City of Clovis

Water Supply Assessment

Home Place Master Plan

Loma Vista Urban Area, Clovis
March 2021

Prepared for:
City of Clovis

Prepared by:
Provost & Pritchard Consulting Group
286 W. Cromwell Avenue, Fresno, CA 93711

COPYRIGHT 2021 by PROVOST & PRITCHARD CONSULTING GROUP
ALL RIGHTS RESERVED
Provost & Pritchard Consulting Group expressly reserves its common law copyright and other applicable property rights to this document. This document is not to be reproduced, changed, or copied in any form or manner whatsoever, nor are they to be assigned to a third party without first obtaining the written permission and consent of Provost & Pritchard Consulting Group In the event of unauthorized reuse of the information contained herein by a third party, the third party shall hold the firm of Provost & Pritchard Consulting Group harmless, and shall bear the cost of Provost & Pritchard Consulting Group's legal fees associated with defending and enforcing these rights.

Report Prepared for:

Client Name

City of Clovis
1033 5th Street
Clovis, CA 93612

Contact:

Sean Smith

(559) 324-2363

Report Prepared by:

Provost & Pritchard Consulting Group

Heather Bashian, PE
Logan Kearnan, EIT

Contact:

Heather Bashian, PE

(559) 449-2700

DATE SIGNED 3/25/2021

Table of Contents

List of Figures

List of Tables

Abbreviations

AF.....acre-feet
AFY.....acre-feet per year
CEQA..... California Environmental Quality Act
County ..... Fresno County
CVP ..... Central Valley Project
DWR.....California Department of Water Resources
gpd/du ..... gallons per day per dwelling unit
gpm.....gallons per minute
KRWA.....Kings River Water Association
LAFCO .....Fresno County Local Agency Formation Commission
Reclamation ..... US Bureau of Reclamation
SWTP.....City of Clovis Surface Water Treatment Plant
UWMP .....City of Clovis Urban Water Management Plan
WMP.....City of Clovis, Draft Water Master Plan Update, Phase III
WRF .....City of Clovis Sewage Treatment/Water Reuse Facility
WSA .....Water Supply Assessment

1 Introduction

1.1 Purpose and Need for the Water Supply Assessment

This Water Supply Assessment (WSA) evaluates the adequacy of available water supplies for the proposed Home Place Master Plan (Project), located in the City of Clovis, Fresno County, California. California Water Code (CWC) §10912(a) requires preparation of a WSA meeting the requirements of CWC §10910 et seq for projects within cities and counties that meet one of several water demand triggers, or the equivalent. These triggers include construction of 500 or more residential units, construction of a shopping center or business establishment having 500,000 square feet of floor space, construction of a commercial office building having more than 250,000 square feet, a proposed hotel or motel having more than 500 rooms, or another project having a water demand equivalent to or greater than the 500-unit development.

The Project's proposed improvements are more than the 500 residential units trigger therefore a WSA is required. The City of Clovis operates the water system to which the Project proposes to connect. This water system meets the standards for a "Public Water System" as set forth in CWC §10912(c); the City is therefore responsible for preparation of the required WSA in accordance with CWC §10910(b).

This WSA discusses the estimated water demands and water supply for the proposed Project. The Project is located in Fresno County, adjacent to the City of Clovis (City) limits; the area will be annexed as part of the Project's progress and the entire Project will be supplied water from the City.

1.2 Reliance on a Related Urban Water Management Plan

If the Project falls within the boundaries of a current Urban Water Management Plan (UWMP) prepared by the water purveyor, CWC §10910(c)(1) requires that the WSA determine whether projected water demand associated with the Project is included as part of that duly adopted UWMP. This Project is within the boundaries of the 2015 Clovis UWMP, which was adopted by the City of Clovis by resolution of the City Council on July 5, 2016 (Carollo Engineers, Inc, 2016). More recently, the City adopted a Water Master Plan Update, Phase III (WMP) in 2018 (Provost & Pritchard Consulting Group, 2018) which includes updated information regarding water supplies and demands. The Project area was included in both the UWMP and WMP. Thus, in accordance with the CWC, the preparers have relied on information from the UWMP wherever possible in preparing the various elements of this Assessment but have used updated information from the WMP where appropriate.

1.3 Document Organization

This WSA is organized as follows:

- *Section 2 describes the Project and its location.*
- *Section 3 provides an overview of the City's primary water supplies.*
- *Section 4 describes the Project's potable and non-potable water demands in addition to those of other existing and planned uses, and how these vary from the numbers used in the UWMP.*
- *Section 5 discusses the adequacy of water supplies during normal years.*
- *Section 6 discusses the adequacy of water supplies during single-dry and multiple-dry years.*
- *Section 7 discusses operational reliability on a daily basis.*
- *Section 8 concludes whether supplies would be adequate during normal, dry-year, and multiple-dry years during a 20-year projection.*
- *Section 9 lists references cited in this WSA.*

2 Project Description

2.1 Project Location and Setting

The City limits currently encompasses 23.3 square miles. The City's Sphere of Influence (SOI) covers 31.6 square miles, while the City's General Plan (GP) encompasses approximately 73 square miles. The City's General Plan (Placeworks, 2014) identified three Urban Centers to focus growth, including Loma Vista, the Northwest area, and the Northeast area. Figure 2-1 identifies the location of the Project in relation to the surrounding Clovis/Fresno region.

The project site includes approximately 307 acres bounded by Leonard, Ashlan, Gettysburg, and Thompson Avenues in southeast Clovis within the Loma Vista Urban Growth Center. Dog Creek flows north to south through the western portion of the Project and will be preserved through the development with a trailway being proposed alongside the creek. Details of the proposed project are provided in Table 2-1. Located just outside the current city limits but within the Sphere of Influence (SOI), the area north and south the Project is developing to primarily residential uses, the area directly west of the Project is the Reagan Educational Complex, and rural residential uses and agricultural parcels remain to the east.

The Project area is designated in the City of Clovis General Plan as Low Density Residential and Neighborhood Commercial. Mixed Use/Business Campus, High Density Residential, and Neighborhood Commercial are designated land uses to the east and School to the west.

2.2 Project Description

The Project is a proposed mixed-density residential area with neighborhood commercial located east of Leonard Avenue between Ashlan Avenue and Gettysburg Avenue. In addition, open space area and parks are being proposed within the development.

The 307-acre Project area is designated as Low Density Residential and Neighborhood Commercial in the City's current General Plan and is currently agricultural land with two homes and related ancillary buildings. Based on the adopted Land Use-based Water Demand Factors (WDFs) stated in the WMP and the existing GP land use designations, the planned water demands, shown in acre-feet per year (AFY), for the Project area are shown in Table 2-1.

Table 2-1. Planned Demand Estimates per WMP and GP

Planned Land Use Designation	Unit Factor (AFY/acre)	Acreage	Demand (AFY)
Low Density Residential	2.5	294.64	736.6
Neighborhood Commercial	2.9	12.06	35.0
Totals:		306.7	771.6

The proposed water demand estimates for this project are summarized in Table 2-2, based on the proposed land uses and WDFs. While the proposed land uses differ from the GP land uses, the area is still primarily residential, therefore, the proposed water demand estimates are only slightly different and are lower than the planned estimates.

Table 2-2. Proposed Water Demand Estimates

Proposed Land Use Designation	Unit Factor (AFY/acre)	Acreage	Demand (AFY)
Medium Density Residential	2.2	251.8	553.9
High Density Residential	4.7	7.3	34.2
Park	3.0	7.4	22.3
Open Space	1.5	28.1	42.2
Neighborhood Commercial	2.9	12.1	35.0
Total:		306.7	687.6

The difference in total for the Project area is 83.9 AFY, or an approximate 10.1 percent decrease in water demand estimates from the GP land uses to the proposed land uses. This difference comes from the change in proposed land use designation, primarily due to the difference in unit factors between low density residential and medium density residential. Considering the difference does not equate to an increased water demand for the area, the Project falls in line with the planned demand estimates.

