Appendix H:
Water Supply Analysis

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Water Supply Assessment for the Merced Gateway Project, City of Merced, California

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April 2016

April 29, 2016

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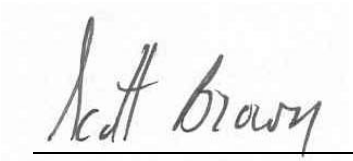

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1 INTRODUCTION

This report analyzes the projected water supply and demand for the Merced Gateway Project (or "Project") in the City of Merced, California. The Water Supply Assessment (WSA) is intended to support environmental planning documentation for the project.

1.1 Regulatory Background

Section 10910 of the California Water Code (as revised by Senate Bill 610, or SB610) requires: "the city or county, at the time that it determines whether an environmental impact report, a negative declaration, or a mitigated negative declaration is required for any project subject to the California Environmental Quality Act pursuant to Section 21080.1 of the Public Resources Code, … [to] identify a water system…that may supply water for the project" and to prepare a WSA to address the increased water use over existing conditions. The WSA is intended to:

1. Identify the water system or systems that would (or may) supply water to the project;
2. Compare project water demands with those projections included in the most-recently adopted Urban Water Management Plan or Plans for those service providers; and
3. Assess whether the public water system's total projected water availability for the entire system(s) during normal, single dry, and multiple dry years over a 20-year period will meet the projected water demand associated with the proposed project, in addition to the public water system's existing and planned future uses (including agricultural and manufacturing uses).

Within this assessment, California Water Code Section 10910(4)(d) requires a discussion of existing water supply entitlements, water rights, or water service contracts relevant to the public water system(s). Also, Section 10910 (2)(f) requires that "If a water supply for a proposed project includes groundwater, the following additional information shall be included in the water supply assessment: (1) a review of any information contained in the urban water management plan relevant to the identified water supply for the proposed project (2) a description of any groundwater basin or basins from which the proposed project will be supplied."

The Merced Gateway project is a combined commercial/residential complex on 77.5 acres that would include 178 high-density residential units and commercial space of up

to 601,127 square feet. Section 10912(a) of the California Water Code outlines the types of projects requiring a Water Supply Assessment, as follows:

1. A proposed residential development of more than 500 dwelling units;
2. A proposed shopping center or other business establishment employing more than 1,000 persons or having more than 500,000 square feet of floor space;
3. A proposed commercial office building employing more than 1,000 persons or having more than 250,000 square feet of floor space;
4. A proposed hotel or motel, or both, having more than 500 rooms;
5. A proposed industrial, manufacturing, or processing plant or industrial park planned to house more than 1,000 persons, occupying more than 40 acres of land, or having more than 650,000 square feet of floor area;
6. A mixed-use project that includes one or more of the projects specified in this subdivision; or
7. A project that would demand an amount of water equivalent to, or greater than, the amount of water required by a 500 dwelling unit project.

Per items 2 and 6 above, the Merced Gateway Project requires a WSA. See Section 3.1 for a discussion of estimated water demand for the Project.

Water supply for the proposed project would be served by the City of Merced ("City"). Water sources available to the City are discussed in Section 0. The City prepared an Urban Water Management ("UWMP") in 2010 (Carollo, 2011) that projected water supply and demand within the service district through 2035. While the Merced Gateway Project was not explicitly considered in the 2010 UWMP, the UWMP did generally account for projected increases in demand associated with expected development related to growth of the City (outlined in the City's 2030 General Plan; City of Merced, 2011).

Section 4 compares the system-wide supply and demand for the City to assess whether there is sufficient supply to support existing water uses, the Project, and other planned future uses through 2030.

1.2 Project Location

The Merced Gateway project is proposed for a 77.5 acre parcel in the southern portion of the City of Merced in Merced County, California. The project site is located east of Highway 99, bounded by East Gerard Avenue to the north, East Mission Avenue to the south, and South Coffee Street to the west (Figure 1). Undeveloped lands bound the site to the east.

1.3 Existing Conditions

The project site is currently undeveloped land that is regularly disked. Seasonal grassy and weedy vegetation is present throughout the site. An existing stretch of Campus Parkway cuts through the southern portion of the site along an east-west trend.

The site currently has two zoning designations, as outlined in the 2030 General Plan (City of Merced, 2011). Approximately 20 acres in the northern portion of the site is designated "Medium- to High-Density Residential", while the remainder (57.5 acres) of the site is designated "Regional Community Commercial". The proposed project is generally consistent with both land-use designations, though some slight alterations are proposed, as described below.

