

## **TECHNICAL MEMORANDUM**

DATE: October 5, 2009 Project No: 418-02-07-22

TO: Jack Bond, City of Modesto

CC: Rich Ulm, City of Modesto  
Jim Alves, City of Modesto  
Glenn Prasad, City of Modesto

FROM: Charles Duncan, Project Manager  
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SUBJECT: City of Modesto's 2010 Water System Engineer's Report  
Facilities Inventory of the Existing Water System for the Contiguous Service Area  
(Facilities Inventory TM)

### **1.0 INTRODUCTION**

From a hydraulic modeling perspective, the City of Modesto (City) provides domestic water to two distinct customer location categories; (1) the contiguous service area, and (2) outlying service areas. The City's contiguous service area is primarily defined by the current Sphere of Influence (SOI), Salida, North Ceres, and some unincorporated Stanislaus County "islands" within and adjacent to the SOI (Empire is within the SOI). The outlying service areas include Del Rio, Ceres (Walnut Manor), Grayson, Waterford, Hickman, and portions of Turlock.

This technical memorandum (TM) describes the existing contiguous service area water system, including its supply, storage, and pipeline facilities (Figure 1). The outlying service area's water systems are discussed in separate TM's.

### **2.0 BACKGROUND**

In the early 1990's, the City, Modesto Irrigation District (MID), and the former Del Este Water Company (DEW Co) formed the Modesto Domestic Water Partnership to use a portion of MID's surface water rights for municipal uses, and entered into a Treatment and Delivery Agreement (TDA) to cover the design, construction, commercial operation, and financing for the Initial Phase of the Modesto Regional Water Treatment Plant (MRWTP). This new treatment plant, along with associated storage and delivery facilities, became operational in 1995. Only the commercial operation portion of that TDA is currently active.

In 1995, the City acquired the DEW Co, which, as a result, became the primary domestic water purveyor in Stanislaus County.

The MRWTP currently treats water from the Modesto Reservoir and conveys it to the City's service area to combine with groundwater sources to meet the City's water supply needs for those municipal customers within the City limits north of the Tuolumne River (southern boundary of MID's service area), including the communities of Salida and Empire. The Initial Phase of the MRWTP significantly reduced the City's reliance on groundwater pumping and also eliminated the groundwater overdraft condition. For a number of years, the City and MID have been working together on the MRWTP Phase Two Expansion, which is currently under construction, so as to provide the City's existing customers with a reliable water source and keep pace with the projected growth.

### **3.0 WATER SUPPLY**

#### **3.1 Surface Water Supply**

Since 1995, the City has received 33,601 acre-feet per year (af/yr) [30 million gallons per day (mgd)], of treated surface water from the MRWTP. The City will be receiving an additional 33,601 af/yr (for a total of 60 mgd) after the expected early 2010 completion of the MRWTP Phase Two Expansion project. The 60 mgd capacity is an annual average, and both the original and expanded facilities will have peaking capacities greater than the annual averages. The original phase of the MRTWP has a functional capacity of 42.5 mgd (permitted by the State to produce up to 45 mgd for the last few years), which helps meet the Maximum Day and Peak Hour demands of North Modesto (peaking capacity for the Phase Two Expansion will be determined after start-up operations and testing protocols are completed).

Delivery of this surface water supply is made possible via the *Amended and Restated Water Treatment and Delivery Agreement* (AR TDA) between the MID and the City, dated October 2005. The AR TDA is the document obligating and controlling the delivery of treated surface water by MID to the City.

To accommodate the additional flow from the MRWTP Phase Two Expansion and maximize its hydraulic benefits, the City has been moving forward with design activities required to construct numerous City-Side Downstream Improvements (Figure 2). As required by the California Environmental Quality Act, the City has evaluated a number of potential sites for each of the three recommended tanks, and has identified preferred sites for each tank location. The West Tank is under construction, the North Tank is being designed, and the property for the Industrial Tank has recently been purchased. These locations are indicated in Figure 2, and will be used in future hydraulic analyses.

