Appendix G

Water Supply Assessment

Tully & Young
Comprehensive Water Planning

Tully & Young, Inc.
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MEMORANDUM

To: Brian Foster

From: Tully & Young, Inc.

Date: October 20, 2017

Subject: West Davis Active Adult Community Land Use Changes

1.0 Introduction

In August of 2017, a Water Supply Assessment (WSA) was prepared for the West Davis Active Adult Community (WDAAC). Since then, the project has been modified to account for minor land use changes and a revision to the planned scope of the commercial portions of the project. The purposes of this memorandum are to discuss the land use changes since Tully & Young, Inc. issued the WSA and determine the resulting impacts to the water demands of the West Davis Active Adult Community (WDAAC). In short, we conclude that although the land use changes increase the project's water demands, the conclusion of sufficiency remains.

2.0 Water Demand as presented in the Water Supply Assessment

The WSA derived sufficiency from two separate analyses. First, the land use and water demands were analyzed and presented in **Table 2-1** and **2-2** of the August 2017 WSA. A map of the land uses proposed in the August 2017 WSA is presented in **Figure 2-1**. Second, the UWMP water demand allocation was derived with a per acre methodology for the project site. The result of this analysis as compared to the WDAAC project was a small surplus in water supply based on the projected water demands of the proposed project as presented in the WSA. **Table 2-1**, **2-2** and **Figure 2-1** are the same as those used in the 2017 WSA and shown below.

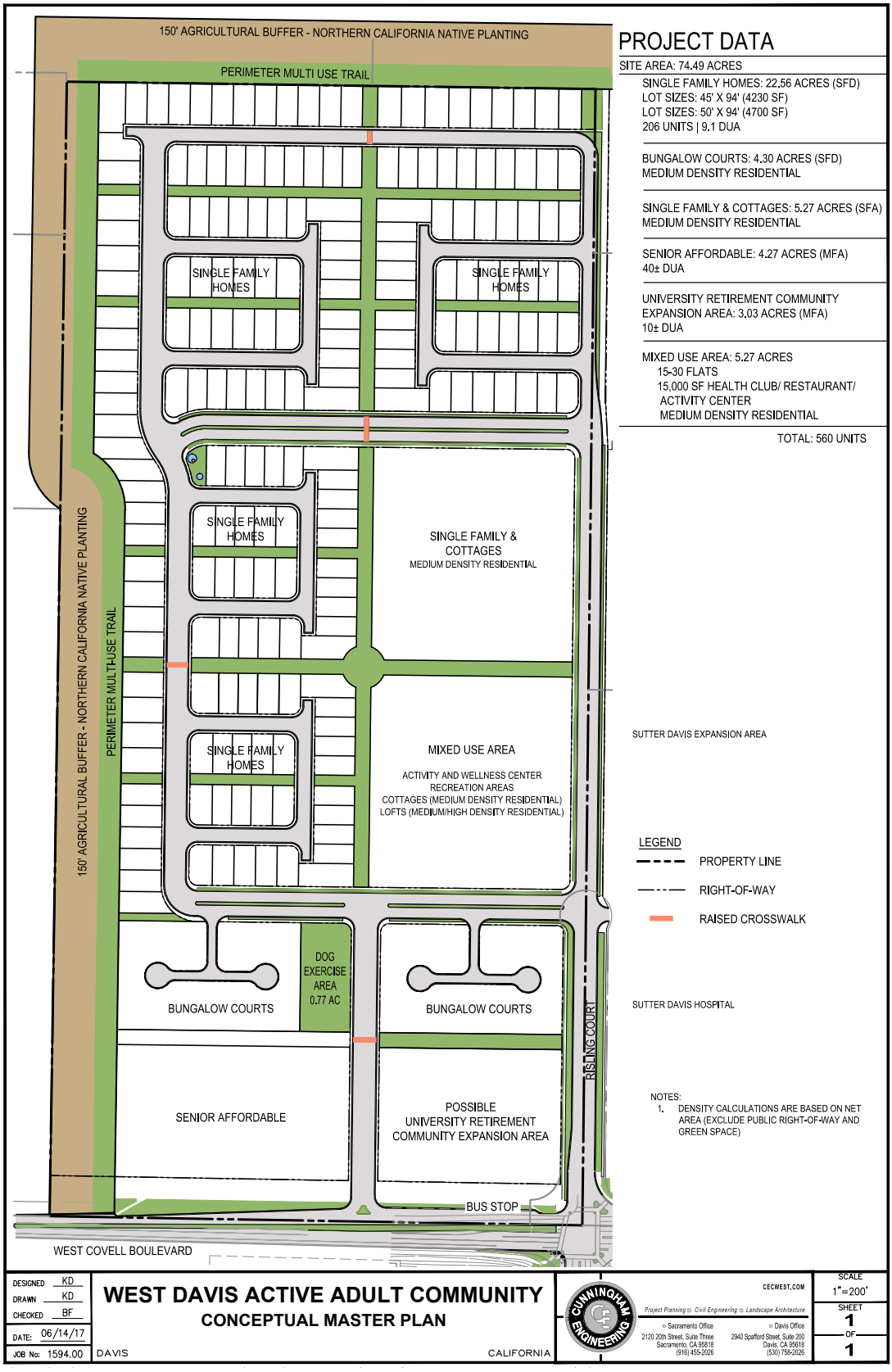
Table 2-1 – WSA Land Use

Land Use	Gross Acreage	Details
Homes, Bungalows, lots	26.78	238 Dwelling Units
Homes and Cottages	5.27	92 Dwelling Units
Continuing Care Retirement Community	3.03	30 Dwelling Units
Senior Affordable Apartments	4.36	150 Dwelling Units
Mixed Use Area	5.27	50 Dwelling Units
Dog Park	0.76	
Linear Park	4.69	
Ag Transition Area	7.19	
Right of Ways	17.59	
Total	**75**	**560 dwelling units**

Table 2-2 – Water Demands in the WSA

	Unit Count or Acreage						Demand Factor	Demand (af/yr)					
Category	Current	2020	2025	2030	2035	2040	(af/du or af/ac)	Current	2020	2025	2030	2035	2040
Residential													
Homes, Bungalows, and Builder Lots	0	0	238	238	238	238	0.19 (indoor)	0	0	45	45	45	45
							0.21 (outdoor)	0	0	49	49	49	49
Cottages	0	0.0	92	92	92	92	0.19 (indoor)	0	0	17	17	17	17
							0.13 (outdoor)	0	0	12	12	12	12
Mixed Use	0	0.0	50	50	50	50	0.15 (indoor)	0	0	8	8	8	8
							0.05 (outdoor)	0	0	3	3	3	3
Senior Affodable Apartments	0	0.0	150	150	150	150	0.15 (indoor)	0	0	23	23	23	23
							0.02 (outdoor)	0	0	3	3	3	3
University Retirement Expansion	0	0.0	30	30	30	30	0.15 (indoor)	0	0	5	5	5	5
							0.19 (outdoor)	0	0	6	6	6	6
DU Total	**0**	**0**	**560**	**560**	**560**	**560**							
							Indoor Subtotal	0	0.0	97	97	97	97
							Outdoor Subtotal	0	0.0	73	73	73	73
Non-Residential													
Mixed Use	0	0	5.3	5.3	5.3	5.3	2.80	0	0	15	15	15	15
							Indoor Subtotal	0	0.0	14.8	15	15	15
Public													
Dog Park	0	0	1	1	1	1	4.01	0	0	3	3	3	3
Linear Park	0	0	2	5	5	5	4.01	0	0	9	19	19	19
Agricultural Transition Area	0	0	7	0	0	0	2.81	0	0	20	0	0	0
Right of Way Landscaping	0	0	18	18	18	18	0.19	0	0	3	3	3	3
							Outdoor Subtotal	0	0.0	36.0	25	25	25
Other Miscellaneous Uses													
Construction Water	0	0	1	0	0	0	1	0	0	1	0	0	0
							Outdoor Subtotal	0	0	1	0	0	0
							Indoor Total	0	0	112	112	112	112
							Outdoor Total	0	0	110	99	99	99
							Total	0	0	222	211	211	211
							Outdoor Non-revenue water 11%	0	0	12	11	11	11
							Indoor Non-revenue water 11%	0	0	12	12	12	12
							Total Indoor	0	0	124	124	124	124
							Total Outdoor	0	0	123	110	110	110
							Total Proposed Project Demand	**0**	**0**	**247**	**234**	**234**	**234**

Figure 2-1 – WSA Land Use Map



The WSA concluded that the pre-loss demands totaled 211 acre-feet.[1] Specifically, the WSA stated:

> *The City of Davis' 2015 UWMP included a number of "Proposed Developments" in analyzing supply reliability for the City. One of the analyzed developments was the "Davis Innovation Center." The Davis Innovation Center was the previous project planned for the site of the new Proposed Project. The UWMP accounted for 619 acre-feet for the entire Innovation Center's 207 acres which is approximately 2.99 acre-feet per acre. Thus, the Proposed Project's area, a mere 75 acres of the original 207 acres, is budgeted in the UWMP for approximately 221 acre-feet.*[2]

3.0 Revised Land Use

Since the completion of the WSA draft, the land use plan has changed. The primary change was related to the replacement of the large multi-use facility with 50 mixed use apartments with a small community center and a 109 condos. Additionally there were some increases in the amount of expected irrigated landscaping as the linear park and agricultural transition area was better defined. It should be noted that the total number of housing units has not changed but has shifted. Specifically, the number of smaller homes and cottages were decreased, from 92 to 33, and the mixed use area apartments were replaced with a greater number of condos, from 50 to 109. **Table 2-1A** presents the revised land use plan.

Table 2-1A – Revised Land Use

Land Use	Gross Acreage	Details
Homes, Bungalows, lots	26.70	238 Dwelling Units
Cottages	3.05	33 Dwelling Units
Continuing Care Retirement Community	3.03	30 Dwelling Units
Senior Affordable Apartments	4.26	150 Dwelling Units
Condos/Unassigned/Wellness Center	6.16	109 Dwelling Units
Dog Park	1.10	
Linear Park	8.16	
Ag Transition Area	4.24	
Right of Ways	17.79	
Total	**74**	**560 dwelling units**

Table 2-2A presents the revised water demand projection.

[1] Note that the loss occurring will be on the City system side and very little will be occurring within the project boundary.