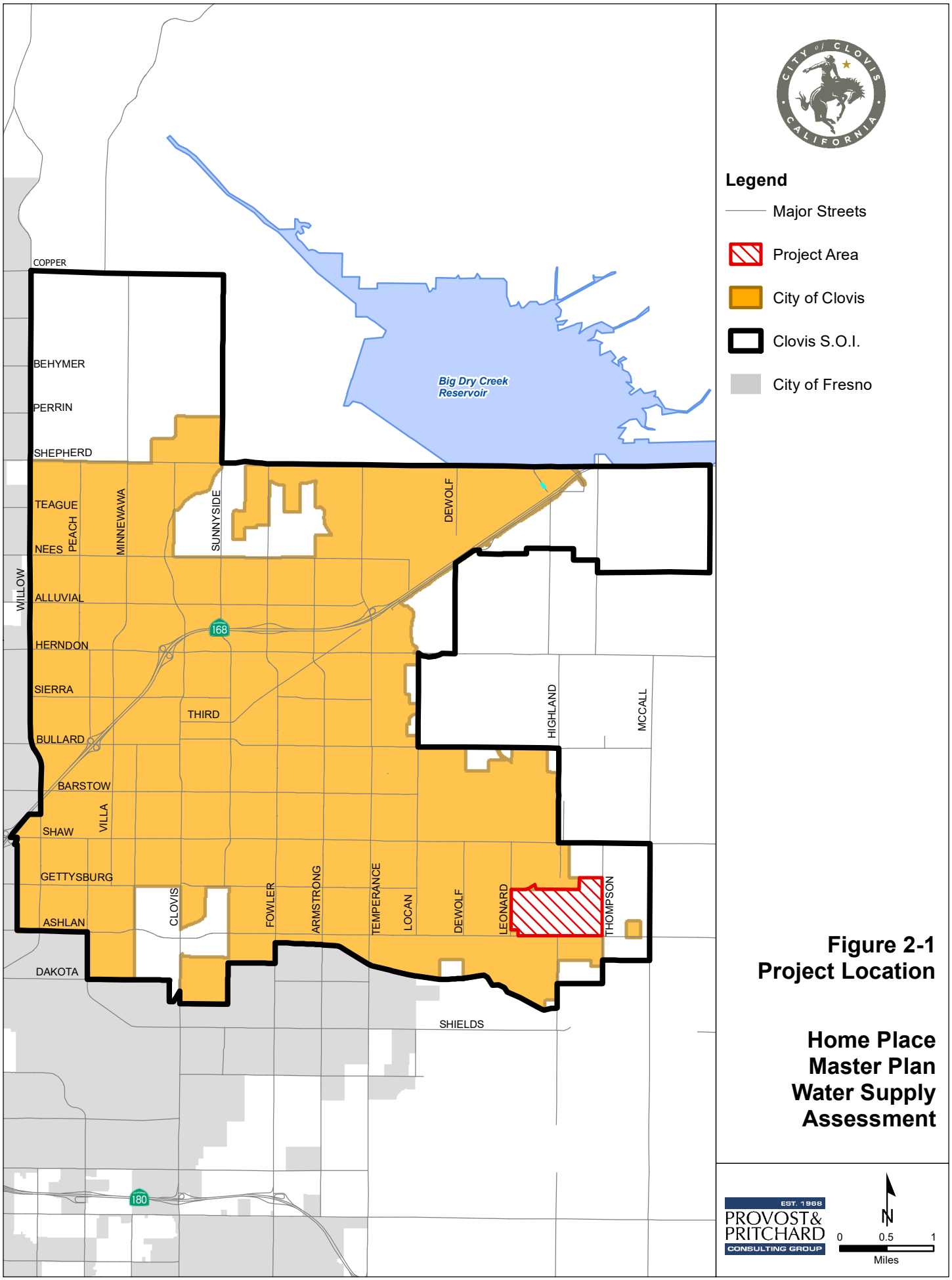


Figure 2-1
Project Location

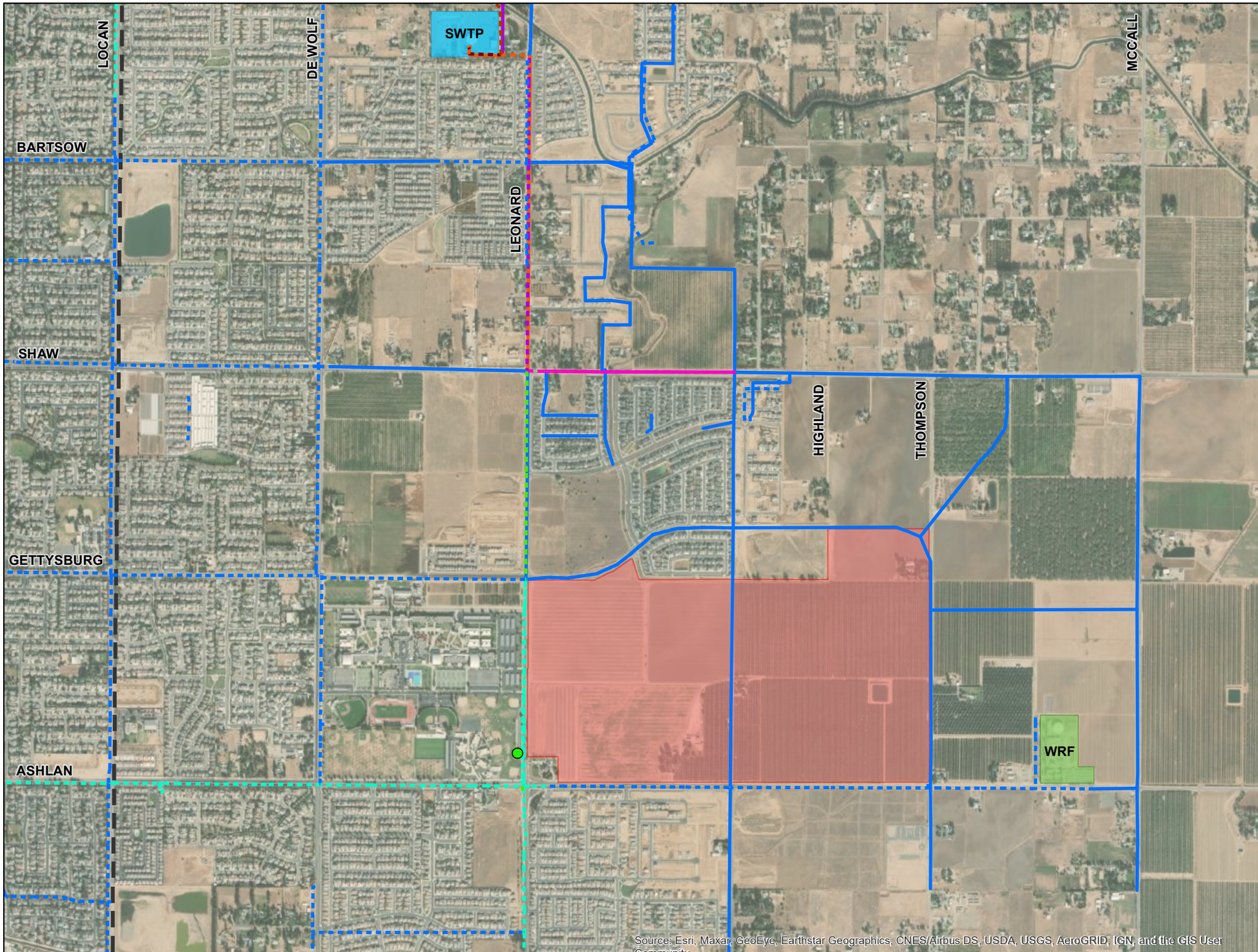
Home Place Master Plan Water Supply Assessment

3/8/2021 : \\ppeng.com\pzdata\clients\Clovis_City of - 1017\Projects\101721001-Clovis McFarlane WSA\400 GIS\Map\project_location.mxd

2.3 Water Supply/Treatment Infrastructure

Surface water is diverted from the Friant-Kern Canal via a pipeline to the City's Surface Water Treatment Plant (SWTP) located at Bullard and Leonard Avenues. Built in 2004, the SWTP has a current treatment capacity of 22.5 million gallons per day (mgd); expansion to 45 mgd is planned. In addition to the supply from the SWTP, the City has groundwater wells located throughout the City, with the nearest being southwest of the Project, at Ashlan and Leonard Avenues.

