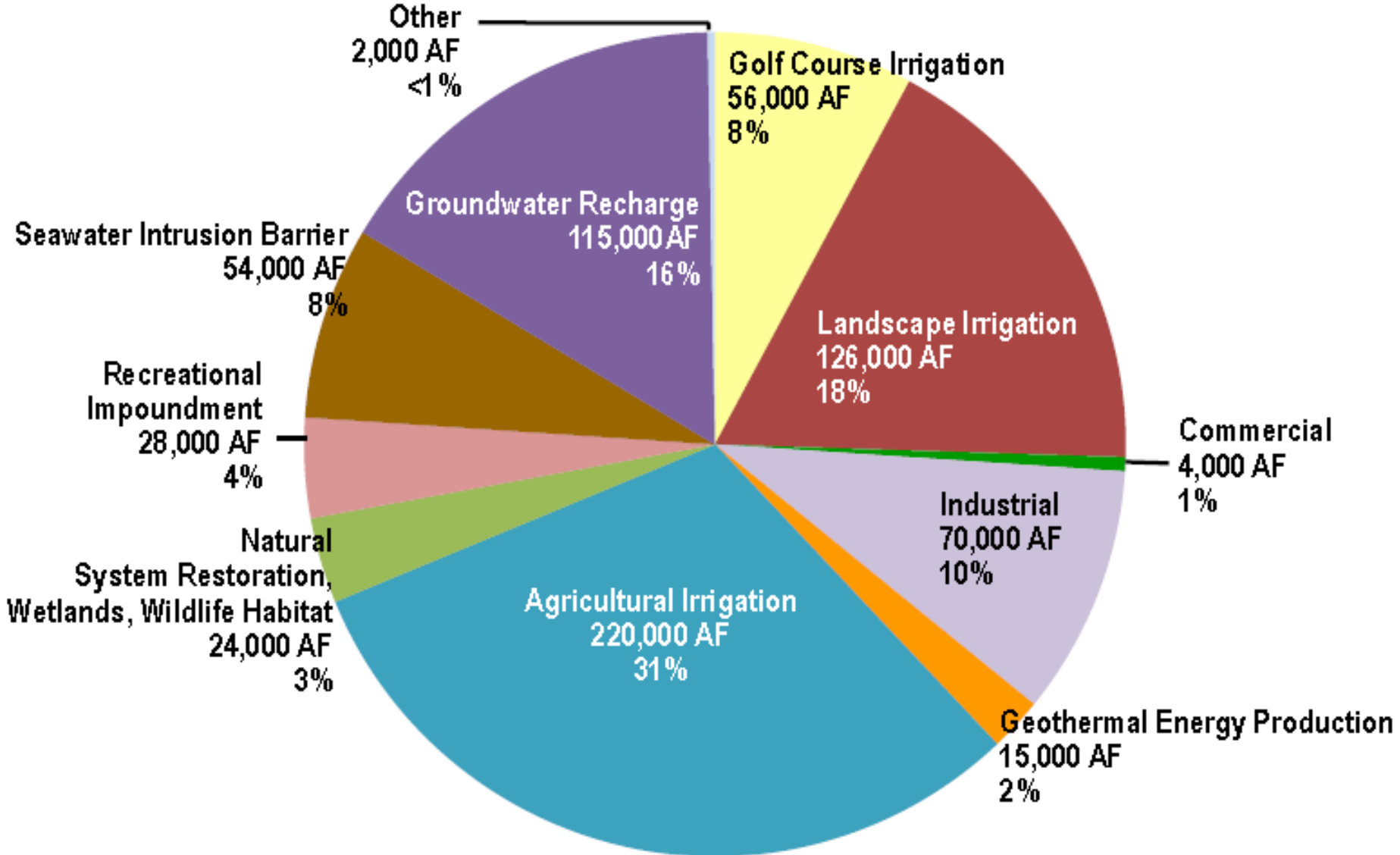
Recycled Water in California

- First use of recycled water in California, 1903
- 300 Water Reclamation Plants
- 5,000 Sites using recycled water
- Over 700,000 acre-feet annually
- Legislative goal:
  - 1.o MAFY More by 2020
  - 2.0 MAFY More by 2030
- Nearly all nonpotable uses can utilize recycled water
- 43 specific uses are allowed

Allowed Uses of Recycled Water



2015 Recycled Water Use: 714,000 acre-feet/881M cubic meters



Recycled Water Use in Coachella Valley

Golf Course and landscape irrigation:

