Meadowbrook Water System Intertie Feasibility Study

Prepared for
Merced Irrigation District

October 2020

Background and Purpose of Study

➢ Project funded by State under 2017 Proposition 1, Sustainable Groundwater Planning Grant Program, on behalf of the GSAs.

➢ Purpose of the grant is to provide funding to assist the GSAs in financing and planning and/or selecting project activities that will improve sustainable groundwater management.

➢ Project is to evaluate the needs and feasibility of connecting the Meadowbrook water system to either the Atwater or Merced city water system

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Meadowbrook Water System

Owner: California American Water Company since 2017

Geographic Area: 3.5 square miles in Merced County

Customers: 5,640 population
1,670 metered service connections including 57 commercial connections

Active Permitted Groundwater Wells:

Well 4	Well 5	Well 6	Total
1,800 gpm	630 gpm	1,160 gpm	3,590 gpm

Storage: No significant storage in the water system

Emergency Backup Power: Ability to connect mobile generators at wells now. Well 4 will be equipped with permanent generator.
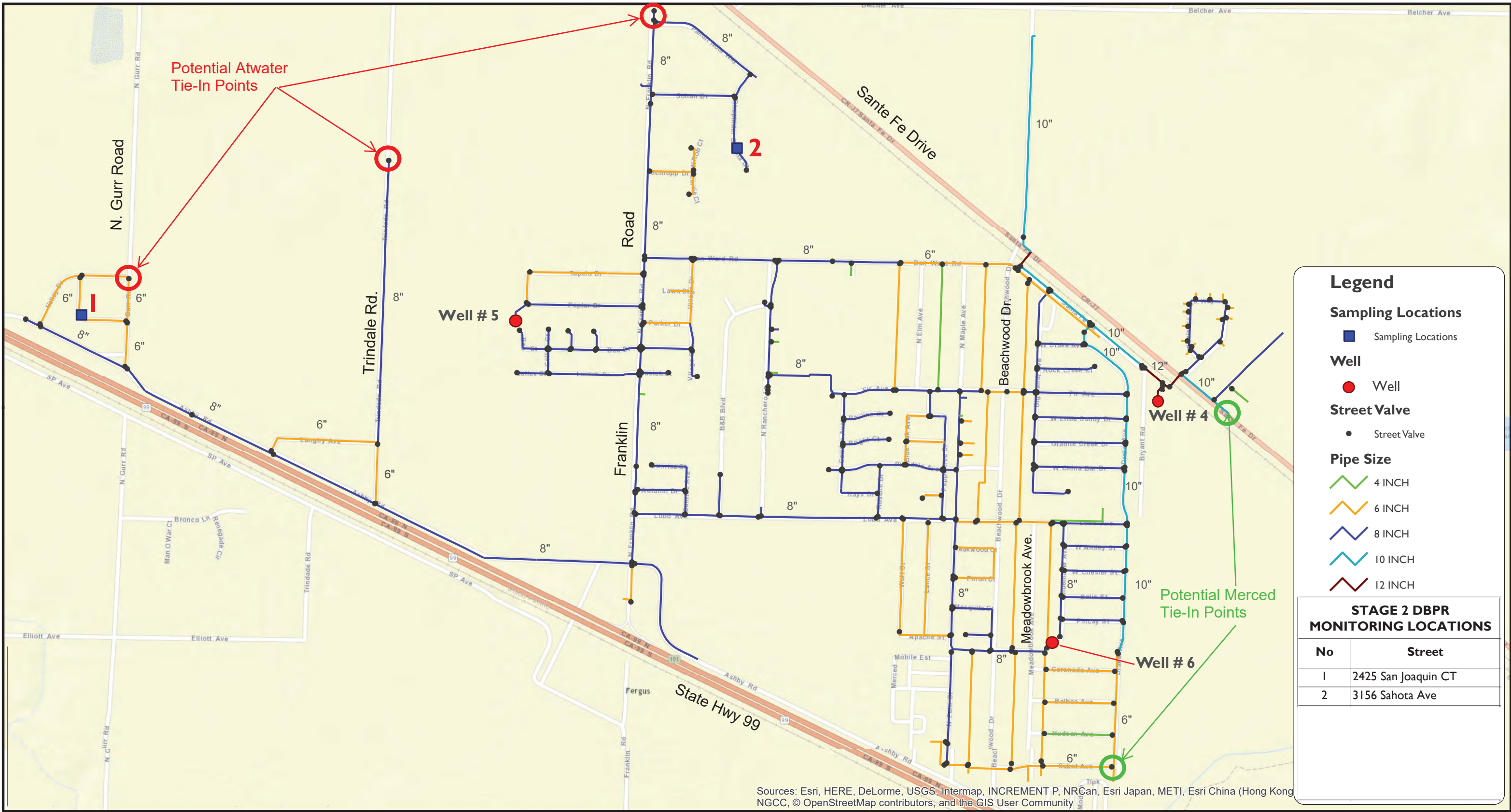
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Meadowbrook Water System

Operating Pressures: 40 to 60 psi

Chlorination: All wells are equipped with chlorination.

System Demands:

Year	Yearly Total (MG)	ADD in Max Month (gpm)	MDD (gpm)	MDD (gallons)	PHD (gpm)
2018	317.266	871	1,305	1,881,000	1,958

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Potential Atwater Tie-In Points

Sante Fe Drive

N. Gurr Road

Trindale Rd.