Water will be delivered to the Project via the City's existing and planned distribution system. The water distribution system is shown in full in the WMP, and in detail for this area on Figure 2-2. The master-planned infrastructure has been constructed along Ashlan and Leonard Avenue, however completion of the 12-inch distribution grid mains in Gettysburg, Highland and Thompson Avenues is proposed as part of the Project. The WMP plans for a 12-inch distribution main in Highland Avenue; the Project proposes a slightly altered alignment due to the proposed layout of the development, but the main's purpose is still satisfied. Internal water mains to supply water to all uses within the Project will also be required and are the responsibility of the developer to design and construct.



Legend

- Well
- Major Streets
- Pressure Zone Boundary
- Clovis WRF
- Clovis SWTP
- Project Area

Existing Water Mains

Size (inches)

- 12
- 16
- 18
- 24
- 30
- 36
- 42
- 48

Future Water Mains

Size (inches)

- 12
- 18
- 30
- 36

Figure 2-2
Potable Water Infrastructure

Home Place Master Plan
Water Supply Assessment

EST. 1968
PROVOST & PRITCHARD
CONSULTING GROUP
An Employee Owned Company

N

0 500 1,000
Feet

3/9/2021: G:\Clovis_City of - 1017\Projects\101721001-Clovis McFarlane WSA\400 GIS\Map\water -facilities.mxd

3 Water Demands

This section summarizes projected water demands of the Project, assuming full buildout before 2035, concurrent with the assumed buildout date within the current SOI. Water demands of anticipated development of the project area were included in the UWMP and WMP and were based on WDFs applied to land uses shown in the City's adopted General Plan. Proposed Project water demands have been estimated based on the proposed land uses and the WDFs shown in the adopted WMP. This section compares water demand estimates developed as part of this study with the City's earlier plans.

3.1 Project Demands

3.1.1 Estimated Water Demand

The water usage projection for the Project was developed based on Water Demand Factors in the WMP for each of the proposed Project land uses.

Project water demands were calculated in 5-year increments, as shown in Table 3-1. This table is based upon the understanding the Project will be entirely constructed by 2035.

Table 3-1. Proposed Water Demands in 5-Year Increments

	2025	2030	2035
Estimated Demand (AFY)	229.2	458.4	687.6

3.2 Demands of Other Existing and Planned Development

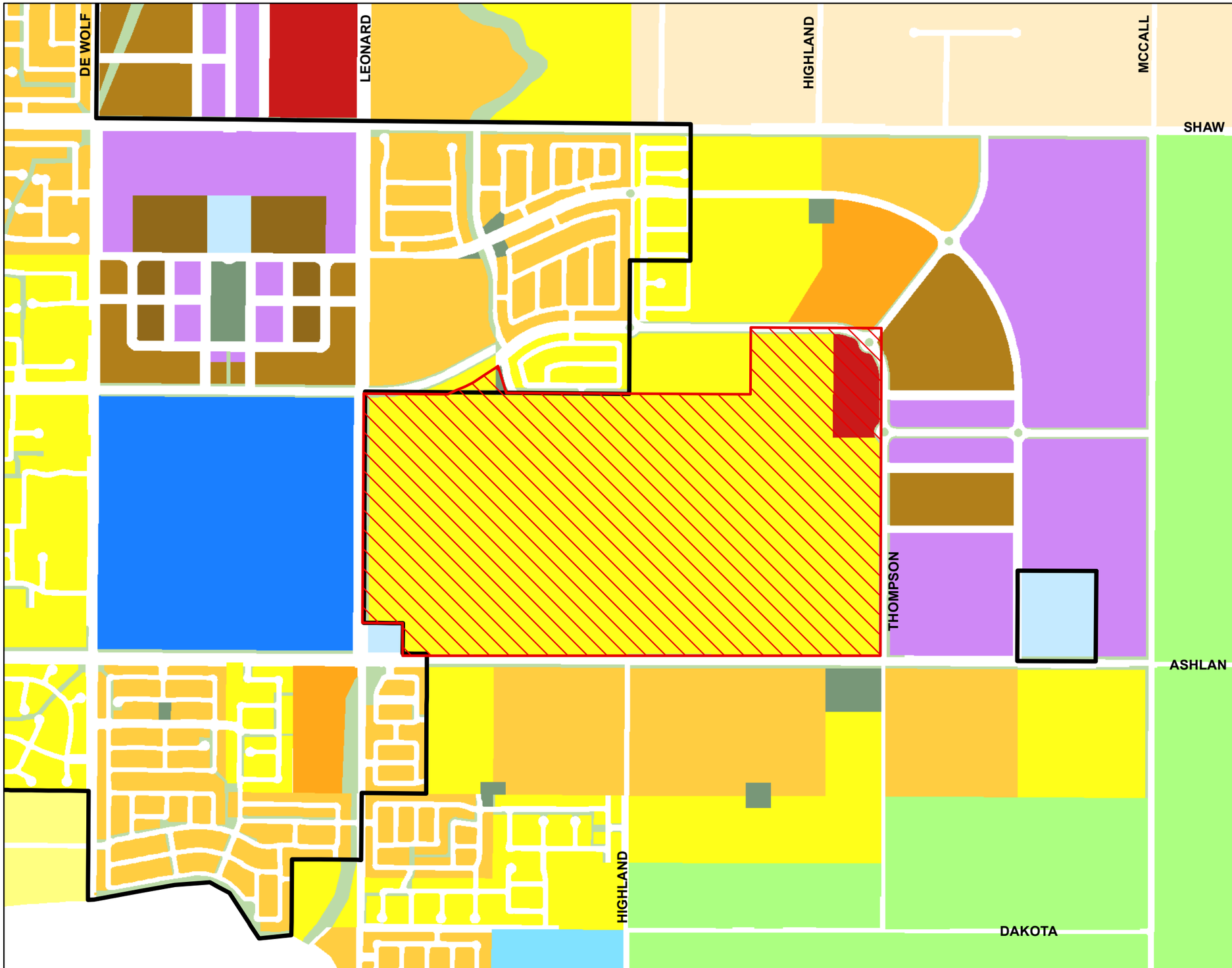
The UWMP and WMP report the planned demands for the land use types proposed with this Project within the City in 2035. These demands are summarized in WMP Table 5.3-2, which is reproduced, in part, below.

Table 3-2. Proposed Water Demands by Land Use Type (AFY)

Land Use	SOI Demands by 2035 (AFY)	Proposed Demands by 2035	
		AFY	% of SOI Demands
Medium Density Residential	7,000	553.9	7.9
High Density Residential	2,100	34.2	1.6
Parks	900	23.3	2.5
Open Space	300	42.2	14.1
Neighborhood Commercial	100	35.0	35.0
Totals	10,400	687.6	6.6

Comparing the total proposed Project water demands in Table 3-1 with the total water demand area analyzed in the WMP and shown in Table 3-2, the Project makes up a very small portion of the overall water anticipated to be delivered by the City, with the Project's portion accounting for 6.6 percent of the total water delivered to these land uses annually by 2035.