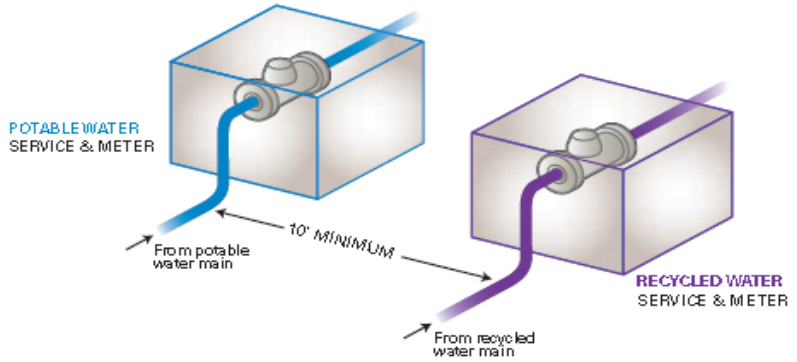
- **Golf Courses**
- **Home-Owner Associations (HOAs)**
- **High-School Athletic Fields**
- **Landscaped areas at CVWD's Palm Desert offices and WRPs.**

Rules and Regulations

- Dos and Don’ts
- Training
- Permit
- Agreement
- Purple
- Signs
- Public notification
- Cross-connection Test
- Annual Survey
- Monitoring and Reporting