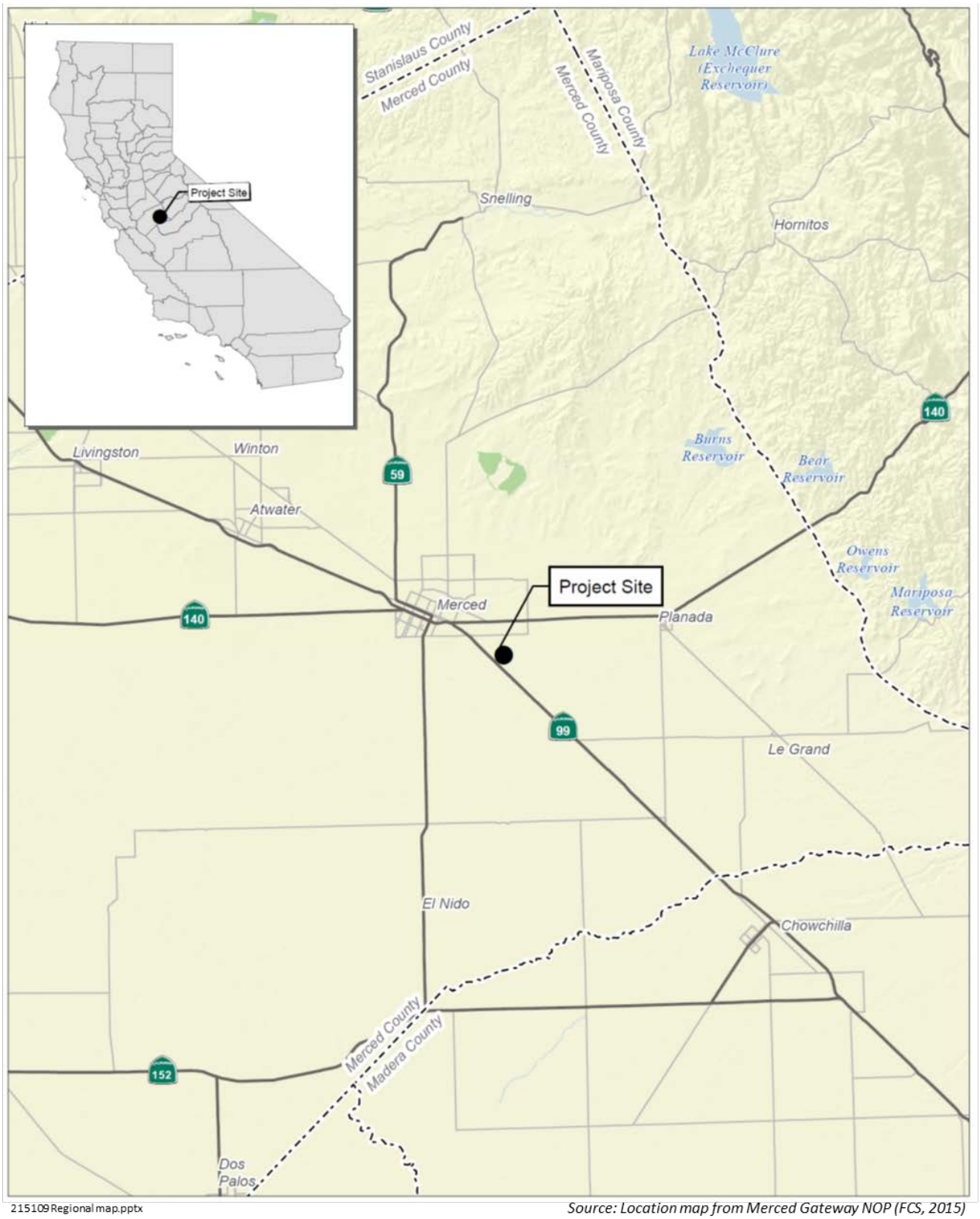

Figure 1 **Regional location map for the Merced Gateway Project, City of Merced, California.**

1.4 Proposed Project

The proposed project would develop the 77–acre site with a mix of high-density residential and commercial buildings. The residential uses would be concentrated in the northwest portion of the site, while commercial buildings would fill in much of the remaining area. The project plan would allow up to 601,127 square feet of commercial building space and up to 178 dwelling units. In addition, a small portion of the site would be reserved for a future fire station. Figure 2 shows the proposed project layout, as presented in the project NOP (FCS, 2015). Anticipated water demands associated with these uses are discussed in Section 3.1.

The project applicant is proposing General Plan Amendments and Zone Changes that would reconfigure the boundary between the residential and commercial portions of the project site to be consistent with the above plan. Overall, the General Plan Amendments and Zone Changes would increase the amount of commercial acreage by 12 acres (to 67.5 acres total) and reduce the amount of residential acreage by approximately 12 acres (to a total of 8 acres of residential use). Although this results in a reduction in the medium- to high-density residential acreage, the Master Plan concept includes a 178-unit, high-density multifamily residential complex (21 units per acre) and no medium-density units, which results in a total number of units consistent with the unit count in the General Plan.

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Source: Location map from Merced Gateway NOP (FCS, 2015)

Figure 2 **Conceptual site plan for the Merced Gateway Project, City of Merced, California.**

2 WATER SUPPLY

The City of Merced obtains its water supply almost exclusively from local groundwater. The following sections summarize the City's water supply (see also Table 1). These descriptions were summarized from the City of Merced 2010 Urban Water Management Plan ("UWMP"; Carollo, 2011), and a draft of the City's updated Water Master Plan (AECOM, 2015).

Table 1 Current and projected sources of water supply for the City of Merced.

Source	Contracted Volume/Capacity (afy)
Groundwater (Merced subbasin)[1]	n/a
Surface water transfer (Merced River)[2]	200

Notes:

[1] The subbasin is not an adjudicated groundwater basin, and there are no legal constraints on pumping. The City anticipates pumping of up to 44,420 AFY in a normal year in 2030 (Carollo, 2011).

[2] Anticipated water transfer agreement with the Merced Irrigation District (MID) to provide surface water for City Park irrigation, up to 200 afy by 2030 (Carollo, 2011).

2.1 Groundwater

The City of Merced relies almost exclusively on local groundwater to supply its customers. The City maintains 19 wells throughout its service area with rated capacities between 1,200 and 4,000 gallons per minute. All of these wells draw water from the underlying Merced subbasin of the larger San Juaquin Valley Groundwater Basin. A brief summary of the subbasin, water-level trends, and efforts by the City and other agencies to manage groundwater decline is included below. Detailed discussion can be found in the City's 2010 UWMP (Carollo, 2011), and in the MAGPI Groundwater Management Plan (AMEC, 2008), from which this discussion was derived.

2.1.1 Merced Subbasin Description

The Merced subbasin lies on the eastern side of the San Joaquin Valley, bounded by the Chowcilla River to the south, the Merced River to the north, the San Joaquin River to the west and the Sierra foothills to the east. The City overlies the central portion of the subbasin.

The subbasin consists of several aquifers of varying thickness and geologic characteristics. While the fractured bedrock that underlies this portion of the Central Valley does yield some water (from the Ione and Valley Springs Formations), the primary source of groundwater is the overlying sediments that comprise the fill within the San Joaquin Valley. Several aquifers are present within the valley fill sediments. In general, the eastern portion of the subbasin consists of interbedded coarse and fine sediments that comprise a leaky aquifer system with little influence of confining layers. Toward the west, older alluvium (and the underlying Mehrten formation—sedimentary bedrock which is also water-bearing) are fully confined by the Corcoran Clay. Overlying the clay is an extension of the leaky aquifer system from the east and a shallow, fully-unconfined aquifer. The City of Merced lies near the eastern edge of the extent of the Corcoran Clay.