The WMP shows the land use designations for the entire City water service area, which were used to plan demand in undeveloped areas. A portion of that plan, including the Project area, is shown on Figure 3-1.



Legend

Clovis City Limits

City of Clovis General Plan Existing Land Use

- AGRICULTURE
- RURAL
- VERY LOW
- LOW
- MEDIUM
- MEDIUM HIGH
- HIGH
- VERY HIGH
- MIXED USE
- COMMERCIAL
- OPEN SPACE
- PUBLIC FACILITIES
- PARKS
- SCHOOLS
- WATER BASIN

Figure 3-1
Land Use Plan in Project Area

Home Place Master Plan
Water Supply Assessment

EST. 1968
PROVOST& PRITCHARD
CONSULTING GROUP
An Employee Owned Company

N

0 500 1,000
Feet

3/9/2021: G:\Clovis_City of - 1017\Projects\101721001-Clovis McFarlane WSA\400 GIS\Map\land use plan.mxd

4 Overview of Water Supplies

CWC §10910(c)(2) allows reliance on the City's UWMP to determine overall water supply reliability if the Project's planned water demand was included in the UWMP. The proposed Project demand is slightly less than what was included in the calculations for the UWMP, the project area itself was included and the overall difference in demand is small in comparison with the overall City demand. This WSA relies in large part on the UWMP and the subsequent WMP, with adjustments to the planned water use numbers to account for the most current Project plans.

§10910(d) requires that a WSA identify any existing water supply entitlements, water rights, or water service contracts relevant to the identified water supply for the proposed project, including any such existing entitlements, rights, or contracts held by the public water system or city or county preparing the WSA. These descriptions appear in detail in Chapter 6 of the UWMP and are summarized below.

4.1 Surface Water

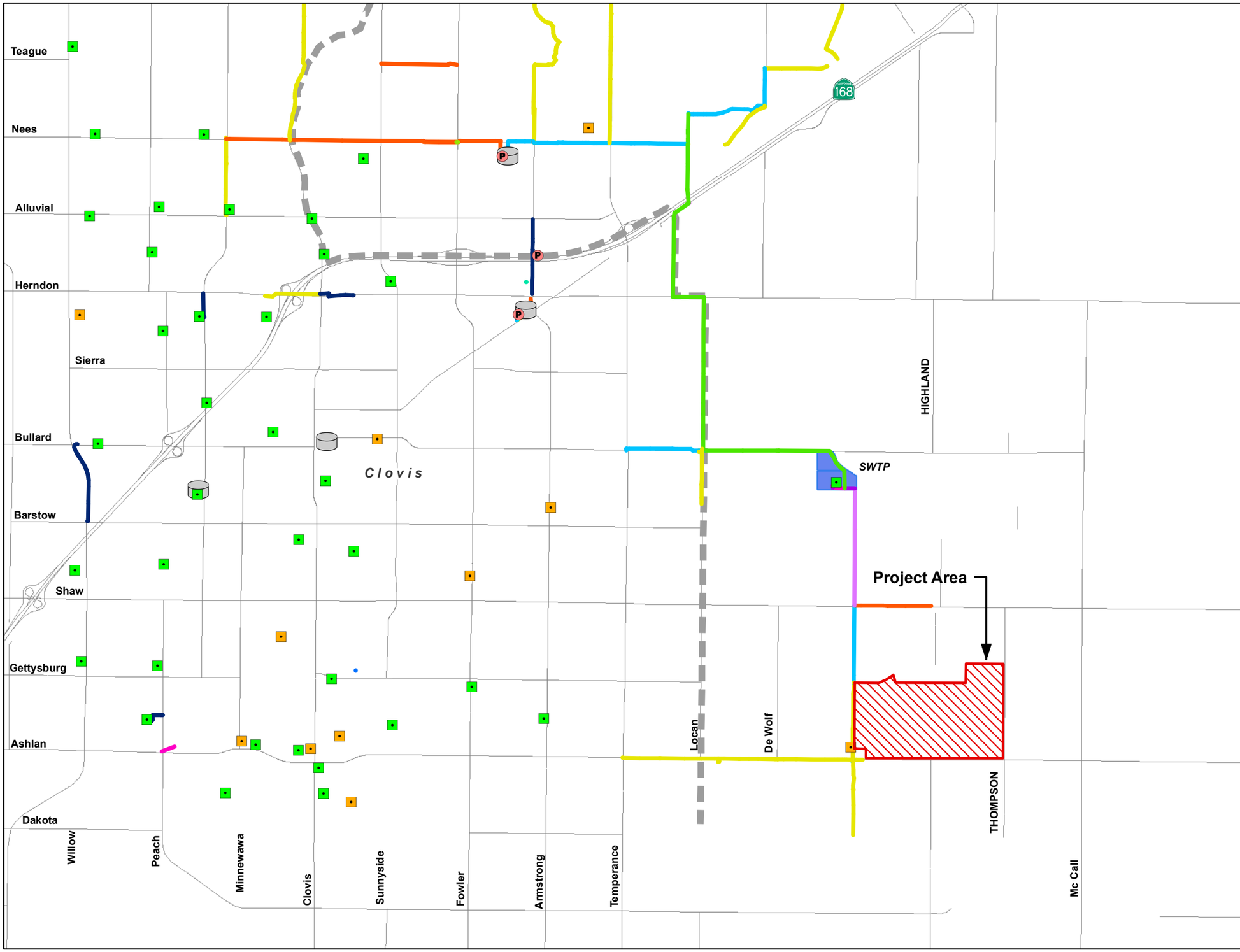
The City's surface water supply is provided through an agreement with Fresno Irrigation District (FID), which allows the City to receive a share of FID's Kings River and Friant Central Valley Project (CVP) entitlements. Garfield Water District (GWD) and International Water District (IWD) are located within the City's General Plan boundaries. As the districts' service areas are urbanized over time, surface supplies available to the two districts will be added to the City's surface water supply. Currently, all surface water available to the City comes from the FID contract. The boundaries of each of the districts are shown on Figure 4-2.

Clovis receives a proportionate share of FID's Kings River entitlement based upon the proportion of its acreage within FID compared with the total area of FID, which is currently 5.9%. Over time, Clovis has received on average 23,609 AFY from FID, though this has varied from 6,978 acre-feet (AF) in the severe drought of 2015 to over 43,000 AF in the wettest year of record. Because of anticipated growth of the City within the FID service area boundary, the City's share of FID Kings River allocation is expected to increase over the build-out of the Project. The UWMP projects that the average delivery to the City will climb from the current 23,609 AFY to 31,670 AFY by 2030.

Similarly, Clovis is entitled to an area-weighted proportion of FID's Friant CVP Class II entitlement. Class II supplies are driven by the snowmelt in the San Joaquin River basin but are not directly proportional to runoff. Water behind Friant Dam is managed by the US Bureau of Reclamation (USBR) and falls into several categories or classes. FID's contract is for Class II supplies, which are less dependable than CVP's Class I water contracts. FID contracts with USBR for 75,000 AFY of Class II supply and has received an average of 13,577 AFY, with the actual number ranging from zero to the full 75,000 AF depending upon the nature of each water year over that period. Clovis has received an average of 798 AFY for its proportionate share.

Garfield Water District (GWD) is located north of the City, with a portion of the district in the City's Sphere of Influence (SOI). GWD holds a Class I CVP contract for 3,500 AFY. Friant CVP Class I supplies are relatively reliable, with USBR delivering 100 percent of the contract amount in nearly every water year that is 85 percent of average runoff or greater. With approximately half of GWD within the City's SOI, an estimated 1,170 AFY is expected to be added to the City's supply as this area develops.