WATER DISTRICT

Recycled Water Program

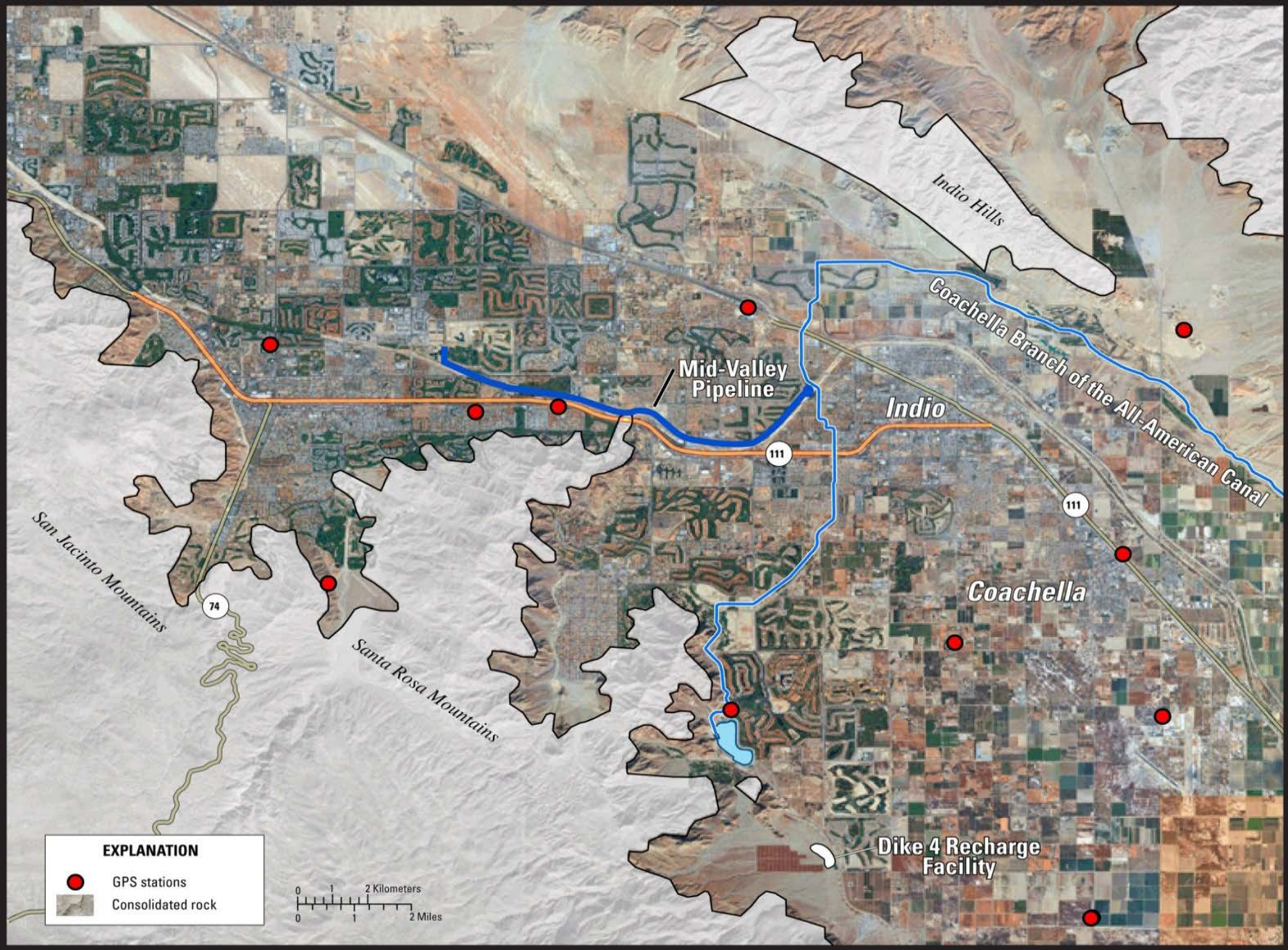


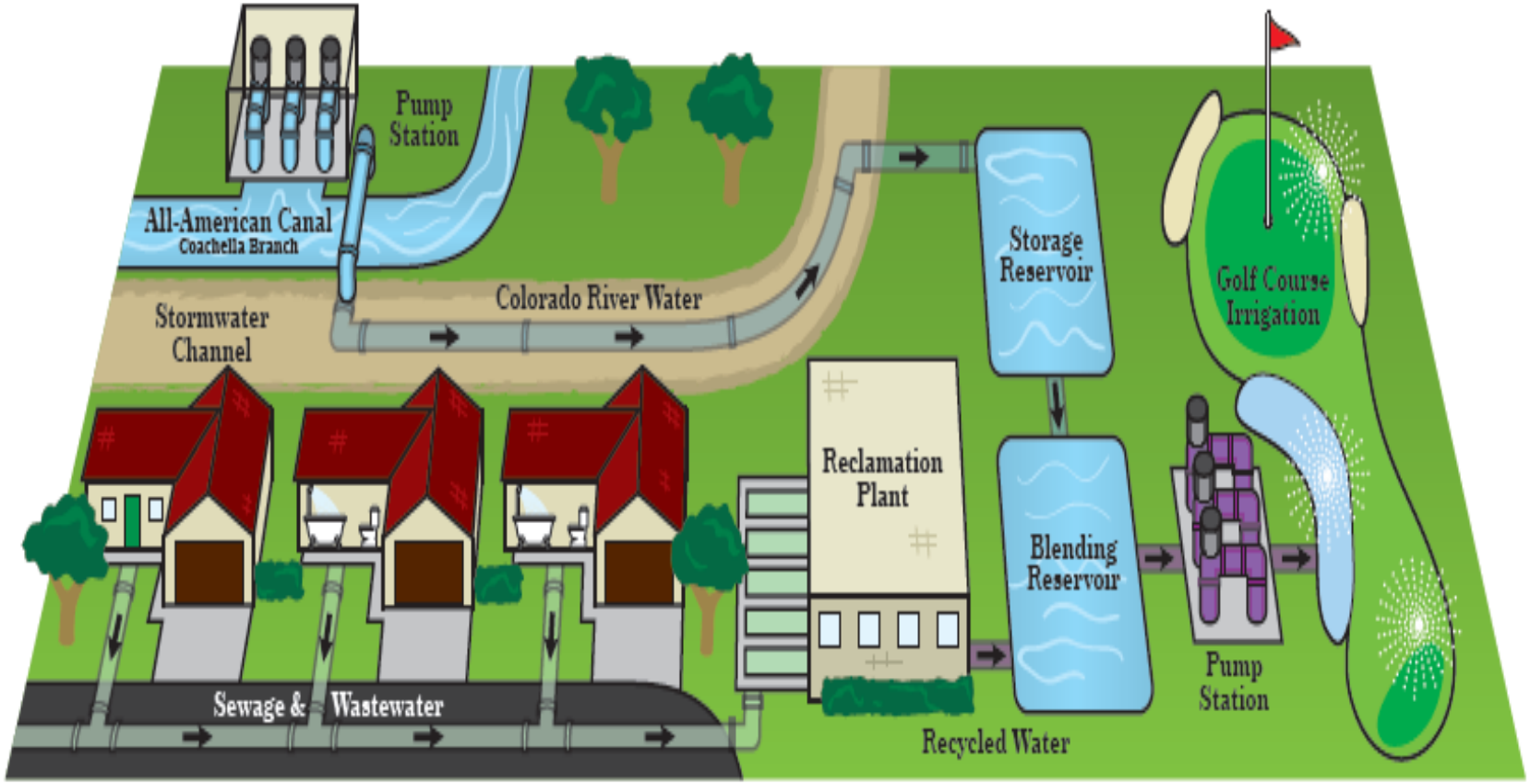
Not enough recycled water

- Recycled water supply is not a sufficient water supply for all golf courses in the mid-valley area.
- Recycled water supply runs out in the summer and golf courses would supplement with groundwater.