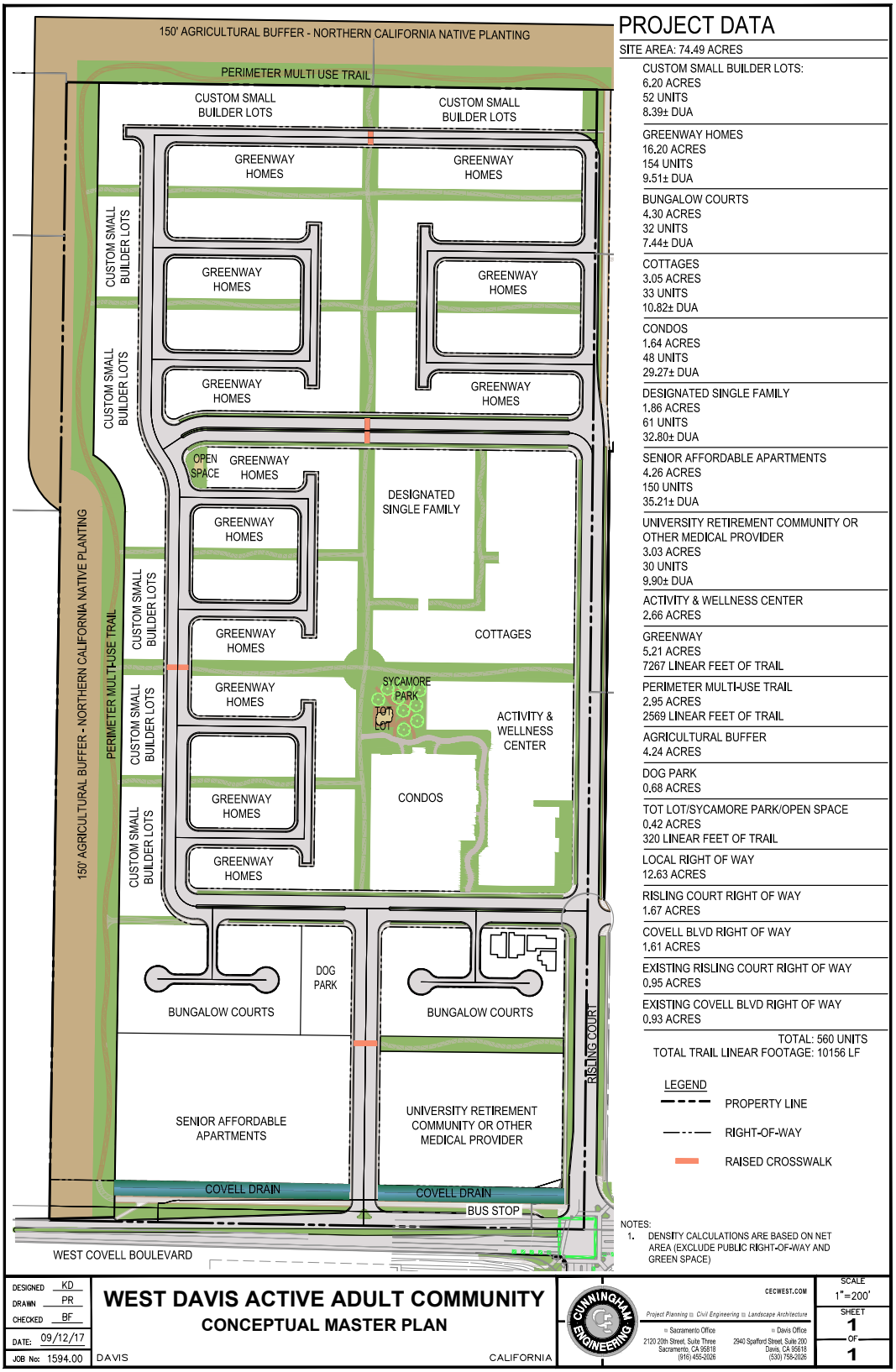
[2] Text from page 4-1 of the August 2017 Water Supply Assessment for the West Davis Active Adult Community project.

Table 2-2A – Revised Water Demands

	Unit Count or Acreage						Demand Factor	Demand (af/yr)					
Category	Current	2020	2025	2030	2035	2040	(af/du or af/ac)	Current	2020	2025	2030	2035	2040
Residential													
Homes, Bungalows, and Builder Lots	0	0	238	238	238	238	0.19 (indoor)	0	0	45	45	45	45
							0.23 (outdoor)	0	0	54	54	54	54
Cottages	0	0.0	33	33	33	33	0.19 (indoor)	0	0	6	6	6	6
							0.22 (outdoor)	0	0	7	7	7	7
Mixed Use	0	0.0	109	109	109	109	0.15 (indoor)	0	0	16	16	16	16
							0.01 (outdoor)	0	0	1	1	1	1
Senior Affodable Apartments	0	0.0	150	150	150	150	0.15 (indoor)	0	0	23	23	23	23
							0.03 (outdoor)	0	0	5	5	5	5
University Retirement Expansion	0	0.0	30	30	30	30	0.15 (indoor)	0	0	5	5	5	5
							0.19 (outdoor)	0	0	6	6	6	6
DU Total	**0**	**0**	**560**	**560**	**560**	**560**							
							Indoor Subtotal	0	0.0	95	95	95	95
							Outdoor Subtotal	0	0.0	73	73	73	73
Non-Residential													
Mixed Use	0	0	2.7	2.7	2.7	2.7	2.80	0	0	7	7	7	7
							Indoor Subtotal	0	0.0	7.4	7	7	7
Public													
Dog Park	0	0	1	1	1	1	4.01	0	0	4	4	4	4
Linear Park	0	0	4	8	8	8	4.01	0	0	16	33	33	33
Agricultural Transition Area	0	0	4	0	0	0	2.81	0	0	12	0	0	0
Right of Way Landscaping	0	0	18	18	18	18	0.19	0	0	3	3	3	3
							Outdoor Subtotal	0	0.0	36.1	41	41	41
Other Miscellaneous Uses													
Construction Water	0	0	1	0	0	0	1	0	0	1	0	0	0
							Outdoor Subtotal	0	0	1	0	0	0
							Indoor Total	0	0	102	102	102	102
							Outdoor Total	0	0	110	114	114	114
							Total	0	0	213	216	216	216
							Outdoor Non-revenue water 11%	0	0	12	13	13	13
							Indoor Non-revenue water 11%	0	0	11	11	11	11
							Total Indoor	0	0	114	114	114	114
							Total Outdoor	0	0	123	127	127	127
							Total Proposed Project Demand	**0**	**0**	**236**	**240**	**240**	**240**

The changes between **Table 2-2** and **Table 2-2A** include the unit counts for the Cottages and Mixed Use in the Residential category. In the Non-Residential category, the Mixed Use acreage was adjusted to reflect the land use change. For the Public category, acreages for the Dog Park, Linear Park, and Agricultural Transition Area were all adjusted.

Figure 2-1A – Revised Land Use Map



4.0 Conclusion of Sufficiency

The net impacts of the land use changes increase the net water demands from 211 acre-feet to 216 acre-feet before loss. With loss included, total demands from the demands analyzed in the August 2017 WSA increase by 6 acre-feet. The addition of this demand still results in a project demand below the UWMP allocation. Thus, despite the demand changes, there is sufficient water supply to serve the Proposed Project and the conclusion of sufficiency stated in the WSA is still valid after considering the impacts of land use changes.

West Davis Active Adult Community Project

SB 610 Water Supply Assessment

CITY OF DAVIS

West Davis Active Adult
SB 610 Water Supply Assessment

Prepared for the
City of Davis

Admin Draft

August 2017

Prepared by:

Tully & Young
Comprehensive Water Planning

Prepared for:
The City of Davis

CITY OF DAVIS

Approved on

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Table of Contents

SECTION 1 – PROJECT INTRODUCTION

1.1 INTRODUCTION

As the lead agency under the California Environmental Quality Act (CEQA), the City of Davis (hereafter referred to as the "City") is assessing the potential environmental impacts associated with the proposed development under the West Davis Active Adult Community (Specific Plan) in the western portion of the City. To support the CEQA analysis, a Water Supply Assessment (WSA) for the West Davis Active Adult Community Specific Plan is necessary (hereafter referred to as the "Proposed Project").

Statutory Background

Enacted in 2001, Senate Bill 610 added section 21151.9 to the Public Resources Code requiring that any proposed "project" as defined in section 10912 of the Water Code comply with Water Code section 10910, et seq. Commonly referred to as a "SB 610 Water Supply Assessment," Water Code section 10910 outlines the necessary information and analysis that must be included in an environmental analysis of the project to ensure that proposed land developments have a sufficient water supply to meet existing and planned water demands over a 20-year projection.

Proposed "projects" requiring the preparation of a SB 610 water supply assessment include, among others, residential developments of more than 500 dwelling units, shopping centers or business establishments employing more than 1,000 persons or having more than 500,000 square feet of floor space, commercial office buildings employing more than 1,000 persons or having more than 250,000 square feet of floor space and projects that would demand an amount of water equivalent to, or greater than, the amount of water required by a 500 dwelling unit project.[1] The Proposed Project requires a WSA because it is a residential development of more than 500 dwelling units.

The WSA will be incorporated into the CEQA document — an Environmental Impact Report (EIR) — being prepared for the Proposed Project (the Project EIR).[2]

Document Preparation and Approval

The WSA law requires that the lead agency – in this case, the City of Davis – identify a "public water system"[3] and further requires the lead agency to request that each identified public water system prepare a WSA for the project. If the lead agency is not able to identify a public water system that may supply water for the project, the lead agency must prepare the WSA itself after

[1] Water Code § 10912, subdivision (a).
[2] Water Code § 10911(b).
[3] A "public water system" is a system that provides water for human consumption that has 3,000 service connections.

consulting with "any entity serving domestic water supplies whose service area includes the project site, the local agency formation commission, and any public water system adjacent to the project site."[4]

In this case, the City of Davis has prepared the WSA because the City plans to serve water to the Proposed Project and the Proposed Project lies within the City's General Plan Area. This document provides the necessary information for the City to make its determinations and to comply with the assessment of water supply sufficiency as required by statute.

Document Organization

This WSA supports the Proposed Project's environmental review process and analyzes the sufficiency of water supplies to meet projected water demands of the Proposed Project through the required planning horizon. The WSA is organized according to the following sections:

Section 1: Project Introduction. This section provides an overview of WSA requirements, and a detailed description of the Proposed Project, especially the land-use elements that will require water service.

Section 2: Proposed Project Estimated Water Demands. This section describes the methodology used to estimate water demands of the Proposed Project and details the estimated water demands at build-out of the Proposed Project.

Section 3: Water Supply Characterization. This section characterizes the City's water supply portfolio that will serve the Proposed Project along with other current and future water demands. City wells, along with water service contracts and agreements are characterized for normal, single dry, and multiple dry year conditions.

Section 4: Sufficiency Analysis. This section assesses whether sufficient water will be available to meet the Proposed Project water demands, while recognizing existing and other potential planned water demands within the City of Davis service area. To provide the necessary conclusions required by statute, the analysis integrates the demand detailed in Section 2 with the characterization of the City's water supply portfolio detailed in Section 3.

[4] Water Code § 10910(b).

1.2 PROPOSED PROJECT DESCRIPTION

The Proposed Project ("Proposed Project" or "Project") is a new residential, mixed use development on approximately 75 acres located adjacent to the northwest corner of the City and within the sphere of influence. The Proposed Project is just west of Sutter Davis Hospital and Highway 113 with the City's west area water tank and booster pump station located to the north.

Project Background

The Project Site is located on lands that were once part of the Davis Innovation Center Project. The Proposed Project is located on the southern portion of the 207 acre Davis Innovation Center Project location. That project was placed on hold by the request of the developer in 2015. The Innovation Center project included a Draft EIR and other supporting documents. As such, much of land specific environmental analysis has been completed and the City accounted for water use on the property in its 2015 Urban Water Management Plan (UWMP). **Figure 1-1**, on the following page, depicts the Proposed Project's location and land uses.

Project Description

This Water Supply Assessment (WSA) includes an evaluation of the Proposed Project, which consists of approximately 560 dwelling units, health club, restaurant, and clubhouse on 75 acres. The breakdown of residential uses includes 150 affordable age restricted apartments, 32 attached age restricted cottages, 92 attached age restricted units, 129 single family age restricted homes, 77 single family non-age restricted homes, a retirement community with 30 detached age restricted units, and 50 attached age restricted mixed use units. Non-residential uses include the 5.3 acre mixed use area with the health club, restaurant, and clubhouse. Public uses include a dog park, greenways, and agricultural buffer zones with trails. The existing on-site agricultural well may be utilized to offset the more expensive potable water for non-potable demands, but this is not considered for purposes of the sufficiency analysis in this WSA. Layout of the Proposed Project uses setbacks in open space to buffer the residential lands from neighboring operating agricultural operations.