The Merced subbasin is not an adjudicated groundwater basin, as defined by DWR. As such, there are no legal constraints on groundwater pumping from the subbasin (Carollo, 2011). However, it is in the City's and other users' best interest for long-term supply to appropriately manage groundwater within the basin. As such, the City has worked as a member of the Merced Area Groundwater Pool Interests (MAGPI) and pursued development of a groundwater management plan, further described below.

2.1.2 Groundwater Levels and Safe Yield

The Merced Irrigation District (MID) and DWR have been monitoring water levels in the subbasin since the 1950s. This monitoring has shown a long-term decline in groundwater levels, approximately 14 feet between 1980 and 2007 (AMEC, 2008), a large portion of which occurred during the late 1980s and early 1990s. Groundwater levels have continued to decline since 2006, especially since 2012 during the current drought (Figure 3).

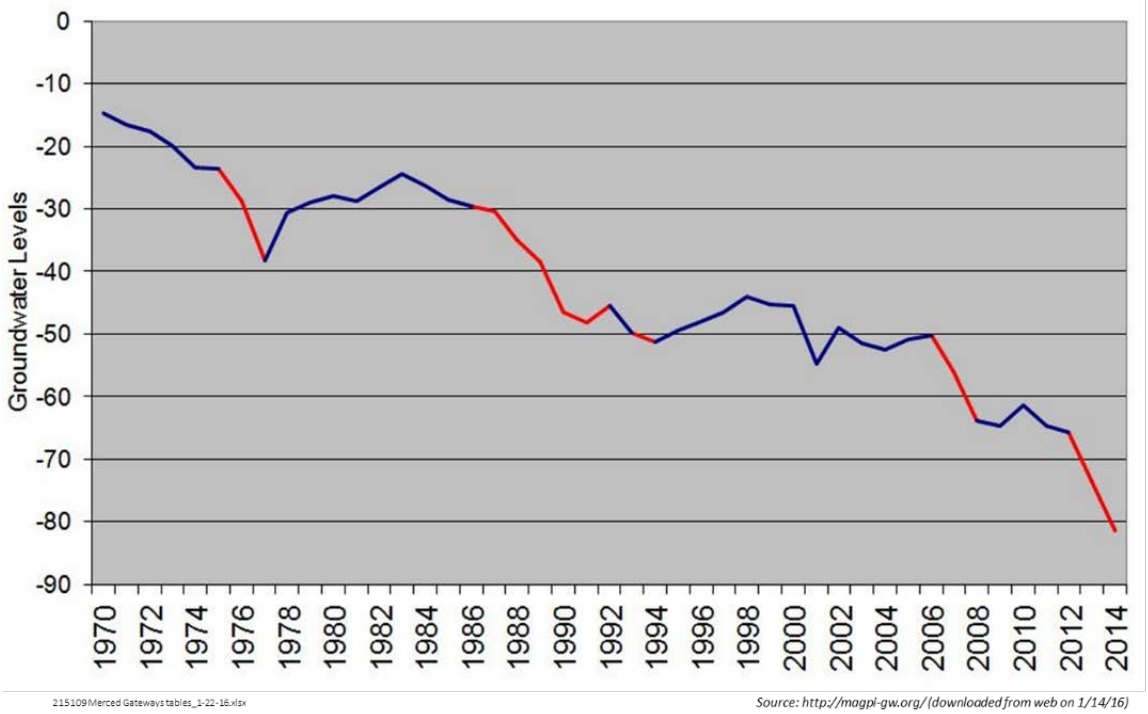

Figure 3 **December average static groundwater levels at MID monitoring wells, 1970-2014.** Blue line segments represent water level trends during normal and wet years, while red segments represent trends during droughts.

Despite the drop in water levels within the subbasin, the City has not encountered groundwater supply constraints within their existing array of wells (Ken Elwin, Merced City Engineer, December 2015 personal communication). However, continued long-term decline in the aquifer could result in degradation of water quality, increased pumping costs, and permanent loss of storage capacity due to compaction of the aquifer sediments (AMEC, 2008).

AMEC (2008) estimated that between 1980 and 2007, there was a cumulative loss of groundwater stored within the subbasin of approximately 720,000 acre-feet. This suggests that annual groundwater extraction would need to be reduced by at least 26,000 afy in order to stabilize groundwater levels in the basin and prevent additional long-term overdraft.

2.1.3 MAGPI GROUNDWATER MANAGEMENT PLAN

The City and other agencies that pump groundwater from the Merced subbasin (including the Merced Irrigation District [1]) have a joint interest in managing the groundwater subbasin to reduce the potential for long-term overdraft. In compliance with the Groundwater Management Act (AB3030) the City and MID completed a draft groundwater management plan for the Merced subbasin in 1997, and along with other groundwater users in the area agreed to form the Merced Area Groundwater Pool Interests (MAGPI). MAGPI adopted an update to the groundwater management plan (GMP) in 2008.

The GMP outlined a number of elements to, among other things, mitigate groundwater overdraft within the subbasin. In-lieu[2] and direct recharge, averaging about 60,000 afy, were implemented in the late 1990s, which helped to slow the decline, but did not fully resolve the overdraft (AMEC, 2008; see Figure 3). MAGPI, MID, Merced County, and the City have been and are currently assessing additional conjunctive use measures intended to stabilize aquifer water levels. These include assessing opportunities for additional managed recharge, optimal use of available surface-water supply, and water conservation efforts. These efforts are further detailed in the Merced Integrated Regional Water Management Plan (RMC, 2013).

In addition, MAGPI has recently begun development and testing of the Merced Water Resources Model (MWRM), a comprehensive surface-groundwater model intended to assess conjunctive use scenarios. Once completed, the model will serve as an additional tool to further refine appropriate management measures and goals for sustainable management of the subbasin in the long term.