The City-Side Downstream Improvements also include the construction of automatic control valves (with flow metering capabilities) at existing and future MID turnouts, and new City transmission mains along the Virginia Corridor, Orangeburg Avenue, and Yosemite Boulevard. These recommendations were made based on hydraulic analyses by WYA, and are also shown in Figure 2.

For purposes of this TM, it will be assumed that the proposed City-Side Downstream Improvements and the MRWTP Phase Two Expansion project are planned but not yet part of the existing system, since only limited portions have been constructed at the time of this report.

### 3.2 Groundwater Supply

The City has 102 operational wells in the contiguous service area. An operational well is defined as any well that has not been formally abandoned. Of these 102 wells, 78 are currently in production (as per the City’s “Wells Out of Service Report” for August 2009, shown in the 2010 Engineer’s Report, Attachment B). These 78 wells supplement the treated surface water from the MRWTP, and are shown on Figure 1 and described in Table 1. The total groundwater pumping capacity was calculated by summing the pumping capacity of the 78 production wells in service. From this calculation, the total pumping capacity of the production wells in the contiguous service area was determined to be approximately 118 mgd. This total groundwater pumping capacity includes wells that feed directly into the City’s storage tanks and does not include wells that are out of service (longer than temporary) for water quality or mechanical reasons.

### 4.0 STORAGE TANKS, BOOSTER PUMP STATIONS, AND PIPELINES

#### 4.1 Storage Tanks

The existing contiguous service area contains eight at-grade storage tanks. Six are owned and operated by the City and two are owned and operated by MID. Each is equipped with a booster pump station (MID’s tanks are served by one pump station), as shown on Figure 1 and described in Table 2. Storage Tanks 1 and 2 are not operational, and are scheduled to be removed. Recently, the 750,000 gallon Galas Subdivision Tank was completed, increasing the total storage capacity of the contiguous service area to 18.15 million gallons (MG), however, this tank is not yet operational.

**Table 2. Existing Contiguous Service Area Storage Characteristics**

Reservoir	Tank Capacity, MG	Service Area	Diameter, feet	Base Elevation, feet	Overflow Elevation, feet
Tank 3	1.3	Contiguous	95	73 <sup>(a)</sup>	24.5
Tank 4	1.3	Contiguous	95	105 <sup>(a)</sup>	24.5
Tank 5	1.3	Contiguous	95	102 <sup>(a)</sup>	24.5
Tank 6	2.0	Contiguous	116	75 <sup>(a)</sup>	24.5
Tank 7	0.5	Contiguous	50	80 <sup>(a)</sup>	33.5
Tank 8	1.0	Contiguous	82	91 <sup>(a)</sup>	24.5
Tank 10 (Galas)	0.7	Contiguous	60 <sup>(b)</sup>	80.50 <sup>(b)</sup>	33.1 <sup>(b)</sup>
MRWTP Reservoirs	10.0 (two at 5.0 each)	Contiguous	146	113	39.5
<b>Total Capacity</b>	<b>18.1</b>				

Note: City Tanks 1 and 2 are abandoned.

<sup>(a)</sup> Tank base elevations based on TopoDepot software allocation in model.

<sup>(b)</sup> Information based on as-built plans provided by the City.

