

Hazen



TRABUCO CANYON WATER DISTRICT

2022 System-wide Master Plan Update and Condition Assessment

FEBRUARY 2024
FINAL REPORT



TRABUCO CANYON WATER DISTRICT 2022 System-wide Master Plan Update and Condition Assessment

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FINAL REPORT

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List of Acronyms

Abbreviation	Definition
ACP	Asbestos cement pipe
ADWF	Average dry weather flow
AF	Acre-foot
AFY	Acre-foot/year
AMP	Allen McCullough Pipeline
AWWA	American Water Works Association
AWWF	Average wet weather flow
CII	Commercial, Industrial, and Institutional
CIP	Capital Improvement Program
CIPP	Cured-in-place pipe
CMMS	Computerized Maintenance Management System
CWWRP	Chiquita Water Reclamation Plant
DB	Database
DBPs	Disinfection by products
DDW	Division of Drinking Water
DEM	Digital Elevation Model
DIP	Ductile iron pipe
DWTP	Dimension Water Treatment Plant
EPS	Extended-period simulation
GIS	Geographic Information System
GPD	Gallon per day
GWTP	Groundwater treatment plant
HGL	Hydraulic grade line
I&C	Instrumentation and Control
IN	Inches
IRWD	Irvine Ranch Water District



Abbreviation	Definition
LS	Lift station
MCC	Motor control center
MG	Million gallon
MGD	Million gallons per day
MWD	Metropolitan Water District
MWDOC	Municipal Water District of Orange County
NDW	Non-domestic water
NRW	Non-revenue water
OCDPW	Orange County Department of Public Works
OCP	Orange County Parks
PRS	Pressure reducing station
PRV	Pressure reducing valve
PS	Pump station
PVC	Polyvinyl chloride
RDII	Rainfall-derived inflow and infiltration
RES	Reservoir
RRWWTP	Robinson Ranch Wastewater Treatment Plant
RUL	Remaining useful life
RWTP	Recycled water treatment plant
SAC	Santiago Aqueduct Commission
SCADA	Supervisory control and data acquisition
SCE	Southern California Edison
SMWD	Santa Margarita Water District
SWRCB	State Water Resources Control Board
TCWD	Trabuco Canyon Water District
UWMP	Urban Water Management Plan
VCP	Vitrified clay pipe



Abbreviation	Definition
WTP	Water treatment plant
WWTP	Wastewater treatment plant



Executive Summary

The 2022 System-wide Master Plan Update and Condition Assessment has been prepared as an update to the 1999 Water, Wastewater and Reclaimed Water Master Plan. This report provides comprehensive documentation, analysis, and recommendations for the water system, non-domestic water system, and sewer system including a calibrated GIS-based hydraulic model for each system. The Master Plan develops a Capital Improvement Program (CIP) that identifies the recommended projects needed to ensure that the District continues to provide safe, reliable, and efficient water, non-domestic water, and sewer service to its customers.

Water System

The District serves an estimated population of 12,921 people with 4,097 active water connections. The District's water system consists of 14 pressure zones of various sizes. The water system has an average daily demand of 2.09 ¹MGD (2021) and is projected to increase to 2.31 ²MGD by year 2045.

The primary components of the water system include:

- Imported water supply from MWD/MWDOC
- 2 groundwater wells
- 14 pressure zones
- 4,097 active water connections
- 64 miles of pipeline
- 10 reservoirs
- 10 pump stations

A system evaluation was performed for the water system using the calibrated hydraulic model and other analysis tools. The major findings from the water system evaluation include:

- The Dimension Water Treatment Plant transmission main is a 60-year-old pipeline with a history of breaks. Pipe breaks require the entire transmission main and DWTP to be shut down and require the District's supply to rely on Plano Trabuco Intertie, imported supply from IRWD at Ridgeline PS, or other emergency intertie locations. Due to the operational issues and break history indicating the transmission main has reached the end of its useful life, and the criticality of this transmission main to the water system, it is recommended to proceed with full replacement of the transmission main.
- No new supply facilities or capacity is needed at this time. The District has enough imported water supply to meet current demand and projected 2045 demands. However, a project is

¹ Average day demand calculated from 2021 calendar year billing data

² Obtained from District's 2020 Urban Water Management Plan



recommended to rehabilitate the District's two wells and bring them back online. These two wells would provide the District with a local water supply.