Road

Franklin

Well # 5

Well # 4

Well # 6

Beachwood Dr.

Meadowbrook Ave.

State Hwy 99

Potential Merced Tie-In Points

Legend

Sampling Locations
- ■ Sampling Locations

Well
- ● Well

Street Valve
- • Street Valve

Pipe Size
- 4 INCH
- 6 INCH
- 8 INCH
- 10 INCH
- 12 INCH

STAGE 2 DBPR MONITORING LOCATIONS	
No	**Street**
1	2425 San Joaquin CT
2	3156 Sahota Ave

Sources: Esri, HERE, DeLorme, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), NGCC, © OpenStreetMap contributors, and the GIS User Community

CALIFORNIA AMERICAN WATER

MEADOWBROOK DISTRIBUTION SYSTEM

N

POTENTIAL CONNECTION POINTS

PROJECT NUMBER: 60612644

0   0.2   0.4   0.8
Miles

FIGURE___1

Evaluation of Meadowbrook System

California Water Works Standards Compliance Criteria

➢ Public water system's source shall have the capacity to meet the system's maximum day demand.

➢ According to the State DDW and AWWA, a water systems should be able to meet maximum day demand or peak hour demand with the largest well out of service.

➢ For systems with 1,000 service connections, the system shall be able to meet 4 hours of peak hour demand using source capacity, storage capacity, and/or emergency connections.

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Evaluation of Meadowbrook System

➤ Meadowbrook's total source capacity is 3,590 gpm and 1,790 gpm with the largest well (Well 4) out of service. In addition, a reliable water system should have sufficient water supply capacity to meet peak demand as well as water requirements during emergencies such as fires, power outages, and natural or manmade disasters. Typical evaluation criteria for the water systems include the following:

    – The well supply must be adequate to meet maximum day demand with the largest well out of service.

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Evaluation of Meadowbrook System

- If storage is not adequate to provide total emergency, fire, and operational storage combined, the well supply must be available to meet the differences.

- If adequate gravity-supplied storage or storage equipped with booster pumps with auxiliary power is not available to meet maximum day demand when there is a power outage, supply wells required to meet the difference must be equipped with auxiliary power.

- If supply from storage in conjunction with wells is not available to meet peak hour demand, the deficit in water supply must be met from the well supply.

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Evaluation of Meadowbrook System

- Storage and/or well supply must be adequate to supply fire flows during maximum day demand.

➢ If supply storage in conjunction with wells is not available to meet PDD during a power outage, the deficit in water supply must be met from wells equipped with auxiliary power. Should this occur, loss of power alone would reduce the peak hour demand due to closure of businesses, schools, etc. Therefore, meeting peak hour demand solely with wells equipped with auxiliary power is not considered necessary.

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Evaluation of Meadowbrook System

➢ It is recommended that this small water system strive to have a sufficient capacity to meet maximum day demand concurrent with one fire flow demand. This water demand should be met with the largest well out of service to achieve reliable firm capacity. Typically, a fire flow of 1,500 gpm would be required for nonsprinklered residential, commercial, and small businesses in this small water system. These criteria were used for evaluation of the Meadowbrook water system and determination of the advantages to providing an intertie to an adjacent water system as shown in the following table.

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Evaluation of Meadowbrook System

Criteria for Meadowbrook Water System Evaluation

Criteria	Meadowbrook System Flow Rate (gpm)	Comments
Average day demand in maximum month	871	--
Maximum day demand	1,305	--
Peak hour demand	1,958	--
Fire flow demand	1,500	--
Maximum day demand plus 1,500-gpm fire flow	2,805	--
Total well supply capacity	3,590 available	Meets all required demands
Total well supply capacity with largest well offline	1,790 available	168 gpm short of meeting peak hour demand 1,015 gpm short of meeting maximum day demand plus fire flow

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Evaluation of Meadowbrook System

Criteria	Meadowbrook System Flow Rate (gpm)	Comments
Storage capacity	0 available	No storage available
Power loss, well supply with auxiliary power	1,800 available[1]	158-gpm capacity short of meeting peak hour demand 1,005 gpm short of meeting maximum day demand plus fire flow
Emergency supply required to meet ADD in maximum month with all wells off during a disaster scenario	871 required 0 available	871 gpm short

[1] Assuming Well 4 is equipped with permanent generator, rented generator may supply additional water from Wells 5 and 6 (1,790 gpm).

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Evaluation of Meadowbrook System

➢ Based on this evaluation for the relatively critical conditions shown above, the water system could benefit by having an additional 1,000-gpm supply such as from an intertie to a nearby water system. If an additional 25 percent is added to this shortage to allow for possible growth (250 gpm), a total of at least 1,250 gpm is estimated as an intertie capacity that would benefit the Meadowbrook system.

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Benefits and Purpose of Intertie

➢ **Emergency Supply**: In the case of a disaster (earthquake, fire, terrorist action) that disables all wells, an intertie of 1,250 gpm would satisfy average daily demands for a maximum month for life safety uses.

➢ **Peak Day/Hour Supply**: An intertie would provide the shortage of approximately 170 gpm during peak hour demands plus some capacity for growth.

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Benefits and Purpose of Intertie

➢ **System Redundancy**: An intertie to an entirely separate larger water system with excess capacity is advantageous for a small water system with only three wells that could be vulnerable to mechanical or structural failures.