Figure 1-1 – Proposed Project Location and Land Uses

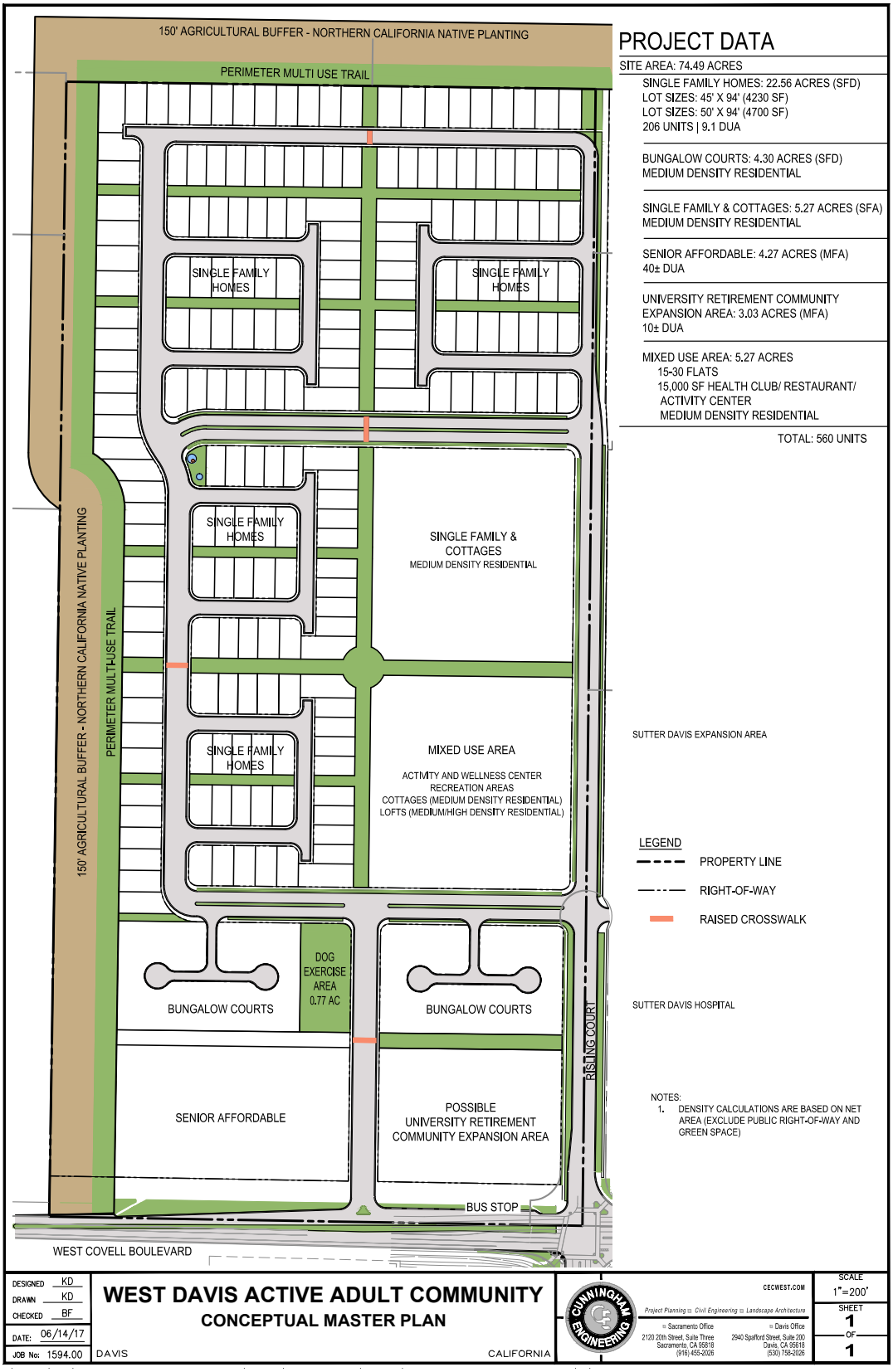

Table 1-1 summarizes the Proposed Project's land use acreages and dwelling unit counts.

Table 1-1 – Summary of Project Land Uses and Acreages

Land Use	Gross Acreage	Details
Homes, Bungalows, lots	26.78	238 Dwelling Units
Homes and Cottages	5.27	92 Dwelling Units
Continuing Care Retirement Community	3.03	30 Dwelling Units
Senior Affordable Apartments	4.36	150 Dwelling Units
Mixed Use Area	5.27	50 Dwelling Units
Dog Park	0.76	
Linear Park	4.69	
Ag Transition Area	7.19	
Right of Ways	17.59	
Total	**75**	**560 dwelling units**

Overall, the Proposed Project includes 560 dwelling units at average densities between 8.9 and 34.4 dwelling units per acre depending on unit type. The Proposed Project consists of both age restricted and non-age restricted units so occupancy rates will differ between housing types. Davis has an average occupancy of 2.64 persons per household.[5] The age-restricted units will be less than 2 as no children will be present and some units will have single individuals. Using the census number for non-age restricted and 2 for age restricted gives a conservative estimate of 1,169 people.1.3 Proposed Project Phasing

Table 1-2 describes the Proposed Project's anticipated construction phases for purposes of this WSA. Each phase represents a portion of the Proposed Project, focusing on particular land use classifications. Before constructing homes, commercial space, or other parts of the Proposed Project, the applicants will begin site grading and Project-wide infrastructure development. Some infrastructure and site grading will continue throughout all phases of the Proposed Project, as necessary. These activities include, among other things, installing facilities for potable water, non-potable water, sewer, electric, telecommunications, gas, stormwater, and roads. During these activities, a small water demand will exist – referred to in this WSA as "construction water." This demand is included in the projected annual water demands presented in **Section 2**.

While the timing of the Proposed Project's ultimate build-out will be market driven, it is anticipated that the Proposed Project should be complete within about 5 years of the start of construction. Project construction should begin in 2020 and be completed well within the 20-year planning horizon contemplated in this WSA.

[5] US Census 2011-2015

Table 1-2 – Proposed Number of Units and Project Phasing

Project Element	Unit Count					
	Current	2020	2025	2030	2035	2040
Homes, Bungalows, lots	0	0	238	238	238	238
Homes and Cottages	0	0	92	92	92	92
Continuing Care Retirement Community	0	0	30	30	30	30
Senior Affordable Apartments	0	0	150	150	150	150
Mixed Use Area	0	0	50	50	50	50
Village Mixed Use	0	0	0	0	0	0

SECTION 2 – PROPOSED PROJECT ESTIMATED WATER DEMANDS

2.1 INTRODUCTION

This section describes the methodology, provides the supporting evidence, and presents the estimated annual water demands for the Proposed Project. For the purpose of estimating annual water demand, the Proposed Project is planned to develop according to the phasing in **Table 1-2.**

2.2 DETERMINING UNIT WATER DEMAND FACTORS

As detailed in **Section 1**, the Proposed Project has specific residential and potential non-residential land uses with defined residential lot-sizes, potential mixed use commercial area, and other greenbelt and open space characteristics. As these attributes vary among the types of proposed land uses, so too will the water needs. To understand the water needs of the entire Proposed Project, unique demand factors that correspond with each unique land use are necessary. This subsection presents the methodology for determining the unit water use demand factors that become the basis of the Proposed Project water demand estimates. Two distinct groups of demand factors are presented: (1) residential, and (2) potential non-residential. The values developed for each distinct group are based on several sources of information; the details of that information is provided below.

2.2.1 Current and Future Mandates

There are several factors that affect the development of unit water demand factors, ranging from state mandates to changes in the types of housing products being offered. These factors are incorporated into the determination of unit water demand factors, as discussed later in this section. Characteristics of the most important factors are described below.

2.2.1.1 Water Conservation Objectives

On November 10, 2009, Governor Arnold Schwarzenegger signed Senate Bill No. 7 (SBX7-7), which established a statewide goal of achieving a 20 percent reduction in urban per capita water use by 2020 for urban retail water suppliers.[6] Since the Proposed Project is yet to be built, this legislation has limited restrictive applicability.

The efforts undertaken by the City, and to a lesser extent the Woodland-Davis Clean Water Agency, to comply with this statute will affect the Proposed Project's use of appliances, fixtures, landscapes and other water using features, through changes or additions to City and County ordinances and/or through an emerging "conservation ethic" seen in the region as a result of drought conditions.

[6] California Water Code § 10608.20

2.2.1.2 Indoor Infrastructure Requirements

In January 2010, the California Building Standards Commission adopted the statewide mandatory Green Building Standards Code (hereafter the "CAL Green Code") that requires the installation of water-efficient indoor infrastructure for all new projects beginning after January 1, 2011. The CAL Green Code was incorporated as Part 11 into Title 24 of the California Code of Regulations.[7] The Cal Green Code was revised in 2013 with the revisions taking effect on January 1, 2014; however these revisions do not have substantial implications to the water use already contemplated by the 2010 Cal Green Code.[8] The CAL Green Code applies to the planning, design, operation, construction, use and occupancy of every newly constructed building or structure. All Proposed Project land uses must satisfy the indoor water use infrastructure standards necessary to meet the CAL Green Code.

The CAL Green Code requires residential and non-residential water efficiency and conservation measures for new buildings and structures that will reduce the overall potable water use inside each building and structure by 20 percent. The 20 percent water savings can be achieved in one of the following ways: (1) installation of plumbing fixtures and fittings that meet the 20 percent reduced flow rate specified in the CAL Green Code, or (2) by demonstrating a 20 percent reduction in water use from the building "water use baseline."[9] The Proposed Project will satisfy one of these two requirements through the use of appliances and fixtures such as high-efficiency toilets, faucet aerators, on-demand water heaters, or other fixtures as well as Energy Star and California Energy Commission-approved appliances.

2.2.1.3 California Model Water Efficient Landscape Ordinance and County Ordinance

The Water Conservation in Landscaping Act was enacted in 2006, requiring the Department of Water Resources ("DWR") to update the Model Water Efficient Landscape Ordinance (MWELO).[10] In 2009, the Office of Administrative Law (OAL) approved the updated MWELO, which required a retail water supplier or a county to adopt the provisions of the MWELO by January 1, 2010, or enact its own provisions equal to or more restrictive than the MWELO

[7] The CAL Green Code is Part 11 in Title 24. All references in this WSA will be to the Chapter and Section numbers that appear in the adopted document which may be obtained by visiting the California Building Standards Commission web site at: http://www.documents.dgs.ca.gov/bsc/CALGreen/2010_CA_Green_Bldg.pdf

[8] "The 2010 CAL Green Code was evaluated for updates during the 2012 Triennial Code Adoption Cycle . HCD evaluated stakeholder input, changes in technology, implementation of sustainable building goals in California, and changes in statutory requirements. As such, the scope of the CAL Green Code was increased to include both low-rise and high-residential structures, additions and alterations." *Guide to the 2013 California Green Building Standards Code (Residential)*, California Department of Housing and Community Development, 2013.

[9] See CAL Green Code. For Residential construction, Section 4.303.1 provides the residential water conservation standard and Table 4.303.2 identifies the infrastructure requirements to meet this standard. Table 4.303.1 and Worksheets WS-1 and WS-2 are to be used in calculating the baseline and the reduced water use if Option 2 is selected. For non-residential construction, Section 5.303.2.3 provides the water conservation standard as well as the baseline and reduced flow rate infrastructure standards. Note that Worksheets WS-1 and WS-2 incorporate both residential and non-residential fixtures, yet the water use is still to be analyzed by "building or structure" as specified in Chapter 1, Section 101.3.

[10] Gov. Code §§ 65591-65599

provisions.[11] Because the City of Davis is a "local agency" under the MWELO, it must require "project applicants" to prepare plans consistent with the requirements of MWELO for review and approval by the City of Davis. The City of Davis is in compliance with this state law and uses the MWELO as written for projects within the City Limits.[12] This WSA uses the methods described in the MWELO in setting landscaping irrigation limits. For the purposes of this WSA, the MWELO limit is applied to all aspects of the Proposed Project.

