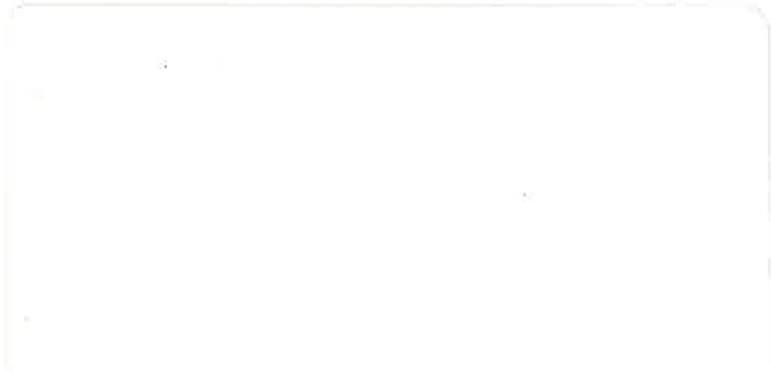


WO# 16-074

DEXTER WILSON ENGINEERING, INC.

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JUN 25 2018

DW Engineering Dept.

Plan Check # 2

8/9/2018
2/14 ✓
MBATES
- No comments
Approved.

**WATER SYSTEM ANALYSIS
FOR
TRACT NO. 37305
IN LAKE ELSINORE
W.O. NO. 16-074**

July 2018

**Prepared For:
K & A Engineering
357 North Sheridan, Suite 117
Corona, CA 92880**

**Prepared by:
Dexter Wilson Engineering, Inc.
2234 Faraday Avenue
Carlsbad, CA 92008**



Job No. 544-045

TABLE OF CONTENTS

	<u>PAGE NO.</u>
CHAPTER 1	
INTRODUCTION	1-1
PROJECT OVERVIEW	1-1
DEVELOPMENT PLAN.....	1-1
PURPOSE OF STUDY	1-1
RELATED STUDIES	1-3
CHAPTER 2	
DESIGN CRITERIA	2-1
WATER SYSTEM	2-1
Water Duty Factors and Peaking Factors	2-1
System Pressure.....	2-1
Reservoir Storage.....	2-2
Pump Stations.....	2-2
CHAPTER 3	
PROJECTED WATER DEMANDS AND RESERVOIR STORAGE	3-1
Projected Water Demand.....	3-1
Reservoir Storage.....	3-2
CHAPTER 4	
EXISTING WATER FACILITIES.....	4-1
1601 Zone.....	4-1
CHAPTER 5	
RECOMMENDED WATER FACILITIES	5-1
WATER SYSTEM ANALYSIS	5-1
1601 Zone.....	5-1
Distribution System	5-1
Reservoir Storage	5-3
Pumping Capacity	5-4
Conclusions.....	5-4

APPENDICES

APPENDIX A RESIDENTIAL LOT SUMMARY

APPENDIX B FIRE FLOW TEST RESULTS

APPENDIX C COMPUTER MODELING OUTPUT

LIST OF TABLES

PAGE NO.

TABLE 2-1	WATER DUTY FACTORS	2-1
TABLE 3-1	TRACT NO. 37305 PROJECTED WATER DEMANDS	3-1
TABLE 3-2	WATER DEMAND SUMMARY.....	3-1
TABLE 3-3	TRACT NO. 37305 RESERVOIR STORAGE REQUIREMENTS.....	3-2
TABLE 5-1	1601 WATER SERVICE ZONE SUMMARY.....	5-1

LIST OF FIGURES

PAGE NO.

FIGURE 1-1	LOCATION MAP	1-2
FIGURE 4-1	EXISTING REGIONAL WATER FACILITIES	4-2
FIGURE 5-1	PROPOSED WATER FACILITIES	5-2
	PROJECT TENTATIVE MAP.....	Map Pocket

EXECUTIVE SUMMARY

The Tract 37305 project is located along Nichols Road, just east of Interstate 15 and west of El Toro Road. The project proposes 168 single family residential units, a commercial site, park site, and open space areas. The project will receive water service from the Elsinore Valley Municipal Water District.

The total average water demand for the project is 134,262 gpd. The project is entirely in the 1601 Zone for water service. The El Toro 1 and 2 Reservoirs and Rosetta Canyon 1 Reservoir provide 1601 Zone storage to the area and there are 1601 Zone waterlines adjacent to the eastern project boundary. Anticipated static pressures on the project will range from approximately 94 psi to 121 psi assuming the El Toro reservoirs are half full. Since all lots will experience pressures of greater than 80 psi, pressure regulators will be required on the services to each lot.

The project can receive service by expanding the existing 1601 Zone. A 20-inch line is required in Nichols Road as part of the District's regional master planning and this line will be installed from the western project boundary to a connection to a 16-inch line east of the project at Manzanita Drive. Another connection will be made to an existing 16-inch line in El Toro Road. Onsite water lines will be primarily 8-inch with some 12-inch piping by the commercial site. Computer modeling was performed and verifies that all pressure and velocity criteria are met during various demand scenarios.

There is currently 0.28 MG of surplus storage in the El Toro and Rosetta Canyon 1601 Zone storage reservoirs. The storage requirement for build out of the Tract 37305 project is 0.31 MG which would result in a 0.03 MG deficit if the projects build out prior to regional improvements. The District has master planned to connect the Alberhill/Lucerne 1601 Zone to the El Toro/Rosetta Canyon 1601 Zone system which would provide more storage to the area.

There is existing 1601 Zone pumping capacity available to serve development in the area. With the addition of the Tract 37305 project, there will still be a surplus of pumping capacity available in the 1601 Zone.

CHAPTER 1

INTRODUCTION

This report provides a water system analysis for the Lake Elsinore Tract No. 37305 project. This report will provide information concerning projected water demands, existing facilities, and recommended facilities associated with serving this project.

PROJECT OVERVIEW

The Tract No. 37305 project is located in the City of Lake Elsinore. Nichols Road borders the project to the north and the project is located just east of Interstate 15 and west of El Toro Road. The Temescal Canyon High School is located just to the south of the project. Water service for the project area is provided by the Elsinore Valley Municipal Water District (EVMWD). Figure 1-1 presents a location map for the project.

