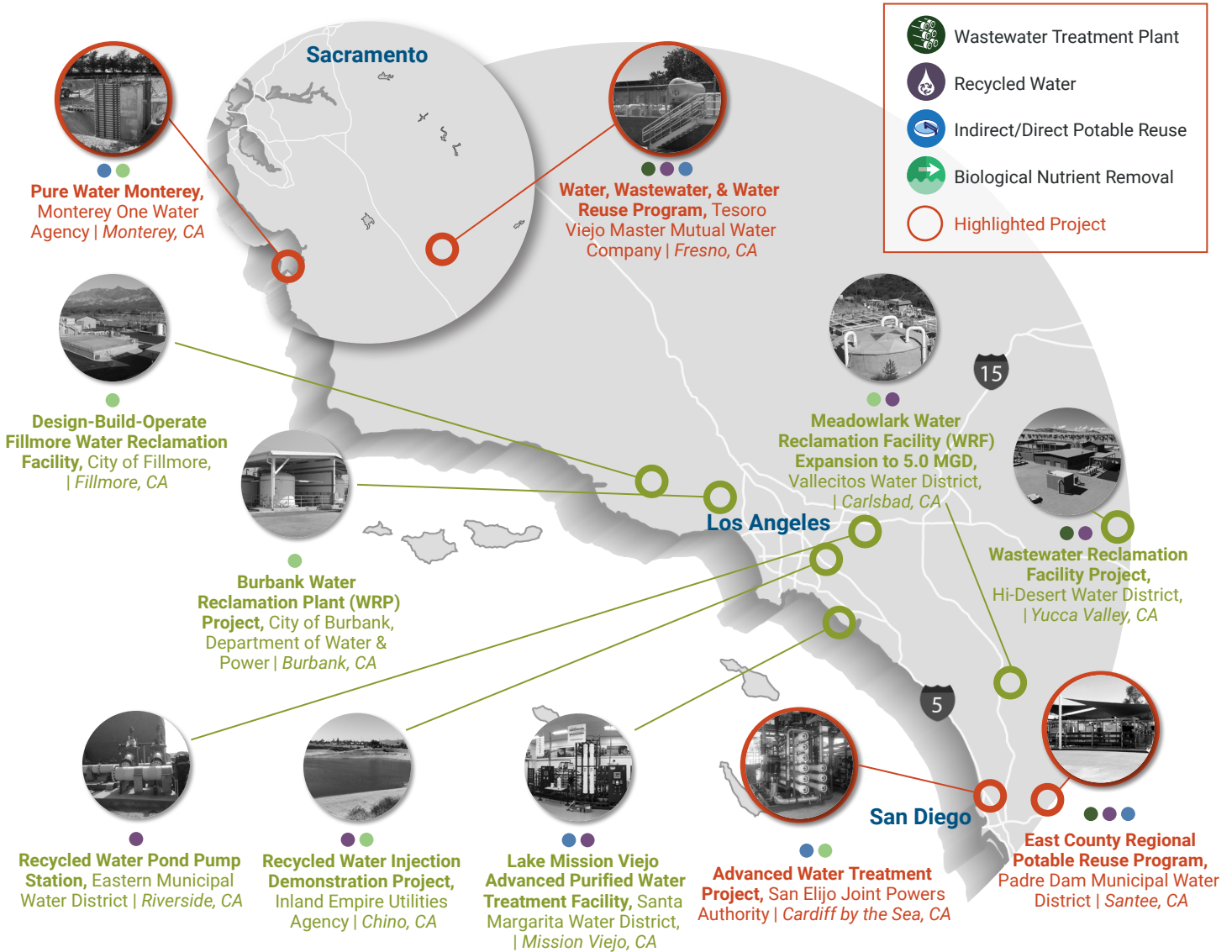


Potable Reuse Experience

EXPERIENCE PLANNING, DESIGNING AND IMPLEMENTING POTABLE REUSE

The following map highlights our team's experience on similar sized potable reuse projects in California.



KENNEDY JENKS RECEIVES AWARD FOR ENGINEERING EXCELLENCE

Kennedy Jenks was awarded the 2017 Engineering Excellence Award from the American Council of Engineering Companies (ACEC) in recognition of excellence in engineering provided for the **Padre Dam Municipal Water District's Advanced Water Purification Demonstration Project**. Completed by our proposed team, Kennedy Jenks provided engineering services in the creation of a reduced-scale facility that has provided:

1. A means for successfully demonstrating the viability of an innovative treatment process to meet Title 22 regulations for groundwater recharge and recovery and emerging regulations for surface water augmentation.
2. Opportunity for training Padre Dam Operations Staff.
3. Testing of the emerging technologies for brine minimization prior to full scale implementation.
4. A means for engaging and educating the public through guided tours and events held at the demonstration facility visitor center.