The MWELO applies to new construction with a landscape area greater than 2,500 square feet.[13] The MWELO "highly recommends" use of a dedicated landscape meter on landscape areas smaller than 5,000 square feet, and requires weather-based irrigation controllers or soil-moisture based controllers or other self-adjusting irrigation controllers for irrigation scheduling in all irrigation systems.[14] The MWELO provides a methodology to calculate total water use based upon a given plant factor and irrigation efficiency.[15] Finally, the MWELO requires the landscape design plan to delineate hydrozones (based upon plant factors) and then to assign a unique valve for each hydrozone (low, medium, high water use).[16]

2.2.1.4 Metering, Volumetric Pricing, and Water Budgets

California Water Code §525 requires water purveyors to install meters on all new service connections after January 1, 1992. California Water Code §527 requires water purveyors to charge for water based upon the actual volume of water delivered if a meter has been installed. Consistent with current customer billing, the City will be billing the Proposed Project water users on a volumetric basis. This will have little impact on the City in terms of implementation as the City is fully metered but new tools are available to help future savings. In 2015, the City replaced all meters on City facilities and parks with Advanced Metering Infrastructure (AMI) and is in the process of converting all customer meters. Once this AMI system is fully online, the City will have a new tool to pinpoint use issues, customer leaks, and other system patterns which can be used to further conservation through better system operation.

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[11] California Code of Regulations (CCR), Tit. 23, Div. 2, Ch. 27, Sec. 492.4. The MWELO provides the local agency discretion to calculate the landscape water budget assuming a portion of landscape demand is met by precipitation, which would further reduce the outdoor water budget. For purposes of this WSA, precipitation is not assumed to satisfy a portion of the outdoor landscape requirement because the determination of an appropriate effective precipitation factor is highly uncertain given the various landscape slopes, terrain composition, concurrent watering schedules, etc.

[12] Information about Davis's MWELO can be found on their website: http://cityofdavis.org/city-hall/public-works/water/water-conservation/model-water-efficient-landscape-ordinance

[13] CCR Tit. 23, Div. 2, Ch. 27, Sec. 490.1.

[14] CCR Tit. 23, Div. 2, Ch. 27, Sec. 492.7(a)(1)(A)-(B).

[15] In calculating Estimated Total Water Use, the MWELO requires use of at least a 71% irrigation efficiency factor. Assuming 71% irrigation efficiency, the average plant factor must be 0.50. It would be possible to stay within the water budget if the average plant factor were higher than 0.50 by designing a system with an irrigation efficiency higher than 71%. Again the relationship between a Plant Factor (PF) and Irrigation Efficiency (IE) in the Applied Water formula is: AW=(ETo*PF)/IE.

[16] CCR Tit. 23, Div. 2, Ch. 27, Secs. 492.3(a)(2)(A) and 492.7(a)(2).

Though the City will be billing customers in the Proposed Project on a volumetric basis, this action alone is not expected to substantially reduce water use. However, it is anticipated that the retail billing system will encourage and help maintain reasonable use (e.g. through rate structure at 87% volumetric pricing), so that the Proposed Project's water demands at build-out are not expected to grow as the Proposed Project progresses.

2.3 RESIDENTIAL WATER USE DEMAND FACTORS

The Proposed Project anticipates five general lot-size designations with the potential for some residential units with the commercial Village Mixed Use Area. The size of the lot has the greatest impact on the annual per-lot demand for water as the irrigation needs for landscaping increase with larger landscaped areas. In contrast, indoor water demands remain relatively consistent regardless of lot size, but do vary slightly based on the number of people per dwelling unit. Distinct demand factors are provided for the following residential uses:

- Indoor Residential Use – this category differentiates the slight variance anticipated to occur between the conventional housing and higher density housing to reflect the difference in people per dwelling unit.

- Outdoor Residential Use – this category addresses the landscape water demands for varying lot sizes and housing types planned within the Proposed Project.

For purposes of this WSA, residential unit water demand factors are described as "the acre-feet of water use annually per dwelling unit" – or simply put, acre-feet/dwelling unit (af/du).

2.3.1 Indoor Residential Water Use Factors

The Proposed Project's residential elements will be built in accordance with all applicable building codes including the Cal Green Code discussed previously.

Given the longevity of the City of Davis, indoor water use is likely highly variable because homes have been built over a long period of time. Older homes still typically use more water than newer homes, even with the additional drivers such as the Cal Green Code. As homes are remodeled and appliances are replaced, indoor water use falls but there will always be lingering old appliances and fixtures in older neighborhoods keeping averages higher than new neighborhoods. Because of the age of the City, average indoor use is not accurate for a new development. With this in mind, Tully & Young reviewed a number of meter studies from throughout northern California and has developed an indoor demand estimate that is in line with newer homes and the impacts of the latest Cal Green Code.

Additionally, the size of the house has little impact on indoor water demands. While a bigger house may have more space dedicated to living areas, water use is predicated on bathroom fixtures and appliances, which are limited by the previously mentioned CAL Green Code. For

the purposes of this WSA, indoor demands are assumed to vary only slightly based on the number of people per unit. The Proposed Project's age restricted units leads to persons per household numbers that differ from previous census records. This difference is due to the fact that age restricted units will almost universally have 2 people (at most) versus the City average of 2.64. For the Proposed Project the projected persons per household are 2.64 for non-age restricted and 2 for the age restricted units. To account for the differences in persons per household, the indoor water demand factors differ between housing unit type with age-restricted units having a lower indoor demand.

2.3.2 Outdoor Residential Water Use Factors

The primary factor driving outdoor water use on a per lot basis is the size of the lot and the landscaping square footage. The Proposed Project includes several residential lot types, each having a unique proposed housing layout and landscaped area. The plantings are intended to consist of low-water, drought-tolerant, and native plants. Landscapes not installed by the developer will be left to the homeowners where MEWLO compliance can not be guaranteed. However, homeowners will be strongly encouraged to follow the sustainability principles and the City of Davis requires compliance for even small landscape projects.[17]

To provide flexibility for the Proposed Project to landscape lots as needed and to provide a conservative assumption for this analysis, each lot is assumed to have a landscaped area equal to the lot square footage minus the house footprint and an amount of hardscaping in line with existing similar houses within the City. The remaining area of each lot is conservatively assumed to demand the maximum allowed by the MWELO. However, this characterization provides for a conservative analysis since the landscaping goals set forth in the Specific Plan will likely result in a lower outdoor residential water demand than is estimated by this WSA because of actions taken by developers and end users to be more water efficient.

A conservative starting point for landscape usage per acre is estimated at 4.01 AF/Ac as 85% of ETo.[18]

The primary driver that could significantly change both existing residential and non-residential outdoor water demands is the MWELO, as noted in **Section 2.2.1.3**. In following MWELO methodologies, landscaping demand may be calculated as an estimate of reference ETo. Using demand values estimated for MWELO, a demand per acre or square foot is applied to the average lot size of each category to develop the outdoor demand for each residence type.

Using the outdoor unit demand factor of 4.01 af/ac/yr and associated landscape area for an average lot in the City, an estimate of current outdoor demands can be derived.[19] Using this

[17] Davis MWELO short form prescriptive compliance - http://cityofdavis.org/home/showdocument?id=5782
[18] ETo is the Evapotranspiration or a standard measurement used to calculate plant water demands. For more information on ETo, refer to MWELO. This value is still accurate for parks under the revised MWELO where special landscaped areas are allowed.

same number and the average lot size from the West Davis Active Adult Community land-use plan, which is a current example of future development in the City, an estimate of future outdoor demands is created. All lot sizes are calculated to use this number. For example, the single family builder lots are expected to share this demand per-acre value but with greater proportions of the lot dedicated to landscape versus areas covered by hardscape and the structure's footprint. The medium density cottage lots are also assumed to have similar per-acre values, but with lesser proportions of the lot dedicated to landscaping. Thus, the larger lots will see per dwelling unit outdoor demand factors that are greater than that of a dwelling unit on a smaller lot such as a cottage.

The revised MWELO provides for determining the Maximum Applied Water Allowance ("MAWA"), where the maximum is determined as 55 percent of the reference evapotranspiration for the area for residential projects and 45 percent for non-residential, resulting in the following equation:

> *MAWA = (ETo) (0.62)(0.55 x LA), where ETo is the reference evapotranspiration in inches per year, LA is the landscape area, and 0.62 is a conversion factor. The resulting value is in "gallons per year"*

The ETo value for the City of Davis is 59 inches as recorded from the Davis CIMIS Weather Station.

- **Single Family.** – The proposed 238 lots of the homes, bungalows, and builder lots designations will include large single family structures with extensive outdoor hardscapes. These designations for the Proposed Project have lots with an average size of approximately 4,900 square feet. For the purposes of this WSA, the Proposed Project will use the outdoor demand factor, derived in **Table 2-1**, of 0.21 acre-feet per year for lots in this class.

- **Cottages.** – The proposed 92 cottage lot designation will include small single family structures with extensive outdoor hardscapes. These designations for the Proposed Project have lots with an average size of approximately 3,600 square feet. For the purposes of this WSA, the Proposed Project will use the outdoor demand factor, derived in **Table 2-1**, of 0.13 acre-feet per year for lots in this class.

[19] This value is conservative for residential use under the revised MWELO but meter results for newer homes in similar areas support using this conservative value. It is anticipated that a small reduction in this value will be seen in the next meter study performed by the City. This reduction is both due to the conservative nature of the value and to ongoing conservation and improvements in water use efficiencies.

- **High Density Senior Affordable Apartments.** – The proposed 150 units of this designation will include attached multi-family dwellings on a single large lot with an average of about 1,100 square-feet of ground area per unit. This dwelling unit type is typically associated with community controlled outdoor spaces so the average outdoor demands are typically quite low with typically less than a few hundred square feet of landscaping per unit. For the purposes of this WSA, the Proposed Project will use the outdoor demand factor, derived in **Table 2-1**, of 0.02 acre-feet per year for lots in this class.

- **Mixed Use Residential.** – The proposed 50 units of this designation are a unique dwelling unit type typically existing above commercial space. Outdoor demands are minimal if present but are typically found. For the purposes of this WSA, the Proposed Project will use the outdoor demand factor, derived in **Table 2-1**, of 0.05 acre-feet per year for lots in this class.

- **University Retirement Expansion.** – The proposed 30 retirement lots will include small single family structures with extensive outdoor hardscapes. These designations for the Proposed Project have lots with an average size of approximately 4,350 square feet. For the purposes of this WSA, the Proposed Project will use the outdoor demand factor, derived in **Table 2-1**, of 0.19 acre-feet per year for lots in this class.

2.3.3 Summary of Residential Water Use Demand Factors

Table 2-1 provides a summary of the baseline demand factor for each residential land use category and the resulting unit demand factor used to estimate the Proposed Project's water use.

Table 2-1 – Summary of Residential Baseline and Proposed Project Demand Factors

Water Demand Category by Dwelling Unit (du) Type	Average Density (du/ac)	Indoor Factor	Outdoor Factor	Total Demand Factor (af/du)
Homes, Bungalows, and Builder Lots	8.9	0.19	0.21	0.40
Cottages	12.0	0.19	0.13	0.32
Mixed Use	14.8	0.19	0.05	0.24
Senior Affodable Apartments	40.0	0.15	0.02	0.17
University Retirement Expansion	10.0	0.15	0.19	0.34

2.4 NON-RESIDENTIAL WATER USE DEMAND FACTORS

The non-residential factors are developed from either details provided in the Proposed Project Specific Plan or are based upon recent water use trends for similar types of land classifications found in other supporting materials.

For purposes of this WSV, the per-lot demand for non-residential classifications is described as either "the acre-feet of water use annually per acre of land", acre-feet/acre (af/ac), or as a single demand projection for a demand category such as the community center (e.g. which has a unit of "1"), acre-feet/unit (af/unit). These values reflect indoor and outdoor water needs expected for typical non-residential use for each of the following classifications:

- Mixed Use – Health Club, Club House, and Restaurant
- Dog Park
- Linear Parks
- Other miscellaneous uses, including common area open space, agricultural setback open space, right-of-way landscaping, and construction water

The method and basis for determining the unit water demand factor for each of these classifications is detailed in the following subsections.