In August 2015, the California Department of Water Resources (DWR) released a draft updated list of critically overdrafted groundwater basins in response to the Sustainable Groundwater Management Act. The list now includes the Merced subbasin, which was not included in the previous (1980) version of the list. As such, the basin will be required to be managed under a groundwater sustainability plan (or coordinated plans) by 2020.

[1] MAGPI consists of 14 members, including the City of Merced and the Merced Irrigation District, among other agencies.

[2] In-lieu recharge results from providing alternate water supply to users who would otherwise pump from groundwater.

The 2008 version of the groundwater management plan will likely serve as the framework for the sustainability plan.

2.2 Surface Water Transfers

While the City currently relies solely on groundwater for its municipal supply, the City and MID intend to enter an agreement for a long-term surface water transfer to offset (by a small amount) a portion of the City's groundwater usage. Up to 200 afy of MID surface water is expected to be transferred to the City by 2030 to support landscape irrigation within some of the City's parks (Carollo, 2011). This would allow the City to proportionally reduce groundwater pumping.

2.3 Recycled Water

The City does not currently rely on recycled water as a regular source of water, and does not have the infrastructure for wide-spread use for irrigation within its service area. The City currently collects and treats wastewater from its customers, and recycles treated water via discharges to Hartley Slough for agricultural use and to support the wildlife management area (Carollo, 2011).

A recently completed project at the wastewater treatment plant has expanded the treatment capacity and implemented tertiary treatment at the plant. This would allow the use of treated water for landscape irrigation, though the City has no plans for wide-spread or long-term use of this water for such purposes (AECOM, 2015). In response to the most recent drought, however, the City has begun to use some of its treated wastewater (via truck sprayers) to irrigate trees and playing fields at public parks[3].

[3] http://www.mercedsunstar.com/news/local/article36938439.html

3 WATER DEMAND

The following section summarizes the anticipated water demand for the proposed Merced Gateway Project, and compares the anticipated demand of the Project to system-wide demand assumptions in the 2010 UWMP.

3.1 Project Demand

As described in Section 1.4, the proposed project consists of several parcels that will be developed to accommodate residential and commercial uses, as well as a proposed fire station. In addition, the project will include associated landscaping areas that will require seasonal irrigation.

Water demand for the Project was estimated based on the land-use acreage of the proposed project (per project plans) and the unit water usage numbers provided in the City's recent Water Master Plan (AECOM, 2015). Water demand for the entire project at build-out is expected to be 150 afy (Table 2). It is important to note that in order to provide a conservatively high project demand, the unit water demand used for this accounting is based on the City's current land-use demand averages and has not been adjusted to account for potential decreases in use associated with higher water-efficiency standards within the City (see Table 4-4 in AECOM, 2015). The UWMP expects an approximate 10 percent reduction in unit water demand by 2030, suggesting that the Project's demand may ultimately be less than the anticipated 150 afy.

Table 2 Estimated water demand for the Merced Gateway Project, City of Merced, California.

Project feature	Project area (acres)	Number of units	Building floor area (sq. ft.)	Water usage rate[1] (af/ac/yr)	Potable water use (afy)
Phase I					
High-density residential	8.0	178		3.2	25.6
Commercial	67.5	n/a	601,127	1.8	121.5
Fire station[2]	1.53	1		2.0	3.1
Total	**77.03**		**601,127**		**150**

Notes:

[1] *From Table 4-4 in the Water Master Plan (AECOM, 2015); used values based on the City's current land-use demand (does not include anticipated water efficiency savings) in order to provide a conservative estimate.*

[2] *Assumed institutional rate for the fire station.*

3.2 Merced System-wide Demand

The system-wide demand projections in the 2010 UWMP were developed based on anticipated population growth within the City's growth boundary over the 20-year planning period, as outlined in the City's 2030 General Plan. Population in 2010 was approximately 81,500 people, and is expected to grow to 159,900 by 2030[4] (UWMP, 2010). As such, population is expected to grow at about 3 percent annually over the planning period.

The UWMP provides a breakdown of the number of connections for various land-use sectors (residential, commercial, etc.) for 2010, and assumes that growth within each sector will keep pace with general population growth over the planning period. Water demand within each sector was calculated based on average water usage by sector between 2005 and 2009[5]. Table 3 summarizes the projected water demand, by sector, over the 20-year planning period as presented in the UWMP.

Table 3 Existing and projected system-wide water demand for the City of Merced by land-use sector, 2010-2030.

	2010 (afy)	2015 (afy)	2020[3] (afy)	2025 (afy)	2030 (afy)
Single-family residential	15,631	19,700	20,991	24,327	28,003
Multi-family residential	3,634	4,580	4,880	5,655	6,510
Commercial/Institutional	2,803	3,533	3,764	4,363	5,022
Industrial	591	745	793	919	1,058
Landscape Irrigation	799	1,008	1,074	1,244	1,432
UC Merced Community	202	500	1,000	1,660	2,394
Total	**23,660**	**30,066**	**32,502**	**38,168**	**44,419**

Notes:

[1] From the City of Merced 2010 UWMP. Numbers vary slightly from those presented in the UWMP due to differences in rounding.

[2] Projections account for demand savings associated with the Water Conservation Bill of 2009.

[3] The increase in demand between 2015 and 2020 is small relative to other years within the planning period (6% increase for 2015-2020, while other years show increases of greater than 15%) is due to anticipated implementation additional water conservation measures to reduce unit demand.

[4] Including UC Merced, which is supplied water by the City.

[5] Water demand estimates incorporate anticipated water conservation related to the Water Conservation Bill of 2009.

The City expects total water demand (nearly all of which comes from groundwater), to increase from 23,660 afy in 2010 to 44,419 afy in 2030. Water demand for the multi-family residential and commercial/industrial sectors (land uses included in the proposed Project) is projected to increase from 3,634 to 6,510 and 2,803 to 5, 022 afy, respectively.