- The system-wide storage analyses illustrate that the District does not have capacity to meet Metropolitan Water District's criteria of 7 days of emergency storage when all water supply sources are offline. A project is recommended to install a new reservoir with an effective volume of at least 1.5 MG.
- The major pumping facilities have sufficient capacity under existing conditions. However, the pumping analyses show a pumping deficiency in the Harris Grade Pressure Zone in 2045. Therefore, adding pump capacity at this time is not needed, but should be evaluated in the future based on actual demands.
- Adequate pressure and fire flow availability is sufficient throughout most of the service area. There are a few areas within the service area experiencing low pressure or low fire flow availability. Projects have been identified for improvements to the affected areas.
- Backup power provisions are recommended at Dimension Water Treatment Plant and several other pump stations.

Non-Domestic Water System

The non-domestic water system is concentrated in the southeastern portions of the District (south of Trabuco Creek Road). The District's non-domestic water comes from two sources: tertiary treated water from the Robinson Ranch Wastewater Treatment Plant (RRWWTP) and urban runoff captured in Dove Lake, Shadow Rock Detention Basin, Dove Creek, and Tick Creek. The District distinguishes between recycled and reclaimed water by designating treated wastewater as reclaimed and captured runoff as recycled. Together both recycled water and reclaimed water comprise the non-domestic water system with an average daily demand of 0.65 MGD.

The primary components of the non-domestic water system include:

- Reclaimed water from RRWWTP and recycled water from captured runoff
- 2 major pressure zones
- 2 primary pump stations and 4 secondary pump stations
- 28 active non-domestic water connections
- 8 miles of pipeline
- 2 earthen dams
- 2 creeks
- 1 detention basin



A system evaluation was performed for the non-domestic water (NDW) system using the calibrated hydraulic model and other analysis tools. The major findings from the non-domestic water system evaluation include:

- No new supply facilities or capacity is needed at this time.
- No new storage facilities are recommended at this time. A project is recommended to replace the existing slide gate stems and supports at Dove Lake and Robinson Ranch Recycled Water Reservoir. Both slide gates are currently inoperable.
- No new pumping facilities are recommended at this time. However, a project is recommended to upgrade Dove Canyon and Robinson Ranch NDW Booster Stations (BS). The Dove Canyon NDW BS discharge provides suction to the Robinson Ranch NDW BS. If either station is out of service, customers downstream of the Robinson Ranch NDW BS are left without water. The current configuration of these pump stations is not ideal for delivering recycled water to customers throughout the service area. The implementation of the project will ensure that Robinson Ranch NDW BS can operate on its own.
- Pipe breaks or other system operation issues were not found to be of concern for the system.
- The system is relatively new, and therefore, pipeline replacement projects are not needed at this time.

Sewer System

The District owns and operates the RRWWTP, which has a current design capacity of 0.85 MGD and provides treatment for developments on the east side of the service area. The wastewater from the west side of the service area is conveyed to Santa Margarita Water District's Chiquita Water Reclamation Plant (CWRP) located in the City of San Juan Capistrano for treatment and disposal.

The primary components of the sewer system owned and operated by the District include:

- Robinson Ranch Wastewater Treatment Plant
- 8 lift stations
- 40.3 miles of gravity pipelines
- 8.7 miles of force mains
- 914 manholes

An evaluation was performed on the sewer system using the calibrated hydraulic model and other analysis tools. While capacity-related capital improvement projects are not recommended based on the analyses, it is recommended that the District implement a recurring 5-year Closed-Circuit Television (CCTV) sewer inspection program.



Condition Assessment

A condition assessment of critical water, non-domestic water, and sewer facilities was conducted. A total of eight (8) critical water and sewer facilities were identified for a focused visual condition assessment. These facilities have the highest criticality within both water and sewer systems.

Hazen developed a non-proprietary asset management support tool, the Summary Dashboard, built in the Microsoft Power BI platform. The Summary Dashboard not only provides an interactive graphical visualization of analysis results, but also provides multiple ways to view the data and examine it from different viewpoints so that further insight can be gained. The Summary Dashboard has been applied to the assets associated with the reservoirs, wells, and pump stations and has the capacity to be expanded to include other facilities in the future.

The findings and recommendations from the condition assessment were incorporated into the CIP.

Capital Improvement Program

A summary of the capital improvement projects and programs identified in this report are shown in Table ES-1 and Table ES-2. Table ES-1 total capital costs for projects were estimated including construction costs, engineering, and administrative costs. Table ES-2 lists annual programs. Annual programs operations and other programs that may be implemented by District staff, outside contractors, and consultants. Project descriptions, cost information, and prioritization criteria are included in Section 16.