Mixed Use

The proposed Mixed Use area will consist of a Health Club, Club House, and a Restaurant. The Health Club is planned for 8,000 square feet (sf) of indoor space plus an outdoor pool. The pool is open to the public but not intended for swim meets or other high attendance events The Club House will be for use by onsite residents and will consist of standard meeting space facilities. The Restaurant is a "fast casual" type intended primarily for use by on-site residents. The Restaurant and Club House will share a 5,000 sf building. Tully & Young, Inc. has conducted a number of meter studies throughout northern California and has found that the best projection of use is a per-acre number for this type of use. Based on the typical usage of health clubs and restaurants, Tully & Young is assuming 2.80 af/ac use on site.

Parks

The Proposed Project includes two distinct park types consisting of a Dog Park and additional Linear Parks.

The Linear Parks are wide corridors that link areas with pedestrian and bikeway trails. The Specific Plan calls for 4.7 acres of these landscaped parks throughout the Proposed Project. Typically ranging from 25 to 35 feet in width, these parkways will use landscaping to provide both a corridor for travel and a buffer between land use types.

As described more fully in the Specific Plan, the main park is described as a 0.8 acre Dog Park located for easy community access. The Dog Park will consist primarily of irrigated turf.

For the Purposes of this WSA the City's calculated conservative landscape demand factor of 4.01 acre-feet/acre is used for both the Linear Parks and Dog Park.

Other Miscellaneous Uses

The Proposed Project has additional miscellaneous land uses including common area open space and on-site agricultural setback. These uses have minimal impacts to the overall projected water use due to their limited size and water needs, or because they are temporary in nature.

Open Space and Agricultural Setback

As of the preparation of this WSA, the Proposed Project includes about 7.2 acres of "agricultural transition area". While including informal trails and natural planted areas, a portion of this land will also be dedicated to providing storm drainage and biofiltration and storage of storm water aligned along streets and drainage courses. Plantings will emphasize drought-tolerant, hardy materials and compatibility with existing surrounding native and adaptive plants. Given the form and function of the landscaping of this project element, a water supply will only be needed to establish plantings for the first few years. After plant establishment, these landscape features will be served by annual precipitation. Plant established water demand factors are based on 70 percent of the maximum applied water allowance under MWELO – 2.81 af/ac.

Right-of-Ways

The Proposed Project includes approximately 17.6 acres of right-of-way. Tully & Young has conducted a number of meter studies for areas with medial landscaping and derived a demand factor that accounts for the majority of areas that is hardscape. For the purposes of this WSA a demand factor of 0.19 acre-feet/acre for right-of-ways is used.

Construction Water

Early phases of the Proposed Project will include site grading and infrastructure installation. These and other construction elements will require dust suppression and other incidental water uses. These are estimated to be nominal, and do not continue beyond the construction phases of the Proposed Project. For purposes of identifying incremental water demands, construction water is assumed within this WSA to be 1 acre-foot per year (this is about 300,000 gallons – or over 75 fill-ups of a 4,000 gallon water truck).

Summary of Non-Residential Demands

Table 2-2 provides a summary of the non-residential demand factors used to estimate the Proposed Project's future demands.

Table 2-2 – Summary of Non-Residential Demand Factors

Land Use	Demand Factor	Unit
Mixed Use	2.80	af/ac
Dog Park	4.01	af/ac
Linear Parks	4.01	af/ac
Agricultural Transition	2.81	af/ac
Natural Open Space	0.0	af/ac
Right of Ways	0.19	af/ac
Construction Water	1.0	af/unit

2.5 PROPOSED PROJECT WATER DEMAND PROJECTION

Combining the Proposed Project's land use details and phasing as summarized in **Table 1-1** and **Table 1-2** with the demand factors presented in **Table 2-1** and **Table 2-2**, the water demands for the Proposed Project from initiation to build-out can be estimated. At completion, the Proposed Project is estimated to need approximately 211 acre-feet of water annually (prior to considerations of non-revenue water, described in the next subsection) and approximately 234 acre-feet when considering non-revenue water, as shown in **Table 2-4**.

2.5.1 Non-Revenue Water Demands

The demand factors presented earlier in this section represent the demand for water at the residential or non-residential customer meter for each category. To fully represent the demand on water resources, non-revenue water also needs to be included. Non-revenue water represents all of the water necessary to deliver to the customer accounts and reflects distribution system leaks, water demands from potentially un-metered uses such as fire protection, hydrant flushing, and unauthorized connections, and inescapable inaccuracies in meter readings.[20] In most instances, the predominant source of non-revenue water is from system leaks – the loss from fittings and connections from water sources through treatment plants, tanks, pumping plants, major delivery system back-bone pipelines, and community distribution systems. Because a significant portion of the delivery system used to bring water to the Proposed Project will be new, the percentage of non-revenue water is estimated to meet the 10 percent goal set forth by the American Water Works Association. Therefore, the Proposed Project's water delivery system is expected to require an additional 23 acre-feet at build-out with 11 acre-feet of that required for outdoor demands that could be mostly met with non-potable water.

[20] The American Water Works Association and the California Urban Water Conservation Council recognize the inherent non-revenue water that is either lost or not accounted for in urban treated water distribution systems and suggest purveyors strive for a value of 10% of all delivered water. Obtaining this value is dependent on numerous factors including the age and extent of distribution system infrastructure, meter rehabilitation programs, and how a purveyor accounts for actions such as fire flows and hydrant flushing.

2.5.2 Projected Treated Demands versus Landscape Water Demands

A unique feature of this project is the separation of indoor and outdoor demands. The on site well, previously used for agricultural purposes, has the capacity to serve more water than is needed onsite. This well will be used to serve the landscaping demands of the project through a separate pipe system. The demand on the City's treatment and distribution system will be limited to the indoor demands. The table below compares the projects water demands by type.

Table 2-3 – Indoor vs Outdoor Water Demands

	Demand (af/yr) without loss		
	Residential	Non-Res	Total
Potable	97	15	112
Non-Potable	73	25	99
Total Demand	**171**	**40**	**211**

Table 2-4 – Estimated Proposed Project Water Demands

	Unit Count or Acreage						Demand Factor	Demand (af/yr)					
Category	Current	2020	2025	2030	2035	2040	(af/du or af/ac)	Current	2020	2025	2030	2035	2040
Residential													
Homes, Bungalows, and Builder Lots	0	0	238	238	238	238	0.19 (indoor)	0	0	45	45	45	45
							0.21 (outdoor)	0	0	49	49	49	49
Cottages	0	0.0	92	92	92	92	0.19 (indoor)	0	0	17	17	17	17
							0.13 (outdoor)	0	0	12	12	12	12
Mixed Use	0	0.0	50	50	50	50	0.15 (indoor)	0	0	8	8	8	8
							0.05 (outdoor)	0	0	3	3	3	3
Senior Affodable Apartments	0	0.0	150	150	150	150	0.15 (indoor)	0	0	23	23	23	23
							0.02 (outdoor)	0	0	3	3	3	3
University Retirement Expansion	0	0.0	30	30	30	30	0.15 (indoor)	0	0	5	5	5	5
							0.19 (outdoor)	0	0	6	6	6	6
DU Total	**0**	**0**	**560**	**560**	**560**	**560**							
							Indoor Subtotal	0	0.0	97	97	97	97
							Outdoor Subtotal	0	0.0	73	73	73	73
Non-Residential													
Mixed Use	0	0	5.3	5.3	5.3	5.3	2.80	0	0	15	15	15	15
							Indoor Subtotal	0	0.0	14.8	15	15	15
Public													
Dog Patrk	0	0	1	1	1	1	4.01	0	0	3	3	3	3
Linear Park	0	0	2	5	5	5	4.01	0	0	9	19	19	19
Agricultural Transition Area	0	0	7	0	0	0	2.81	0	0	20	0	0	0
Right of Way Landscaping	0	0	18	18	18	18	0.19	0	0	3	3	3	3
							Outdoor Subtotal	0	0.0	36.0	25	25	25
Other Miscellaneous Uses													
Construction Water	0	0	1	0	0	0	1	0	0	1	0	0	0
							Outdoor Subtotal	0	0	1	0	0	0
							Indoor Total	0	0	112	112	112	112
							Outdoor Total	0	0	110	99	99	99
							Total	0	0	222	211	211	211
							Outdoor Non-revenue water 11%	0	0	12	11	11	11
							Indoor Non-revenue water 11%	0	0	12	12	12	12
							Total Indoor	0	0	124	124	124	124
							Total Outdoor	0	0	123	110	110	110
							Total Proposed Project Demand	**0**	**0**	**247**	**234**	**234**	**234**

SECTION 3 – WATER SUPPLY CHARACTERIZATION

3.1 INTRODUCTION

This chapter describes the City of Davis' (City) existing and planned supplies for the 20 year period covered in this Water Supply Assessment (WSA). The water supplies that are used within the City and its Sphere of Influence (SOI) are derived from the Woodland-Davis Clean Water Agency (WDCWA) water rights and its Central Valley Project Settlement Contract as well as the City's rights to groundwater. All water supplies derived from these sources are managed in order to best meet the City's demands in different year types, reduce delivery costs, manage water quality issues, and handle drought and emergency situations. As such, water deliveries from each identified source may fluctuate in any given year because of management decisions, regulatory constraints, and hydrological conditions. Nevertheless, the City will provide retail water to meet the Proposed Project's needs.

3.2 HISTORICAL POTABLE WATER SUPPLIES

The City's water supplies have historically included water supplies solely derived from its groundwater resources. In June of 2016, the City began using a new water diversion facility from the Sacramento River and began taking water supplies from WDCWA's surface water assets. The City's additional water sources will reduce its historical reliance upon groundwater and improve other water quality issues associated with utilization of groundwater resources. In normal years, the City anticipates relying upon WDCWA's surface water assets to meet the majority of the City's water demands. In dry years, the City anticipates using additional groundwater to meet demands that its surface water supplies are unable to meet. In short, the City is developing a robust conjunctive use program in coordination with WDCWA that will allow it to optimally manage its surface and groundwater resources to serve its near-term and long-term demands.

The City generally only purchases and delivers water that is necessary to meet the City's customers' demands. Thus, although the WDCWA may have rights and entitlements to significant sources of water, the City only utilizes the amount it needs under those rights and entitlements. **Tables 3-1** and **3-2**, on the following page, show the City's historical water supply deliveries.

Table 3-1 – City of Davis Historic Water Supplies

Year	Groundwater	Year	Groundwater
1995	12,494	2006	14,333
1996	12,995	2007	14,762
1997	13,857	2008	14,219
1998	11,908	2009	12,835
1999	13,740	2010	11,957
2000	14,099	2011	11,531
2001	15,072	2012	12,218
2002	15,112	2013	12,338
2003	14,551	2014	10,901
2004	15,100	2015	9,211
2005	14,452	'95-'13 ave	13,556

Table 3-2 – City of Davis 2016 Water Supplies[21]

Month	Groundwater	Permit	CVP Contract
Jan	467	0	0
Feb	446	0	0
Mar	465	0	0
Apr	703	0	0
May	959	0	0
Jun	0	0	1,093
Jul	0	0	1,218
Aug	264	0	980
Sep	0	0	1,150
Oct	400	412	0
Nov	0	527	0
Dec	0	452	0
	3,704	**1,391**	**4,440**

[21] These water supplies are derived from the availability of various assets under the City's rights and contracts as well as rescheduling opportunities associated with the CVP supply. Total water use derived from the City's measured demands coupled with supply availability produced the supply numbers depicted in this table.