International Water District (IWD) is located east of the City's SOI, within the General Plan boundary. IWD holds a Class I CVP contract for 1,200 AFY, with the same reliability characteristics as discussed above. The City's General Plan designates a portion of the District's area as industrial and residential use. At build-out of that area, an annual average of approximately 600 AFY will be added to the City's surface water resources.



Legend

- Major Streets
- Well - Active
- Well - Not Active
- Pump Station
- Pressure Zone Boundary
- Project Area
- Storage Tank

Water Lines

- 14"
- 15"
- 16"
- 18"
- 20"
- 24"
- 25"
- 30"
- 36"
- 42"
- 48"

Figure 4-1
Major Existing Potable Water Infrastructure

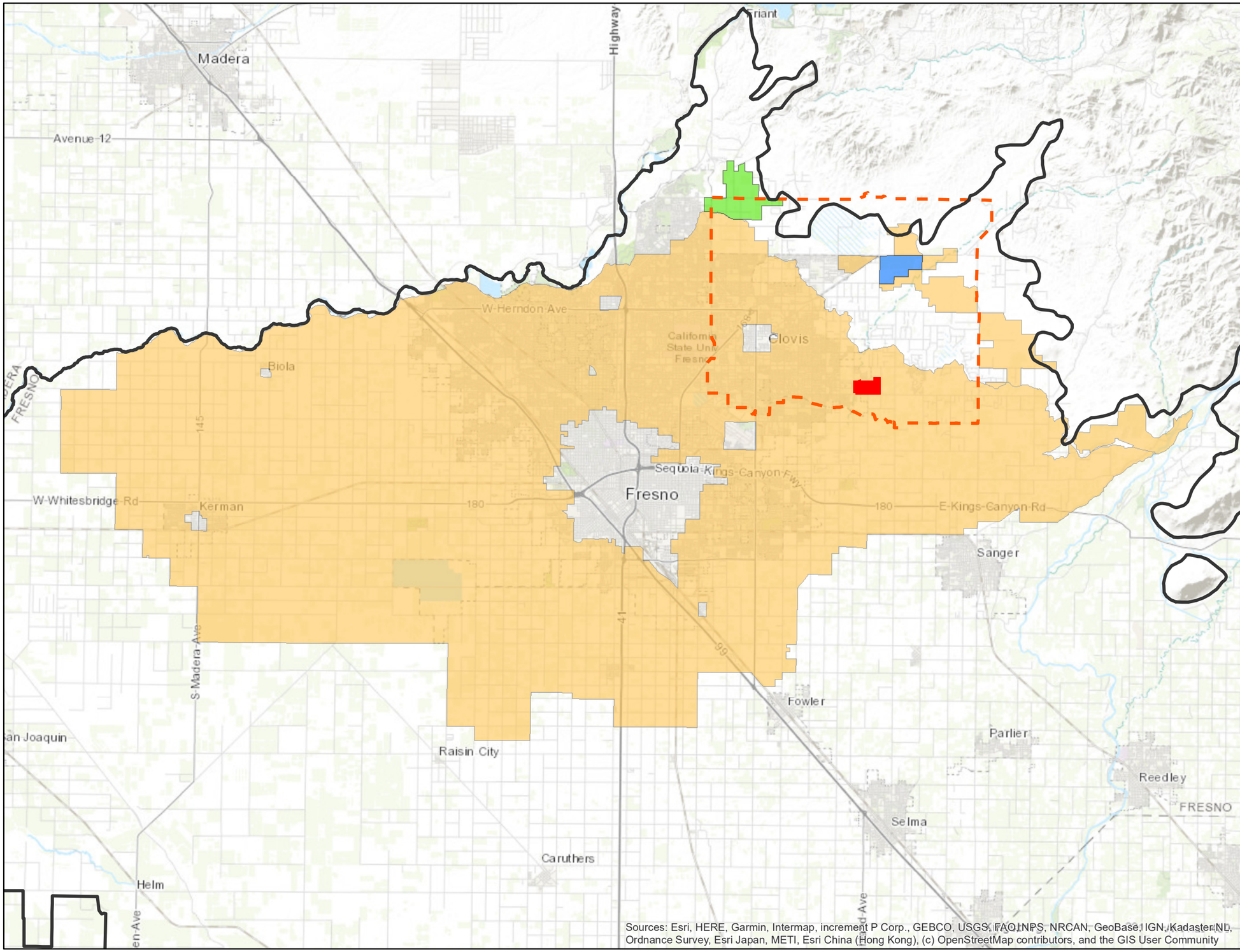
Home Place Master Plan
Water Supply Assessment

EST. 1968
PROVOST & PRITCHARD
CONSULTING GROUP
An Employee Owned Company

N

0 0.25 0.5
Miles

3/9/2021: G:\Clovis_City of - 1017\Projects\101721001-Clovis McFarlane WSA\400 GIS\Map\major_existing_infrastructure.mxd



Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community

Legend

- Project Area
- Kings Groundwater Subbasin
- General Plan Boundary
- Garfield Water District
- International Water District
- Fresno Irrigation District

Figure 4-2
Irrigation and Water Districts

Home Place Master Plan
Water Supply Assessment

EST. 1968
PROVOST & PRITCHARD
CONSULTING GROUP
An Employee Owned Company

N

0 2 4
Miles

3/9/2021: G:\Clovis_City of - 1017\Projects\101721001-Clovis McFarlane WSA\400 GIS\Map\irrigation and water districts.mxd

The City's overall water use in 2015 was 21,972 AF (UWMP, Table 4.4). While the average yield from the FID contract could appear to be adequate to meet the demand, two factors require the City to have other available supplies. First, the FID supply contract is not completely reliable year to year. The combined delivery of San Joaquin and Kings river water per year has ranged from 32 percent of the total demand to over 215 percent of demand. Second, the timing of the surface water deliveries around the calendar do not meet the City's needs for potable water. Surface water is available from January through September in the wettest years and may be available for only a 60 to 90-day period in a very dry year. That is not acceptable for a municipal water system with demands every day of the year. The other supplies discussed below are available throughout the year and are used to maximize and firm up the surface water supply.

4.2 Supply from Storage

Since 2004, the City has been storing water in the aquifer to create a stable source of supply over the years. The City has been working with FID to recharge surface water, using the City's contracted shares of capacity in FID's Waldron Banking Facility and Boswell Groundwater Banking Facility, to build up credit in those facilities which allows for annual water withdrawals, on an as-needed or as-requested basis. The surface water banked includes portions of FID's Kings and CVP supplies and may in the future also include other surface water supplies that FID is able to secure on the spot market. Recharged water is purchased under separate agreements with FID and is not included in the surface water totals in the previous section, so this is truly a separate and additional water supply. This process is fully explained in the UWMP.

In 2015, 11,222 AF were withdrawn from storage during the worst drought on record. The City has created a recharge plan accounting for historic variations in surface water supplies that will allow it to withdraw an annual 13,500 AF, the maximum withdrawal allowed under the City's agreements with FID. This is considered a firm supply. The 13,500 AF maximum annual withdrawal is built into the water supply projections in the UWMP for each year over the planning horizon.

4.3 Groundwater

Until 2004, the City relied totally on pumped groundwater to meet its water demands. With the construction of the SWTP that year and subsequent construction of the banked water facilities and Water Reclamation Plant described in the following sections, the City now intends to rely more heavily on those three supplies and not use pumped groundwater to meet its normal water demands.

The City is located within the Kings Groundwater sub-basin, a part of the Tulare Lake Hydrogeologic Basin as described in the Department of Water Resources Bulletin 118 (Department of Water Resources, 2003). The groundwater basin is in overdraft and has been for many years. However, it has not been adjudicated.

The UWMP provide a great deal of additional information and analysis, and project an annual groundwater budget for the City that varies from 9,964 AF to 13,994 AF depending on the other water

resources available at various milestone years. However, the projected water supplies were updated in the WMP (WMP Tables 6.11-1 and 7.4-1) and are summarized below in Table 4-1.