Table ES-1: Summary of Capital Improvement Projects

Project #	Name	Project Cost	Priority Level
W-2	Dimension Water Treatment Plant Improvements-Phase 1 (Electrical)	\$1,620,000	1
W-5	Plano Trabuco Pump Station Upgrades	\$160,000	1
W-20	10-inch Pipeline Replacement from Cooks Corner to Harris Grade Tanks	\$2,500,000	1
W-31	PSPS Transfer Switch Upgrade	\$60,000	1
W-32	DWTP Office Trailer Replacement	\$350,000	1
W-33	DWTP Vault Improvements	\$80,000	1
W-34	SCADA Improvements (70% Water)	\$400,000	1
W-12	Canyon Creek Pump Station Upgrades, ALT#2	\$470,000	1
W-26	New Reservoir - Effective Volume 1.5 MG	\$5,910,000	1
NDW-24	Dove Lake Slide Gate Replacement	\$2,000,000	1
NDW-23	Tick Creek and Dove Creek Urban Recovery Booster Stations	\$780,000	1
NDW-13	Dove Canyon NDW and Robinson Ranch NDW Booster Station Improvements	\$1,000,000	1
NDW-51	SCADA Improvements (5% RW)	\$20,000	1
NDW-52	Fleet & Heavy Equipment (5%)	\$63,142	1
S-7	Barneburg Lift Station Upgrades	\$80,000	1
S-9	Heritage Lift Station Upgrades	\$1,400,000	1



Project #	Name	Project Cost	Priority Level
S-10	Plano Trabuco Lift Station Upgrades	\$560,000	1
S-11	Via Allegre Lift Station Improvements	\$130,000	1
S-22	WWTP Reclaimed Reservoir Gate Improvement	\$150,000	1
S-39	Golf Club Sewer Lift Station	\$1,800,000	1
S-40	Hoffman Blower Room Rehab	\$400,000	1
S-41	WWTP PLC Replacement/Fiber Upgrade	\$130,000	1
S-42	PSPS Transfer Switch Upgrade	\$60,000	1
S-44	SCADA Improvements (25% Sewer)	\$100,000	1
S-45	El Toro Lift Station Improvements - FM Valve Replacement	\$80,000	1
S-6	Robinson Ranch WWTP Improvements - Phase 1	\$3,450,000	1
S-24	5-year CCTV Monitoring Program	\$150,000	1
S-43	Fleet & Heavy Equipment (25%)	\$315,710	1
PRIORITY 1 TOTAL		\$24,218,852	
Project #	Name	Project Cost	Priority Level
W-4	Dimension Water Treatment Plant Improvements-Phase 2	\$400,000	2
W-25	Fire Flow Availability Improvements	\$1,540,000	2
W-1	Permanent Generator Installation at Robinson Ranch Pump Station	\$1,030,000	2
W-15	Rose Canyon Reservoir Coating and Site Improvements	\$1,140,000	2A
W-16	Harris Grade #1 Reservoir Coating and Site Improvements	\$990,000	2B
W-17	Upper Dove Canyon Reservoir Coating and Site Improvements	\$1,280,000	2C
W-18	Trabuco #2 Reservoir Coating and Site Improvements	\$1,950,000	2D
S-8	Robinson Ranch WWTP Improvements - Phase 2	\$1,330,000	2
PRIORITY 2 TOTAL		\$9,660,000	
Project #	Name	Project Cost	Priority Level
W-29	Permanent Generator Installation at DWTP	\$1,030,000	3
W-3	Transmission Main Replacement - Dimension Water Treatment Plant to Ridgeline Pump Station	\$10,930,000	3
W-19	Trabuco #1 Reservoir Coating and Site Improvements	\$1,150,000	3
W-30	Robinson Ranch PS Upgrades	TBD	3
S-14	El Toro Lift Station Improvements	\$5,530,000	3
S-27	Robinson Ranch WWTP Improvements - Phase 3	\$170,000	3
S-28	New Force Main - Golf Club to WWTP	\$5,260,000	3
PRIORITY 3 TOTAL		\$24,070,000	



Table ES-2: Summary of Annual Programs

Project #	Name	Project Cost
W-35	PRV Improvements Program	\$20,000
W-36	Water Pump Replacement Program	\$50,000
W-37	Valve Replacement Program	\$30,000
W-38	Fleet & Heavy Equipment (70%) Replacement Program	\$91,000
NDW-50	Dove Canyon PRV Replacement	\$200,000
S-46	Wet Well Recoating Program	\$30,000
S-47	Manhole Recoating Program	\$20,000
S-48	Sewer Pump Replacement	\$50,000
S-49	Chiquita Capital Improvement Program	\$178,000
TOTAL		\$669,000

1. Introduction

The 2022 System-wide Master Plan and Condition Assessment has been prepared as an update to the 1999 Water, Wastewater, and Reclaimed Water Master Plan. This report provides comprehensive documentation, analysis, and recommendations for the water, non-domestic water, and sewer systems, including a calibrated GIS-based hydraulic model for each system.