Mid-Valley Pipeline In-Lieu Project

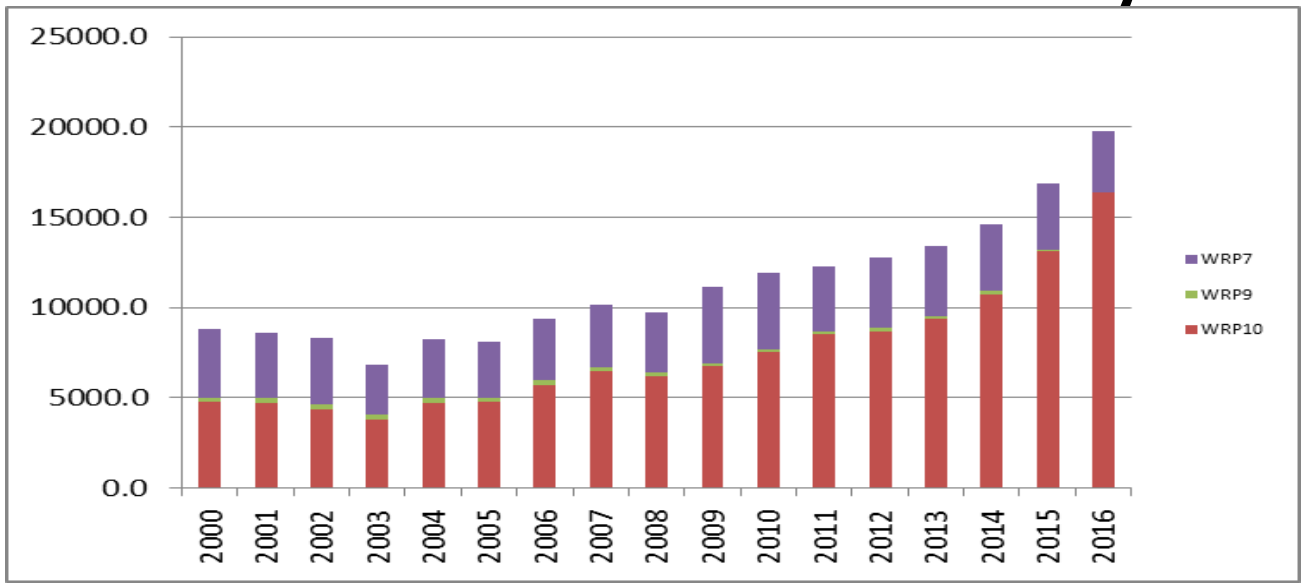
- The MVP delivers canal water to WRP10. Completed in 2009. 7 mile, 54” pipeline of welded steel with cement mortar lining in the wash.
- Canal water supplements the recycled water supply and provided to golf courses in lieu of their pumping groundwater.
- Completion of the MVP system after 2027 to provide up to 37,000 AFY of Canal water and 15,000 AFY of WRP10 recycled water to Mid-Valley golf courses.
- In 2016, CVWD provided 19,769 acft of nonpotable water (which includes 9,026 acft of recycled water) to golf courses in the mid-valley area. Meeting 93% of their demand.


Indio Hills
Coachella Branch of the All-American Canal
Mid-Valley Pipeline
Indio
111
111
74
San Jacinto Mountains
Santa Rosa Mountains
Coachella
Dike 4 Recharge Facility
EXPLANATION
GPS stations
Consolidated rock
0 1 2 Kilometers
0 1 2 Miles


Pump Station
All-American Canal
Coachella Branch
Colorado River Water
Stormwater Channel
Storage Reservoir
Golf Course Irrigation
Reclamation Plant
Blending Reservoir
Pump Station
Sewage & Wastewater
Recycled Water