The 2010 UWMP found (based on past water usage records) that City-wide demand tends to increase during drought periods, due predominantly to increased landscape irrigation. As such, the UWMP assumed that dry-year demand during the planning period would be as much as 24 percent higher (maximum deviation from the long-term trend, which occurred in 1984) than normal-year demand. During the most recent drought, however, the City was able to drastically *reduce* total water demand through enactment of drought conservation measures. Table 4 shows the actual water usage within the City's distribution area since the 2010 UWMP was completed, as well as the interpolated yearly demand based on the projections in the UWMP for both normal and dry years. Figure 4 depicts these trends graphically. Between 2010 and 2013, actual water usage generally tracked at or slightly below the anticipated normal-year demand from the UWMP. After additional drought conservation measures were enacted in 2015 water usage dropped dramatically; 2015 demand was less than 60 percent of anticipated normal-year demand for that year, and less than 50 percent of anticipated single-dry-year demand.

Table 4 **Recent water usage for the City of Merced.** Estimated usage based on projections in the 2010 UWMP are also shown. Up until drought restrictions were enacted in 2015, potable demand was at or slightly below UWMP normal-year demand. During the recent drought, actual potable water demand was significantly lower than dry-year demand anticipated in the 2010 UWMP.

	2010 (afy)	2011 (afy)	2012 (afy)	2013 (afy)	2014 (afy)	2015 (afy)
Total water use[1]	**23,661**	**23,117**	**25,899**	**27,469**	**25,234**	**17,954**
Total projected normal-year water demand (2010 UWMP)[2]	23,661	24,942	26,222	27,503	28,783	30,064
Total projected dry-year water demand (2010 UWMP)[2]	29,110	30,688	32,265	33,843	35,420	36,998

Notes:

[1] Actual water usage within the City's water service district; 2010-2012 usage from AECOM (2015); 2013-2015 usage provided by personal communication from Ken Elwin, City Engineer.

[2] Linear interpolation of 2010 usage and UWMP projected potable normal-/dry-year water demand for 2015.

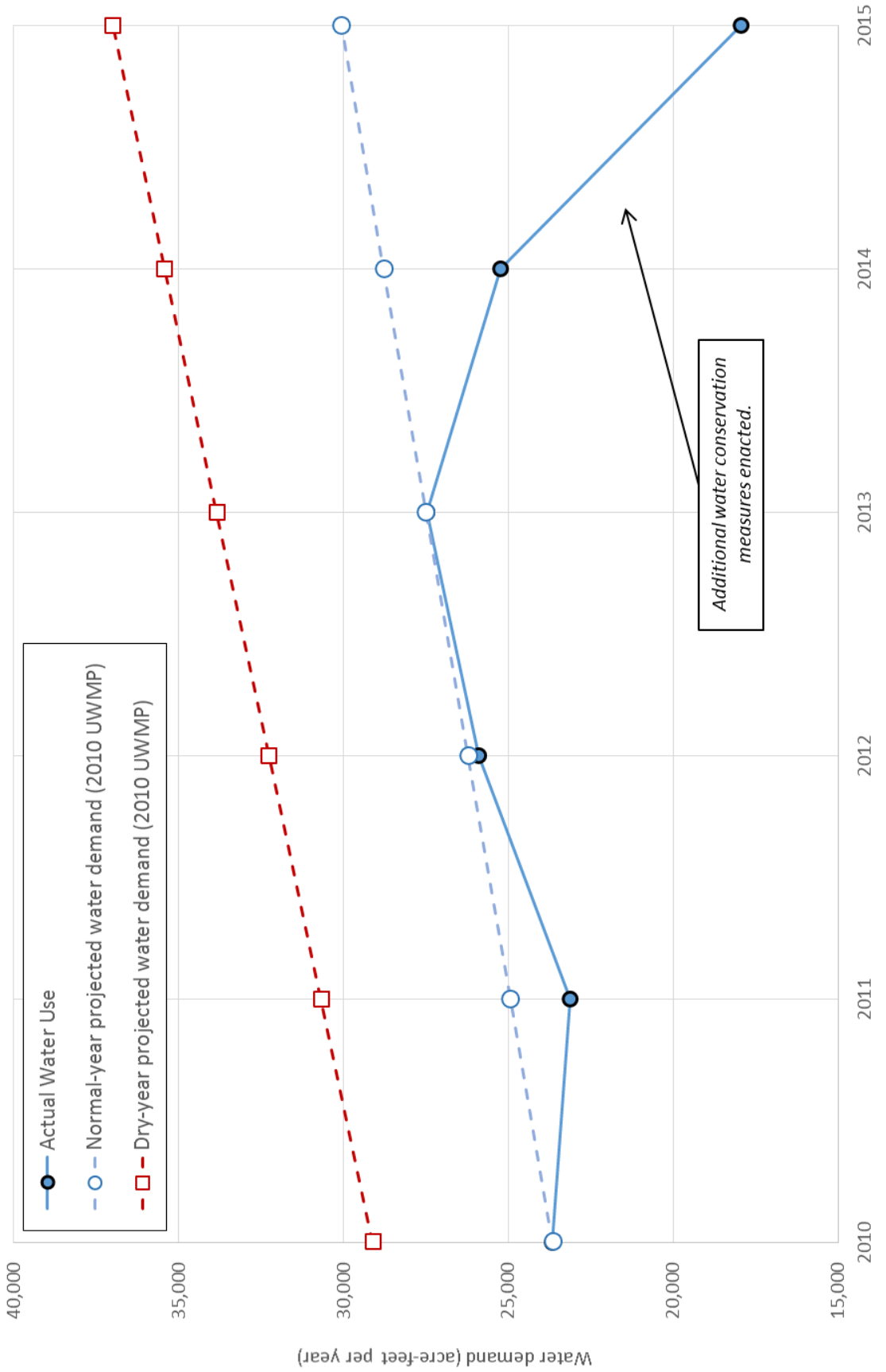

Figure 4 Recent water usage for the City of Merced compared to normal- and dry-year projections in the 2010 UWMP.

Demand has dropped significantly in response to the recent drought. The City has been in a Stage 2 Water Emergency since the mid-1990s due to overdraft of the groundwater aquifer, but implemented additional restrictions in 2015 in response to the most recent drought. See Table 4 for data sources.