Chapter 9 of the WMP calculates a sustainable groundwater yield for the service area and concludes the sustainable yield to be 9,400 AFY. While the North Kings Groundwater Sustainability Plan (NKGSP) has been written and adopted, it does not yet include a firmer approximation of sustainable yield, although development of one is anticipated. The sustainable yield from the WMP has been used for this assessment.

Table 4-1. Planned Water Supplies – Normal Year

Water Source	2035 Water Supply (AFY)
Groundwater [1]	9,400
Surface Water [2]	41,100
Exchanges	0
Supply from Storage [2]	4,500
Recycled Water [2]	4,500
Total	59,500

Notes:
[1] Sustainable pumping yield from WMP Table 6.11-1, Note 3
[2] WMP Table 7.4-1

4.4 Recycled Water

Most of the City's wastewater flow is treated at the RWRF, located southwest of the City of Fresno on Jensen Avenue. In 2009, the City of Clovis completed a new WRF. In 2015, the WRF produced approximately 1,870 AF (1.67 mgd, on average). Of that total, 21 percent was recycled for mostly landscape irrigation, with the remainder being discharged to FID's Fancher Creek for agricultural irrigation.

Ultimately the WRF will be expanded to be able to treat 8.4 mgd, or 9,400 AF per year, and will make a substantial contribution to the City's overall water resources. According to both the 2015 UWMP and 2018 WMP, recycled water is used for irrigation of public and private landscape within the service area. Areas receiving or planned to receive recycled water include the Freeway 168 corridor between Shepherd Avenue and Armstrong Avenue, the existing Clovis Community Medical Center campus, and multiple City parks and landscape areas.

Landscape irrigation will continue to be the main use of recycled water in the future. All public landscape areas within three-quarters of a mile of the distribution system are considered potential recycled water use areas. Clovis Unified School District is evaluating the use of recycled water for its landscape areas. Caltrans has undertaken a project to expand their use of recycled water along Freeway 168 from Armstrong Avenue west to Sierra Avenue. Concurrent with the Project's development, the City will expand its use of recycled water and broaden its range of beneficial uses to potentially include irrigating the public landscape space to be developed with the Project.

To affect that increase in use, the City now requires all new development of public landscape near recycled water transmission lines to use recycled water. Additional actions include extending the recycled water distribution system to discharge at groundwater recharge facilities and reducing the cost of recycled water. The WMP indicates planned use of recycled water supply will be 4,500 AFY by 2035 (WMP Table 7.4-1).

4.5 Exchanges

Water exchanges, transfers, and water banking allow purveyors to manage demand and supply variability by ensuring water will be available for the near future. The majority of the City's wastewater is treated at the RWRF. Under an agreement with FID, the City of Fresno receives approximately one AF of Kings River surface water in exchange for each two AF of reclaimed water produced by the RWRF. Clovis is entitled to receive a percentage of that exchange, in proportion to its prorated share of the RWRF flow, which amounted to approximately 868 AF in 2015. This water is limited by agreement to being used for groundwater recharge activities. Conservatively, the City has not planned for exchange supplies in the future.

4.6 Water Supply Summary

The five sources discussed above make up the City's water resources. These are tabulated overall for 2020 and for each subsequent 5-year period through 2035 in Table 4-1 above.

The City's overall water resources are projected to increase from 33,139 AF per year in 2015 to 64,703 AF per year in 2035. Nearly all this increase will come from increasing surface water resources from 6,989 AF per year in 2015 to 59,500 AF per year in 2035. The mix of water supplies the City plans to use to meet these demands is changing over time and is illustrated on Figure 6-2 (reproduced from the WMP Figure 9.6-1).

5 Normal Year Water Operations

This section evaluates the ability of the City to meet the overall water demands during normal water years. A normal year is a year, or averaged range of years, that most closely represents the average water supply available to the City. In this case, the normal year reflects the overall water supply summary discussed in Section 4.

This Chapter relies on information taken from Section 6 of the UWMP and Section 7 of the WMP, except that groundwater supply is limited to 9,400 AF/year as discussed in Section 4 above. Table 5-1 repeats Table 4-1 and shows the supplies available to the City in normal years in 5-year increments.

Table 5-1. Planned Water Supplies (Restated)

Water Source	2035 Water Supply (AFY)
Groundwater [1]	9,400
Surface Water [2]	41,100
Exchanges	0
Supply from Storage [2]	4,500
Recycled Water [2]	4,500
Total	59,500
Notes: [1] Sustainable pumping yield from WMP Table 6.11-1, Note 3 [2] WMP Table 7.4-1	

Table 5-2 compares the City's water demands and compares them with the normal year water supplies. As shown, total supplies would exceed total demands. Adequate supplies are available to serve the City and its water customers in normal rainfall years such as those discussed in this section.

Table 5-2. Comparison of Normal Year Supplies and Demands

Condition	2035 Water Supply (AFY)
Water Demand	45,000
Water Supply	59,500
Excess/Shortage	15,000

6 Single-Dry and Multiple-Dry Year Water Supplies

This section evaluates the availability of City water supplies during single-dry and multiple-dry water years, based on Project buildout in 2035. Numerous factors will work to change the relative quantities of water the City receives from its several water sources. Since each of these has a different reliability in dry years, the overall water supply reliability will change over time. The following sections discuss how this will occur.

A single-dry year is the year that represents the lowest water supply available to the Project and is referred to as a "critical dry" water year in the WMP. To define the single-dry year, this WSA uses the hydrologic conditions existing during 2015, the driest single year of record in terms of Kings River entitlement, and during 2014 when there was a zero allocation of both Class I and Class II Friant CVP water.

A multiple-dry year period represents the lowest average supply available to the Project for a consecutive three-year period. This analysis is referred to as a "multi-dry" condition in the WMP. The WSA analysis is based on the three consecutive driest years of record for the Project's surface water supplies, which were water years 2012/13 through 2014/15.

6.1 Water Year Effects on Water Sources

6.1.1 Kings River Surface Water

Both the single-dry and multiple-dry analyses are most affected by the variations in Kings River entitlement in dry years. Because FID was the first of the 27 Kings River Water Association members to begin river diversions (in the late 19th century), FID's entitlement does not vary directly in proportion to overall annual runoff; rather it favors FID versus all the other Kings River diverters. When river flows are low due to slow runoff, low annual precipitation or both, FID's share of the daily river flow increases.

The effect of this is that FID's entitlement, as a percentage of its average entitlement, is higher than the overall water year percentage flow, for virtually any below-average water year. As noted in the WMP, the anticipated share of Kings River water is shown as 37,000 AFY (WMP Table 7.4-1) in 2035 for an average water year; however, in a critical dry year, that amount is reduced to 11,100 AF (WMP Table 9.5-2).

As discussed in the WMP, the multiple dry year scenario was documented in 2013-2015 where FID's overall Kings River entitlements were 100 percent, 58 percent, and 30 percent of average entitlement. This represents exceptionally strong reliability for a runoff-based water supply. For planning purposes, the multiple dry years' Kings River water are 37,000, 20,400, and 11,100 AF in 2035 (WMP Table 9.5-3).

6.1.2 Friant CVP Surface Water:

Over the period of 1986 through 2016, the average Class II allocation has been 38 percent of contracted amount. However, Class II supplies are particularly subject to the water year type. Over the 49-year period mentioned, Class II allocation was zero in 15 of those years, with one 5-year and one 6-year period with no Class II allocations at all. For the selected multiple-dry year period of 2013 through 2015, no Class II water was allocated at all.

While Class I entitlements do not currently affect the City's FID supplies, they will affect the future-year Garfield Water District and International Water District entitlements. Class I allocations in the three multiple-dry years were 62 percent, 0 percent, and 0 percent of the contracted amount, respectively.