EAST COUNTY REGIONAL POTABLE REUSE PROGRAM

Padre Dam Municipal Water District | Santee, CA



TEAM MEMBERS INVOLVED:

Steve Diamond – AWP Facility Lead
Pat Huston – Project Director;
Client Manager
Corey Young – Project Manager
Todd Reynolds – QA/QC
Jean DeBroux – QA/QC
Joe Wojslaw – QA/QC
Janet Hoffman – Cost Estimating
Sachi Itagaki – Grant Funding
David Seymour – Process Modeling
Dawn Taffler – Title 22 ENG Report,
Project Portal, Budgeting Support
Ryan Huston – Project Administration,
AWP Pipeline Study
Mark Preston – Architectural Lead

DURATION: 2011 – Ongoing

RELEVANT FEATURES:

- 15 mgd AWT Facility (MF/RO, UV-AOP) for groundwater recharge/reservoir augmentation
- Awarded the 2017 Engineering Excellence Award from the American Council of Engineering Companies (ACEC)
- Program Management/Preliminary Design
- CEQA compliance
- Regulatory approval
- Startup, operation and commissioning with AWT demonstration facility
- SRF Funding
- Public Outreach

USING ADAPTIVE MANAGEMENT STRATEGIES TO DEVELOP A LOCAL POTABLE REUSE PROGRAM

Kennedy Jenks has been providing program management and engineering services for this innovative three-phase **\$500M potable reuse program** for Padre Dam Municipal Water District and its East County Partners since 2011.

Kennedy Jenks performed a comprehensive feasibility study of alternatives for providing up to 15 mgd of potable reuse water for groundwater recharge and reservoir augmentation to provide a new local water supply source, funded in part by a SWRCB Recycled Water Planning Grant.

Kennedy Jenks led the **design of an advanced water treatment demonstration facility** capable of producing 100,000 gpd of MF/RO product water and Advanced Oxidation Process product meeting regulatory requirements for groundwater recharge and recovery, which has been in operations since 2015.

The pilot plant tested state-of-the-art treatment technologies to demonstrate a sufficient combination of redundancy, monitoring, and failure response to reliably provide pathogen control disinfection with free chlorine disinfection.

The Program is currently in the preliminary design phase and the Kennedy Jenks Team is preparing the necessary engineering studies and predesign documents, providing permitting and regulatory coordination, financial management assistance and stakeholder outreach support with the primary purpose to achieve CEQA compliance and support of regulatory approval. Kennedy Jenks is leading the **preliminary design to expand the water reclamation facility, optimize advance treatment facility and conveyance elements, explore brine disposal and solids handling solutions, and pursue energy recovery opportunities.**

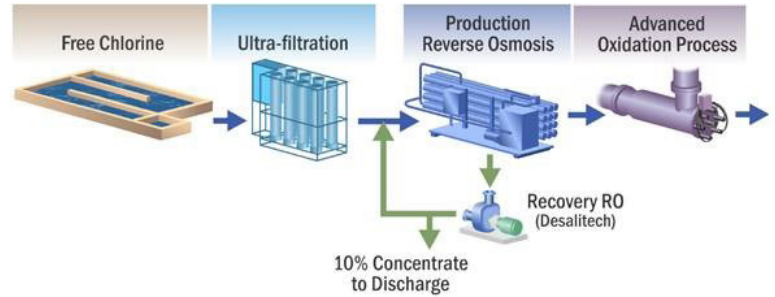
“Since 2011, Kennedy Jenks have provided highly effective engineering, design, construction support, and start-up services to the District. Services for this project were completed on time and within budget. The District couldn’t be more pleased with their performance.”