The 2022 System-wide Master Plan and Condition Assessment will serve as a roadmap (Figure 1-1) for addressing the District's water, non-domestic water, and sewer needs. It provides an actionable, achievable, and prioritized capital improvement plan. It addresses the current and future needs of the system and will serve as a guide for planning, operating, and maintaining the District's water, non-domestic water, and sewer systems.

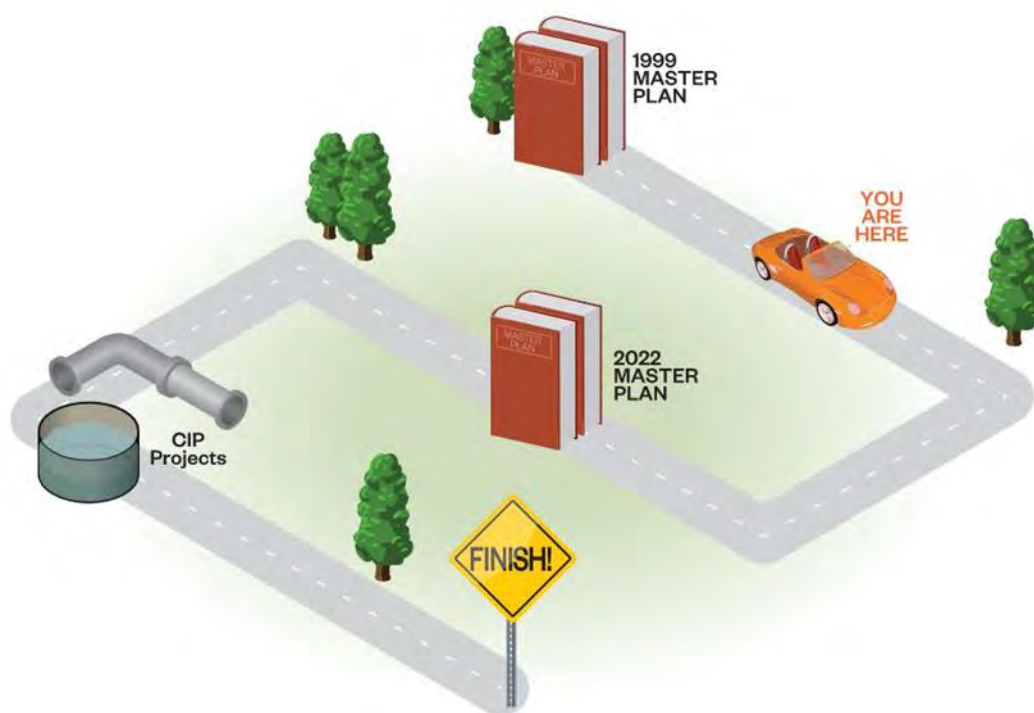


Figure 1-1: Graphical Representation of the District's "Roadmap"



The 2022 System-wide Master Plan and Condition Assessment (2022 Master Plan) incorporates the following elements:

- Land Use
- Existing System Documentation
- Demands and Sewer Flows
- Evaluation and Design Criteria
- Hydraulic Models
- System Evaluation
- Condition Assessment
- Capital Improvement Projects

1.1 Background

Trabuco Canyon Water District is a water district organized and operating pursuant to Section 30000, and following, of the Water Code of the State of California. The District was organized on February 26, 1962, under Division XII of the California Water Code. The District encompasses an area of approximately 8,200 acres in the southeastern portion of Orange County and its service area includes communities within the City of Rancho Santa Margarita, City of Lake Forest, City of Mission Viejo, Trabuco Canyon, and other areas of unincorporated Orange County.

1.2 Purpose and Planning Horizon

The 2022 Master Plan has been prepared to evaluate the District's water, non-domestic water, and sewer systems under existing conditions and through a 25-year planning horizon extending through year 2045. The Master Plan develops a Capital Improvement Program (CIP) that identifies the recommended projects needed to ensure that the District continues to provide safe, reliable, and efficient water, non-domestic water, and sewer service to its customers.