6.1.3 Supply from Storage

The quantity of water available for withdrawal from the City's storage facilities is not reduced in drier water years. Because of the shortage of surface supplies, withdrawals from storage will have to be maximized to meet demands. The contract for the Waldron facility allows annual withdrawals of up to approximately 9,000 AF per year, while the Boswell Facility allows up to 90 percent of the safe yield, expected to be near 3,600 AF per year. According to the WMP, the combined withdrawal limit from the two facilities is 13,500 AF/year. In any year where surface water deliveries are substantially limited, the City would want to use these resources to the limit.

A related matter is how contributions are made to supply storage. Whereas in normal years the City is making deposits to both facilities, in a drier year those contributions would be reduced or halted since the surface supplies necessary for the deposits would not be available. Since the deposits come from surface water resources not counted in the City's water balance, being acquired under separate FID agreements, the curtailment of deposits does not reduce the City's water demand.

6.1.4 Groundwater

As of the preparation of the 2015 UWMP, the City of Clovis operated 34 municipal water wells, located throughout the service area. Their total production over the period 1984 through 2014 is shown in Figure 6-1 below, which is taken from the WMP.

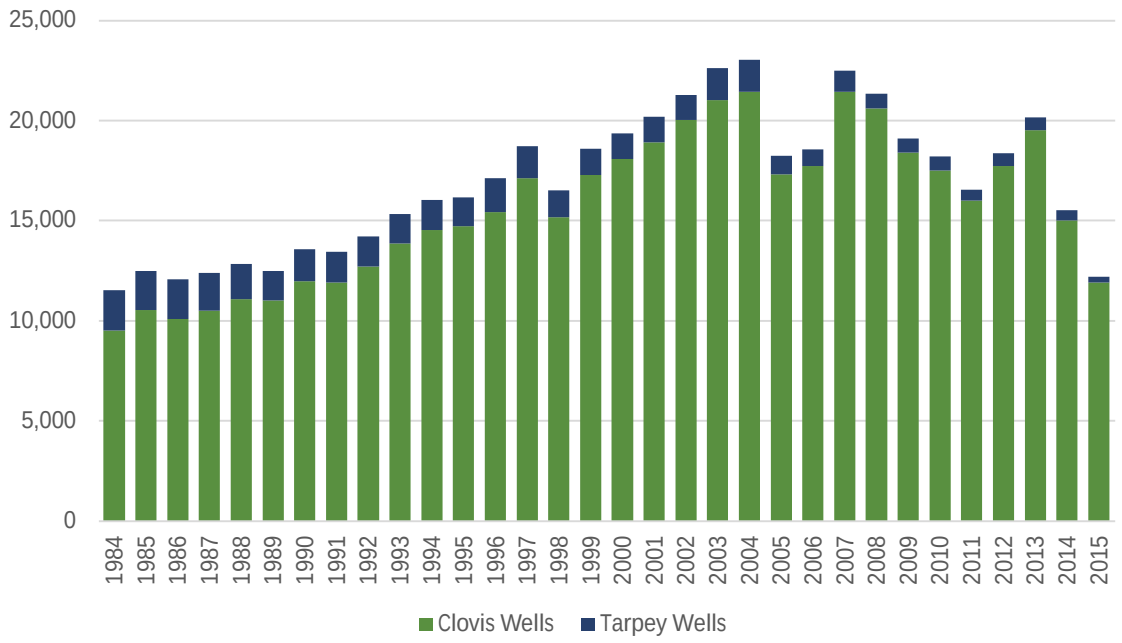


Figure 6-1. City Groundwater Production (1984-2015)

According to the UWMP, the City aims to reduce its direct groundwater consumption whenever possible. All the City's water demands will be met by a combination of surface water and supplies from storage, in water years when those two resources are sufficient to meet demands. In drier years, when surface water supplies are limited, the City will pump additional groundwater, beyond the 9,400 AFY accounted for in a normal year, to make up the shortfall. This is noted in Table 9.5-3 in the WMP.

Planning to make that objective possible is very important, as Chapter 9 of the WMP states that the sustainable groundwater supply in the City service area is 9,400 AF per year, for normal, dry, and multi-dry years. The UWMP shows greater groundwater use than that for every year through 2035 and includes a calculated groundwater overdraft. For the time being, there is no restriction against pumping groundwater above the sustainable aquifer yield. However, the NKGSP indicates the City must sustainably use groundwater; therefore, it is assumed the estimates in the UWMP are potentially more than what will be sustainable in the future.

This WSA uses 9,400 AF per year as the sustainable groundwater pumping amount, being more conservative than the UWMP values, and as stated in the WMP. Due to the very large size of the aquifer underlying the City, available groundwater is not quickly affected by the type of water year. Anticipating a mix of wet and dry years similar to what has been historically seen, this WSA does not reduce available groundwater in dry or multiple-dry years.

6.1.5 Recycled Water

Recycled water production, being tied directly to indoor water use, does not vary significantly with the water year type, and is not adjusted from normal for this analysis.

6.2 Changes in Water Source Reliability Over the Planning Horizon

In 2015, surface water made up 21 percent of the City's direct water supply and was the source of the water used to create another 34 percent in the form of Supply from Storage. In 2035, the surface water supply will have risen to 69 percent of the total while the Supply from Storage will have declined to 8 percent in a normal year. Figure 6-2 (reproduced from the WMP Figure 9.6-1) illustrates the City's historical and planned mix of water supplies over time.

This means the City's reliance on surface water supplies, either directly used or pumped from subsurface storage, will have increased from 55 percent to 74 percent of the total. While there is a margin of normal year supply available over planned demand over the entire planning horizon, some provision may have to be made for additional reliable storage to account for such a large portion of surface water being subject to water year variability. See the reliability analysis in Section 6.3 following.

6.3 Summary of Single-Dry and Multiple-Dry Year Reliability Over the Planning Horizon

Supply for multiple dry years would be drawn from a combination of Kings River surface water, supply from storage, groundwater, and recycled water. As shown in the WMP, it is anticipated that neither CVP Class I or CVP Class II (San Joaquin river) supplies would be available in the critical dry year, nor in two of the three multiple dry years; CVP Class I and Class II supplies would be anticipated to be available in the first of the multiple dry year scenario. Project demand was assumed to be constant across all water years.

The supplies that would be available during single-dry and multiple-dry years at buildout are summarized in Table 6-1. As shown, adequate supplies would be available to supply the City and along with it the Project under all studied conditions. No additional conservation measures are required, although the Section 8 of the UWMP contains a water shortage contingency plan that could be partially or fully implemented if needed or mandated.

Table 6-1. Single-Dry and Multiple-Dry Year Water Supplies Available, 2035

Description	Single-Dry Year	Multiple-Dry Year		
		Year 1	Year 2	Year 3
Baseline Demands	45,000	45,000	45,000	45,000
Water Supply				
Surface water	11,100	41,100	20,500	11,100
Groundwater Supply from Storage	9,400	9,400	9,400	9,400
Recycled Water	4,500	4,500	4,500	4,500
Supply from Storage Recycled Water	11,200	10,000	11,200	10,300
Total Supply	36,200	65,000	45,600	35,300
Excess/<Deficit> in Supply	<8,800>	20,000	600	<9,700>
Percent Excess/<Deficit> versus Demand	<19.6>	44.4	1.3	<21.6>
Baseline Demands w/15% Conservation	38,300	38,300	38,300	38,300
Excess/<Deficit> in Supply w/Demand Conservation	<2,100>	26,700	7,300	<3,000>
Percent Excess/<Deficit> versus Demand w/Conservation	<19.6>	69.7	19.1	<7.8>
Additional Groundwater Supplies [1]	2,100	0	0	3,000
Excess/<Deficit> in Supply w/Demand Conservation and Additional Supplies	0	26,700	7,300	0
Percent Excess/<Deficit> versus Demand w/Conservation and Additional Supplies	0	69.7	19.1	0

Notes:

[1] As noted in the WMP, during a dry year condition, based on lower use of groundwater supplies than the sustainable yield allows, additional groundwater supplies may be used to augment the City's supplies. Additionally, the City may elect to mandate stricter conservation measures to further reduce demands. Increasing conservation from 15% to 22% resolves the shortage in water supply without additional groundwater supplies.