– Albert Lau, Director of Engineering & Planning
Padre Dam Municipal Water District

Advanced Water Purification Demonstration Project - Innovative Technologies for Treatment and Regulatory Compliance

UTILIZING FREE CHLORINE TO COMPLIMENT THE AWP TREATMENT PROCESS

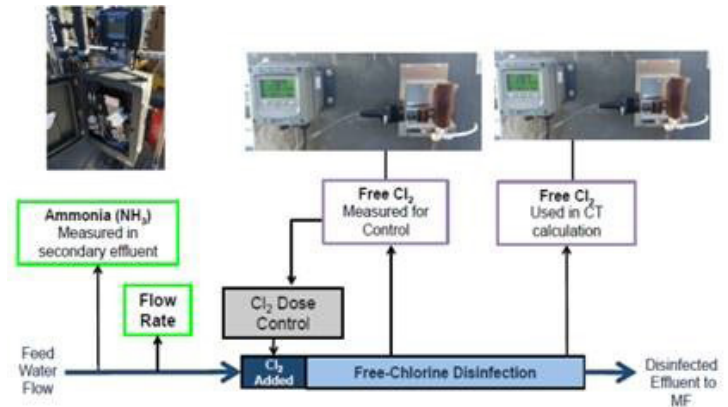
The AWP Demo Plant evaluated the performance of advanced treatment unit operations in achieving the pathogen control and removal of a suite of regulated and other chemicals of concern to meet IPR requirements. While a long-standing practice in drinking water, free chlorine disinfection (FC) is not credited in recycled waters unless demonstrated in accordance with the California State Water Resources Control Board (SWRCB) Division of Drinking Water (DDW) requirements. Hence, the AWP Demonstration Plant was set up, with a primary goal of demonstrating the effectiveness of a FC system for recycled water.



AWP Demonstration Plant

INNOVATIVE TREATMENT OPTIMIZATION: CHLORINE DOSING AND AMMONIA CHALLENGE TEST

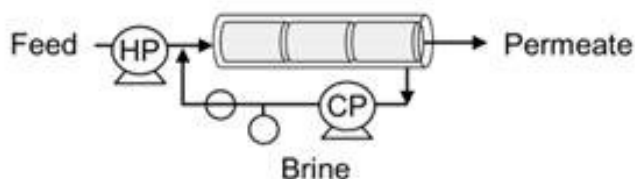
One of the key advancements made during this project was the implementation of a control system to effectively respond to ammonia inputs into the system. The ability of the control system—which utilized both **feed-forward** and **feed-back controls**—to provide a continuous free chlorine residual was demonstrated through challenge testing. The testing demonstrated that the system provides a high degree of protection against viruses even in the presence of ammonia.



Chlorine disinfection monitoring & control diagram

STATE-OF-THE-ART BRINE MINIMIZATION SOLUTIONS

Another significant challenge is to find a sustainable strategy for residuals management. This is particularly important for brine disposal given that Padre Dam is an inland facility and the RO processes generate significant amounts of brine flow. The AWP Demo Project explored a state-of-the-art technologies to decrease brine using an alternative design and operational mode called **Closed Circuit Desalination (CCD)** developed by Desalitech, Inc., which has been shown to significantly increase recoveries. Our team is currently leading technology validation with DDW.



Desalitech Pilot Closed Circuit Desalination System and Conceptual sketch of a typical CCD system

PURE WATER MONTEREY

Monterey One Water Agency, Monterey, CA



TEAM MEMBERS INVOLVED:

Steve Diamond – AWT Lead
Janet Hoffman – Cost Estimates
Jeff Morris – Electrical
Joe Wojslaw – QA/QC
Jean Debroux – QA/QC
Todd Reynolds – Project Manager
Melanie Tan – O&M Design Review
Sachi Itagaki – Permitting
Mark Preston – Architecture
Kim Sloat – CMAR Proc Docs,
Guaranteed Max Price
Negotiations, ESDC/Startup
Paul Chau – Engineering Support

DURATION: 2016 – 2017

RELEVANT FEATURES:

- Fast-track design
- Advanced treatment facility including ozone, ultrafiltration, reverse osmosis, UV-AOP, and product water stabilization
- 3-D design and Operations focused workshops
- Pre-procured the Ozone, MF and RO, UV-AOP equipment
- Supported CEQA permitting and DDW Engineering Report
- Medium voltage (21 kV) power system
- Fully automated controls system

Monterey One Water (M1W) and Monterey Peninsula Water Management District have partnered to create Pure Water Monterey, a \$115M groundwater replenishment project. Kennedy Jenks led the planning, design, and permitting support for the Pure Water Monterey Program and worked closely with the project partners, regulators, funding agencies, and stakeholders. Kennedy Jenks successfully delivered the 30% design for the AWPf in just 12 weeks to meet the client's aggressive schedule and to help confirm project concepts and costs for State Revolving Fund and California Public Utilities Commission approval. **The 4 MGD AWPf is designed for future expansion to 6.5 MGD** and the treatment processes include ozone pre-oxidation, microfiltration, reverse

osmosis, UV advanced oxidation, and post-treatment stabilization processes.