3.3 EXISTING WATER SUPPLIES AND ENTITLEMENTS

There are three primary water rights and contracts (collectively, "water supplies") that are used within the City's existing service area and SOI. All three of these water supplies are used to meet the water demands for the City's residents. In several areas within the City, the water supplies can be interchanged and commingled for delivery to end users. The water supplies are:

- WDCWA's SWRCB Appropriative Water Right Permit 20281
- WDCWA's Central Valley Project Contract No. 14-06-200-7422X-R-1; and
- City of Davis' Groundwater rights

Each of these water supplies are subject to a unique set of conditions based upon the terms of the underlying water rights, the regulatory environment, the contractual limitations, and the City's ability to access and deliver the supplies to meet targeted end-user needs. Within this structural framework, the City manages its water assets to meet its customers' demands. Importantly, the structural framework morphs and changes, requiring the City's water managers to adjust the water asset management and use.[22]

3.3.1 Woodland-Davis Clean Water Agency

The Woodland-Davis Clean Water Agency (WDCWA) is a joint powers authority established by the Cities of Woodland and Davis to develop a sustainable high-quality water supply. The cities signed the "Amended and Restated Woodland-Davis Clean Water Agency Joint Powers Agreement" on February 26, 2013 that outlines the structure and governance of the JPA. This Agreement, coupled with the "Amended and Restated Woodland-Davis Clean Water Agency and University of California Agreement Concerning Potential Water Supply Contract" allocate water supplies, infrastructure costs, and operating issues among the participating agencies.

WDCWA and Reclamation District 2035 constructed a new water intake on the Sacramento River to divert surface water supplies to the cities of Woodland and Davis in order to allow those cities to reduce their dependence on groundwater. The WDCWA holds water right permit 20281 and CVP contract 14-06-200-7422X-R-1 and allocates the water assets under those contracts pursuant to the above noted agreements. In short, the pertinent cost allocation and supply allocation under the agreements is as follows: 52.1% for the City of Woodland, 44.4% for the City of Davis, and 3.5% for the University of California. The information in the following sections describes the key aspects of WDCWA's water assets that make up the wholesale water that is delivered to the Cities of Woodland and Davis as well as UC Davis.

[22] The City may investigate additional water assets that may be included in its water supply portfolio, including surface diversions that would be banked in groundwater aquifers.

3.3.1.1 SWRCB Appropriative Water Right Permit 20281

The WDCWA's appropriative water right Permit 20281 (Permit) provides the primary surface water supply for the City that the City's retail customers will use from the fall through spring each year, as that right is available. The Permit allows WDCWA to divert a maximum 80 cubic feet per second (cfs) of water at its diversion facility on the Sacramento River. WDCWA may divert a maximum volume each year of 45,000 acre-feet. The Permit has a priority date of April 19, 1994 – rendering it a significantly junior water right on the Sacramento River watershed system. The WDCWA began diverting water under this Permit in 2016.

The Permit is subject to two important conditions: Term 20 and Term 25. Term 20 is a standard permit term that is contained in nearly all recently issued SWRCB Appropriative water right permits. Term 20 is commonly referred to as "Term 91." Term 91 does not authorize water diversions under the permit when "satisfaction of inbasin entitlements requires release of supplemental Project water by the Central Valley Project or the State Water Project." The "inbasin entitlements" include other water users as well as needs of the environment. Thus, although the water right allows diversions of water all year, the actual diversion period is limited by the needs of other demands on the broader Sacramento-San Joaquin Bay Delta.

In 2015, Term 91 was in effect – which would have disallowed diversions under this Permit – from April 30 through November 2. In 2016, Term 91 was in effect from May 2 through October 14 limiting diversions under this Permit. To date, in 2017, Term 91 has not been declared and the WDCWA continues to divert water under the Permit to meet its local demands.

Term 25 is another important term in the WDCWA appropriative water right Permit. Term 25 states, in relevant part, the following: "No water shall be diverted under this permit until Permittee obtains a long-term water supply covering those periods when water is not available for diversion pursuant to this permit." Accordingly, the WDCWA was unable to divert water under this Permit until it acquired a water supply that could be used when Term 91 was in effect or otherwise "not available." The WDCWA acquired an additional water supply, noted below, in order to satisfy the Permit term.

WDCWA has recently initiated water diversions under its Permit. These diversions started on October 15, 2016 and have continued uninterrupted since that time. The water supplies have been delivered to the City of Davis through the terms of the applicable agreements. The supplies have resulted in reduced pumping from groundwater resources that have augmented groundwater supplies available to the City.

The total volume of water available under this Permit is divided proportionally pursuant to the allocation terms noted above. Thus, the total annual allowable water supply of

45,000 acre-feet would be divided as follows: City of Woodland 23,445 AF, City of Davis 19,980 AF, and the University of California 1,575 AF. Although these water supplies can be manipulated by the participating agencies, for purposes of this WSA we assume that the maximum water available under the Permit to the City of Davis to meet its long-term demands would be 19,980 acre-feet per year.

3.3.1.2 Central Valley Project Contract No. 14-06-200-7422X-R-1

The second surface water supply available to the City is based upon the terms and conditions contained in Central Valley Project Contract No. 14-06-200-7422X-R-1 issued to the WDCWA (Settlement Contract). The Settlement Contract is just that – a settlement of water right claims against the United States when the United States acquired water rights and constructed the Central Valley Project. The "Settlement Contractors" essentially dismissed their claims against the United States in return for specific water supply contracts that generally promised water supply deliveries pursuant to the terms of underlying water rights.

The WDCWA was not an original Settlement Contractor. In 2010, however, the WDCWA purchased a portion of the underlying water rights from an existing Settlement Contractor and was assigned the protections of a Settlement Contract in an agreement with Conoway Preservation Group, LLC (CPG). The 2010 Agreement assigned a portion of CPG's water rights under Licenses 904 and 5487 to WDCWA. WDCWA now holds two water right licenses – License 904A and 5487A that make up the underlying water rights under the assigned Settlement Contract. License 904A has a priority date of March 1, 1919 and License 5487A has a priority date of September 8, 1947. The maximum volumes of water available collectively under these water right Licenses is 10,000 AF/year even though License 904A has a maximum annual volume of 7,500 AF/year and License 5487A has a maximum annual volume of 4,919 AF/year (combined 12,419 AF/year).

The Settlement Contract entitles WDCWA to a maximum of 10,000 acre-feet per year of water supplies from the Sacramento River. Article 5(c) notes, however, that in critical years the maximum water supply available will be only 7,500 acre-feet. The contract entitles WDCWA to divert water from April through October. However, the Settlement Contract has some other specific terms that limit this open-ended diversion:

1. The WDCWA may schedule deliveries as follows "at no cost": June: 2,500 AF, July: 3,500 AF, August: 500 AF, and September: 3,500 AF.

2. The water may be made available under Article 3(c)(1) in other months "at additional cost".

3. Under Article 3(c)(2)(ii) the July August and September maximum annual diversion is 7,500 AF.

Accordingly, in light of the ability to move water assets around in various months, we assume for purposes of this WSA that the majority of the water supplies available for use will be used in the no-cost months as noted in the Settlement Contract. If additional water is available for use that was not used in the "no cost months" then that water will be diverted as available in other months of the year. Water was initially diverted under this contract in June of 2015. **Table 3-3** and **3-4** represent the water supplies available under the Settlement Contract in accordance with the WDCWA's allocation system:

Table 3-3 – WDCWA Normal Year Settlement Contract Allocation (10,000 AF available)

Contracting Entity	Percentage Supply	Annual Allocation
City of Woodland	52.1%	5,210 acre-feet
City of Davis	44.4%	4,440 acre-feet
University of California	3.5%	350 acre-feet

Table 3-4 – WDCWA Dry Year Settlement Contract Allocation (7,500 AF available)

Contracting Entity	Percentage Supply	Annual Allocation
City of Woodland	52.1%	3,907.5 acre-feet
City of Davis	44.4%	3,330 acre-feet
University of California	3.5%	262.5 acre-feet

The City of Davis can allocate its portion of its water supply delivered from WDCWA into a monthly allocation. Thus, **Tables 3-5** and **3-6** represents the City of Davis' monthly Settlement Contract allocation:

Table 3-5 – City of Davis Normal Year Settlement Contract Allocation (4,440 AF available)[23]

Month	Percentage Supply based on Settlement Contract Terms	Monthly Allocation
June	44.4%	1,110 acre-feet
July	44.4%	1,554 acre-feet
August	44.4%	222 acre-feet
September	44.4%	1,554 acre-feet

[23] Although the supplies depicted are designated for the months shown, the City may take the supplies in other months as needed, subject to other fees and conditions. Any change does not alter total available supply.

Table 3-6 – City of Davis Dry Year Settlement Contract Allocation (3,330 AF available)

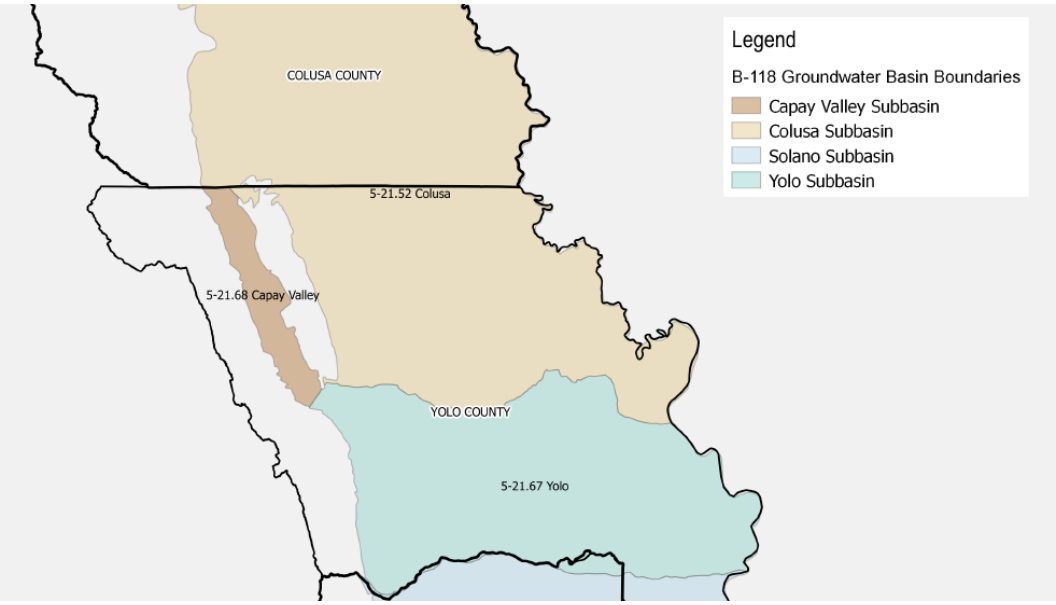
Month	Percentage Supply based on Settlement Contract Terms	Monthly Allocation
June	44.4%	832.5 acre-feet
July	44.4%	1,165.5 acre-feet
August	44.4%	166.5 acre-feet
September	44.4%	1,165.5 acre-feet

3.3.3 Groundwater Supplies and Management[24]

The City of Davis has historically pumped groundwater from the Yolo Subbasin (DWR Bulletin 118 noted 5-21.67) which is part of the broader Sacramento Valley groundwater basin. A map of the Yolo Subbasin is depicted below in **Figure 3-1**. The Subbasin is essentially bounded by the Coast Ranges in the west, Putah Creek in the south, Cache Creek in the north, and the Sacramento River on the east. The groundwater supplies within the Subbasin are shared by numerous agricultural and urban purveyors. The City has greatly reduced its reliance on groundwater to meet its needs since the development of the surface water supplies derived from the Woodland-Davis Clean Water Agency. The development of these surface supplies have allowed the City to use groundwater only in instances where surface water assets are unavailable.