The demand reductions achieved in 2014 and 2015 are the result of some measures that are likely only temporary in nature (further limitations on landscape irrigation, for example). Other measures, however, may have a lasting effect on unit water demand. The City has encouraged conversion to drought-tolerant plantings through the State's Turf Replacement Initiative, and continues to provide low-flow water fixtures for residential customers. In addition, the City Council recently approved funding for water-usage meters for the 10,800 residential customers (nearly half) who currently are meter-less. City staff have estimated that non-metered customers on average use nearly twice as much water as metered customers[6], so the program could result in substantial long-term water savings.

3.3 Project Comparison to System-wide Demand

The Merced Gateway project was not specifically mentioned in the City's 2010 UWMP. However, the project is within the City's sphere of influence and generally consistent with the General Plan upon which the UWMP projections were based. As described in Section 3.1, the Project proposes to increase commercial uses at the site, and provide "high-density" instead of "medium- to high-density" residential uses on a smaller portion of the site. This change is expected to result in similar water use to the General Plan, as shown in Table 5.

Table 5 Water usage for the Merced Gateway project compared to estimated usage for the parcel under the General Plan.

Project feature	Merced Gateway Project area (acres)	Water usage rate[1] (af/ac/yr)	Potable water use (afy)	General Plan area (acres)	Water usage rate[1] (af/ac/yr)	Potable water use (afy)
Phase I						
High density residential	8.0	3.2	25.6	…	…	…
Medium- to high-density residential	…	…	…	20.0	2.65	53.0
Commercial	67.5	1.8	121.5	57.03	1.8	102.7
Fire station[2]	1.53	2.0	3.1	…	…	…
Total	**77.03**		**150**	**77.03**		**156**

Notes:

[1] From Table 4-4 in the Water Master Plan (AECOM, 2015); used values based on the City's current land-use demand (does not include anticipated water efficiency savings) in order to provide a conservative estimate.

[2] Assumed institutional rate for the fire station; fire station area assumed commercial under General Plan.

[6] Information on the City's metering program was obtained from a press release (#596) on the City's website at www.cityofmerced.org, dated 5/14/2015.

Table 6 shows the estimated Merced Gateway water usage compared to the projected total, residential, and commercial water usage increases for 2015-2020 from the UWMP. The Project would comprise 6 percent of the total increase, 3 percent of the residential sector increase, and 17 percent of the commercial sector increase over the five-year period, all of which seem reasonable and in-line with expected water-usage growth over the period. Over the long-term, the project would be expected to use between 0.3 and 0.5 percent of the City's total water supply (Table 7).

Table 6 Estimated Merced Gateway project water demand compared to projected demand increases for 2015 to 2020 in the UWMP.

	Water demand
	(afy)
Merced Gateway Project (total demand)[1]	150
Change in system-wide total demand from 2015-2020[2]	2436
Project as a percent of system-wide increase	*6%*
Merced Gateway Project (residential demand)[1]	26
Change in system-wide multi-family residential demand from 2015-2020[2]	946
Project as a percent of system-wide increase	*3%*
Merced Gateway Project (commercial/ institutional demand)[3]	125
Change in system-wide commercial/institutional demand from 2015-2020[2]	730
Project as a percent of system-wide increase	*17%*

[1] *From Table 2.*
[2] *From Table 3.*
[3] *From Table 2; includes proposed fire station.*

Table 7 Comparison of the Merced Gateway project demand to system-wide demand for the 2015-2030 planning period.

	2015	**2020**	**2025**	**2030**
	(afy)	(afy)	(afy)	(afy)
Projected potable water demand (UWMP)[1]	*30,066*	*32,502*	*38,168*	*44,419*
Merced Gateway Project demand[2]	*0*	*150*	*150*	*150*
Project percentage of total demand	--	*0.5%*	*0.4%*	*0.3%*

Notes:
[1] *From 2010 City of Merced UWMP, Table 3.14; incoprorates assumed water conservation measures.*
[2] *From Table 2.*

4 SUPPLY AND DEMAND COMPARISON

This section compares future City-wide water demand to anticipated available supply under 'normal year,' 'single dry year,' and 'multiple dry year' scenarios. Because the Merced Gateway is consistent with the City's general plan on which the demand projections were based (see Section 3.3), the Project's water usage is assumed to be incorporated in the demand projections from the UWMP. As such the water supply/demand comparison presented here are the same as in the 2010 UWMP.

The UWMP assumed that groundwater will be fully available to meet demand under all year-type scenarios. While the City recognizes that the Merced subbasin is currently in a state of overdraft, there are, as of yet, no legal constraints to groundwater withdrawal by the City, nor do they anticipate any operational constraints[7] due to the declining water levels. The City remains committed to protecting the groundwater resources through implementation of the groundwater management plan (see Section 2.1.3) and through demand reduction (see Chapter 5) but from a planning perspective the City sees groundwater as a fully available supply.

As described in Section 2.2, a small portion of the City's water supply would be obtained through surface-water transfers from MID. The 2010 UWMP estimated the reliability of this supply based on data from the DWR Hydrologic Classification Indices for the San Joaquin Valley (1901-2010). The analysis estimated that 100 percent of water-transfer supply would be available in normal years, but that this supply would be reduced for dry- and multi-dry-year scenarios. Table 8 provides a summary of the estimated percent availability for the various year types.

[7] Such as through "drying" of wells, prohibitive pumping costs, or degradation of groundwater quality as a result of declining water levels.

Table 8 **Supply reliability for City of Merced water supply sources.** Assumed percent of supply available for various year-type scenarios.

Source	Year Type				
	Normal Year	Single Dry Year	Dry year 1	Dry year 2	Dry year 3
Groundwater[1]	100%	100%	100%	100%	100%
Surface-water transfers[2]	100%	18%	48%	55%	28%

Notes:

[1] The UWMP assumes that groundwater is fully available to meet demand during all year-type scenarios.

[2] Surface-water availability based on generalized hydrologic conditions for the San Juaquin Valley (DWR--see section 5.1 in the 2010 UWMP).