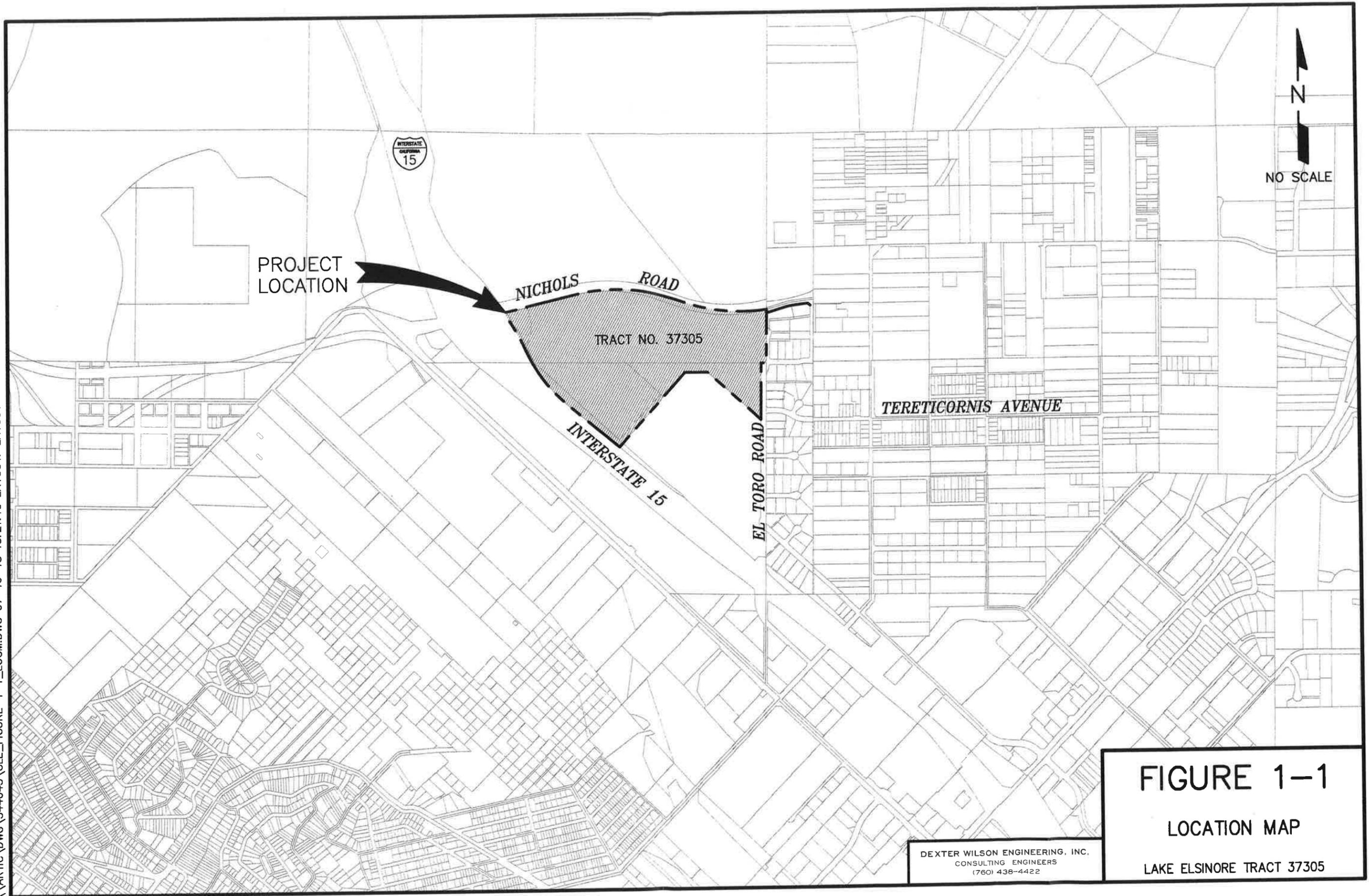
DEVELOPMENT PLAN

The Tract No. 37305 project encompasses a total of approximately 74 acres. The proposed land use development plan includes single-family residential totaling 168 units, a commercial site, a park site, and open space areas.

PURPOSE OF STUDY

The Tract No. 37305 project is located within the Elsinore Valley Municipal Water District for water service. Based on the range of elevations on the project and existing facilities in the area, water service to the project will be provided by the 1601 Zone. The purpose of this report is to establish the water facilities that will be required for the development of the Tract No. 37305 project.

\\ARTIC\DWG\544045\CLE_FIGURE-1-1_LOC.M.DWG 07-16-18 13:21:10 LAYOUT: LAYOUT



PROJECT
LOCATION

NICHOLS ROAD

TRACT NO. 37305

INTERSTATE 15

EL TORO ROAD

TERETICORNIS AVENUE



FIGURE 1-1

LOCATION MAP

LAKE ELSINORE TRACT 37305

DEXTER WILSON ENGINEERING, INC.
CONSULTING ENGINEERS
(760) 438-4422

RELATED STUDIES

MWH prepared the District's August 2016 Water System Master Plan. This document provides a District wide analysis of existing and future proposed water supply, storage, and transmission facilities. Relevant information from this document on regional facilities in the vicinity of Tract No. 37305 is provided in Chapter 5 of this report.

CHAPTER 2

DESIGN CRITERIA

This chapter presents the design criteria used to evaluate recommended water system improvements for the Tract No. 37305 project. The criteria utilized in this study are in accordance with the District's July 2017 Design Standards and 2016 Water Master Plan. The design criteria are used for evaluating the design and sizing of proposed improvements to accommodate development in the study area.

WATER SYSTEM

Water Duty Factors and Peaking Factors

Table 2-1 presents the water duty factors used in projecting water demands for the project. To convert average day water demands to maximum day demands and peak hour demands, factors of 1.75 and 3.5 were used, respectively.

Land Use Category	Water Duty Factor
Single Family Residential (4-6 Du/Ac)	2,300 gpd/ac
Commercial	2,500 gpd/ac
Parks	2,300 gpd/ac

System Pressure

The water distribution system has been designed to maintain static pressures between 60 psi and 125 psi. This criteria is used to initially divide a project between water service zones, assuming the supply reservoir is half full. Computer modeling is then performed to ensure that adequate residual pressures are obtained under all demand conditions. The system has been designed to yield minimum residual pressures of 40 psi during peak hour demands and 20 psi during maximum day demand plus fire flow conditions. All lots where

maximum static pressures will exceed 80 psi are required to have pressure regulators on the water service lateral in accordance with the California Plumbing Code.

Reservoir Storage

Reservoirs are sized to provide emergency, operational, and fire flow storage. Emergency and operational storage are to be equivalent to 130 percent of the maximum daily demand of the service area. Fire flow storage is to be equivalent to the largest fire flow requirement and duration for the area being served. Where multiple reservoirs provide service to the same pressure zone in an area, the required fire flow storage needs to be provided for the zone, but not in each individual reservoir.

Pump Stations

Pump stations are sized for the greater of the following two conditions:

- Maximum day demand over a 16 hour period for the area being supplied by the pump station.
- 50 percent of the maximum fire flow requirement within the service area.

CHAPTER 3

PROJECTED WATER DEMANDS AND RESERVOIR STORAGE

This chapter provides the projected water demands and reservoir storage requirements for the Tract 37305 project. The study area is located within the 1601 Zone for water service.

Projected Water Demand

Table 3-1 presents the projected water demand for Tract 37305. Table 3-2 summarizes the projected average day, maximum day, and peak hour demands for the project.

TABLE 3-1 TRACT NO. 37305 PROJECTED WATER DEMANDS			
Description	Quantity	Unit Water Demand	Total Water Demand, gpd
1601 Zone			
SF Residential	168 Units/36.2 Ac	2,300 gpd/Ac	83,260
Commercial	14.43 Ac	2,500 gpd/Ac	36,075
Park	6.49 Ac	2,300 gpd/Ac	14,927
TOTAL 1601 ZONE			134,262

TABLE 3-2 WATER DEMAND SUMMARY			
Zone	Average Day Demand, mgd	Maximum Day Demand, mgd	Peak Hour Demand, mgd
1601	0.134 ✓	0.235 ✓	0.470 ✓

Reservoir Storage

Based on the information presented above and using the criteria from Chapter 2 (130% of MDD), Table 3-3 summarizes the reservoir storage requirements for the project.

TABLE 3-3 TRACT NO. 37305 RESERVOIR STORAGE REQUIREMENTS				
Zone	Maximum Day Demand, mgd	Required Operational and Emergency Storage, MG	Required Fire Flow Storage, MG	Total Required Storage, MG
1601	0.235	0.31 ✓	0 ¹	0.31

¹ There are existing reservoirs in this zone that already include a fire flow component (Master Plan (Table 7-5 indicates an existing fire flow component of 4,000 gpm for four hours.)

CHAPTER 4

EXISTING WATER FACILITIES

The existing water facilities in the vicinity of the project are located in the 1601 water service zone. Figure 4-1 presents a map showing the boundaries of the project and the existing regional water facilities in the vicinity of the project.

1601 Zone

The existing 1601 Zone El Toro Reservoirs are located just to the northeast of the Tract No. 37305 project. These reservoirs consist of 0.25 million gallon (MG) El Toro 1 and 0.40 MG El Toro 2 tanks located at the same site. The piping system from these tanks is also connected to the 2.5 MG Rosetta Canyon 1 tank located to the southeast. In the vicinity of the project, there is a 10-inch line from the El Toro Reservoirs and 16-inch lines in Manzanita Drive and El Toro Road. There are 12-inch lines adjacent to the high school and in Tereticornis Avenue. The other pipelines in the area are generally smaller distribution lines that provide service to existing development to the east of the project.

CHAPTER 5

RECOMMENDED WATER FACILITIES

This chapter presents the recommendations for water system improvements required to provide service to the Tract No. 37305 project.

WATER SYSTEM ANALYSIS

The evaluation performed to determine the recommended onsite water system for the project consists of reviewing previous studies and applying current District criteria. Figure 5-1 provides the proposed layout of onsite facilities for the project. An evaluation of distribution, storage and pumping facilities was provided for the 1601 Zone.

1601 Zone

The 1601 Zone will supply the Tract No. 37305 project. Table 5-1 summarizes the anticipated static pressures within this pressure zone of the project based on an HGL of 1,589 feet. Appendix A summarizes all of the lots within the project with pad elevations and maximum static pressures. Since all lots will experience pressures of greater than 80 psi, pressure regulators will be required on all lots.

Lot Elevation, ft.		Static Pressure, psi ¹	
Minimum	Maximum	Minimum	Maximum
1,310	1,371	94	121

¹ Assuming the El Toro Reservoirs are half full which corresponds to an elevation of 1,589 feet.