**Table 1. Existing Groundwater Well Production Information for the Contiguous Service Area<sup>(a)</sup>**

City Well Number	Area	Well Status <sup>(c)</sup>	Date Drilled	Depth [ft]	Gravel Packed	Pump Capacity <sup>(a)</sup> [gpm]	Available Capacity <sup>(b)</sup> [gpm]	Pump HP	Existing Backup Power	Remarks
1	Modesto		1954	118	no	950	950	75		
2	Modesto	OOS	1976	255	no	1,500		150		OOS <sup>(c)</sup> [Uranium]
3	Modesto	OOS	1956	138	yes	650		100		OOS <sup>(c)</sup> [PCE]
4	Modesto		1933	225	no	950	950	100		
6	Modesto		1921	234	no	950	950	75	Y	
7	Modesto		1922	260	no	950	950	75		
8	Modesto	OOS	1964	220	no	775		50		OOS <sup>(c)</sup> [Uranium]
10	Modesto		1939	110	no	400	400	60		
14	Modesto	OOS	1948	263	no	1,500		100	Y	OOS <sup>(c)</sup> [Uranium]
16	Modesto		1976	312	no	1,800	1,800	150		
17	Modesto		1954	232	no	1,450	1,450	100		
18	Modesto	OOS	1956	250	no	750		100		OOS <sup>(c)</sup> [Nitrates]
19	South Modesto	OOS	1986	240	no	600		unknown		OOS <sup>(c)</sup> [Uranium]
21	Modesto	OOS	1959	320	no	1,500		125		OOS <sup>(c)</sup> [Uranium]
22	Modesto	OOS	1960	280	no	1,000		125		OOS <sup>(c)</sup> [Uranium]
24	Modesto	OOS	1961	300	no	1,500		150		OOS <sup>(c)</sup> [Uranium]
25	Modesto		1962	395	no	1,500	1,500	125	Y	
29	South Modesto		1964	144	no	1,058	1,058	75		
30	South Modesto		1964	123	no	1,000	1,000	75		
32	Modesto	OOS	1948	216	yes	800		60		OOS <sup>(c)</sup> [Nitrates]
33	Modesto		1966	380	no	1,800	1,800	150	Y	
34	Modesto	OOS	1967	112	no	1,250		100		OOS <sup>(c)</sup> [Uranium]
36	Modesto		1968	158	no	1,050	1,050	100		
37	Modesto	OOS	1970	228	no	1,250		125		OOS <sup>(c)</sup> [Gross Alpha]
38	South Modesto		1971	252	no	1,163	1,163	100		
39	Modesto		1972	292	no	1,950	1,950	150	Y	
40	Modesto		1974	275	no	1,400	1,400	150	Y	
41	Modesto		1976	248	no	1,200	1,200	150	Y	
42	Modesto		1976	430	no	1,800	1,800	150	Y	
43	Modesto		1977	321	no	1,900	1,900	150	Y	
44	Modesto	OOS	1980	220	no	1,250		100	Y	OOS <sup>(c)</sup> [Uranium]
45	Modesto		1985	292	no	1,500	1,500	125		
46	Modesto		1985	329	no	1,150	1,150	75		
47	Modesto		1985	280	no	1,600	1,600	150		
48	Modesto		1990	500	yes	1,330	1,330	150		
49	South Modesto	OOS	1984	266	no	500		75	Y	OOS <sup>(c)</sup> [Arsenic]
50	Modesto		2000	295	yes	800	800	100		
51	Modesto		1990	470	yes	2,200	2,200	250		
52	Modesto		1992	280	yes	1,600	1,600	150	Y	
53	Modesto	OOS	1992	255	yes	1,500		100		OOS <sup>(c)</sup> [Nitrates]
54	Modesto		1993	472	yes	2,400	2,400	200	Share with Tank 4	
55	South Modesto	OOS	1993	265	yes	1,500		100		OOS <sup>(c)</sup> [Uranium]
56	Modesto		1964	250	yes	650	650	75		
57	Modesto		1994	200	yes	1,350	1,350	100	Y	
58	Modesto		1994	500	yes	1,300	1,300	100		
59	Modesto		1995	265	yes	1,400	1,400	125		
61	Modesto		2006	422	yes	1,575	1,575	200	Y	
62	Modesto		2004	390	yes	2,200	2,200	200	Y	
63	Modesto	OOS	2006	500	NP(d)	NP(d)		NP(d)		OOS [Under construction]
64	Modesto		2005	430	yes	1,800	1,800	200	Y	
65	Modesto		2000	379	yes	2,000	2,000	200	Share with Tank 5	
66	South Modesto	OOS	NP <sup>(d)</sup>	NP <sup>(d)</sup>	yes	1,350		200	Share with Tank 10	OOS <sup>(d)</sup> [Mechanical]
100	South Modesto		1958	127	no	650	650	40		
204	Modesto		1954	256	no	1,450	1,450	150		
211	Modesto		1974	215	no	1,450	1,450	100		
212	Modesto		1973	169	no	1,000	1,000	100		
214	South Modesto	OOS	1964/90	162	no	400		40		OOS <sup>(c)</sup> [Nitrates]
216	South Modesto		1960/88	200	no	550	550	40		
217	South Modesto		1949/72	232	no	400	400	40		
223	South Modesto		1940	134	no	400	400	40	Share with Tank 8	
225	Modesto		1946/56	320	no	1,200	1,200	150	Y	
226	Modesto	OOS	1963	235	no	675		40 <sup>(e)</sup>		OOS <sup>(c)</sup> [Arsenic]
229	Modesto		1950/85	230	no	425	425	50		
232	Modesto		1949	81	yes	775	775	75		
236	Modesto	OOS	1950	224	no	750		75		OOS <sup>(c)</sup> [Nitrates]
237	Modesto		1960/86/87	300	no	630	630	40		
241	Modesto		1953	217	no	350	350	40		
247	Modesto		1964	225	no	560	560	40		
250	Salida		1949/85	246	no	835	835	75		
259	Modesto		1960/78	344	no	400	400	40		
262	Modesto		1954/75	290	no	350	350	40		
264	Modesto		1958/83	428	no	700	700	40		
265	Modesto		1960	300	no	500	500	40		
267	Modesto		1951	270	no	1,190	1,190	100		
269	Modesto		1959	265	no	750	750	50		
277	Modesto		1976	257	no	1,000	1,000	100		
278	Modesto		1972	270	no	800	800	100		
279	Modesto		1971	208	no	800	800	100	Y	
281	Salida		1979	365	no	480	480	100		
283	Modesto	OOS	1980	165	no	800		75		OOS <sup>(c)</sup> [Uranium]
284	South Modesto		1981	224	no	750	750	75		