4.1 Normal Year

Table 9 summarizes the normal-year supply and demand for the City of Merced for the planning period. Both groundwater and surface-water transfers from MID are assumed to be fully available under the normal year scenario.

Table 9 **Comparison of water supply and demand for a normal-year scenario.**

Source	2015	2020	2025	2030
	(afy)	(afy)	(afy)	(afy)
Groundwater supply [1]	*30,006*	*32,397*	*38,016*	*44,220*
Surface-water transfers [2]	*58*	*105*	*153*	*200*
Total potable supply	30,064	32,502	38,169	44,420
Potable demand[3]	30,064	32,502	38,169	44,420
Potable supply minus demand	*0*	*0*	*0*	*0*

Notes:

[1] The City pumps groundwater to meet demand; the 2010 UWMP concluded that groundwater supply is available to meet demand.

[2] Assumed surface-water transfers from the Merced River to support landscape irrigation. 100 percent available in normal years (see Table 8).

[3] Projected potable normal-year demand, from Table 3; consistent with 2010 UWMP

As concluded in the 2010 UWMP, the City anticipates adequate normal-year supply through 2030.

4.2 Single Dry Year

Based on past demand during dry periods (see Section 3.2) the 2010 UWMP estimated dry-year demand to be 24 percent higher than normal-year demand. Despite the increase, the UWMP concluded that adequate supply would be available to meet that demand as summarized in Table 10.

Table 10 Comparison of water supply and demand for a single dry-year scenario.

Source	2015	2020	2025	2030
	(afy)	(afy)	(afy)	(afy)
Groundwater supply [1]	*36,968*	*39,959*	*46,920*	*54,601*
Surface-water transfers [2]	*10*	*19*	*28*	*36*
Total potable supply	36,979	39,977	46,948	54,637
Potable demand[4]	36,979	39,977	46,948	54,637
Potable supply minus demand	*0*	*0*	*0*	*0*

Notes:

[1] The City pumps groundwater to meet demand; the 2010 UWMP concluded that groundwater supply was available to meet demand.

[2] Assumed surface-water transfers from the Merced River to support landscape irrigation. 18 percent available in dry years (see Table 8).

[3] Projected potable dry-year demand, 123% of normal-year demand; consistent with 2010 UWMP.

It is important to note that the City was able to *reduce* water demand well *below* normal-year projections during the most recent drought. Some of these reductions may be permanent (on a per-user basis—see Section 3.2). In addition, the City, MID, and other MAGPI members are continuing long-term groundwater management efforts to optimize conjunctive use of the regional surface/groundwater supply. The goal of that program is to reduce or eliminate long-term overdraft of the subbasin (see Section 2.1.3), in part by maximizing recharge during wet years in order to have adequate supply during dry years over the long-term.

4.3 Multiple Dry Years

The 2010 UWMP assumed that a multi-year dry period would result in sustained demand at single-dry-year amounts. The UWMP concluded that adequate water supply would be available during a multi-year drought to meet prolonged single-dry-year demand (Table 11).

Table 11 Comparison of water supply and demand for a multiple dry-year scenario.

Source	2015			2020			2025			2030		
	Year 1	Year 2	Year 3	Year 1	Year 2	Year 3	Year 1	Year 2	Year 3	Year 1	Year 2	Year 3
	(afy)	(afy)	(afy)	(afy)	(afy)	(afy)	(afy)	(afy)	(afy)	(afy)	(afy)	(afy)
Groundwater supply[1]	*36,953*	*36,949*	*36,965*	*39,927*	*39,920*	*39,948*	*46,873*	*46,862*	*46,904*	*54,539*	*54,525*	*54,579*
Surface-water transfers[2]	*28*	*32*	*16*	*50*	*58*	*29*	*73*	*84*	*43*	*96*	*110*	*56*
Total potable supply	36,981	36,981	36,981	39,977	39,977	39,977	46,947	46,947	46,947	54,635	54,635	54,635
Potable demand[3]	36,981	36,981	36,981	39,977	39,977	39,977	46,947	46,947	46,947	54,635	54,635	54,635
Potable supply minus demand	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*

Notes:

[1] *The City pumps groundwater to meet demand; the 2010 UWMP concluded that groundwater supply was available to meet demand.*

[2] *Assumed surface-water transfers from the Merced River to support landscape irrigation. 48, 55, and 28 percent available in years 1-3 of a multi-year dry period (see Table 8).*

[3] *Projected potable dry-year demand, 123% of normal-year demand; consistent with 2010 UWMP.*

As with the single-dry year scenario, future water demand during droughts is likely to be significantly less than anticipated in the UWMP, and continued groundwater management efforts will help to optimize conditions to improve subbasin overdraft conditions.

5 DEMAND MANAGEMENT

As discussed above, the City's 2010 UWMP found that adequate water supply is available (predominantly from groundwater) to meet projected demand increases over the 20-year planning period. The City recognizes, however, that the groundwater subbasin has been and continues to be in an overdrafted condition (see Section 2.1.2), and that appropriate management of long-term water supply will require working with other groundwater users to optimize use of the groundwater resource to eliminate the overdraft. As described in Section 2.1.3, the City and other MAGPI users have implemented and continue to research ways to increase groundwater recharge during wet years (both through direct and in-lieu recharge). In addition, the City has implemented and continues to encourage water conservation efforts within the City.

5.1 Water Emergency Ordinance

In 1993 the City adopted a water conservation ordinance, revised in 2000, that outlines a water contingency plan during dry periods or other times when water supply may be limited. Recognizing that the Merced subbasin is in an overdrafted state, the City has maintained a Stage 2 Water Emergency since the mid-1990s. Under this ordinance washing of driveways, sidewalks, and external building walls is prohibited. Non-recirculating fountains, use of potable water for non-domestic purposes when another source is available, and other unreasonable uses of water are also prohibited. In addition, outdoor irrigation restrictions limit landscape watering to certain days of the week depending on street address. The 2010 UWMP long-term demand projections account for the continued implementation of the Water Emergency Ordinance[8].