➢ **Fire Flow**: An intertie of 1,250 gpm plus existing Wells 5 and 6 (total 3,040 gpm) will provide fire flow capacity of 1,500 gpm during maximum day demands (total 3,805 gpm) with the largest well out of service.

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Benefits and Purpose of Intertie

➢ **Supply Future Connections**: An intertie of 1,250 gpm would provide an additional 250 gpm for growth and would accommodate <mark>approximately 200 additional service connections</mark> at 1.17 gpm each during peak hour conditions.

➢ **Pressure Increase**: An intertie connection of 1,250 gpm would maintain system pressures to customers during critical maximum day demands with a 1,500-gpm fire flow with the largest well out of service. A minimum of 20 psi is required by fire codes.

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Benefits and Purpose of Intertie

➢ **Water Quality**: Should one or more of the three existing wells be impacted by a groundwater contaminant (nitrates, TCP, PCE, DBCP, arsenic, etc.) requiring it to be shut down for an extended period and/or treated, an intertie that can be readily opened would be important.

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City of Atwater Water System

➢ Active wells: 8

➢ Service connections: Approximately 5,460

➢ Storage available: 1.5 MG for Atwater

➢ Source Capacity: <mark>15,500 gpm</mark>

➢ Emergency Generators: 7 wells
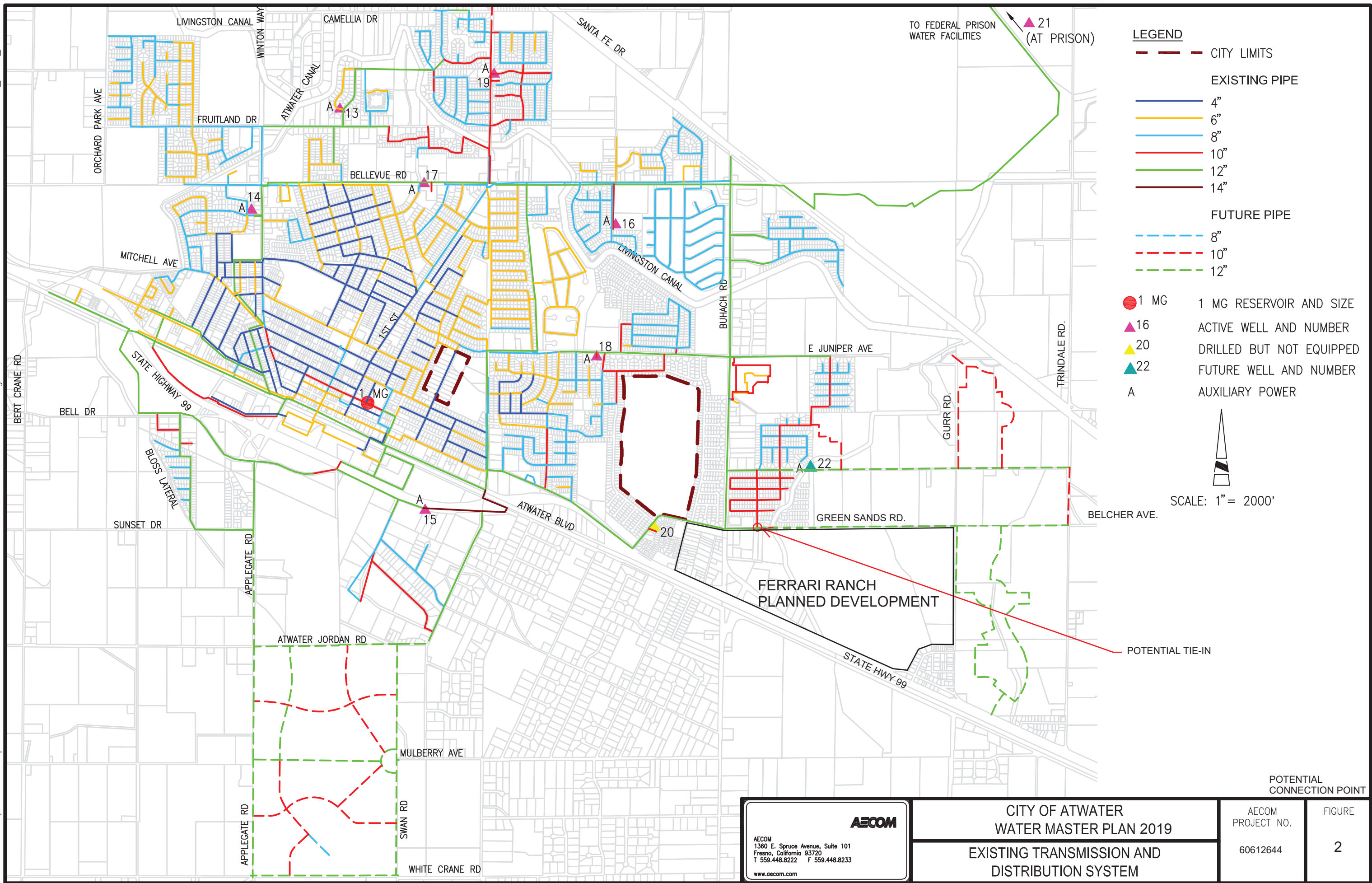
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LEGEND

CITY LIMITS

EXISTING PIPE
- 4"
- 6"
- 8"
- 10"
- 12"
- 14"

FUTURE PIPE
- 8"
- 10"
- 12"