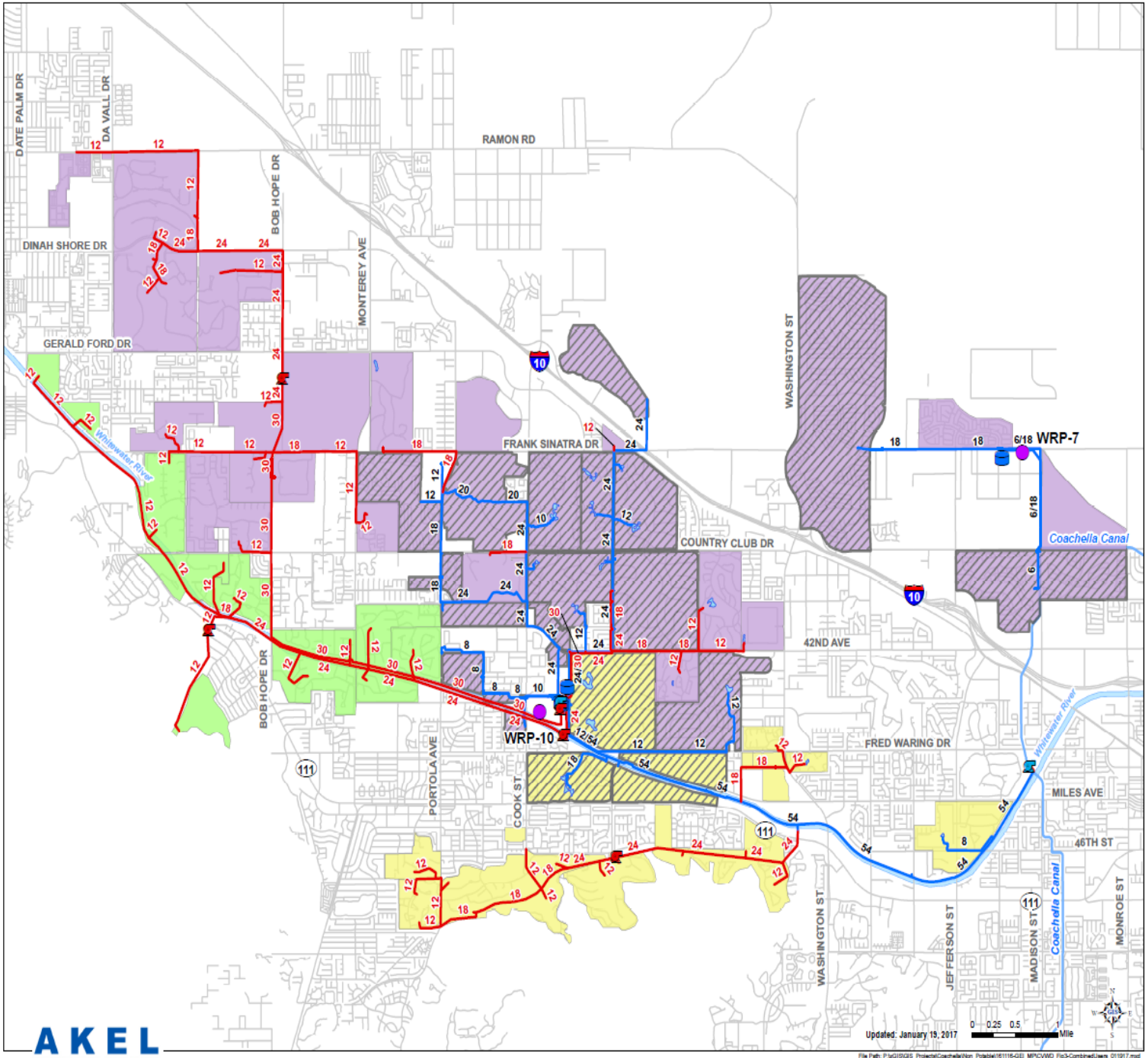
Nonpotable Water use in Mid-Valley

Year	total
2000	8831.9
2001	8565.2
2002	8299.4
2003	6844.2
2004	8208.9
2005	8109.3
2006	9342.7
2007	10127.0
2008	9750.2
2009	11162.6
2010	11915.5
2011	12281.2
2012	12756
2013	13385
2014	14602
2015	16876
2016	19796



New Connections :

1968	Palm Desert Country Club
1987	Santa Rosa, Palm Desert Greens, Portola CC
1991	Golf Center, Marriott Desert Springs, Vista Del Montanas, Silver Sands, Casa Blanca
1992	West Coast Turf
1993	Sunrise
1994	Indian Ridge CC
1996	Palm Desert High School
1997	Sun City Palm Desert, Desert Willow
1998	Mountain View Falls
2006	Toscana, Shadow Hills
2012	CVWD's PDA & PDO, Indian Wells Golf Resort
2014	Classic Club, Palm Desert CC (remaining)
2016	Desert Horizons, Lakes CC, Avondale
2017	Desert Falls, Palm Valley Country Club



Legend

Future Improvements

- Pump Stations
- Non-Potable Pipelines

Future Users by Source

- Blended Water
- MVP
- MVP Extension

Existing System

- Water Reclamation Plant
- Bladder Reservoirs
- Pump Stations
- Non-Potable Pipelines