5.2 UWMP Demand Management Measures

The 2010 UWMP lists other demand management measures prescribed by DWR, and describes the implementation status (and/or feasibility) for each within the City. The following measures have been implemented by the City (as of 2010):

- Residential plumbing retrofits—the City offers free low-flow shower heads and other types of low-flow retrofits.

[8] Water usage data since 2010 (see Figure 3) show that actual water usage has trended at or below projected normal-year demand in the UWMP, suggesting that projections, at least over the short-term, are reasonably accurate (if not somewhat conservatively high).

- Water system audits—the City maintains a leak repair program, but does not perform regular system-wide audits because many customers are not (yet) metered.
- Meter with commodity rates—since 1992, the City has required all new connections to be metered.
- Public information program—the City distributes a variety of brochures and other materials to customers describing conservation methods and benefits.
- School education program—the City conducts speaking engagements at the City's schools and supplies schools with water conservation educational materials.
- Water conservation coordinator—the City employs a water conservation specialist (currently Leah Brown), responsible for overseeing water conservation education, implementation, citation, and notices.
- Water waste prohibition—the City's 1993 ordinance outlines water waste prohibitions, as described above.

Two other measures were listed in 2010 as "planned for implementation", and have (at least in part) been implemented in response to the most recent drought (see Section 5.3 below):

- Landscape irrigation programs—the City encourages the use of irrigation controllers that reference evapotranspiration for optimization of outdoor watering, but has not yet implemented a specific program.
- Conservation pricing—the City does not currently implement a tiered rate structure, and the current rate plan will be in place through 2017. Efforts to increase customer metering (see Section 5.3 below), would allow for better optimization of a tiered structure, and the City will consider such a system in upcoming rate analyses[9].

[9] A recent California Supreme Court ruling (April 2015) struck down a tiered rate structure for water customers in San Juan Capistrano (http://www.mercurynews.com/drought/ci_27954116/california-drought-court-rules-tiered-water-rates-violate). The full implications of this decision have yet to be realized and may affect the degree to which the City, and other water suppliers, can implement conservation measures that include tiered pricing.

The UWMP assumed that these measures would be phased in by 2020, and adjusted long-term demand projections accordingly to account for improvements in unit demand efficiency[10].

5.3 Other Recent Water Conservation Measures

In response to the recent drought (beginning in 2013), the City has enacted additional water conservation measures to further reduce water consumption within the City. These measures include:

- Additional limitations on landscape irrigation—watering only allowed on two days per week;
- Increased publicity about the drought and water conservation measures;
- Authorization to purchase water meters to install for the remaining meter-less residential account—installation began in June 2015 and full implementation is expected by the spring of 2016.

The measures listed above also served to reduce unit demand in order to comply with Governor Brown's executive order (B-29-15) to reduce urban water consumption in the state by 25 percent. The implementation plan associated with that order (CA DWR, 2015a), divided the State's water suppliers into different tiers based on their existing unit water consumption rate. Suppliers with low unit consumption are required to reduce usage by less than 25 percent, while suppliers with higher consumption were required to reduce by greater than 25 percent. The City falls into Tier 9, and is required to reduce its unit consumption by 36 percent relative to 2013 usage. As of October 2015 the City has achieved compliance with the Order, with a cumulative savings of over 40 percent (CA DWR, 2015b).

[10] The percent change in normal year demand between 2015 and 2020 in the UWMP is less than that for other years (see Table 3) because of the assumed implementation of additional water conservation measures to reduce unit water demand. See Figure 3.1 in the 2010 UWMP (Carollo, 2011).

6 SUMMARY

The Merced Gateway project is a combination high-density residential and commercial project planned on 77 acres within the City of Merced. The project would use up to 150 afy of water (supplied by the City of Merced) for domestic, commercial, and landscape irrigation uses.

The City of Merced obtains nearly all of its water from groundwater supply, pumping (along with other Cities, Districts, and private well owners) from the underlying Merced subbasin. Water levels within the subbasin have been declining since the 1970s, and the basin is overdrafted. Through the Merced Area Groundwater Pool Interests (MAGPI), the groundwater users developed a groundwater management plan in 1997 (updated in 2008), and have implemented efforts to increase recharge and decrease pumping to eliminate the basin overdraft. Continued groundwater decline during recent droughts indicates that the basin is still overdrafted despite these efforts. MAGPI continues to investigate and implement management measures to eliminate this overdraft.

The Merced Gateway project was not directly referenced in the Merced 2030 General Plan, but is consistent with that plan from a water demand perspective and as such is considered to be included in population and water usage increases over that period that were used for water supply planning in the 2010 Urban Water Management Plan (UWMP). The UWMP projected normal-year water demand to increase from 23,660 afy in 2010 to 44,419 afy in 2030, and dry-year demand to increase from 29,110 afy in 2010 to 54,649 afy in 2030. Multi-year droughts are assumed to have the same demand as the single-dry-year scenario. The UWMP found that sufficient water supply is available to meet this demand for all normal-year, dry-year, and multi-dry-year scenarios. In essence, the City is aware that overdraft is occurring and is making progress in the combat against that, but the overdraft in itself is not a limitation on the City's ability to draw water from the aquifer. Therefore, the water supply is considered to be sufficient.

In addition to the groundwater management plan efforts to reduce overdraft, the City has also implemented various demand management measures to reduce the City's per-capita water consumption. These include irrigation and car washing restrictions, prohibitions on driveway and sidewalk washing, water efficiency educational programs, residential plumbing retrofits, and support to fully meter all customers. During the most recent drought, the City has decreased water usage to well below projected normal- and dry-year demand for 2015, and has achieved a cumulative per-capita decrease in consumption of over 40 percent since 2013.

Based on the information above, City-wide supply is anticipated to be available to meet demand, including that of the Merced Gateway project.

7 LIMITATIONS

This technical report was prepared in general accordance with the accepted standard-of-practice existing in Northern California at the time the analyses were performed. No other warranty is made or implied. Readers are asked to contact us if they have additional relevant information, or wish to propose revisions or modified descriptions of conditions, such that the best data can be applied at the earliest possible date.

8 REFERENCES

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