The aquifers in the Davis area are recharged from rainfall, applied irrigation water, streambed recharge, irrigation channel recharge and water moving through the Yolo Bypass. Putah Creek and Cache Creek provide substantial stream channel infiltration.

Figure 3-1 – Yolo Subbasin 5-21.67



[24] The majority of the information about groundwater is derived from the City of Davis' 2015 Urban Water Management Plan at Section 6 on pages 6-1 *et seq*.

The City's groundwater supply is provided by 12 active wells as shown in **Table 3-7**. These wells are located in both the "intermediate aquifer" and the "deep aquifer." The "intermediate aquifer" begins at about 200 feet below the ground surface and the "deep aquifer" begins at about 700 feet below the ground surface. The deep aquifer's water chemistry has lower levels of nitrate and selenium, making it better suited for drinking water supplies. Moreover, the water at this depth is "less hard" than water at the intermediate depth, improving quality for municipal uses. Thus, urban water supplies are better derived from the deep aquifer while supplemental supplies are better derived from the intermediate aquifer.

Table 3-7 – Groundwater Wells

Well No	Well Depth Classification	Capacity (gpm)
11	Intermediate	1,360
15	Intermediate	1,178
23	Intermediate	1,700
24	Intermediate	1,855
26	Intermediate	1,591
27	Intermediate	1,058
28	Deep	591
30	Deep	1,712
31	Deep	2,759
32	Deep	2,339
33	Deep	1,750
34	Deep	2,348
Total Deep Well Capacity		**11,499**
Total Capacity		**20,241**

The Total Capacity of the wells is 20,241 gallons per minute (gpm).[25] In the majority of situations, the City will use only water derived from its deep wells but will keep the wells in the intermediate levels online for additional uses as needed.[26] Together, the water supply available through these wells is sufficient to meet the City's needs but are only used to supplement the surface water supplies derived from WDWCA surface water assets.

The Yolo Subbasin is not an adjudicated groundwater basin. The Yolo Subbasin, however, has been declared a "high priority basin" for purposes of the Sustainable Groundwater Management Act (SGMA). It is not designated as "critically overdrafted" but it is subject to a rigorous water management program. The water management program is governed by the Water Resources Association of Yolo County (WRA), which is a consortium of local water agencies providing a regional forum to coordinate and facilitate water issues in Yolo County. Moreover, the City of Davis developed a groundwater management plan in 2006 that includes basin management objectives for monitoring and evaluating water levels, water quality, and inelastic ground subsidence.[27] Additional groundwater management actions are anticipated with the development of a Groundwater Sustainability Plan as required by the Sustainable Groundwater Management Act. This plan is in its earliest formative stages.

The City's historical pumping numbers is depicted in **Table 3-8**. As shown in that table, with the development of surface water supplies in 2015, the City has reduced its dependence upon groundwater to meet its overall demands. Accordingly, the City will continue to protect and secure its unused groundwater as it implements its conjunctive use projects.

[25] The total capacity of 20,241 gpm equates to 107.4 AF/day if wells were pumped continuously and at full capacity.
[26] Deep well 30 is the first "stand by well" that would be used if surface and groundwater supplies cannot meet demands and wells 23, 24, 26 and 27 are the next stand by wells that would be used. Telephone call with City Staff on July 19, 2017.
[27] A copy of the City of Davis Groundwater Management Plan can be found at http://cityofdavis.org/home/showdocument?id=4653

Table 3-8 – City of Davis Historical Groundwater Use

Year	Groundwater Production (Acre Feet per year)
2000	14,099
2001	15,112
2002	14,551
2003	15,100
2005	14,452
2006	14,333
2007	14,762
2008	14,219
2009	12,835
2010	11,957
2011	11,531
2012	12,218
2013	12,338
2014	10,901
2015	9,211
2016	3,704

The pumping data noted in **Table 3-8** shows the significant decrease in groundwater usage within the City that has accompanied the acquisition and use of surface water supplies from WDCWA in 2016. This conjunctive use effort will allow the City to better meet its long-term needs as well as preserve its groundwater assets for additional uses, as needed, in the future. Nevertheless, the utility of wells denoted in **Table 3-7** as well as the groundwater analysis in the City's 2015 UWMP, demonstrates that there is sufficient groundwater to meet the City's existing needs.[28]

3.4 WATER SUPPLY SUMMARY

Tables 3-9 and **3-10** summarize the City of Davis' reasonably available water supplies in normal and dry conditions. These supplies may be manipulated as the water assets are needed to meet the City's demands. In other words, as shown in **Section 4**, the City only utilizes water supplies from its water asset portfolio that it needs to meet its demands. This manipulation may include using more surface water assets under Permit 20281 and its CVP Contract in certain hydrological and regulatory conditions rather than using groundwater. The Permit water supply is equally spread out during available months for use but may be redistributed to other months as needed. The groundwater numbers depicted in the tables indicate a maximum volume available assuming full utilization of the City's pumping capacity.

[28] City of Davis 2015 Urban Water Management Plan at Section 6.

Table 3-9 – Normal Year Water Supply Availability[29]

Month	CVP Settlement Contract Supply	Permit 20281	Groundwater
January		2,200	3,329
February		2,200	3,007
March		2,200	3,329
April		2,200	3,222
May		2,200	3,329
June		2,200	3,222
July	1,554		3,329
August	1,332		3,329
September	1,554		3,222
October		2,200	3,329
November		2,200	3,222
December		2,200	3,329
Total	**4,440**	**19,800**	**39,198**

Table 3-10 – Dry Year Water Supply Availability

Month	CVP Settlement Contract Supply	Permit 20281	Groundwater
January		2,200	3,329
February		2,200	3,007
March		2,200	3,329
April		2,200	3,222
May			3,329
June	832.5		3,222
July	1,165.5		3,329
August	166.5		3,329
September	1,165.5		3,222
October			3,329
November		2,200	3,222
December		2,200	3,329
Total	**3,330**	**13,200**	**39,198**

[29] CVP supplies depicted here show a shift in acquisition from June to August so as to maximize the use of all available surface water supplies even though there may be additional expenses in changing the month of use.

SECTION 4 – SUFFICIENCY ANALYSIS

4.1 INTRODUCTION

The analysis detailed in this section provides a basis for determining whether sufficient water supplies exist to meet the estimated water demand of the Proposed Project.[30] The WSA must provide a reasoned analysis of the likely availability of the identified supplies to serve the Proposed Project, while considering the demands of existing and other future planned-for demands on those supplies. [31]

This section includes:

- The demand and supply conclusions for the Proposed Project's area as contemplated in the City's 2015 Urban Water Management Plan
- Analysis of sufficiency of the City's conjunctive use program, including both groundwater and surface water, to serve the Proposed Project, considering variations in supply and demand characteristics under normal, single-dry and multi-dry hydrologic conditions.
- Alternatives analysis of sufficiency, when considering non-potable water supply sources, that will be used to meet a portion of the demands of the Proposed Project.

4.2 DEMAND AND SUPPLY CONCLUSIONS IN THE 2015 UWMP

The City of Davis' 2015 UWMP included a number of "Proposed Developments" in analyzing supply reliability for the City. One of the analyzed developments was the "Davis Innovation Center." The Davis Innovation Center was the previous project planned for the site of the new Proposed Project. The UWMP accounted for 619 acre-feet for the entire Innovation Center's 207 acres which is approximately 2.99 acre-feet per acre. Thus, the Proposed Project's area, a mere 75 acres of the original 207 acres, is budgeted in the UWMP for approximately 221 acre-feet. This total budgeted volume of water is greater than the 211 acre-feet the Proposed Project is expected to use. Once the

[30] CWC § 10910 (c)(4) provides that "If the city or county is required to comply with this part pursuant to subdivision (b), the water supply assessment for the project shall include a discussion with regard to whether the total projected water supplies, determined to be available by the city or county for the project during normal, single dry, and multiple dry water years during a 20-year projection, will meet the projected water demand associated with the proposed project, in addition to existing and planned future uses, including agricultural and manufacturing uses."

[31] *Vineyard Area Citizens for Responsible Growth, Inc*. v. *City of Rancho Cordova* (2007) 40 Cal.4th 412, 430-32.

proposed raw water supply is accounted for, the City's water system will be using much less than what the project was budgeted for in the 2015 UWMP.

In addition, the City's 2015 UWMP did not account for surface water supplies in conducting its analysis. Although the development of surface water supplies is mentioned in the UWMP, the UWMP did not account for those supplies in assessing supply availability. Thus, the project's 211 acre-feet of total usage that was contemplated in the Davis Innovation Center in the existing UWMP, had supplies that were wholly derived from groundwater supply sources. Since that time, the City has developed surface water sources through the WDCWA.

4.3 Proposed Project's Water Sufficiency Analysis

The sufficiency analysis integrates the Proposed Project's water demands detailed in **Section 2** with the water supplies characterized in **Section 3.** The assessment incorporates the City's existing and planned future uses as discussed in the 2015 UWMP. The maximum annual water supply results are presented in **Table 4-1** beginning with "current" conditions (recognized as 2016, the first year with surface water contract use)[32] and continuing with 5-year increments from 2015 through 2040. While the analysis at various intervals before build-out is important, the most critical projection for the sufficiency analysis occurs beyond 2030 when build-out is projected in the 2015 UWMP. This analysis assumes that the Proposed Project is fully constructed in line with the Specific Plan, well before the City's build-out.

Table 4-1 – Maximum Annual Water Supply Availability

Surface Water and Groundwater	Estimated Supply (af/yr)					
	Current	2020	2025	2030	2035	2040
Normal Year						
Surface Water	24,420	24,420	24,420	24,420	24,420	24,420
Groundwater	39,198	39,198	39,198	39,198	39,198	39,198
Normal Year Total	63,618	63,618	63,618	63,618	63,618	63,618
Dry Year						
Surface Water	16,530	16,530	16,530	16,530	16,530	16,530
Groundwater	39,198	39,198	39,198	39,198	39,198	39,198
Dry Year Total	55,728	55,728	55,728	55,728	55,728	55,728

As noted in **Section 3**, the City will only utilize the water supplies that are needed to meet its annual demands. Thus, a depiction of the total available supplies in **Table 4-1** is

[32] This period was chosen to represent the "current" condition because of the surface supply addition. It is recognized that the drought impacts reduced water use over the current normal use thus the current groundwater portion of supplies was conservatively approximated at 4,000 acre-feet, slightly higher than projected.

misleading in terms of how water will be used. First, as noted in **Section 3**, although the City has the physical capacity to pump significant volumes of groundwater, this amount of groundwater will likely never be used – even if the City were to utilize groundwater to meet its entire build-out demands. Thus, characterizing the pumping capacity as the groundwater supply overestimates actual groundwater utility even though it is technically possible to produce significant volumes of groundwater.

Second, with the development of the WDCWA's surface water supplies, the City anticipates using as much surface water during a water year as can be made available through the new project. Importantly, the City anticipates developing active conjunctive use projects with its surface water supplies so that more surface water can be stored and less naturally occurring groundwater will be used. All of these efforts to develop additional water supplies are in the planning stages with the WDCWA. For purposes of this WSA sufficiency analysis, however, we assume that the Proposed Project and future planned projects will only utilize the water assets that are currently available to the City.

The normal year and dry year sufficiency analyses are derived from the water rights and contractual limitations that the WDCWA has established. The key provisions of these water assets, as noted in **Section 3**, are as follows:

- Permit 20281: In normal years, as much as 19,800 acre-feet could be available depending on whether Term 20 is instituted and in what months the water supply is curtailed. In dry years, we assume that the direct diversion water supplies under this Permit will be unavailable from May through October. This reduction in diversion months likely necessitates that the City reduce its overall dependence on the Permit supply to 13,200 acre-feet.

- CVP Settlement Contract: In normal years, 10,000 acre-feet is available to the WDCWA of which 4,400 acre-feet is available to the City of Davis. In dry years, the total available to WDCWA is reduced to 7,500 acre-feet of which 3,330 acre-feet is available to the City of Davis.