**Table 1. Existing Groundwater Well Production Information for the Contiguous Service Area<sup>(a)</sup>**

City Well Number	Area	Well Status <sup>(c)</sup>	Date Drilled	Depth [ft]	Gravel Packed	Pump Capacity <sup>(a)</sup> [gpm]	Available Capacity <sup>(b)</sup> [gpm]	Pump HP	Existing Backup Power	Remarks
285	Modesto	OOS	1984	300	no	1,000		100	Y	OOS <sup>(c)</sup> [Nitrates]
287	South Modesto		1954	102	yes	750	750	75		
288	Salida		1986	230	no	650	650	50		
290	Salida		1987	304	no	633	633	50		
291	Modesto		1988	268	no	500	500	75		
292	Modesto		1988	267	no	850	850	75		
293	Modesto	OOS	1988	256	no	825		100	Share with 294 & 296	OOS <sup>(c)</sup> [Nitrates]
294	Modesto		1989	345	no	1,325	1,325	100	Share with 293 & 296	
296	Modesto		1991	298	no	900	900	75	Share with 293 & 294	
297	Salida		2000	322	no	1,300	1,300	100		
298	Salida		1990	324	no	1,200	1,200	100	Y	
299	Salida		1990	258	no	450	450	100	Y	
300	Modesto		1990	368	no	700	700	75		
301	Modesto		1991	156	no	500	500	40	Share with Tank 6	
304	Modesto	OOS	1991	172	no	525		40	Share with Tank 6	OOS <sup>(c)</sup> [Uranium]
305	South Modesto		1991	344	no	750	750	75	Share with Tank 8	
307	Modesto		1993	268	no	1,050	1,050	100		
308	Modesto		1993	256	no	850	850	75		
310	Modesto		1994	330	no	1,320	1,320	150	Y	
312	Modesto		2002	355	NP <sup>(d)</sup>	1,000	1,000	100		
313	Modesto		2000	322	NP <sup>(d)</sup>	1,175	1,175	100	Y	
<b>Total Available System Pumping Capacity [gpm]</b>						106,574				
<b>Total Pumping Capacity without 2009 Out of Service Wells [gpm]</b>						82,424				
<b>Actual System Pumping Capacity [gpm]</b>						82,424				
<b>Actual System Pumping Capacity [mgd]</b>						119				