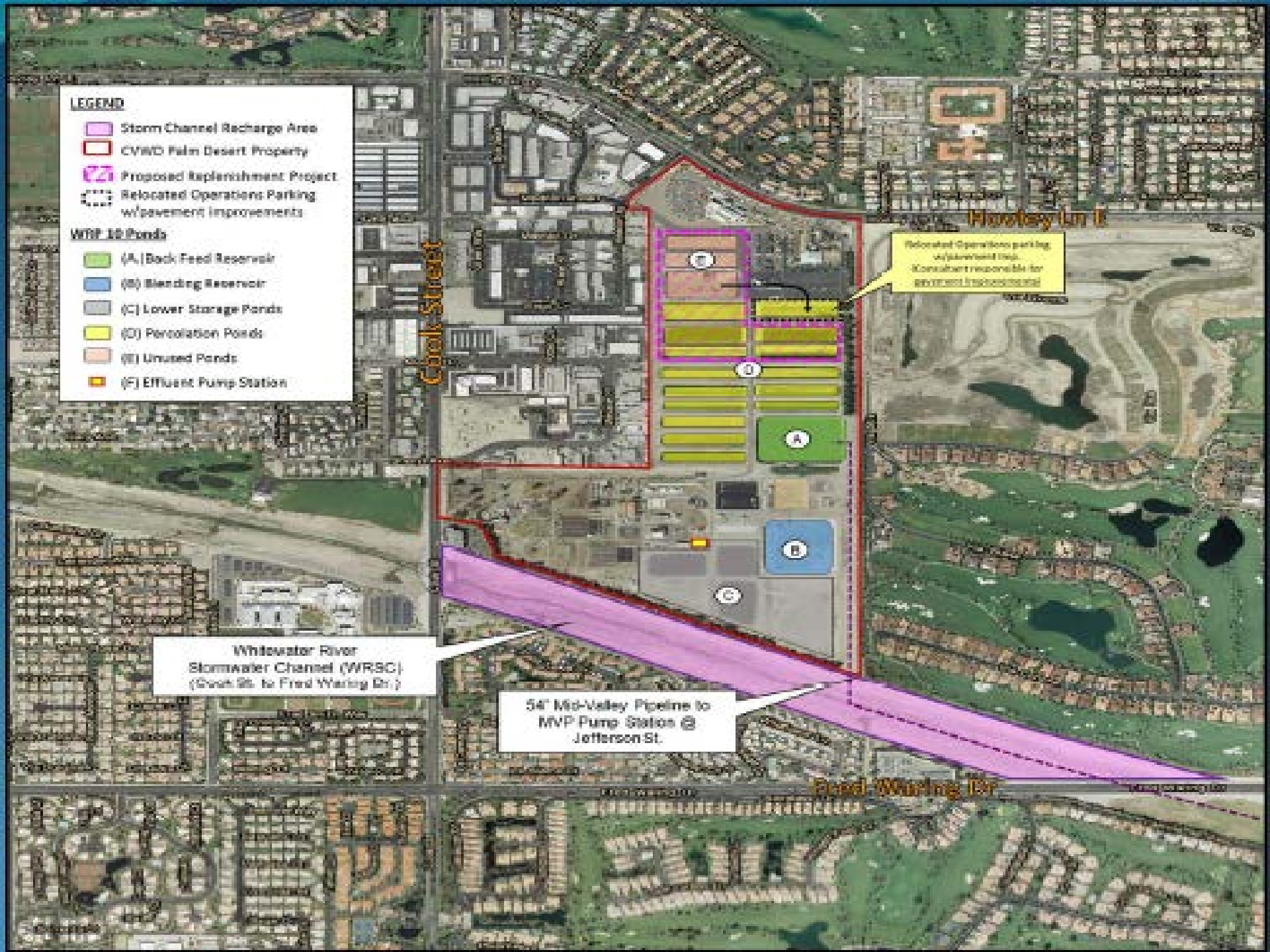
Existing Users by Source

- Blended Water
- MVP
- Street Centerlines
- Coachella Canal
- Whitewater River

PRELIMINARY

Figure 3
Existing and Future System by Source
Non-Potable Water System Master Plan
Coachella Valley Water District

AKEL ENGINEERING GROUP, INC.


LEGEND
Storm Channel Recharge Area
CVWD Palm Desert Property
Proposed Replenishment Project
Relocated Operations Parking w/pavement improvements
WRP 10 Ponds
(A) Back Feed Reservoir
(B) Blending Reservoir
(C) Lower Storage Ponds
(D) Percolation Ponds
(E) Unused Ponds
(F) Effluent Pump Station
Cook Street
Hovley Ln E
Relocated Operations parking w/pavement imp.
Consultant responsible for
Whitewater River
Stormwater Channel (WRSC)
54" Mid-Valley Pipeline to
MVP Pump Station @
Jefferson St.
Fred Waring Dr

Replenishment - West Valley	17/18 Proposed Budget	18/19 Proposed Budget	19/20 Proposed Budget	20/21 Proposed Budget	21/22 Proposed Budget	Out Years
Replenishment - West Valley						
Marriott Shadow Ridge Connection	X					
Marriott Desert Springs North Course Connection	X					
Desert Falls Country Club Connection	X					
Palm Desert Resort Country Club Connection		X				
The Oasis Country Club Connection		X				
Woodhaven Country Club Connection		X				
Desert Island Country Club Connection			X			
Indian Wells Tennis Garden Connection			X			
Rancho Mirage Country Club Connection			X			
Southwest Community Church			X			
Springs Country Club Connection			X			
Annenberg (aka Sunnylands) Golf Club Connection				X		
Tamarisk Country Club Connection				X		
Mission Hills Country Club Connection					X	
Outdoor Resort RV Park Connection					X	
Suncrest Country Club Connection					X	
Westin Mission Hills Country Club Connection					X	
El Dorado Country Club -Deep Canyon Branch						X
Palm Springs Cemetery Connection						X
Indian Wells Country Club (Cove and Classic) - Deep Canyon Branch						X
La Rocca Condominiums Resort (Indian Wells)						X
Chaparral Country Club Connection						X
Date Palm Country Club Connection						X
Marrakesh Country Club						X
Marriott Rancho Las Palmas Connection						X
Monterey Country Club Connection						X
Morning Side Country Club Connection						X
Porcupine Creek Connection						X
Shadow Mountain Country Club						X
Sunrise Country Club Connection						X
Thunderbird Country Club Connection						X
Vintage Country Club -Deep Canyon Branch						X
Replenishment - East Valley	**17/18 Proposed Budget**	**18/19 Proposed Budget**	**19/20 Proposed Budget**	**20/21 Proposed Budget**	**21/22 Proposed Budget**	**Out Years**
Replenishment - East Valley						
PGA West Weiskopf Golf Course Connection				X		
Bermuda Dunes Country Club Connection	X					
Palm Royal Country Club			X			
Eagle Falls Golf Course Connection			X			
Rancho Casa Blanca Golf Course Connection			X			
The Quarry Country Club Golf Course Connection				X		
Indian Springs Golf Club Connection	X					
Shadow Hills North Course			X			

NPW Connections

Why would a golf course connect?