1.3 Scope of Work

A summary of the major tasks undertaken for the development of this Master Plan is included below.

- Hydraulic Model Software Evaluation
 - The District's existing water and recycled water models were built in InfoWater (an Innovyze product). Bentley and Innovyze water and sewer model software capabilities and costs were presented to the District for a review to determine which software the water and non-domestic water models would be updated in, and which software the sewer model would be developed in.



- Data Collection and Review
 - Review of all available information pertinent to the development of this Master Plan, including, but not limited to, previous Master Plan, GIS files, as-builts, and supply source/water production data. There were also a multitude of field visits to the various system facilities and correspondence with District Engineering and Operations staff.
- Water and Non-domestic Water Hydraulic Model Update
 - Model infrastructure update using the latest geodatabase for both the water and non-domestic water systems. Calibration of water and non-domestic water hydraulic models using field data. Updated hydraulic models were used to facilitate system analysis and master planning.
- Water System and Non-domestic Water Analysis
 - Established service and design criteria for evaluating existing facilities. Evaluated existing facilities and established recommendations for future improvements. Analyzed the adequacy and reliability of the District's facilities for near term and future conditions.
- Sewer Model Development
 - Model development utilizing the latest geodatabase to develop a dynamic hydraulic model. Calibration of sewer model using dry weather flow monitoring data, conducted at locations throughout the system as part of this project. The model was used to facilitate system analysis and master planning.
- Condition Assessment
 - Utilized system information including drawings, O&M manuals, maintenance records, discussions with District staff, GIS geodatabase and shapefiles, and hydraulic models to develop and populate an asset inventory for the District's facilities including pump stations, reservoirs, lift stations, treatment facilities as well as distribution and collection system pipelines. This task also included a focused condition assessment of select facilities that have the highest criticality within both water and sewer systems.
- Master Plan Report
 - The Master Plan Report includes a compilation of the study and analyses that were performed under this contract, including addressing land use, system descriptions, demands and sewer loads, evaluation and design criteria, hydraulic model updates, system evaluation, condition assessment, and capital improvement recommendations.



1.4 Study Area

1.4.1 Service Area

The District serves a population of an estimated 12,921 people with 4,097 active water connections. The water system includes imported water, local groundwater, and local surface water. Imported water is provided by Metropolitan Water District of Southern California (MWD) through Municipal Water District of Orange County (MWDOC). Groundwater production wells include two wells that extract water from the Arroyo Trabuco aquifer, which is part of the San Juan Basin. Irvine Ranch Water District (IRWD) receives water from Lake Mathews and stores it in Irvine Lake. Raw water stored in Irvine Lake is used for emergencies only. The District's water system consists of 14 pressure zones of various sizes. The water service area is shown in Figure 1-2.

The non-domestic water system (NDW) is concentrated in the southeastern portions of the District (south of Trabuco Creek Road). The District's non-domestic water comes from two sources: tertiary treated water from the District's Robinson Ranch Wastewater Treatment Plant (RRWWTP) and urban runoff captured in Dove Lake, Shadow Rock Detention Basin, Dove Creek, and Tick Creek. The District distinguishes between recycled and reclaimed water by designating treated wastewater as reclaimed and captured runoff as recycled. Together both recycled water and reclaimed water comprise the non-domestic water system.

For practical purposes, the sewer service area is considered the same as the water service area. Wastewater from the western portion of the District is treated at the Santa Margarita Water District's Chiquita Water Reclamation Plant. The central portion of the District, consisting of areas within unincorporated Orange County, primarily include properties with individual septic systems. The eastern portion of the District is served through the District-owned sewer system and wastewater treatment facilities.