<sup>(a)</sup> Based on information provided by City.

<sup>(b)</sup> Does not include wells out of service for water quality or Pump Repair.

<sup>(c)</sup> OOS = Out of service well per Wells Out of Service in July 2009 Report.

<sup>(d)</sup> NP = Information not provided.

<sup>(e)</sup> Pump HP per 2002 Well Directory.

<sup>(f)</sup> Construction of the Galas well has recently been completed, but it is not yet operational.

#### **4.2 Booster Pumping Facilities**

The City's pumping capacity can be separated into two categories: groundwater well pumps and booster pump stations at each tank. Within the contiguous service area, there are 7 active booster pump stations (one is owned and operated by MID). Table 3 details the pumping capacity, the presence of backup power, and other information for each booster pumping facility.

#### **4.3 Pipelines**

The existing contiguous service area's system consists of approximately 940 miles of pipelines, which are shown on Figure 1. Existing distribution pipeline sizes range from 2 to 12 inches in diameter, along with larger transmission mains ranging in size from 14 to 24 inches in diameter. The MID owned transmission mains range in size from 24 to 42 inches in diameter. The older pipelines are found in the Downtown and former Del Este service areas of the City and are primarily constructed of cast iron, welded steel, or asbestos cement. Sometimes ductile iron and reinforced concrete pipe are found in mains exceeding 16 inch in diameter.

A portion of the transmission pipelines traversing the City is owned by MID and treated surface water is discharged into either the former Del Este system or the City system through a number of turnouts. Originally, each turnout was to be equipped with a butterfly valve, flow control valve, and meter. However, these flow control valves and meters were only installed on the Del Este turnouts. Meters and flow control valves were never constructed on the original City turnouts. When the City acquired the Del Este system, the former Del Este flow control valves and meters were removed. Currently, each turnout is equipped with a butterfly valve, which does not allow flow or pressure to be regulated to the degree necessary to control a hydraulic system of the City's complexity.

### **5.0 RECENT SYSTEM IMPROVEMENTS**

The City has made a number of improvements to the contiguous service area over the past few years. These system changes include the following:

- Constructed 4 new wells: Well 61 (Kaiser), Well 62 (Freedom), Well 64 (McKinney-Colony) and Well 66 (Galas). Three of which are currently operational (Well 66 is not).
- Replaced, upsized, or installed approximately 50,000 linear feet of water distribution and transmission mains;
- Installed (or have construction plans to install) treatment equipment and/or blending lines to bring Wells 49, 236, and 283 back-in-service;
- Constructed 0.7 MG Galas Tank in South Modesto, referenced as Tank 10, in Table 2; and,
- Replaced booster pump stations at Tanks 6, 7, and 8 to increase capacity and reliability for South Modesto service area.