Distribution System. The 1601 Zone portion of the project will be supplied by connecting to the existing 16-inch water line at two locations and constructing onsite looping.

\\ARTIC\DWG\544045\CLE_WAT-FIGURE-5-1_PRO-W.DWG 07-16-18 14:13:23 LAYOUT: LAYOUT

LEGEND

- PROJECT BOUNDARY
- - - EXISTING 1601 ZONE
- PROPOSED 1601 ZONE

NOTE: ALL PROPOSED PIPES ARE RECOMMENDED AS 8-INCH UNLESS NOTED.

EL TORO RESERVOIRS

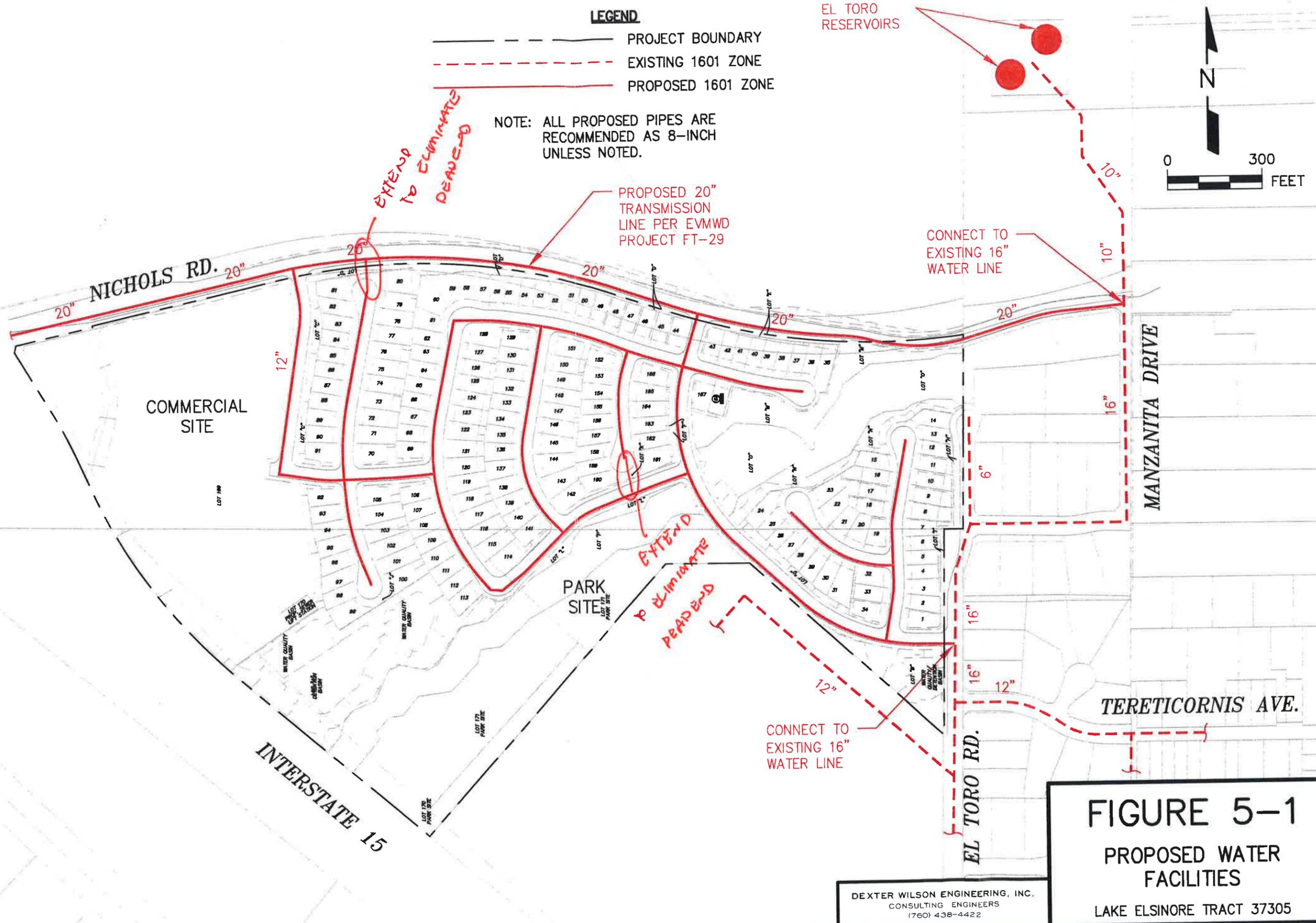
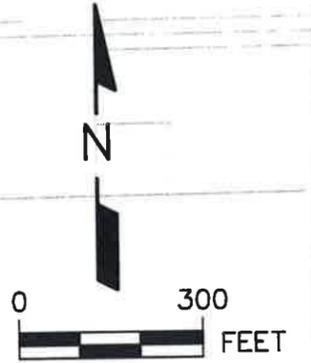


FIGURE 5-1

PROPOSED WATER FACILITIES

LAKE ELSINORE TRACT 37305

DEXTER WILSON ENGINEERING, INC.
CONSULTING ENGINEERS
(760) 438-4422

The EVMWD Master Plan identifies a 20-inch regional transmission line in Nichols Road from Terra Cotta Road west of Interstate 15 to the El Toro Reservoir Site. The EVMWD Master Plan identifies this section of line as Project FT-29. The project will be required to construct a portion of this 20-inch water line from the western project boundary to just east of El Toro Road. A 12-inch line is proposed adjacent to the commercial site and 8-inch lines are proposed in the residential areas.

To evaluate the onsite water system for the project, fire flow test results were requested and obtained from EVMWD. The fire flow test results were obtained from a hydrant off the 16-inch line in El Toro Road and are included in Appendix B for reference.

The fire flow test results were used to establish an input hydraulic gradeline in a hydraulic model for the project. The hydraulic model evaluated the onsite system under average day demands, peak hour demands, and maximum day demand plus fire flow scenarios. The results of the hydraulic analysis are provided in Appendix C and Exhibit A provides the corresponding node and pipe diagram.

The computer modeling results confirm that pressure and velocity criteria are met under all scenarios. Residual pressures easily exceed the minimum requirements during average day demand, peak hour demand, and maximum day demand plus fire flow scenarios.

Reservoir Storage. The existing 1601 Zone storage in this area of the District is the existing Rosetta Canyon 1 and El Toro 1 and 2 tanks with a total capacity of 3.15 MG. The District 2016 Master Plan identifies a current storage surplus of 0.28 MG in these 1601 Zone tanks. Based on a project storage requirement of 0.31 MG (Table 3-2), build out of the project would result in a storage deficit of 0.03 MG in the existing El Toro and Rosetta Canyon 1601 Zone storage.

In the ultimate condition, the Rosetta Canyon 1/El Toro 1 and 2 1601 Zone system is proposed to be connected with the Lucerne/Alberhill 1601 Zone system by the proposed 20-inch Nichols Road transmission line. The EVMWD Master Plan (Table 7-5, Page 7-14) identifies the Lucerne/Alberhill 1601 Zone system as having a surplus of 2.17 MG under existing conditions. Based on this and the District's planning for future regional storage in the 1601 Zone, additional storage is not required to support the proposed Tract 37305 project.

Pumping Capacity. The 1601 Zone Rosetta Canyon No. 1 tank and El Toro tanks are supplied from the Rosetta Canyon No. 1 pump station. This station has a firm pumping capacity of 4,800 gpm and a storage surplus capacity of 2,776 gpm per the EVMWD Master Plan (Table 7-8, Page 7-16). The pumping capacity requirements of the 1601 Zone will increase by approximately 280 gpm with the buildout of the Tract No. 37305 project. Based on this, there is adequate pumping capacity to serve the project.

Conclusions

The following conclusions have been based on this water system analysis for the Tract 37305 project in Lake Elsinore.

- The project is entirely within the 1601 Zone for water service and can receive service by expanding the existing 1601 Zone system in the vicinity of the project. Figure 5-1 provides the proposed water system improvements for the project.
- All lots on the project will receive maximum static pressures of greater than 80 psi and require pressure regulators. Appendix A identifies the maximum static pressure for each lot.
- Computer modeling was performed and verifies that the proposed piping improvements will allow EVMWD velocity and minimum pressure criteria to be met during average demand, peak hour demand, and maximum day demand plus fire flow scenarios.
- The El Toro 1 and 2 and Rosetta Canyon 1 1601 Zone Reservoirs currently have a surplus capacity of 0.28 MG per the District Master Plan. Build out of the Tract 37305 project has a storage requirement of 0.31 MG which would result in a deficit of 0.03 MG in the existing storage system. The District has master planned for the connection of pipelines to connect the Alberhill/Lucerne 1601 Zone to the El Toro/Rosetta 1601 Zone which will increase the available storage in this area.
- There is adequate existing 1601 Zone pumping capacity to support build out of the Tract 37305 project.