1 MG   1 MG RESERVOIR AND SIZE
▲ 16   ACTIVE WELL AND NUMBER
▲ 20   DRILLED BUT NOT EQUIPPED
▲ 22   FUTURE WELL AND NUMBER
A   AUXILIARY POWER

SCALE: 1" = 2000'

FERRARI RANCH
PLANNED DEVELOPMENT
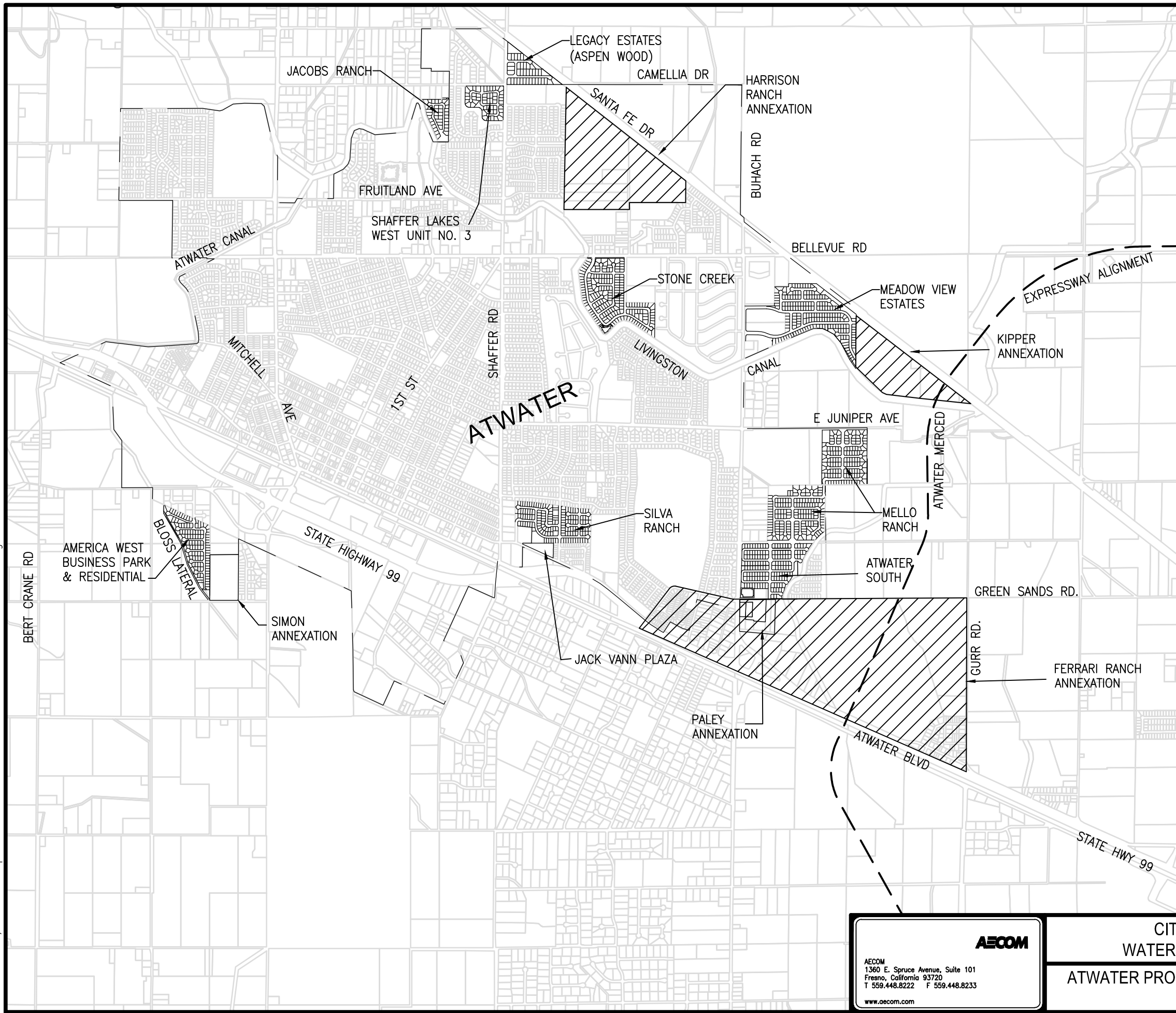
POTENTIAL TIE-IN

POTENTIAL
CONNECTION POINT

CITY OF ATWATER
WATER MASTER PLAN 2019
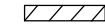
EXISTING TRANSMISSION AND
DISTRIBUTION SYSTEM

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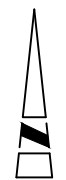
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60612644

FIGURE

2

Street labels: LIVINGSTON CANAL, CAMELLIA DR, SANTA FE DR, WINTON WAY, ATWATER CANAL, ORCHARD PARK AVE, FRUITLAND DR, BELLEVUE RD, MITCHELL AVE, 1ST ST, LIVINGSTON CANAL, BUHACH RD, E JUNIPER AVE, TRINDALE RD., GURR RD., BERT CRANE RD, STATE HIGHWAY 99, BELL DR, BLOSS LATERAL, SUNSET DR, APPLEGATE RD, ATWATER BLVD, GREEN SANDS RD., BELCHER AVE., ATWATER JORDAN RD, MULBERRY AVE, APPLEGATE RD, SWAN RD, WHITE CRANE RD, STATE HWY 99

TO FEDERAL PRISON WATER FACILITIES
▲ 21 (AT PRISON)