- There is no fiscal impact to irrigate with nonpotable water.
- Rate is equal to or less than their alternative water source. (RAC + PC).85 = NPWC
- Cost difference is meant to go towards purple pipe and signs, water and soil amendments, sprinkler heads, lake management, etc.
- Nutrients serve as fertilizer.
- To be in line with the CVWMP.

Golf courses using nonpotable water will allow potable water to be available for potable uses.

Estimated annual use of water is 1000 acft / year per golf course

1000 AFY x 121 golf courses= 121,000 AFY

30.5 golf courses in the east valley have access to canal water and 5 are focused on for future canal water use.

1000 AFY x (30.5 golf courses + 5 golf courses) = 35,500 AFY

23.5 golf courses in the mid-valley use nonpotable water.

1000 AFY x 23.5 golf courses = 23,500 AFY

6 golf courses in upper valley (DWA) use recycled water.

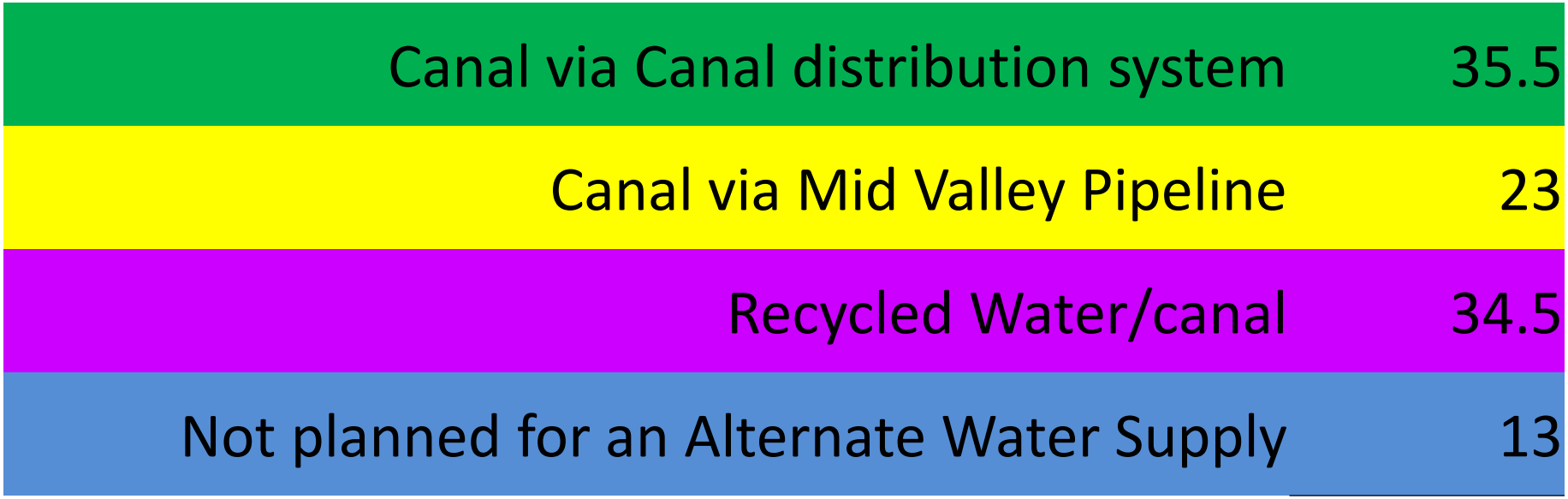
1000 AFY x 6 golf courses = 6,000 AFY

The future Mid-Valley Pipeline Project, includes 34 golf courses in mid-valley to use recycled/canal water blend