APPENDIX A

RESIDENTIAL LOT SUMMARY

**APPENDIX A
PAD ELEVATION AND PRESSURE SUMMARY**

Lot No.	Pad El. Ft.	Design HGL, Ft.	Static Pressure, psi
		Max.	Max.
1	1355.2	1601	106.5
2	1356.5	1601	105.9
3	1357.4	1601	105.5
4	1358.3	1601	105.2
5	1359.2	1601	104.8
6	1360	1601	104.4
7	1361	1601	104.0
8	1362.1	1601	103.5
9	1363.3	1601	103.0
10	1365.5	1601	102.0
11	1367.8	1601	101.0
12	1369.7	1601	100.2
13	1370	1601	100.1
14	1370.5	1601	99.9
15	1365.3	1601	102.1
16	1364.8	1601	102.3
17	1363	1601	103.1
18	1361.4	1601	103.8
19	1359.5	1601	104.6
20	1360.5	1601	104.2
21	1361.5	1601	103.8
22	1362.5	1601	103.3
23	1363.5	1601	102.9
24	1363.8	1601	102.8
25	1363.7	1601	102.8
26	1363.2	1601	103.0
27	1362.6	1601	103.3
28	1361.9	1601	103.6
29	1361.1	1601	103.9
30	1360.5	1601	104.2
31	1360	1601	104.4
32	1357.7	1601	105.4
33	1356.7	1601	105.8
34	1355.3	1601	106.5
35	1359.7	1601	104.5
36	1359.5	1601	104.6
37	1359.4	1601	104.7
38	1358.8	1601	104.9
39	1358.1	1601	105.2

Lot No.	Pad El. Ft.	Design HGL, Ft.	Static Pressure, psi
		Max.	Max.
40	1357.4	1601	105.5
41	1356.9	1601	105.8
42	1356.4	1601	106.0
43	1355.9	1601	106.2
44	1354.5	1601	106.8
45	1352.3	1601	107.8
46	1349.7	1601	108.9
47	1347	1601	110.1
48	1344.5	1601	111.1
49	1342.6	1601	112.0
50	1341.1	1601	112.6
51	1339.9	1601	113.1
52	1339.1	1601	113.5
53	1338.4	1601	113.8
54	1337.6	1601	114.1
55	1336.9	1601	114.4
56	1336.2	1601	114.7
57	1335.4	1601	115.1
58	1334.6	1601	115.4
59	1333.7	1601	115.8
60	1333.6	1601	115.9
61	1333.5	1601	115.9
62	1332.9	1601	116.2
63	1332.3	1601	116.4
64	1331.7	1601	116.7
65	1331	1601	117.0
66	1330.3	1601	117.3
67	1329.5	1601	117.6
68	1328.8	1601	117.9
69	1328.2	1601	118.2
70	1314.8	1601	124.0
71	1315.7	1601	123.6
72	1316.4	1601	123.3
73	1317	1601	123.1
74	1317.7	1601	122.7
75	1318.3	1601	122.5
76	1319	1601	122.2
77	1319.8	1601	121.8
78	1320.6	1601	121.5
79	1321	1601	121.3
80	1321.2	1601	121.2
81	1321.2	1601	121.2
82	1320.4	1601	121.6
83	1319.7	1601	121.9
84	1319.1	1601	122.1

Lot No.	Pad El. Ft.	Design HGL, Ft.	Static Pressure, psi
		Max.	Max.
85	1318.5	1601	122.4
86	1317.9	1601	122.7
87	1317.3	1601	122.9
88	1316.7	1601	123.2
89	1315.8	1601	123.6
90	1315.1	1601	123.9
91	1314.8	1601	124.0
92	1313.8	1601	124.4
93	1313.2	1601	124.7
94	1312.7	1601	124.9
95	1312.3	1601	125.1
96	1311.8	1601	125.3
97	1311.3	1601	125.5
98	1310.5	1601	125.9
99	1310	1601	126.1
100	1310.3	1601	126.0
101	1311	1601	125.6
102	1311.8	1601	125.3
103	1312.4	1601	125.0
104	1313	1601	124.8
105	1313.8	1601	124.4
106	1327.4	1601	118.5
107	1327.9	1601	118.3
108	1328.3	1601	118.2
109	1328.8	1601	117.9
110	1329.2	1601	117.8
111	1329.7	1601	117.5
112	1330.2	1601	117.3
113	1330.7	1601	117.1
114	1330.6	1601	117.2
115	1330	1601	117.4
116	1329.4	1601	117.7
117	1328.7	1601	118.0
118	1328.1	1601	118.2
119	1327.5	1601	118.5
120	1327.4	1601	118.5
121	1328.3	1601	118.2
122	1329.3	1601	117.7
123	1330.1	1601	117.4
124	1330.8	1601	117.1
125	1331.5	1601	116.8
126	1332.1	1601	116.5
127	1332.7	1601	116.2
128	1333.4	1601	115.9
129	1338.7	1601	113.6

Lot No.	Pad El. Ft.	Design HGL, Ft.	Static Pressure, psi
		Max.	Max.
130	1339.3	1601	113.4
131	1339.8	1601	113.2
132	1340.2	1601	113.0
133	1340.1	1601	113.0
134	1339.7	1601	113.2
135	1339.6	1601	113.3
136	1339.2	1601	113.4
137	1338.7	1601	113.6
138	1338.3	1601	113.8
139	1337.9	1601	114.0
140	1337.4	1601	114.2
141	1337.1	1601	114.3
142	1337.2	1601	114.3
143	1338	1601	114.0
144	1338.8	1601	113.6
145	1339.6	1601	113.3
146	1340.5	1601	112.9
147	1340.6	1601	112.8
148	1340.3	1601	113.0
149	1339.8	1601	113.2
150	1339.3	1601	113.4
151	1338.8	1601	113.6
152	1347.5	1601	109.8
153	1347.8	1601	109.7
154	1347.8	1601	109.7
155	1347.6	1601	109.8
156	1347.4	1601	109.9
157	1347	1601	110.1
158	1346.4	1601	110.3
159	1345.9	1601	110.5
160	1345.5	1601	110.7
161	1346	1601	110.5
162	1346.6	1601	110.2
163	1347.3	1601	109.9
164	1347.8	1601	109.7
165	1347.8	1601	109.7
166	1347.4	1601	109.9
167	1356	1601	106.2
168	1356.6	1601	105.9

APPENDIX B

FIRE FLOW TEST RESULTS

Board of Directors
Harvey R. Ryan, President
Andy Morris, Vice President
Phil Williams, Treasurer
George Cambero, Director
Nancy Horton, Director



General Manager
John D. Vega
District Secretary
Terese Quintanar
Legal Counsel
Best Best & Krieger

EVMWD will provide reliable, cost-effective, high quality water and wastewater services that are dedicated to the people we serve.

April 6, 2018

Riverside County Fire Department
Attn: Steve Paine
130 S. Main Street
Lake Elsinore, CA 92530

**Subject: Fire Flow Test Results for SE Corner El Toro Rd. & El Toro Rd.
Conducted on 03/28/18**

Dear Steve Paine:

The Elsinore Valley Municipal Water District (EVMWD) is providing this letter in response to the customer's request dated 03/19/18, for fire flow test data near El Toro Rd. & El Toro Rd. On 03/28/18, EVMWD Staff conducted a Flow Test utilizing a 6-inch residential type hydrant with 4-inch and 2.5-inch outlets.

All fire hydrants are served from pressure zone 1601 and are connected to a 16-inch diameter waterline. The test resulted in a static pressure of 99 pounds per square inch (psi) and a residual pressure of 92 psi with a total observed flow rate of 2,613.06 gallons per minute (gpm). The fire flow test resulted in a calculated available flow of 9,671.97 gpm at 20 psi residual.

Furthermore, the nearest fire hydrant is approximately 76.44 feet from the Property.

Please contact Engineering Services at (951) 674-3146 Ext. 6705 or engservices@evmwd.net, if you have any questions regarding this test.