LEGEND

(hatch)	EXSITING OR FUTURE DEVELOPMENT LOT LAYOUT
(hatch)	NEW DEVELOPMENT LOT LAYOUT
– – –	PROPOSED ATWATER – MERCED EXPRESSWAY
(hatch)	PENDING AND RECENT ANNEXATION

Map labels:

LEGACY ESTATES (ASPEN WOOD)
JACOBS RANCH
CAMELLIA DR
HARRISON RANCH ANNEXATION
SANTA FE DR
BUHACH RD
FRUITLAND AVE
SHAFFER LAKES WEST UNIT NO. 3
BELLEVUE RD
ATWATER CANAL
STONE CREEK
MEADOW VIEW ESTATES
EXPRESSWAY ALIGNMENT
KIPPER ANNEXATION
MITCHELL AVE
SHAFFER RD
1ST ST
LIVINGSTON CANAL
ATWATER
E JUNIPER AVE
ATWATER MERCED
BERT CRANE RD
BLOSS LATERAL
AMERICA WEST BUSINESS PARK & RESIDENTIAL
STATE HIGHWAY 99
SILVA RANCH
MELLO RANCH
SIMON ANNEXATION
ATWATER SOUTH
GREEN SANDS RD.
JACK VANN PLAZA
GURR RD.
FERRARI RANCH ANNEXATION
PALEY ANNEXATION
ATWATER BLVD
STATE HWY 99

SCALE: 1"=2000'

CITY OF ATWATER
WATER MASTER PLAN 2019
ATWATER PROPOSED DEVELOPMENTS AS OF 2018

AECOM PROJECT NO.
60612644

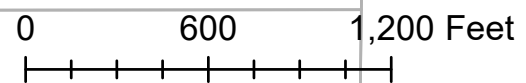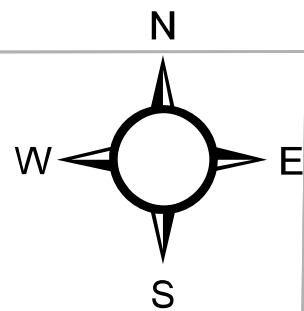FIGURE
3

LEGEND

Wells

△ Proposed Well

△ Existing Well

Tanks

■ Proposed Ferrari Ranch Tank

DIAMETER

— Proposed 8-Inch

— Proposed 10-Inch

— Proposed 12-Inch

— Existing Pipes

⌐⌐ Project Boundary

Green Sands Ave.

Well 20

Proposed Ferrari Tank

Proposed Ferrari Well

Gurr Road

Highway 99

N
W   E
S

0   600   1,200 Feet

K:\Projects\ATWATER_CITY\60313352-On-Call Engineering\400-Technical\406 Ferrari Utilities\Water\Figures

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CITY OF ATWATER
FERRARI RANCH UTILITY PLAN

CONCEPTUAL WATER PIPE LAYOUT

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FIGURE

4

Storage Evaluation per Atwater Master Plan

➤ Based on evaluation criteria and as shown in Table 7 of the report, Atwater is approximately 2.2 MG short of recommended operational/fire/emergency storage with largest well out of service.

➤ However, there is an additional Well 21, 0.5-MG storage, and a booster station at the federal prison that could be used to supply Atwater in an emergency.

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Well Supply Evaluation per Atwater Master Plan

➤ Peak hour demand: 17,570 gpm

➤ Firm well capacity with largest well offline[1]: 11,300 gpm

➤ Supply from storage[2]: 3,000 gpm

➤ Deficit supply capacity[3]: (3,270 gpm)

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[1] Well supply does not include Well 21 and Well 17 (largest active well).

[2] Includes 1-MG elevated tank supplying 2,500 gpm plus one of the two 0.5-MG reservoirs at prison supplying 500 gpm. Assumes one 0.5-MG MG reservoir would be dedicated to the federal prison.

[3] Deficit can be met using Well 20 (2,000 gpm) once equipped or using water from federal prison system (1,270 gpm).

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Well Supply Evaluation per Atwater Master Plan

➢ <mark>Evaluation of supply needed to satisfy maximum day demand without largest well during power outage</mark>.

Supply Requirements for Current (2018) Demand
(Maximum Day Without Largest Well) During Power Outage (gpm)

City's Existing Maximum Day Demand	10,910
Approximate Available Well Supply (10,100 gpm)[1]	10,100
Approximate Available Storage Supply[2]	3,000
City's Excess Supply Capacity	2,190

[1] Well supply does not include the supply from Well 21 and the largest well (Well 17) and the wells without auxiliary generators (Well 13).

[2] Includes 1-MG elevated tank plus one of the two 0.5-MG reservoirs at the prison. Assumes one 0.5-MG reservoir would be dedicated to the federal prison.