The AWPf is currently in construction with an expected startup date in November 2019. Kennedy Jenks is currently leading engineering support services during construction which includes facility start-up, testing and training.

Parallel to the AWPf design work, our team led the design of the conveyance system and GWR injection well facilities, including optimizing pump station design and operational criteria, conducting hydraulic analysis, and performing injection well modeling—also delivered on a fast-track schedule. The project aims to deliver purified water in 2019.

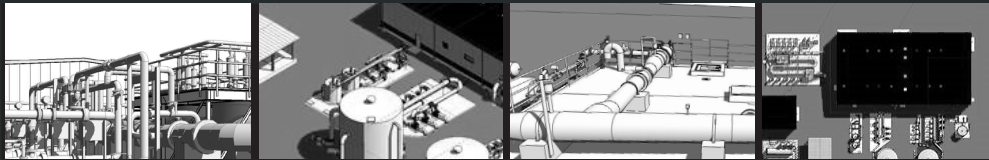
“Kennedy Jenks performed very well during the 8 month, fast-track design of our unique 5.0 mgd Advance Water Purification Facility and Product Water Pump Station. We were particularly impressed with the way they collaborated with our O&M Staff during design. Their use of 3D design tools and facilitation of design development meetings led to a very efficient review process. They also provided corporate level oversight, and brought forward ideas and suggestions on a variety of permitting, funding and delivery considerations that helped us manage risks and bring together this program. We would recommend Kennedy Jenks to anyone considering a similar project.”

– Paul Sciuto, General Manager Monterey One Water Agency

Designing with the End in Mind: O&M

3D VIRTUAL WORKSHOPS

Feedback from your O&M staff is essential to avoid incurring additional costs during and after construction and to provide a safe and efficient environment to work in. On a fast-track design schedule, this additional burden can be overwhelming. To facilitate reviews and feedback from O&M, for M1W we leveraged design review workshops using 3D renders to quickly communicate design concepts and features. Compared to reviewing over 300 sheets of drawings and 1,000 pages of specifications we found a greater rate and quality of feedback through our workshop using virtual walk-throughs.



Facilitating decision-making is a critical, and often overlooked, component to maintaining a design schedule. Using 3D design allows virtual walk-throughs to quickly communicate design concepts that can promote comfortable and valuable feedback about the design.

STARTUP, COMMISSIONING, & TRAINING

Startup and commissioning is a critical phase where additional effort and attention is needed—especially from O&M. It also represents an area of potential risk to existing plant, where troubleshooting of integrated controls and systems can occur and where O&M availability can become strained from added responsibilities. Two key challenges are: (1) delivering clear communication for the design and construction and (2) providing training with sufficient time to feel confident and ready to take over operations of new treatment processes.

TOP 5 LESSONS LEARNED FROM DESIGNING THE M1W AWP

1. The use of 3D BIM seamlessly integrated design disciplines on a fast track schedule and greatly facilitated O&M feedback on design submittals.
2. Greater degrees of system automation benefited from early development and regular communication of control strategies—particularly for startup and commissioning.
3. Understanding trade-offs in O&M staffing plan and automation allowed comfortable design decisions to be made.
4. Early and regular Contractor outreach helped promote interest in the project resulting in more competitive bids amidst an active bidding environment.
5. Alternative procurement strategies helped mitigate uncertainties in equipment performance and cost.

GOALS FOR EARLY STARTUP & TRAINING PLANNING

- Communicate design intent and theory of operations
- Overview water quality and regulatory compliance
- Incorporate O&M review and input on SCADA design
- Summarize startup sequence by unit process
- Allow O&M to observe and participate in system testing
- Advocate for enabling the design to meet O&M needs
- Review manuals and SOPs
- Define logistic needs (e.g. source water and disposal needs)