Sincerely,

Matthew Bates, P.E.
Engineering Manager

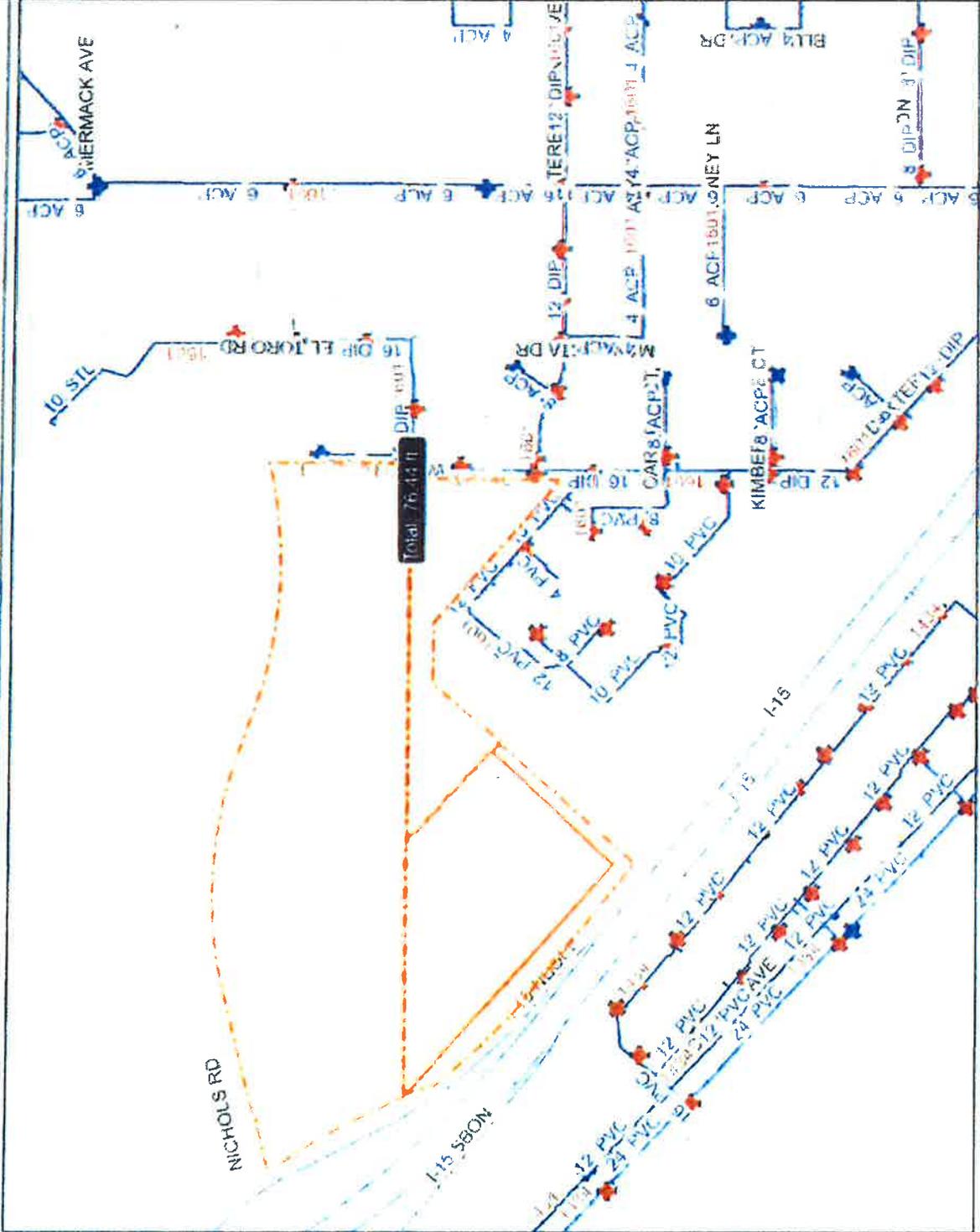
MB/ay

Enclosed: Fire Flow Test Exhibit

Cc: K & A Engineering, Inc. – Customer
File

F:\ENGINE\FIRE HYDRANT TEST\2018\March\SE El Toro & El Toro APNs 389-200-038,039, 389-210-008, 032,034,036\Fire Marshall Letter El Toro & El Toro.doc

SE Corner El Toro Rd & El Toro Rd.



Legend

- EVMWD Boundary
- Highways
- Street Centerlines
- Parcels
- Waterbodies
- Fire Hydrants
- Fire Hydrant
- Whithead
- Label Pressure Main
- Label Pressure Zone
- Pressure Main
- Distribution Main
- Transmission Main
- Air Release
- Blowoff
- Hydrant Lateral
- Unknown
- Sampling Point
- Service Lines
- Service Lateral
- Fire service
- Commercial
- Irrigation Service
- Industrial Service

1:7,560

Notes

This application has been provided to give a visual display of District facilities and related geographic information. To be sure of complete accuracy, please check with Engineering staff for the most up to date information.



Data Sources: EVMWD, County of Riverside

4/5/2018 1:31:41 PM



Fire Flow Test Report

P.O. Box 3000
31315 Cheney St
Lake Elsinore, CA 92531-3000
(951)874-3148

Date of Test: 03/28/2018

Time of Test: 12:50 PM

Hydrant #: FH-9876

Residual Hydrant Location: EL TORO RD

Hydrant Type: Residential

Pressure Zone: 1601

Tested By: Andrew Saucedo

Static Pressure (PSI): 99

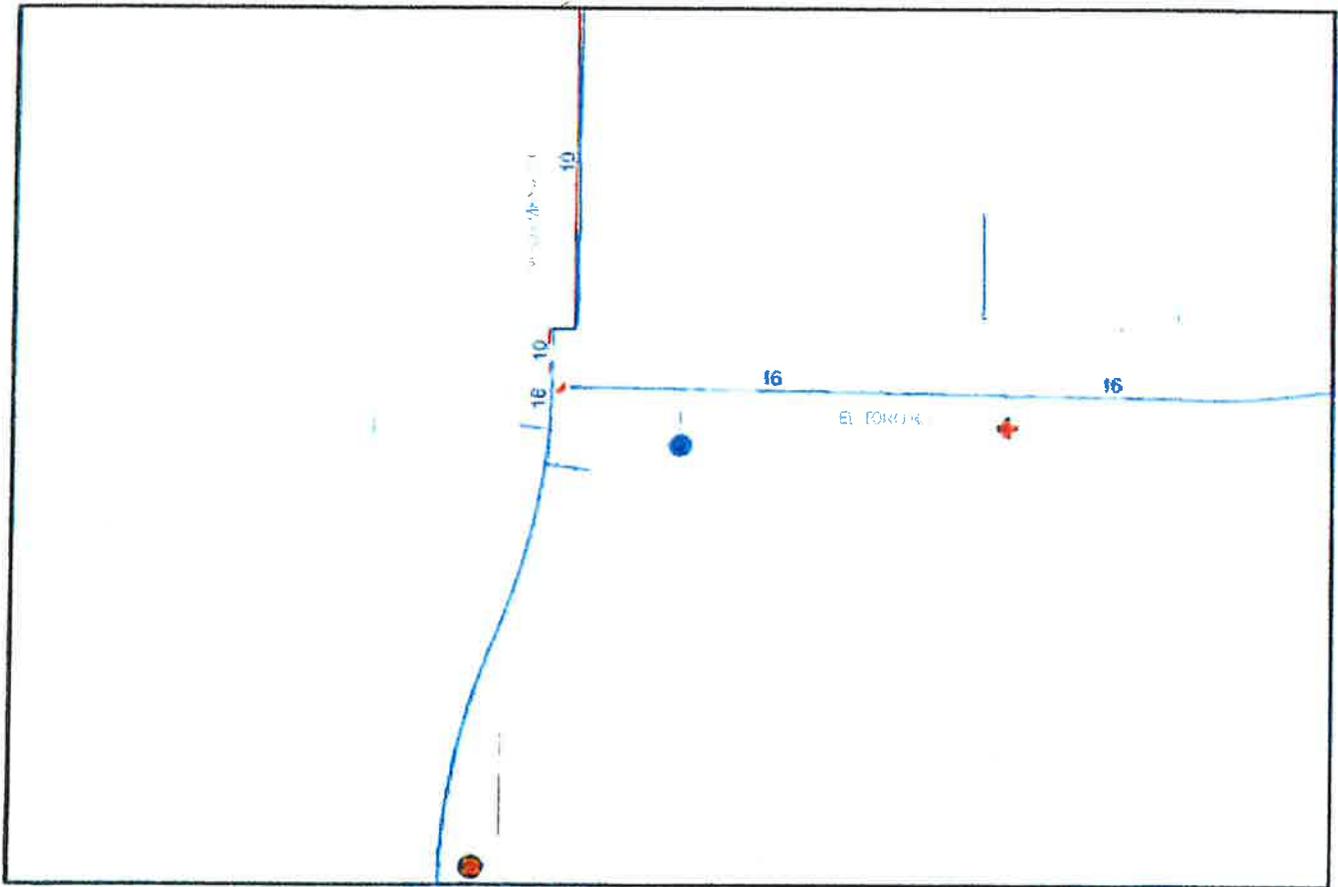
Residual Pressure (PSI): 92

Pitot (PSI): 80

Flow Hydrant (GPM): 2,613.06

Flow @ 20 PSI (GPM): 9,671.97

Reviewed By: _____



Pipe diameter indicated by number on pipeline.