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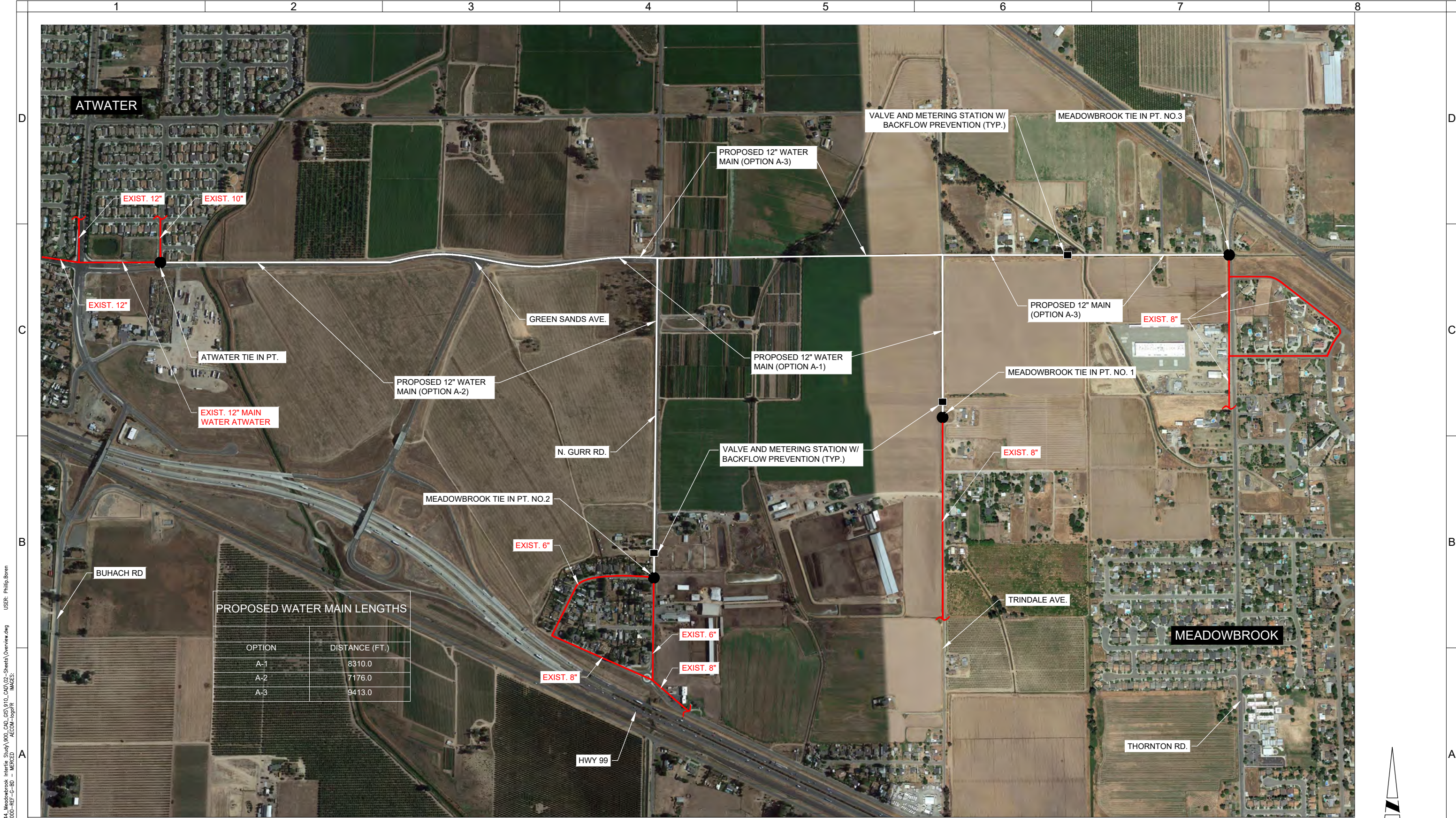# Well Supply Evaluation per Atwater Master Plan

➢ Evaluation of supply needed to meet maximum day demand plus 3,000-gpm fire flow shows adequacy

  – Maximum day plus fire flow = 13,910 gpm

  – Firm supply 11,300 gpm + 3,000 gpm storage = 14,300 gpm

➢ Based on the above evaluation, Atwater would have excess supply capacity of approximately 2,190 during maximum day demand with largest well off.

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City of Atwater Water System

Figure 5 shows three options, with Option A-2 being preferred.

Supply Requirements for Current (2018) Demand
(Maximum Day Without Largest Well) During Power Outage (gpm)

Option	Size (in.)	Length (ft)	Pressure Loss at 1,250 gpm (psi)	Pipe Size at Connection
A-1	12	8,310	18	One 8-in. dia.
A-2	12	7,176	16	Two 6-in. dia.
A-3	12	9,413	19	One 8-in. dia.

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ATWATER

EXIST. 12"   EXIST. 10"

EXIST. 12"

ATWATER TIE IN PT.

EXIST. 12" MAIN
WATER ATWATER

PROPOSED 12" WATER
MAIN (OPTION A-2)

N. GURR RD.

GREEN SANDS AVE.

PROPOSED 12" WATER
MAIN (OPTION A-3)

VALVE AND METERING STATION W/
BACKFLOW PREVENTION (TYP.)

MEADOWBROOK TIE IN PT. NO.3

PROPOSED 12" MAIN
(OPTION A-3)

EXIST. 8"

PROPOSED 12" WATER
MAIN (OPTION A-1)

MEADOWBROOK TIE IN PT. NO. 1

VALVE AND METERING STATION W/
BACKFLOW PREVENTION (TYP.)

EXIST. 8"

MEADOWBROOK TIE IN PT. NO.2

EXIST. 6"

BUHACH RD

TRINDALE AVE.

MEADOWBROOK

EXIST. 6"

EXIST. 8"

EXIST. 8"

HWY 99

THORNTON RD.