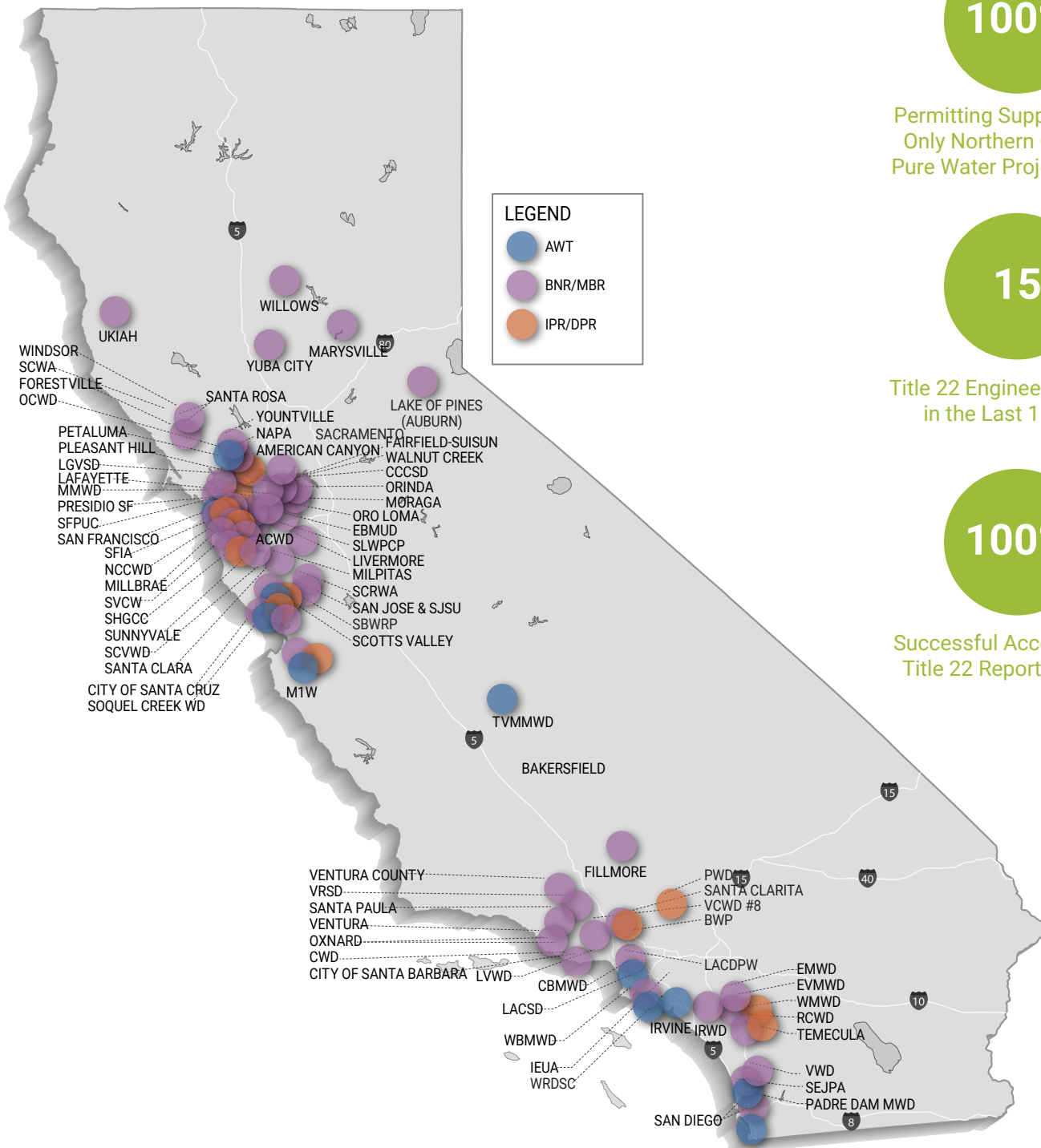


PERMITTING EXPERIENCE

KJ has been committed to water recycling in California since wastewater was first recognized as a valuable renewable resource. KJ completed the water recycling facility at San Francisco's Golden Gate Park in the 1930s and has since completed over 50 recycled water related projects in seven western states and Hawaii with a combined construction value of over \$1B.

Our team has provided regulatory and permitting support services including modifications to Reports of Waste Discharge (ROWD), Waste Discharge Requirement (WDR) permits and National Pollutant Discharge Elimination System (NPDES) permits, as well as providing our clients support in responding to proposed changes in discharge regulations, water quality objectives and basin plans associated with a change in place of use. We have developed Title 22 engineering reports for non-potable and potable reuse permits and worked with DDW for new technology validation approvals.

Planning, Permitting and Design Experience Throughout California



100%

Permitting Support for the Only Northern California Pure Water Project to Date

15

Title 22 Engineering Report in the Last 15 Years

100%

Successful Acceptance of Title 22 Reports by DDW

Successful Permitting Experience from Concept through Implementation

Our team has led or provided key support on 15 Title 22 engineering reports in the last 15 years, as shown in the table below. We understand DDW's process and know when and how to engage them through the course of design and construction. We have also led several technology validations to help our clients gain approval to use the latest treatment processes. The benefit to our clients is that we can efficiently translate design, treatment, and operational criteria to meet regulatory requirements, saving time for a more streamlined project approval.