P.O. Box 3000
 31315 Chaney Street
 Lake Elsinore, CA 92531-3000
 P: (951) 674-3146
 F: (951) 245-5946

FIRE FLOW TEST REPORT

Date 3-28-2018 **Work Order No.** _____
Tested by Andrew Saucedo **Reviewed by** Brian Vigil *BV*
Flow Hydrant Location 28526 El Toro **Flow Hydrant Type** 6" Residential Hydrant
Remarks _____

Pressure at Residual Hydrant in PSI					
Time	Hydrant Static [PSI]	Hydrant Residual [PSI]	Pressure Drop		
			During Test (H.) [PSI]	To 20 PSI Residual (H.) [PSI]	
12:50:00 PM	99	92	7	79	
Flow Data at Hydrants					
Hydrant #	Diffuser #	Diffuser Throat Diameter (D)	Diffuser Discharge Co-efficient (C)	Pitot Pressure (P) [PSI]	Calculated Flow Adjustment for Diffuser
1	6	2.498	0.812	80	1351
2	1	2.473	0.828	70	1263
3					
4					
Flow at 20 PSI Residual Pressure [GPM]		9671.97			

APPENDIX C

COMPUTER MODELING OUTPUT

The following conditions were modeled:

1. Average Day Demands.
2. Peak Hour Demands.
3. Maximum Day Demands plus 1,500 gpm fire flow at Node 28.
4. Maximum Day Demands plus 3,000 gpm fire flow at Node 30.

FLOWRATE IS EXPRESSED IN GPM AND PRESSURE IN PSIG

A SUMMARY OF THE ORIGINAL DATA FOLLOWS

PIPE NO.	NODE NOS.	LENGTH (FEET)	DIAMETER (INCHES)	ROUGHNESS	MINOR LOSS K	FIXED GRADE
1	0 2	200.0	16.0	130.0	.00	1589.00
2	2 3	200.0	8.0	130.0	.00	
3	2 4	1800.0	16.0	130.0	.00	
4	3 5	280.0	8.0	130.0	.00	
5	4 8	1400.0	20.0	130.0	.00	
6	5 7	400.0	8.0	130.0	.00	
7	3 6	850.0	8.0	130.0	.00	
8	5 9	350.0	8.0	130.0	.00	
9	6 10	400.0	8.0	130.0	.00	
11	10 12	400.0	8.0	130.0	.00	
13	8 10	200.0	8.0	130.0	.00	
15	10 14	175.0	8.0	130.0	.00	
17	14 16	370.0	8.0	130.0	.00	
19	6 20	470.0	8.0	130.0	.00	
21	18 20	650.0	8.0	130.0	.00	
23	14 18	300.0	8.0	130.0	.00	
25	8 32	1300.0	20.0	130.0	.00	
27	18 22	750.0	8.0	130.0	.00	
29	20 22	650.0	8.0	130.0	.00	
31	22 24	275.0	8.0	130.0	.00	
33	24 28	600.0	8.0	130.0	.00	
35	24 26	350.0	8.0	130.0	.00	
37	24 30	210.0	8.0	130.0	.00	
39	30 32	670.0	12.0	130.0	.00	

JUNCTION NUMBER	DEMAND	ELEVATION	CONNECTING PIPES
2	.00	1352.00	1 2 3
3	4.00	1352.00	2 4 7
4	.00	1386.00	3 5
5	4.00	1357.00	4 6 8
6	10.00	1350.00	7 9 19
7	4.00	1370.00	6
8	.00	1354.00	5 13 25
9	4.00	1364.00	8
10	4.00	1354.00	9 11 13 15
12	4.00	1360.00	11
14	4.00	1347.00	15 17 23
16	4.00	1346.00	17
18	5.00	1338.00	21 23 27
20	5.00	1337.00	19 21 29
22	4.00	1328.00	27 29 31
24	4.00	1314.00	31 33 35 37
26	4.00	1310.00	35
28	4.00	1321.00	33

30	25.00	1305.00	37	39
32	.00	1309.00	25	39

OUTPUT SELECTION: ALL RESULTS ARE OUTPUT EACH PERIOD

THIS SYSTEM HAS 24 PIPES WITH 20 JUNCTIONS , 4 LOOPS AND 1 FGNS

THE RESULTS ARE OBTAINED AFTER 9 TRIALS WITH AN ACCURACY = .00091

TRACT 37305 WATER SYSTEM ANALYSIS

544045A

AVERAGE DAY DEMANDS

PIPE NO.	NODE NOS.	FLOWRATE	HEAD LOSS	PUMP HEAD	MINOR LOSS	VELOCITY	HL/1000
1	0 2	93.00	.00	.00	.00	.15	.01
2	2 3	30.99	.01	.00	.00	.20	.03
3	2 4	62.01	.01	.00	.00	.10	.00
4	3 5	12.00	.00	.00	.00	.08	.01
5	4 8	62.01	.00	.00	.00	.06	.00
6	5 7	4.00	.00	.00	.00	.03	.00
7	3 6	14.99	.01	.00	.00	.10	.01
8	5 9	4.00	.00	.00	.00	.03	.00
9	6 10	-3.41	.00	.00	.00	-.02	.00
11	10 12	4.00	.00	.00	.00	.03	.00
13	8 10	24.94	.00	.00	.00	.16	.02
15	10 14	13.53	.00	.00	.00	.09	.01
17	14 16	4.00	.00	.00	.00	.03	.00
19	6 20	8.39	.00	.00	.00	.05	.00
21	18 20	-1.17	.00	.00	.00	-.01	.00
23	14 18	5.53	.00	.00	.00	.04	.00
25	8 32	37.08	.00	.00	.00	.04	.00
27	18 22	1.70	.00	.00	.00	.01	.00
29	20 22	2.23	.00	.00	.00	.01	.00
31	22 24	-.08	.00	.00	.00	.00	.00
33	24 28	4.00	.00	.00	.00	.03	.00
35	24 26	4.00	.00	.00	.00	.03	.00
37	24 30	-12.08	.00	.00	.00	-.08	-.01
39	30 32	-37.08	.00	.00	.00	-.11	-.01

JUNCTION NUMBER	DEMAND	GRADE LINE	ELEVATION	PRESSURE
2	.00	1589.00	1352.00	102.70
3	4.00	1588.99	1352.00	102.70
4	.00	1588.99	1386.00	87.96
5	4.00	1588.99	1357.00	100.53
6	10.00	1588.99	1350.00	103.56
7	4.00	1588.99	1370.00	94.90
8	.00	1588.99	1354.00	101.83
9	4.00	1588.99	1364.00	97.50
10	4.00	1588.99	1354.00	101.83
12	4.00	1588.99	1360.00	99.23
14	4.00	1588.99	1347.00	104.86
16	4.00	1588.98	1346.00	105.29
18	5.00	1588.98	1338.00	108.76

20	5.00	1588.98	1337.00	109.19
22	4.00	1588.98	1328.00	113.09
24	4.00	1588.98	1314.00	119.16
26	4.00	1588.98	1310.00	120.89
28	4.00	1588.98	1321.00	116.13
30	25.00	1588.99	1305.00	123.06
32	.00	1588.99	1309.00	121.33