PROPOSED WATER MAIN LENGTHS

OPTION	DISTANCE (FT.)
A-1	8310.0
A-2	7176.0
A-3	9413.0

0   200'   400'

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USER: Philip Boren

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DATE: Mar 10, 2020 10:20am

Title block

VERIFY SCALES

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ON ORIGINAL DRAWING

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THIS SHEET, ADJUST
SCALES ACCORDINGLY

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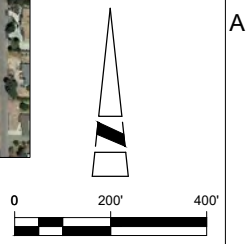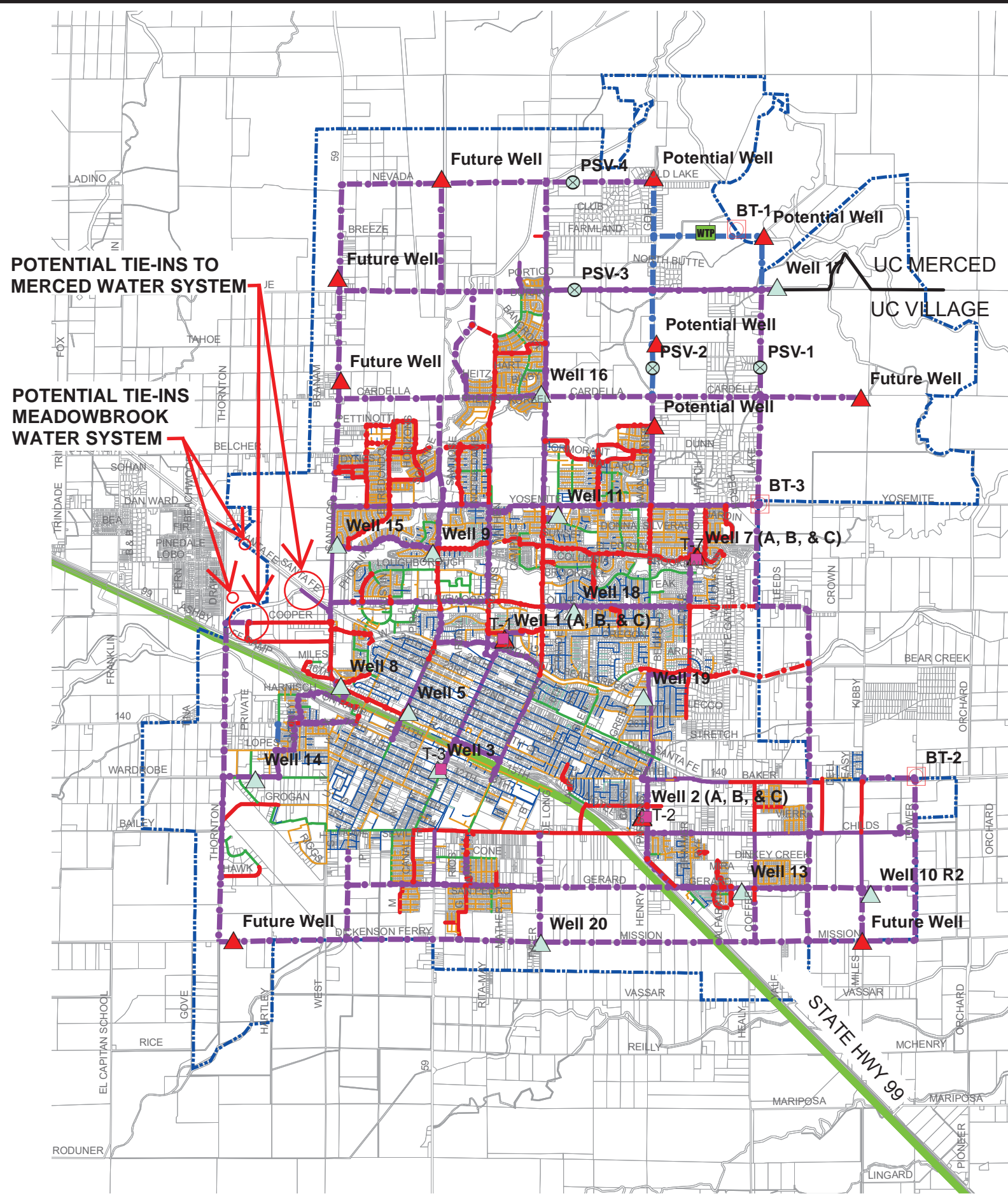MEADOWBROOK

ATWATER/MEADOWBROOK
POTENTIAL CONNECTION POINTS

FIG. 5

REV   DATE   DESCRIPTION   APPR

City of Merced Water System

➢ Active wells: 20

➢ Service connections: 21,523

➢ Storage available: 1MG

➢ Source capacity: 54,400 gpm[1]

➢ Emergency backup generators: All wells

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[1] 59,400 gpm once two more wells are completed.

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POTENTIAL TIE-INS TO MERCED WATER SYSTEM

POTENTIAL TIE-INS MEADOWBROOK WATER SYSTEM

UC MERCED

UC VILLAGE

LEGEND

- ■ Existing Tank
- △ Existing Wells
- ▲ Future Wells
- ⬡ 2030 Booster Pump
- ⊗ 2030 Pressure Sustaining Valve
- WTP Water Treatment Plant

Existing Pipelines
- ── 4 in.
- ── 6 in.
- ── 8 in.
- ── 10 in.
- ── 12 in.
- ── 16 in.
- ── 18 in.