1000 AFY x 34 golf courses = 34,000 AFY

121,000 AFY – 35,500 AFY – 23,500 AFY - 6,000 AFY – 34,000 AFY = 22,000 AFY

When build out is complete…



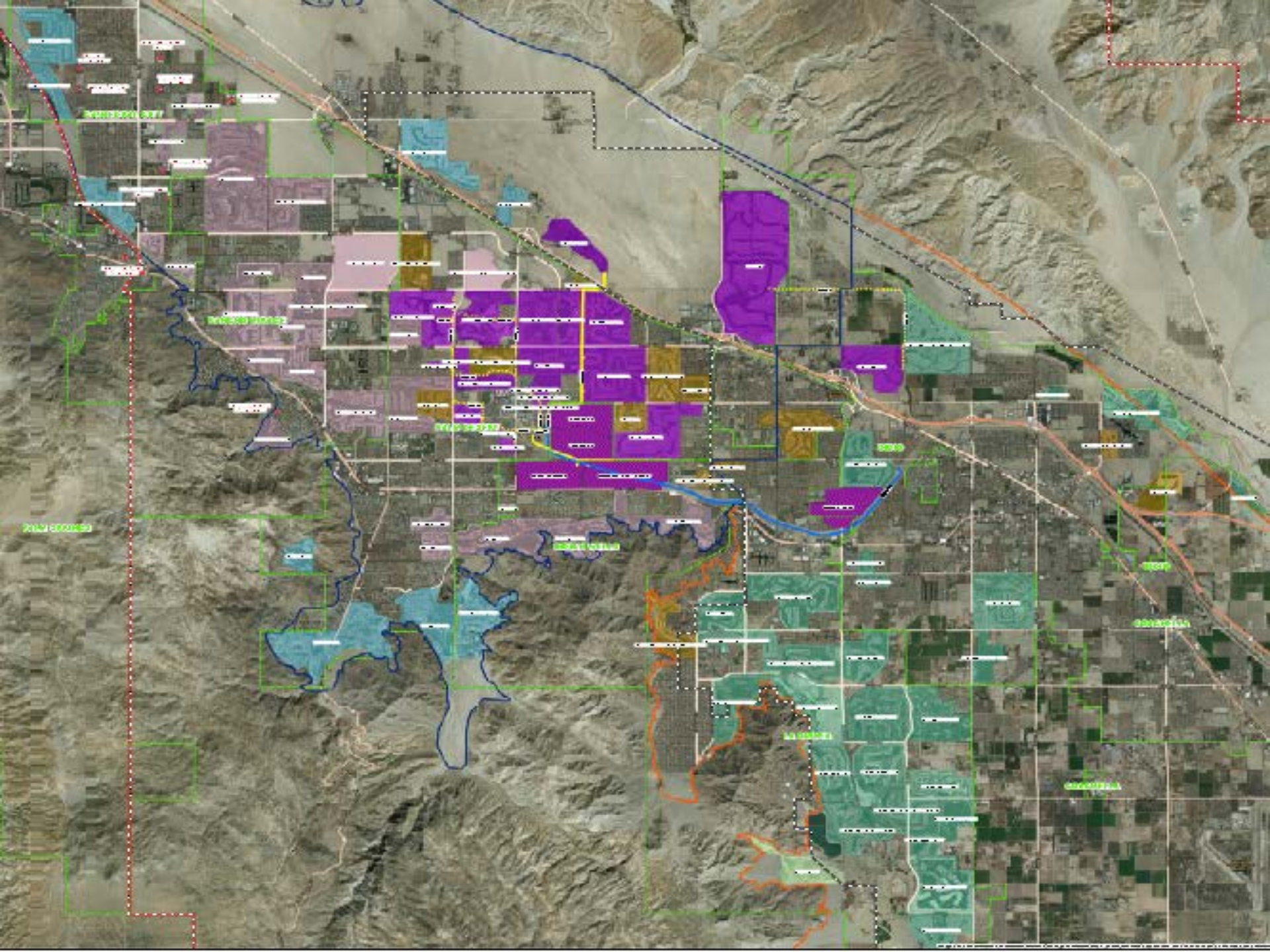
Total Golf Courses:	106
Alternate Water Source:	93
Per Cent Using Alternate Water Source:	88%

Thank you

Olivia Bennett

Nonpotable Water Operations Manager

Recycled Water Program



Recycled Water Quality Across California (in ppm)

	CVWD Coachella Valley	MNWD Orange Co	SFPUD San Francisco	LADWP Los Angeles	OMWD San Diego County
Chloride	85	226	55	43	381
Sodium	81	190	68	91	231
Calcium	48	140	21	58	67
Magnesium	9	60	8	26	35
Nitrogen	≤15	42	NR	7	11
Bicarbonate	130	195	216	196	172
EC	**0.70**	**1.8**	**0.7**	**0.9**	**1.5**
TDS	**445**	**1140**	**462**	**610**	**979**
SAR	**4.5**	**6.0**	**3.2**	**2.5**	**5.7**

Relationship between TDS / EC: 640 PPM = 1.0 dS/m

Quality Range of Coachella Valley Irrigation Sources in PPM

	Groundwater	Canal	Recycled Water
Chloride (Cl)	8-203	110-120	84-110
Sodium (Na)	22-124	110-130	70-87
Calcium (Ca)	47-87	80-90	36-58
Magnesium (Mg)	23-197	29-33	9-12
Nitrogen (N)	**0-27**	**<2**	**8-22**
Phosphorous (P)	NA	0	<3
Potassium (K)	**NA**	**3-7**	**10-20**
Bicarbonate (HCO3)	34-172	170-188	83-150
EC (dS/m)	**0.1 - 1.43**	**1.1-1.2**	**0.66-0.80**
TDS (PPM)	**120-915**	**690-830**	**420-480**
SAR	**1.3-5.2**	**2.9-6.4**	**4.1-5.1**