THE NET SYSTEM DEMAND = 93.00

SUMMARY OF INFLOWS (+) AND OUTFLOWS (-) FROM FIXED GRADE NODES

PIPE NUMBER	FLOWRATE
1	93.00

THE NET FLOW INTO THE SYSTEM FROM FIXED GRADE NODES = 93.00

THE NET FLOW OUT OF THE SYSTEM INTO FIXED GRADE NODES = .00

A SUMMARY OF CONDITIONS SPECIFIED FOR THE NEXT SIMULATION FOLLOWS

THE DEMANDS ARE CHANGED FROM ORIGINAL VALUES BY A FACTOR = 4.50

THE RESULTS ARE OBTAINED AFTER 2 TRIALS WITH AN ACCURACY = .00001

PEAK HOUR DEMANDS

PIPE NO.	NODE NOS.	FLOWRATE	HEAD LOSS	PUMP HEAD	MINOR LOSS	VELOCITY	HL/1000
1	0 2	418.50	.02	.00	.00	.67	.12
2	2 3	139.43	.10	.00	.00	.89	.48
3	2 4	279.07	.11	.00	.00	.45	.06
4	3 5	54.00	.02	.00	.00	.34	.08
5	4 8	279.07	.03	.00	.00	.28	.02
6	5 7	18.00	.00	.00	.00	.11	.01
7	3 6	67.43	.11	.00	.00	.43	.12
8	5 9	18.00	.00	.00	.00	.11	.01
9	6 10	-15.34	.00	.00	.00	-.10	-.01
11	10 12	18.00	.00	.00	.00	.11	.01
13	8 10	112.22	.06	.00	.00	.72	.32
15	10 14	60.88	.02	.00	.00	.39	.10
17	14 16	18.00	.00	.00	.00	.11	.01
19	6 20	37.77	.02	.00	.00	.24	.04
21	18 20	-5.25	.00	.00	.00	-.03	.00
23	14 18	24.88	.01	.00	.00	.16	.02
25	8 32	166.85	.01	.00	.00	.17	.01
27	18 22	7.63	.00	.00	.00	.05	.00
29	20 22	10.02	.00	.00	.00	.06	.00
31	22 24	-.35	.00	.00	.00	.00	.00
33	24 28	18.00	.01	.00	.00	.11	.01
35	24 26	18.00	.00	.00	.00	.11	.01
37	24 30	-54.35	-.02	.00	.00	-.35	-.08
39	30 32	-166.85	-.06	.00	.00	-.47	-.09

JUNCTION NUMBER	DEMAND	GRADE LINE	ELEVATION	PRESSURE
2	.00	1588.98	1352.00	102.69
3	18.00	1588.88	1352.00	102.65
4	.00	1588.87	1386.00	87.91
5	18.00	1588.86	1357.00	100.47
6	45.00	1588.77	1350.00	103.47
7	18.00	1588.85	1370.00	94.84
8	.00	1588.84	1354.00	101.76
9	18.00	1588.85	1364.00	97.44
10	18.00	1588.78	1354.00	101.74
12	18.00	1588.77	1360.00	99.14
14	18.00	1588.76	1347.00	104.76
16	18.00	1588.76	1346.00	105.19
18	22.50	1588.75	1338.00	108.66
20	22.50	1588.75	1337.00	109.09
22	18.00	1588.75	1328.00	112.99
24	18.00	1588.75	1314.00	119.06
26	18.00	1588.75	1310.00	120.79
28	18.00	1588.75	1321.00	116.02
30	112.50	1588.77	1305.00	122.97
32	.00	1588.83	1309.00	121.26

THE NET SYSTEM DEMAND = 418.50

SUMMARY OF INFLOWS (+) AND OUTFLOWS (-) FROM FIXED GRADE NODES

PIPE NUMBER	FLOWRATE
1	418.50

THE NET FLOW INTO THE SYSTEM FROM FIXED GRADE NODES = 418.50
 THE NET FLOW OUT OF THE SYSTEM INTO FIXED GRADE NODES = .00

A SUMMARY OF CONDITIONS SPECIFIED FOR THE NEXT SIMULATION FOLLOWS

THE DEMANDS ARE CHANGED FROM ORIGINAL VALUES BY A FACTOR = 2.00

THE FOLLOWING SPECIFIC DEMAND CHANGES ARE MADE :

JUNCTION NUMBER	DEMAND
28	1508.00

THE FOLLOWING CHANGES IN PIPE DATA ARE SPECIFIED

FOR PIPE NUMBER 1 THE VALUE OF THE FIXED GRADE IS CHANGED TO 1570.0

THE RESULTS ARE OBTAINED AFTER 4 TRIALS WITH AN ACCURACY = .00004

MAXIMUM DAY DEMANDS PLUS 1500 GPM FIRE FLOW AT NODE 28

PIPE NO.	NODE NOS.	FLOWRATE	HEAD LOSS	PUMP HEAD	MINOR LOSS	VELOCITY	HL/1000
1	0 2	1686.00	.33	.00	.00	2.69	1.64
2	2 3	381.38	.61	.00	.00	2.43	3.06

3	2	4	1304.62	1.84	.00	.00	2.08	1.02
4	3	5	24.00	.01	.00	.00	.15	.02
5	4	8	1304.62	.48	.00	.00	1.33	.34
6	5	7	8.00	.00	.00	.00	.05	.00
7	3	6	349.38	2.21	.00	.00	2.23	2.61
8	5	9	8.00	.00	.00	.00	.05	.00
9	6	10	4.84	.00	.00	.00	.03	.00
11	10	12	8.00	.00	.00	.00	.05	.00
13	8	10	343.57	.51	.00	.00	2.19	2.53
15	10	14	332.41	.42	.00	.00	2.12	2.38
17	14	16	8.00	.00	.00	.00	.05	.00
19	6	20	324.54	1.07	.00	.00	2.07	2.27
21	18	20	7.84	.00	.00	.00	.05	.00
23	14	18	316.41	.65	.00	.00	2.02	2.17
25	8	32	961.05	.25	.00	.00	.98	.20
27	18	22	298.57	1.46	.00	.00	1.91	1.95
29	20	22	322.38	1.46	.00	.00	2.06	2.24
31	22	24	612.95	2.03	.00	.00	3.91	7.38
33	24	28	1508.00	23.46	.00	.00	9.62	39.09
35	24	26	8.00	.00	.00	.00	.05	.00
37	24	30	-911.05	-3.23	.00	.00	-5.81	-15.37
39	30	32	-961.05	-1.58	.00	.00	-2.73	-2.36

JUNCTION NUMBER	DEMAND	GRADE LINE	ELEVATION	PRESSURE
2	.00	1569.67	1352.00	94.32
3	8.00	1569.06	1352.00	94.06
4	.00	1567.83	1386.00	78.79
5	8.00	1569.05	1357.00	91.89
6	20.00	1566.84	1350.00	93.97
7	8.00	1569.05	1370.00	86.26
8	.00	1567.35	1354.00	92.45
9	8.00	1569.05	1364.00	88.86
10	8.00	1566.84	1354.00	92.23
12	8.00	1566.84	1360.00	89.63
14	8.00	1566.43	1347.00	95.09
16	8.00	1566.43	1346.00	95.52
18	10.00	1565.78	1338.00	98.70
20	10.00	1565.78	1337.00	99.14
22	8.00	1564.32	1328.00	102.40
24	8.00	1562.29	1314.00	107.59
26	8.00	1562.29	1310.00	109.32
28	1508.00	1538.83	1321.00	94.39
30	50.00	1565.52	1305.00	112.89
32	.00	1567.09	1309.00	111.84

THE NET SYSTEM DEMAND = 1686.00

SUMMARY OF INFLOWS(+) AND OUTFLOWS(-) FROM FIXED GRADE NODES

PIPE NUMBER	FLOWRATE
1	1686.00

THE NET FLOW INTO THE SYSTEM FROM FIXED GRADE NODES = 1686.00

THE NET FLOW OUT OF THE SYSTEM INTO FIXED GRADE NODES = .00

A SUMMARY OF CONDITIONS SPECIFIED FOR THE NEXT SIMULATION FOLLOWS

THE DEMANDS ARE CHANGED FROM ORIGINAL VALUES BY A FACTOR = 2.00

THE FOLLOWING SPECIFIC DEMAND CHANGES ARE MADE :