2030 Pipelines
- ─ ─ 12 in.
- ••• 16 in.
- ─ ─ 18 in.
- ── 12
- ── 16
- ── Future High Speed Rail Alignment
- ▭ Merced Vision 2030 Boundary
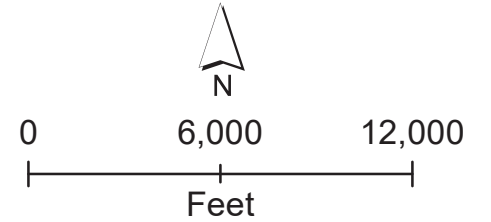
0   6,000   12,000
Feet

N

STATE HWY 99

AECOM Water

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CITY OF MERCED WATER
MASTER PLAN 2015

RECOMMENDED WATER
SYSTEM IMPROVEMENTS

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FIGURE

6

V:\Merced_CityMODEL\GIS\FIGURES\2012 WMP Figures\2030 Figures

City of Merced Water System

Existing City of Merced Water Supply and Pumping Capacity

Well No.	Existing Pumping Capacity, gpm	Existing Maximum Day Demand Plus Fire Flow, gpm[1]	Existing Peak Hour Demand, gpm
1A	2,200		
1C	2,200		
2A	2,200		
2B	2,200		
2C	2,500		
3C	3,000		
5B	3,000		
7C	2,800		
8	2,000		
9	1,800		
10R2	3,000		
11	3,000		
13	3,000		
14	4,000		

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City of Merced Water System

Well No.	Existing Pumping Capacity, gpm	Existing Maximum Day Demand Plus Fire Flow, gpm[1]	Existing Peak Hour Demand, gpm
15	3,500		
16	3,500		
17	2,500		
18	3,000		
19	2,500		
20 (under const.)	(2.500)		
21	2,500		
22 (under const.	(2,500)		
Total Capacity	**54,400[3]**		
Total Firm Capacity[2]	**50,400**	**34,508**	**44,960**

[1] Based on a maximum day demand of 30,508 gpm and a fire flow of 4,000 gpm in 2012.

[2] Defined as the total capacity of the individual wells with the largest well pump out of service. For this case Well 14 is the largest well and so was not considered in calculating firm pumping capacity.

[3] 59,400-gpm total capacity when construction is completed.

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Storage Evaluation per Merced Master Plan

Comparison of Existing Available and Required Storage Capacity for Merced

Available Storage Capacity, MG	Required Storage Capacity, MG				Excess Capacity[3] (MG)
	Operational	Fire Flow	Emergency	Total	
44.96[1]	13.35	0.96[2]	23.40	37.71	7.25

[1] Available storage from groundwater wells. Based on the production of 80% of City wells minus Average Day Demand. 20% of City wells assumed out of service.

[2] Based on required institutional fire flow of 4,000 gpm flowing for four hours.

[3] Calculated as required storage minus available storage.

➢ Excess storage capacity = 7.25 MG

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Demand Analysis

➢ Maximum day demand: Capable of meeting maximum day demand with 3,000 gpm fire flow per Master Plan analysis.

➢ Peak hour demand: Capable of meeting peak hour demand per Master Plan analysis.

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Merced Water System Excess Capacity

➢ Merced has an excess firm supply capacity of 15,782 gpm[1] during maximum day demand plus fire flow with largest well out of service.

➢ Merced has an excess firm supply capacity of 5,440 gpm[2] during peak hour demands.

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[1] 20,892 gpm when Wells 20 and 22 are completed and equipped.

[2] 10,440 gpm when Wells 20 and 22 are completed and equipped.

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Merced Intertie Locations

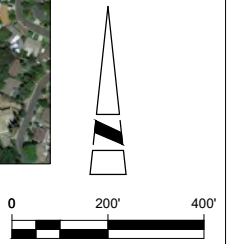Figure 7 shows two options, with Option M-1 being preferred.

Parameters for Intertie to City of Merced

Option	Size (in.)	Length (ft)	Pressure Loss at 1,250 gpm (psi)	Pipe Sizes at Connection
M-1	12	3,612	10	One 10-in. dia
M-2	12	1,511	7	Two 6-in. dia

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MEADOWBROOK TIE IN PT. NO.1

VALVE AND METERING STATION W/ BACKFLOW PREVENTION

EXIST 10" WATER MEADOWBROOK

PROPOSED 12" WATER MAIN (OPTION M-1)

SANTA FE DR.

MEADOWBROOK

EXIST. 10"

EXIST. 6"

EXIST. 6"

MERCED TIE IN PT. NO.1

EXIST. 16" WATER MERCED

MEADOWBROOK TIE IN PT. NO.2

MERCED TIE IN PT. NO. 2

COOPER AVE.

HWY 99

PROPOSED 12" WATER MAIN (OPTION M-2)

EXISTING 12" MAINS

MERCED

VALVE AND METERING STATION W/ BACKFLOW PREVENTION

PROPOSED WATER MAIN LENGTHS

OPTION	DISTANCE (FT.)
M-1	3612.0
M-2	1511.0

0   200'   400'

MEADOWBROOK

MERCED/MEADOWBROOK
POTENTIAL CONNECTION POINTS

FIG. 7

Estimated Construction Costs for Interties

> Atwater

- Option A-1: $2,257,400
- Option A-2: $1,994,500
- Option A-3: $2,601,500

> Merced

- Option M-1: $1,185,800
- Option M-2: $ 764,300

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