6.4 Climate-Based Reliability Factors

This WSA defers to the UWMP for consideration of the overall effects of climate change upon supply reliability. See Section 3.3 of the UWMP.

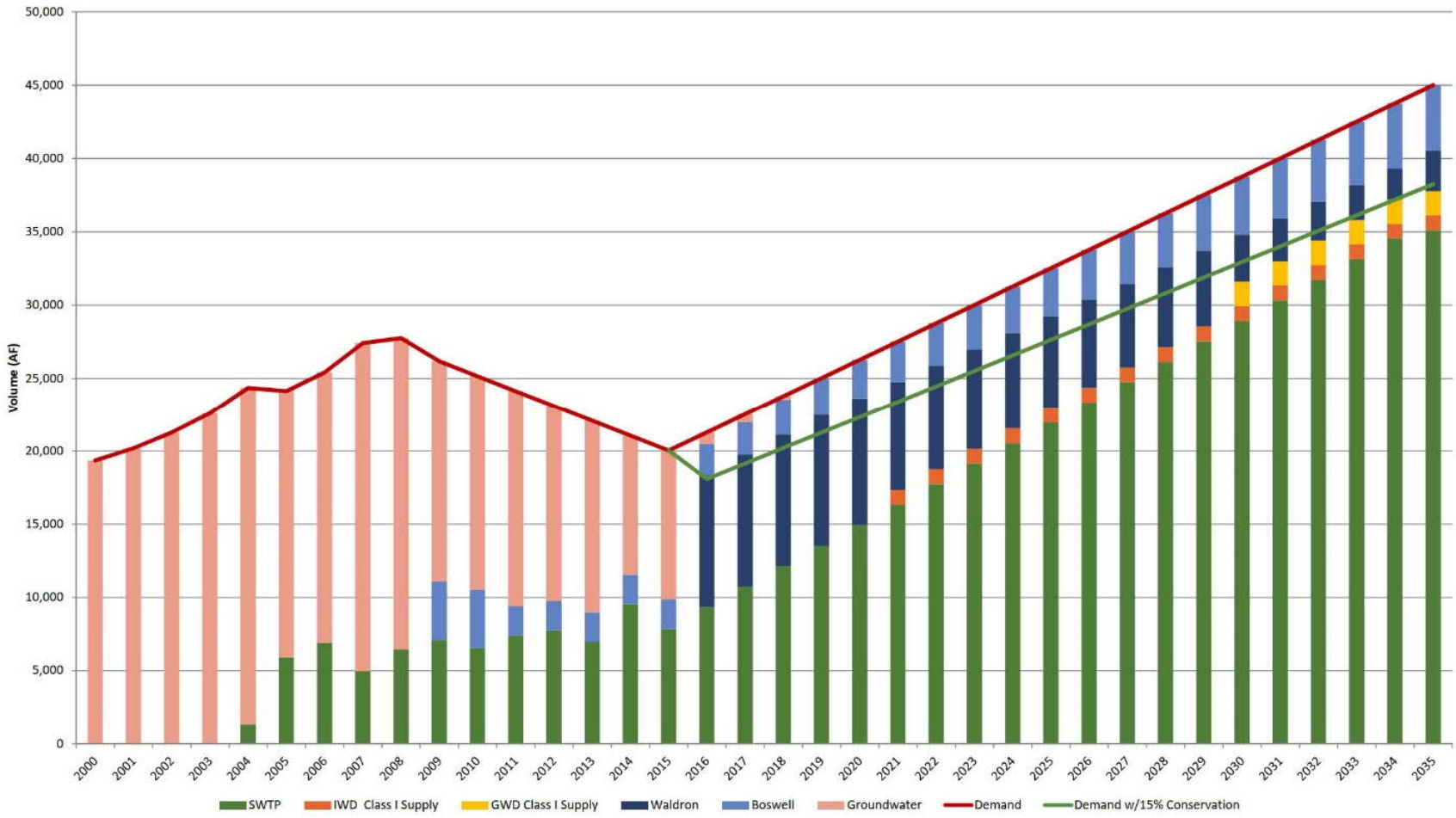


Figure 6-2. Mix of Water Supplies Over Time

7 Operational Reliability

The City's surface water entitlement does not accrue all at once during a given water year. Rather, the Kings River entitlement accrues daily throughout the year based on actual river runoff and the KRWA entitlement schedule. The daily nature of the Kings River supply is especially important early in the water year, which begins October 1. The very low river flows in October and November mean that supply is low, and the City must rely on other water supplies during those months. The relatively large supplies available from storage help mitigate the seasonal nature of the surface water supply, and these are further backed up by groundwater supplies equivalent to almost half the City's total annual demand.

The City has not had any issue with temporary water shortages to date. The City's WMP indicates a need to increase their surface water and groundwater supplies to meet future demands and provides detail on how much of each supply is needed compared to the existing supplies. The WMP also includes a Capital Improvements Program identifying capital projects that are necessary to acquire and facilitate the movement of current and future water supplies throughout the City's system in a reliable manner. The City's adherence to their planning documents and consistent development of these water supplies and infrastructure is critical for the City's continued growth and development and will provide operational reliability into the future.

8 Conclusions

As summarized in Table 8-1, the City has adequate supplies to meet the needs of all the City's water customers including the Project, in normal water years, over the 20-year planning horizon.

In the buildout year, if demand is as projected, the City will be short of water to meet dry year demands and would be short in the second and third years of a multiple-dry event. Conservation measures, detailed in the UWMP, have been developed that would mitigate these shortfalls by reducing demand approximately 15 percent. Evidence from the 2013 to 2015 drought suggests that those results, and more, are achievable. Additionally, as the City has surplus water supplies in normal years, short-term additional groundwater extraction in the single-dry year or one year of a multiple-dry year, is also planned as part of their water portfolio.

As discussed in Section 7, the City has plans to continue to acquire water supplies and construct infrastructure to supply current and future water users. Therefore, we conclude the City of Clovis has adequate water supplies to meet the needs of the City in normal, dry, and multi-dry years given the previously discussed potential demand reductions and supply augmentations.

Table 8-1. Summary of Project Water Supplies and Demands

Description	Normal Year	Single-Dry Year	Multiple-Dry Year		
			Year 1	Year 2	Year 3
Baseline Demands w/15% Conservation	38,300	38,300	38,300	38,300	38,300
Total Supply w/Additional Groundwater	59,500	38,300	65,000	45,600	38,300
Excess/<Deficit> in Supply versus Demand	21,200	0	20,000	600	0
Percent Excess/<Deficit> in Supply versus Demand	47.1	0	44.4	1.3	0

As noted above, additional groundwater supplies may not be necessary in the critical year or multiple year drought depending on operational decisions regarding conservation; however, the City's WMP notes additional groundwater supplies would be available on a short-term basis during a drought condition.

9 References

Carollo Engineers, Inc. (2016). *City of Clovis, 2015 Urban Water Management Plan Update.* Clovis.

Placeworks. (2014). *General Plan, City of Clovis.* Clovis.

Department of Water Resources. (2003). *Bulletin 118 - California's Groundwater.* Sacramento.

Provost & Pritchard Consulting Group. (2018). *City of Clovis, Water Master Plan Update, Phase III.* Clovis.