JUNCTION NUMBER	DEMAND
30	3050.00

THE FOLLOWING CHANGES IN PIPE DATA ARE SPECIFIED

FOR PIPE NUMBER 1 THE VALUE OF THE FIXED GRADE IS CHANGED TO 1570.0

THE RESULTS ARE OBTAINED AFTER 4 TRIALS WITH AN ACCURACY = .00057

MAXIMUM DAY DEMANDS PLUS 3000 GPM FIRE FLOW AT NODE 30

PIPE NO.	NODE NOS.	FLOWRATE	HEAD LOSS	PUMP HEAD	MINOR LOSS	VELOCITY	HL/1000
1	0 2	3186.00	1.07	.00	.00	5.08	5.34
2	2 3	646.93	1.63	.00	.00	4.13	8.15
3	2 4	2539.07	6.32	.00	.00	4.05	3.51
4	3 5	24.00	.01	.00	.00	.15	.02
5	4 8	2539.07	1.66	.00	.00	2.59	1.18
6	5 7	8.00	.00	.00	.00	.05	.00
7	3 6	614.93	6.31	.00	.00	3.92	7.42
8	5 9	8.00	.00	.00	.00	.05	.00
9	6 10	172.60	.28	.00	.00	1.10	.71
11	10 12	8.00	.00	.00	.00	.05	.00
13	8 10	235.29	.25	.00	.00	1.50	1.25
15	10 14	391.89	.56	.00	.00	2.50	3.22
17	14 16	8.00	.00	.00	.00	.05	.00
19	6 20	422.32	1.74	.00	.00	2.70	3.70
21	18 20	-8.12	.00	.00	.00	-.05	.00
23	14 18	375.89	.90	.00	.00	2.40	2.98
25	8 32	2303.78	1.29	.00	.00	2.35	.99
27	18 22	374.01	2.22	.00	.00	2.39	2.96
29	20 22	404.21	2.22	.00	.00	2.58	3.41
31	22 24	770.22	3.10	.00	.00	4.92	11.26
33	24 28	8.00	.00	.00	.00	.05	.00
35	24 26	8.00	.00	.00	.00	.05	.00
37	24 30	746.22	2.23	.00	.00	4.76	10.62
39	30 32	-2303.78	-7.97	.00	.00	-6.53	-11.90

JUNCTION NUMBER	DEMAND	GRADE LINE	ELEVATION	PRESSURE
2	.00	1568.93	1352.00	94.00
3	8.00	1567.30	1352.00	93.30
4	.00	1562.62	1386.00	76.53
5	8.00	1567.30	1357.00	91.13
6	20.00	1560.99	1350.00	91.43
7	8.00	1567.29	1370.00	85.49
8	.00	1560.96	1354.00	89.68
9	8.00	1567.29	1364.00	88.09
10	8.00	1560.71	1354.00	89.57
12	8.00	1560.71	1360.00	86.97
14	8.00	1560.14	1347.00	92.36
16	8.00	1560.14	1346.00	92.80

18	10.00	1559.25	1338.00	95.87
20	10.00	1559.25	1337.00	96.31
22	8.00	1557.03	1328.00	99.25
24	8.00	1553.94	1314.00	103.97
26	8.00	1553.93	1310.00	105.70
28	8.00	1553.93	1321.00	100.94
30	3050.00	1551.70	1305.00	106.91
32	.00	1559.67	1309.00	108.63

THE NET SYSTEM DEMAND = 3186.00

SUMMARY OF INFLOWS(+) AND OUTFLOWS(-) FROM FIXED GRADE NODES

PIPE NUMBER	FLOWRATE
1	3186.00

THE NET FLOW INTO THE SYSTEM FROM FIXED GRADE NODES = 3186.00

THE NET FLOW OUT OF THE SYSTEM INTO FIXED GRADE NODES = .00

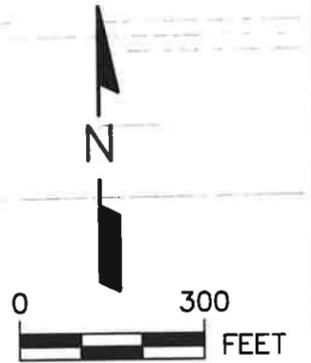
\\ARTIC\DWG\544045\CLE_WAT--EXHIBIT-A-NP.DWG 07-16-18 14:20:24 LAYOUT: LAYOUT

LEGEND

- PROJECT BOUNDARY
- EXISTING 1601 ZONE
- PROPOSED 1601 ZONE
- (32) COMPUTER MODEL NODE NUMBER
- [25] COMPUTER MODEL PIPE NUMBER

NOTE: ALL PROPOSED PIPES ARE RECOMMENDED AS 8-INCH UNLESS NOTED.

EL TORO RESERVOIRS



PROPOSED 20" TRANSMISSION LINE PER EVMWD PROJECT FT-29

CONNECT TO EXISTING 16" WATER LINE

CONNECT TO EXISTING 16" WATER LINE

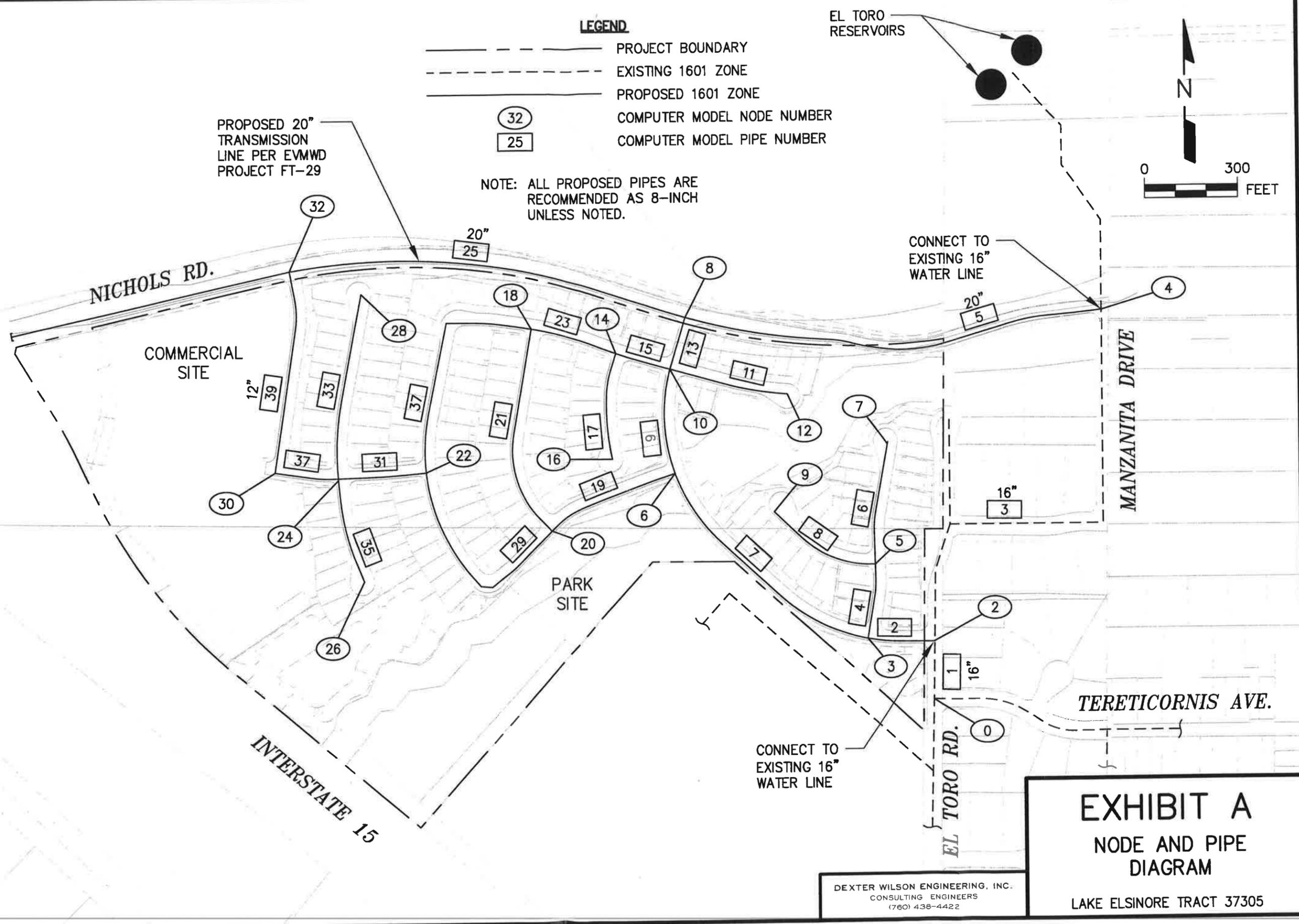


EXHIBIT A
NODE AND PIPE
DIAGRAM

DEXTER WILSON ENGINEERING, INC.
 CONSULTING ENGINEERS
 (760) 438-4422

LAKE ELSINORE TRACT 37305