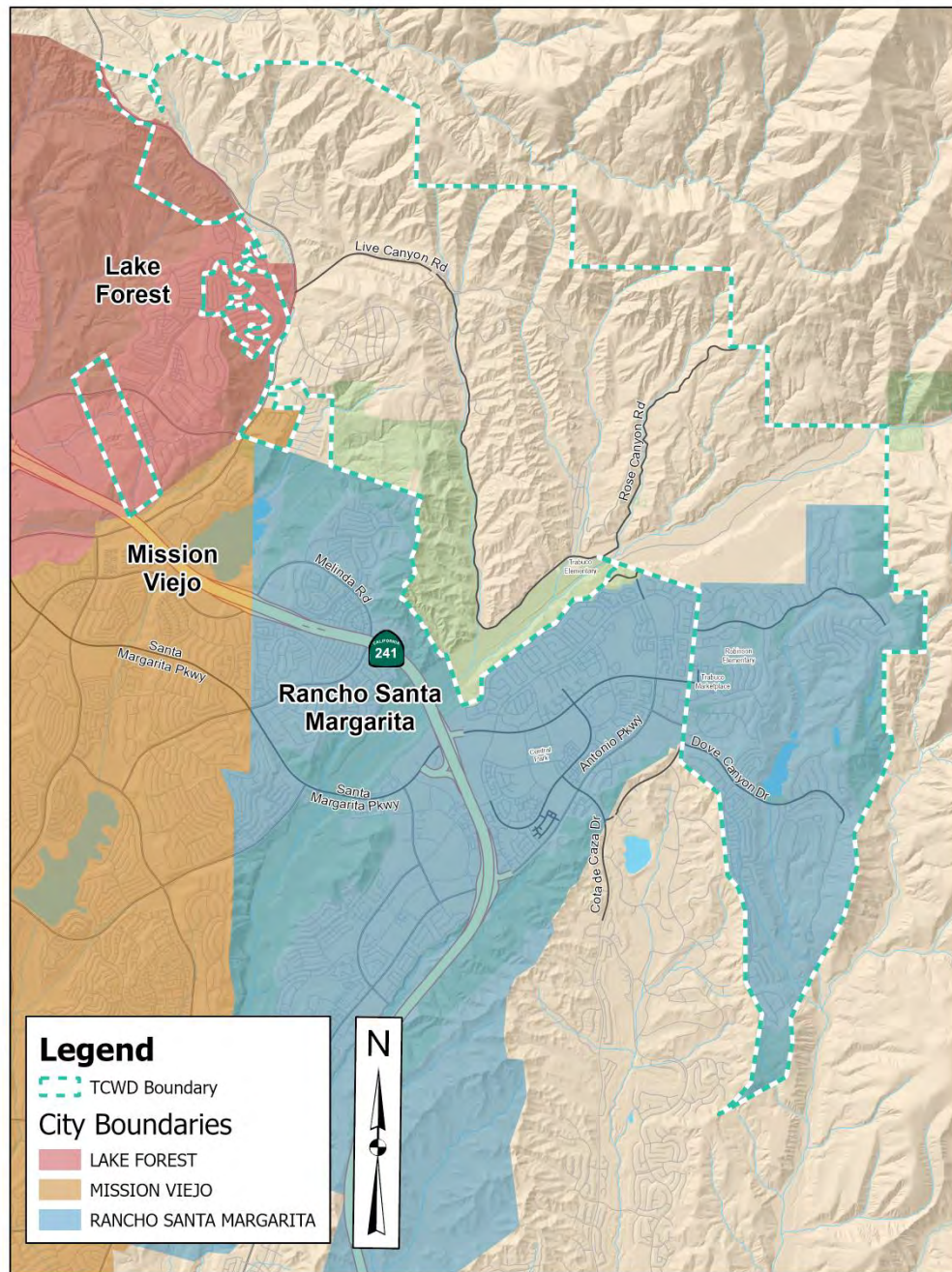


Figure 1-2: District Service Area



1.5 Land Use

This section summarizes the existing land use and future developments. Land use is an important factor in master planning and hydraulic modeling to accurately allocate residential, commercial, industrial, and other water demands and sewer loads.

1.5.1 Existing Land Use

The District's service area can best be described as a predominantly single family residential and open space located in Southern Orange County. There are community parks, a golf course, and O'Neill Regional Park within the service area. Existing land use data was obtained from the City of Mission Viejo, City of Lake Forest, City of Rancho Santa Margarita, and County of Orange.

Table 1-1 summarizes the current land use designations and their corresponding area and percentage. Exhibit 1-1 shows the various land use designations throughout the District.

Table 1-1 : Existing Land Use

Land Use Designation	Area (acre)	%
Agricultural	139	1.88%
Commercial	30	0.40%
Open Space	2,441	33.16%
Open Space Golf	209	2.84%
Park	43	0.58%
Public	361	4.91%
Residential	4,141	56.23%
TOTAL	7,364	100%

1.5.2 Future Land Use and Housing

The District currently is aware of over 40 developments (Figure 1-3) in some stage of planning. These developments are a mixture of low, medium, and high-density residential developments and are projected to generate an average daily demand of approximately 1.3 MGD by 2035.