**Table 3. Summary of Existing City Booster Pumping Facilities**

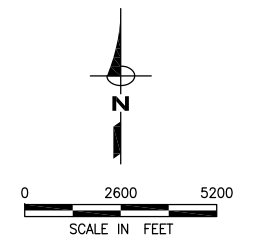
Pump Station	Area	Pump	Pumps [Capacity, gpm]					Rated Capacity	Existing Backup	Remarks
		HP	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	[gpm] <sup>(a)</sup>	Power <sup>(b)</sup>	
<i>Booster Pump Stations</i>										
Tank 3	Modesto	NP <sup>(c)</sup>	600	600	600	600		2,400	Y	
Tank 4	Modesto	NP <sup>(c)</sup>	950	950	950	910		3,760	Y	
Tank 5	Modesto	NP <sup>(c)</sup>	950	900	950	950		3,750	Y	
Tank 6	Modesto	NP <sup>(c)</sup>	2,475	2,460	2,515			7,450	Y	
Tank 7	Modesto	NP <sup>(c)</sup>	2,450	2,450	2,450			7,350	Y	
Tank 8	Modesto	NP <sup>(c)</sup>	2,570	2,570	2,570			7,710	Y	
Tank 10 (Galas Tank)	South Modesto	NP <sup>(c)</sup>	2,085	2,085	2,085			6,255	Y	
MID Terminal Reservoir	Modesto	NP <sup>(c)</sup>	13,900	13,900	6,950	6,950	13,900	55,600	Y	
<b>Total Booster Pump Station Capacity [gpm]</b>								94,275		
<b>Total Booster Pump Station Capacity [mgd]</b>								136		

<sup>(a)</sup> Pump capacity based information provided by City Staff.

<sup>(b)</sup> Backup power information provided by City Staff.