Title 22 Engineering Report and Technology Validation Qualifications

Clients	"Recycled Water Projects with Title 22 Engineering Reports"	Facility			Use			Title 22 Report					Status
		Tertiary Treatment	Advanced Treatment (MF/RO)	Treatment Validation	Design-Build	Non-Potable Reuse	Agricultural Reuse	Potable Reuse	Coordination with Facility Owner	Coordination with DDW	KJ Lead Role	KJ Support Role	
Kennedy Jenks Consultants Title 22 Engineering Reports													
Padre Dam MWD, El Cajon, County of San Diego (JPA)	East County Pure Water Program		✓		✓	✓		✓	✓	✓			In Development
Monterey One Water	Pure Water Monterey		✓			✓	✓	✓	✓		✓		Approved
Tesoro Viejo Vieho Master Munutual Water Company (TVMMWC)	TVMMWD Wastewater and Water Reuse Program	✓			✓	✓	✓		✓	✓			Conditional Approval
San Elijo Joint Powers Authority	Advanced Water Treatment Design & Project Delivery		✓		✓	✓			✓	✓	✓		Approved
Palmdale Water District	Palmdale Regional Groundwater Recharge & Recovery Project	✓						✓	✓	✓			Conditional Approval
Hi-Desert Water District	HDWD Water Reclamation Facility	✓			✓	✓	✓				✓		Conditional Approval
Ventura County	Moorpark WWTP Title 22 Report	✓			✓	✓	✓		✓		✓		Approved
	Moorpark WWTP Update for rate increase approval of DynaSand Filters	✓			✓	✓	✓		✓		✓		Conditional Approval
City of Filmore	Filmore Water Reclamation Facility Project	✓			✓	✓			✓	✓	✓		Approved
Marin Municipal Water District - Central Marin Sanitation Agency	Recycled Water Truck Program					✓			✓		✓		Approved
Marin Municipal Water District - Las Gallinas Valley Reclamation Plant	Recycled Water Treatment and Distribution	✓	✓			✓	✓		✓	✓	✓		Approved
"South Bayside System Authority/ City of Redwood City"	San Mateo Jail	✓				✓			✓	✓	✓		Approved
	Redwood Shores Recycled Water Program	✓				✓			✓	✓		✓	Approved
North Coast County Water District	Pacifica Recycled Water Program	✓				✓	✓		✓	✓	✓		Approved
Rohnert Park	UDD Irrigation Site					✓			✓		✓		Approved
Kennedy Jenks Consultants Title 22 Technology Validation and Approval													
East County Advanced Water Purification Program (Padre Dam MWD)	Title 22 Technology Approval for CCRO Brine Minimization (Desalitech)		✓	✓	✓				✓	✓	✓		In Development
	Title 22 Regulatory Approval for log-removal value (LRV) credits for free chlorine		✓	✓	✓				✓	✓	✓		In Development
City of Roseville	Title 22 Technology Approval for Compressible Medium Fuzzy Filter (Schreiber, LLC)	✓		✓		✓	✓		✓	✓	✓		Approved
	Title 22 filtration rate increase approval for Cloth Depth Disk Filter (Aqua-Aerobics Systems, Inc.)	✓		✓		✓	✓		✓	✓	✓		Approved
Linda County Water District	Title 22 Technology Approval for Compressible Medium Flex Filter (WesTech, Inc.)	✓		✓		✓	✓		✓	✓	✓		In Development
University of California at Davis	Title 22 approval of original Compressible Medium Fuzzy Filter (Schreiber, Inc.)	✓		✓		✓	✓		✓	✓	✓		Approved
San Francisco Public Utilities Commission	Westside Recycled Water Project		✓		✓	✓			✓			✓	Conditional Approval

Kennedy Jenks has been a leader in implementing water recycling in California since wastewater was first recognized as a valuable renewable resource.



Kennedy Jenks

Jean Debroux, PhD

Potable Reuse Practice Leader

Location: San Francisco

Phone: 415.243.2451

Email: JeanDebroux@kennedyjenks.com

Dawn Taffler, PE, LEED®

One Water Practice Leader

Location: Pasadena

Phone: 626.568.4323

Email: DawnTaffler@kennedyjenks.com