Furthermore, the District does not anticipate any low-income housing in its service area between now and 2045. It is expected that the low-income Regional Housing Needs Assessment (RHNA) allocations for relevant jurisdictions will most likely occur outside the District's service area, dependent on city discretion.

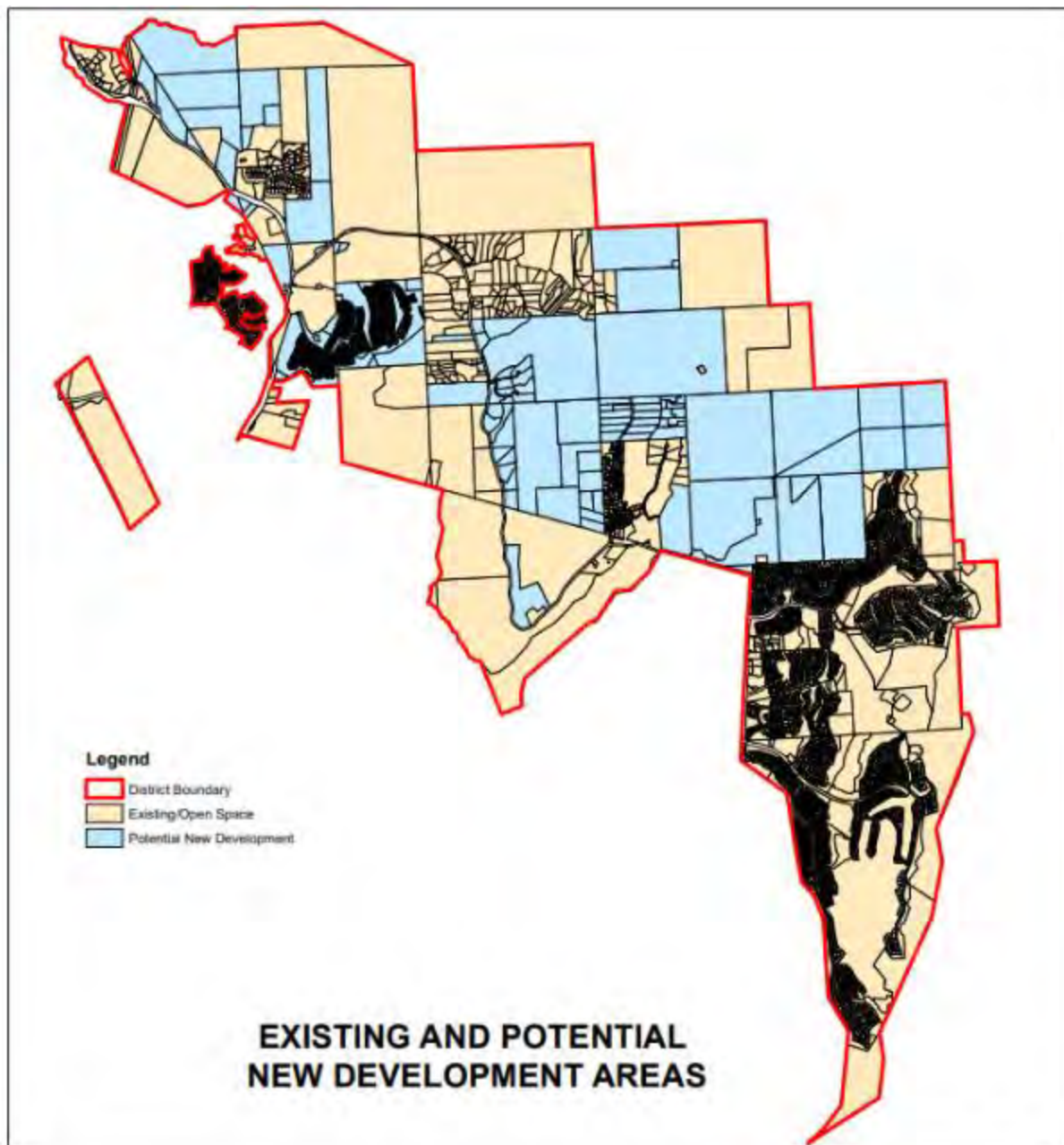


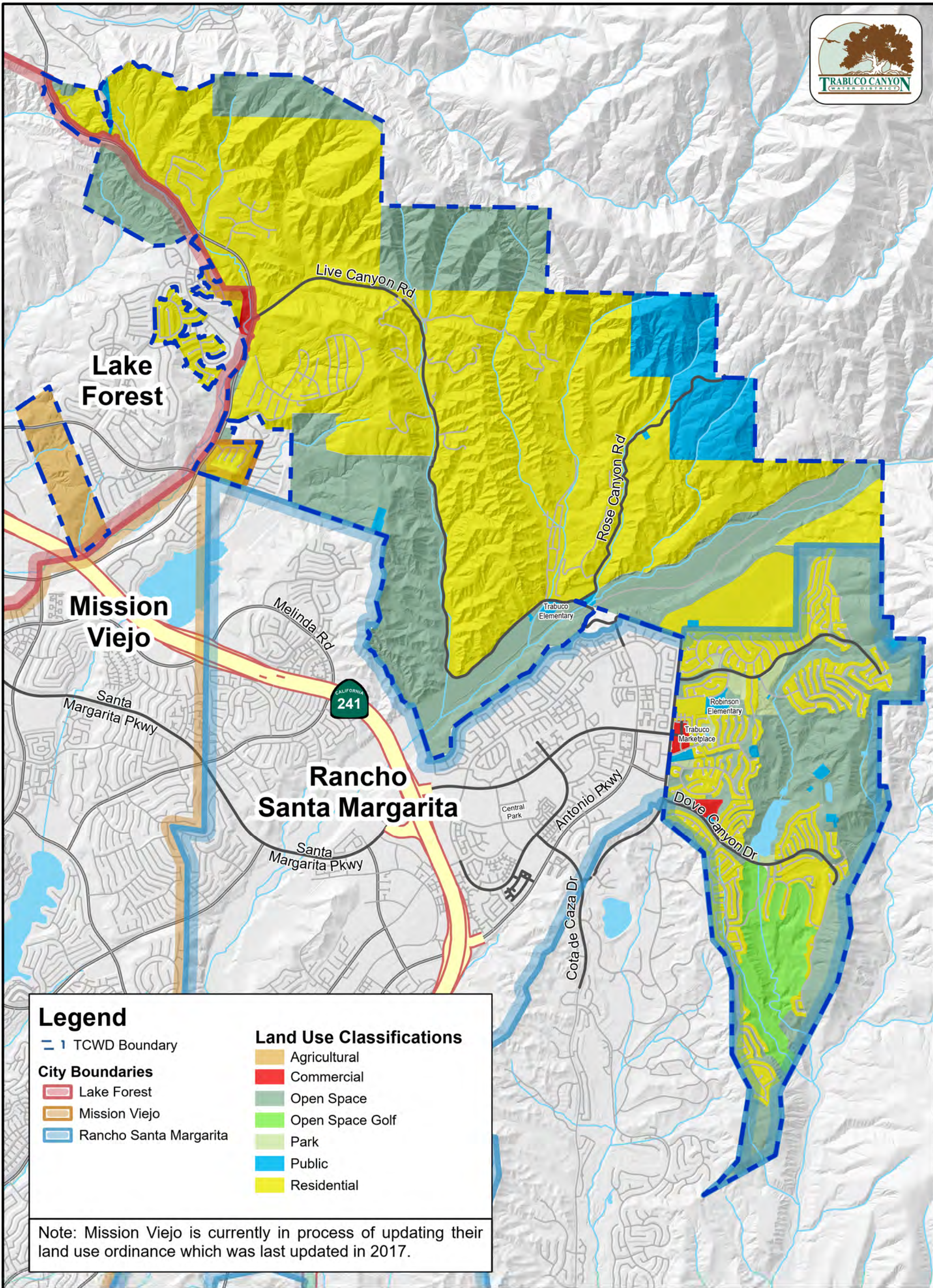
Figure 1-3: New Developments Locations from 2020 Urban Water Management Plan



1.6 Related Reports

There were two (2) additional reports that were prepared in parallel with the Master Plan effort that have been included in the appendices.

- *Rose Canyon and Lang Wells – Preliminary Study and Cost Estimate Technical Memorandum* – the purpose of this study was to identify the improvements needed on the Rose Canyon and Lang Wells, with the intent of putting the wells back into service and operating the groundwater treatment facility.
- *Robinson Ranch Wastewater Treatment Plant Preliminary Process Assessment Technical Memorandum* - On April 26-28, 2022, a technical team from Hazen and Sawyer conducted a field condition assessment of the Robinson Ranch Wastewater Treatment Plant (WWTP). As part of the field condition assessment, a high-level review of the WWTP process was also conducted and summarized in this technical memorandum.



0 0.25 0.5
Miles



Land Use

Exhibit 1-1

Hazen

Trabuco Canyon Water District
Master Plan