<sup>(c)</sup> NP = Information not provided

**FIGURE 1**  
**City of Modesto**  
**EXISTING CONTIGUOUS**  
**SERVICE AREA**  
**SYSTEM FACILITIES**

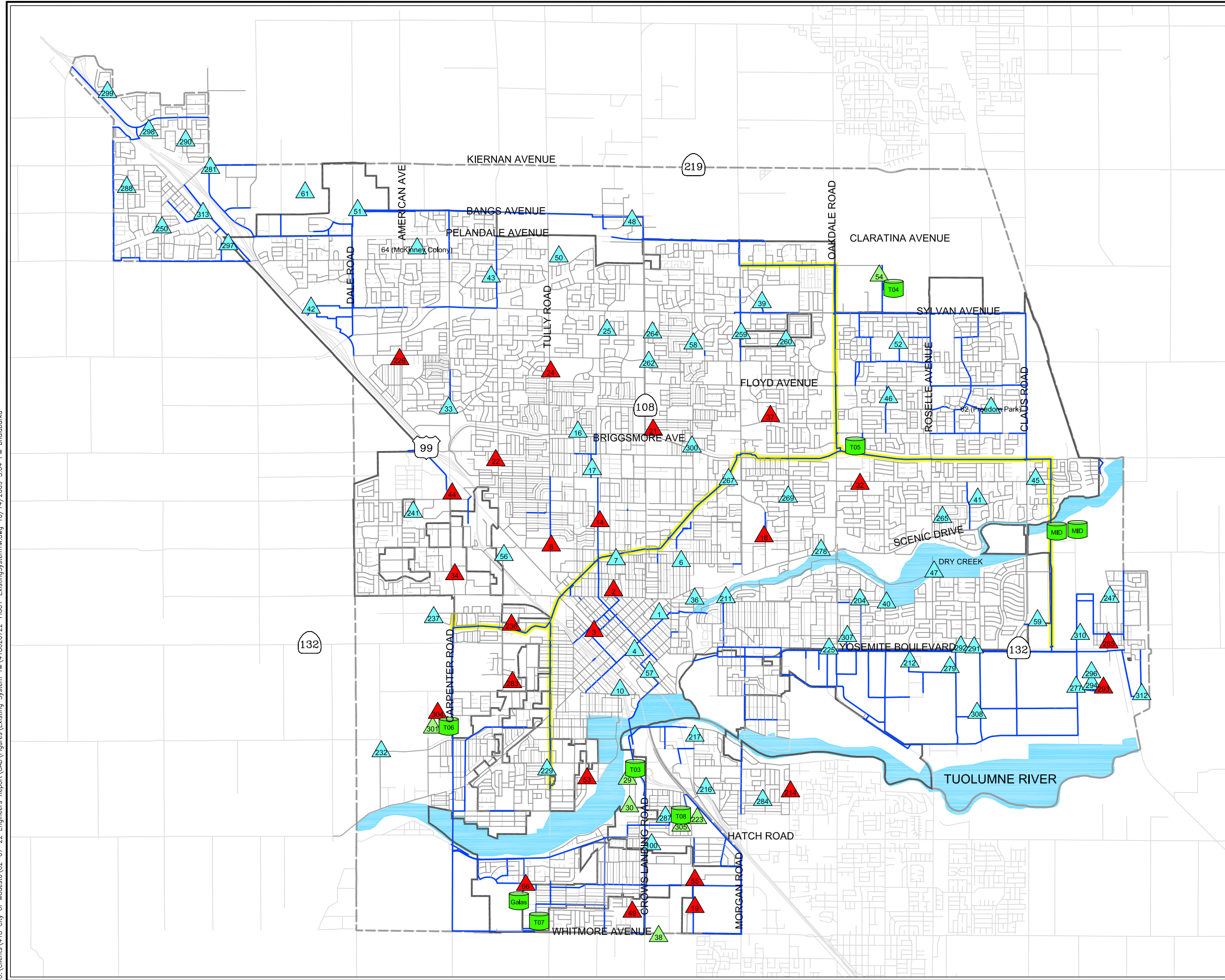


**NOTES**

1. PIPE CONFIGURATIONS AND WELL LOCATIONS BASED ON GIS INFORMATION PROVIDED BY CITY.
2. BOUNDARY FOR CITY IS APPROXIMATE AND BASED ON GIS INFORMATION PROVIDED BY CITY.
3. WELL OUT OF SERVICE INFORMATION BASED ON AUGUST 2009 REPORT (DATED 9/11/2009)

**LEGEND**

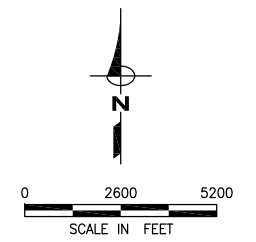
- EXISTING CITY TANK & PUMP STATION
- OPERATING WELL AS OF 7-2009
- NON-OPERATING WELL AS OF 7-2009
- BLENDING WELL
- CITY LIMITS
- CONTIGUOUS SERVICE AREA BOUNDARY
- DISTRIBUTION PIPELINE
- 12" OR LARGER PIPELINE
- MID TRANSMISSION LINE



O:\Clients\418 City of Modesto\02-07-22 Engineers Report\CAD\Figures\Existing System TM\418020722-FIG01-ExistingSystemTM.dwg 10/14/2009 5:04 PM bhalaburka



**FIGURE 2**  
**City of Modesto**  
**EXISTING CONTIGUOUS**  
**SERVICE AREA,**  
**MID FACILITIES**  
**AND PROPOSED CITY**  
**DOWNSTREAM**  
**IMPROVEMENTS**



**NOTES**

1. PIPE CONFIGURATIONS AND WELL LOCATIONS BASED ON GIS INFORMATION PROVIDED BY CITY.
2. BOUNDARY FOR CITY IS APPROXIMATE AND BASED ON GIS INFORMATION PROVIDED BY CITY

**LEGEND**

- CITY STORAGE TANK
- PROPOSED DOWNSTREAM TANK
- CITY LIMITS
- CONTIGUOUS SERVICE AREA BOUNDARY
- PROPOSED DOWNSTREAM PIPELINE
- DISTRIBUTION PIPELINE
- EXISTING MID TRANSMISSION MAIN
- MID TURNOUT / CONNECTION