Table 4-2 shows the anticipated water demands for the City as it approaches buildout. These water demands are derived from the City's 2015 UWMP as well as the anticipated Proposed Project demands depicted in Section 2.

Table 4-2 – Current Normal Year Annual and Planned Future Annual Demands

City of Davis	Estimated Water Demand (af/yr)				
	2020	2025	2030	2035	2040
City of Davis Demand	14,227	14,416	13,992	13,992	13,992
Proposed Project	0	247	234	234	234
Total Demand	14,227	14,663	14,226	14,226	14,226

Conservative modifications to the estimated demands of the Proposed Project are made to reflect conditions expected during single-dry and multiple dry year events as follows:

Single dry year: Landscape irrigation demands will increase to reflect the generalized earlier start of the landscape irrigation season due to limited rainfall in the single driest year. Since this increase only applies to the outdoor portion of a customer's demand, an adjustment factor of 5 percent is applied to the total normal-year water demand values to conservatively reflect the expected increase in demand for water.

Multiple dry years: During multiple dry years, demands are also expected to increase during the first in a series of dry years – as discussed above for the single dry year condition. However, during the second and third consecutive dry years, demands also are expected to reflect water shortage contingency plans implemented by the municipal water purveyor.[33] During the second year, the water purveyor is assumed to request a reduction target of 10 percent. The resulting demand, however, only reflects a 5 percent reduction to accommodate conservatively low participation by customers. During the third year, the purveyor is expected to set a conservation target of 20 percent. For this analysis, the demands in the third year are only reduced by 10 percent to again reflect a conservatively low participation rate by the customers. Thus, during multiple dry conditions, demands both increase due to reduced effective precipitation, but also decrease (from the increased demand) to reflect implementation of short-term conservation measures.

Table 4-3 shows the anticipated dry year water demands for the City as it approaches buildout. These water demands are derived from the City's 2015 UWMP as well as the anticipated Proposed Project demands depicted in Section 2 with the dry year impacts as described above.

Table 4-3 – Current Annual Demands and Planned Future Annual Demands for Single Dry and Multi-Dry Years

City of Davis		Estimated Water Demand (af/yr)				
		2020	2025	2030	2035	2040
Single Dry/ Multi-Dry Year 1	City of Davis Demand	14,938	15,137	14,692	14,692	14,692
	Proposed Project	0	259	246	246	246
	Total Demand	14,938	15,396	14,937	14,937	14,937
Multi-Dry Year 2	City of Davis Demand	12,804	12,974	12,593	12,593	12,593
	Proposed Project	0	222	211	211	211
	Total Demand	12,804	13,197	12,803	12,803	12,803
Multi-Dry Year 3	City of Davis Demand	11,382	11,533	11,194	11,194	11,194
	Proposed Project	0	198	187	187	187
	Total Demand	11,382	11,730	11,381	11,381	11,381

[33] Though the municipal water purveyor does not exist yet for the Proposed Project, this WSA assumes that whatever purveyor is established will develop a water shortage contingency plan to address drought conditions.

4.4.1 Existing and Planned Future Uses

As required by statute, the analysis of sufficiency needs to consider existing and planned future uses that would be served in addition to the Proposed Project. Since there are other users of the same groundwater basin, the identification of existing and planned future uses expands beyond the boundaries of the City.

4.4.1.1 Future Groundwater Demand Growth Outside the City

The City of Davis does not expect any significant growth in groundwater use in the areas adjacent to the City. This is due to the conjunctive use of Yolo County Flood Control and Water Conservation District delivered surface water in the area and the lack of undeveloped farmland in the area. Further urban growth adjacent to and outside of the City is not expected without the land first being annexed into the City.

4.4.1.2 Future Groundwater Demand Growth by the City

Future groundwater uses within the areas of the SOI are similar to historic and existing uses of groundwater for irrigated agricultural, and therefore reasonably certain to exist. This agricultural demand is not part of the City though it does share the same aquifer. With the City's recent connection to the WDCWA Treatment Plant, the City has shifted significantly to surface water and will only pump groundwater at historic rates in emergency or severe drought conditions. Due to increasing groundwater quality regulations, it is not likely that the City will ever move back to full groundwater dependence.

Therefore, it is safe to conclude that the increment of additional groundwater use for the City's planned growth would also still maintain current stable conditions as this amount will be significantly lower than historic pumping by the City.

4.5 WATER SUPPLY SUFFICIENCY ANALYSIS

The following section details the sufficiency of the City of Davis' water supplies as compared with total demands for normal, single-dry, and multi-dry year periods. **Table 4-4** provides the sufficiency analysis conclusions. In short, the City has both surplus surface water and groundwater during all months of usage during normal, single dry, and multiple-dry years. As noted in **Section 3**, the anticipated source used to meet monthly demands may vary based upon the City's desire to conjunctively manage its water assets to maximize their utility.

Table 4-4 – Water Demand and Supply Comparisons during Normal, Single-Dry, and Multiple-Dry Years[34]

Year	Projected Baseline Water Demand (AF)			Hydrologic Year Type	Water Supplies (Acre-feet)				
	City of Davis	West Davis Active Adult	Total		Permit	CVP	Surface Water Used	Groundwater Supply	Groundwater Used
2020	14,227	0	14,227	Normal	19,980	4,440	9,763	39,198	4,464
				Single Dry	13,200	3,330	8,761	39,198	6,177
				Multiple Dry Yr-3	13,200	3,330	7,788	39,198	3,594
2025	14,416	247	14,663	Normal	19,980	4,440	9,851	39,198	4,812
				Single Dry	13,200	3,330	8,824	39,198	6,572
				Multiple Dry Yr-3	13,200	3,330	7,908	39,198	3,823
2030	13,992	234	14,226	Normal	19,980	4,440	9,794	39,198	4,432
				Single Dry	13,200	3,330	8,761	39,198	6,177
				Multiple Dry Yr-3	13,200	3,330	7,788	39,198	3,593
2035	13,992	234	14,226	Normal	19,980	4,440	9,794	39,198	4,432
				Single Dry	13,200	3,330	8,761	39,198	6,177
				Multiple Dry Yr-3	13,200	3,330	7,788	39,198	3,593
2040	13,992	234	14,226	Normal	19,980	4,440	9,794	39,198	4,432
				Single Dry	13,200	3,330	8,761	39,198	6,177
				Multiple Dry Yr-3	13,200	3,330	7,788	39,198	3,593

Table 4-5 – Water Supply Sufficiency at Build-out

Month	Demand			Supply			Surplus		
	Normal	Single Dry	Multi-Dry	Normal	Single Dry	Multi-Dry	Normal	Single Dry	Multi-Dry
Jan	619	650	620	5,529	5,529	5,529	4,910	4,879	4,909
Feb	654	687	582	5,207	5,207	5,207	4,553	4,520	4,625
Mar	970	1,018	834	5,529	5,529	5,529	4,559	4,511	4,695
Apr	1,073	1,127	908	5,422	5,422	5,422	4,349	4,295	4,514
May	1,485	1,559	1,091	5,529	3,329	3,329	4,044	1,770	2,238
Jun	1,649	1,731	1,195	5,422	4,055	4,055	3,773	2,324	2,859
Jul	1,777	1,865	1,298	4,883	4,495	4,495	3,106	2,629	3,197
Aug	1,693	1,777	1,304	4,659	3,496	3,496	2,966	1,718	2,192
Sep	1,420	1,491	1,245	4,776	4,388	4,388	3,356	2,897	3,143
Oct	1,317	1,383	1,093	5,529	3,329	3,329	4,212	1,946	2,236
Nov	906	951	659	5,422	5,422	5,422	4,516	4,471	4,763
Dec	665	698	551	5,529	5,529	5,529	4,864	4,831	4,978
	14,226	**14,937**	**11,381**	**63,436**	**55,728**	**55,728**	**49,210**	**40,791**	**44,347**

4.6 WATER SYSTEM CAPACITY

Based on the comparison of contracted rights and projected citywide demands there is ample water supply for the City to reach its projected build-out. Rights only entitle the City to the water, infrastructure is needed to actually deliver supplies to the Proposed Project. Primary infrastructure includes treatment, pumping, and piping.

4.6.1 Existing Treatment Plant Capacity

The new WDCWA Treatment Plant was built to supply water to Woodland, Davis, and UC Davis. All designs are recent and capacities were designed to serve the Cities and UC as they currently exist. As the Proposed Project is on land that was accounted for in

[34] Values in this table are both derived in Section 3 and pulled from the 2015 UWMP source material.

the 2015 UWMP, it is safe to assume that adequate surface water capacity exists to serve the Proposed Project.

4.6.2 Groundwater System Capacity

As discussed in the groundwater section, the City has an ample supply of water to accommodate future development. With the transition to surface water, there is an abundance of well capacity. This system can provide more water for use in curtailment periods as well as peak demands that will likely ever be needed. The City will be optimizing it's groundwater system to minimize maintenance costs, maintain appropriate backup supplies, and maintaining water quality in the system.

4.6.3 System Infrastructure Capacity

The Proposed Project will finance all needed infrastructure upgrades necessary to serve on site metered demands and meet fireflow requirements. The City of Davis operates an extensive Innovyze based water model. Further, the City is currently installing AMI which will allow for improved system analysis. The Proposed Project will rely on information from the City's system model to ensure sufficient capacity.

4.7 NON-POTABLE SOURCE SCENARIO

Located on the southwest portion of the Proposed Project is an existing agricultural supply well that was previously used for irrigation on the property. It is proposed to convert this agricultural supply well to an irrigation well to supply non-potable supplies for landscape irrigation needs on site. This is proposed to offset the high costs of treated water with the lower cost of simply pumping underlying groundwater.

The well and landscape water system would be owned and operated by a homeowners association or other type of community governance. Purple pipe would be used to ensure no accidental cross connection. Well water in the area is generally of potable quality so body contact does not carry the same risk as recycled water however no drinking level monitoring will be conducted. The total impact to the supply availability may not differ even if this groundwater well is used because the City already accounts for the groundwater usage in its estimation of available supply. Development of a new well does not necessarily equate to an additional supply but simply may offset one source of supply for another source of supply from the same groundwater source.

4.7.1 Potential Impacts to Other Neighboring Groundwater Users

Located north of the project is a neighborhood which is served by groundwater and has expressed concern over impacts to their water rights by use of well water to serve the Proposed Project. There are no likely risks or impacts to the existing users based on a number of factors primarily being the City's shift to surface water supplies. Additionally

the rights of these water users are juxtaposed against the appropriation of the Proposed Project so effort and money would not be spent on the non-potable system without secure knowledge that water would be available.

As a reference point, if the parcel had historically been irrigated as part of an agricultural production operation, groundwater use per acre would have been much higher than the proposed use. As defined in **Table 2-3** the proposed maximum outdoor demands are only 110 acre-feet per year. Typical agricultural demands are between 3 and 5 acre-feet per year per acre so the 75 acres of the Proposed Project would have been using at least double what the Proposed Project is expected to.

In 2016 the WDCWA Treatment Plant came online and began to serve surface water to the City. With the treatment plant in operation, well pumping has declined by over 10 MGD. While most of the large City production wells are deeper, some are in the same zone as residential wells in the area north of the City. With the City pumping seriously curtailed it is anticipated that groundwater levels will rebound in and around the City. This reduction in pumping by thousands of acre-feet is much more likely to benefit the groundwater users to the north than a Proposed Projects pumping of just more than 100 acre-feet.

Appendix A

Tully & Young
Comprehensive Water Planning

Tully & Young, Inc.
3600 American River Drive, Suite 260
Sacramento, CA 95864

MEMORANDUM

To: Brian Foster

From: Tully & Young, Inc.

Date: October 20, 2017

Subject: West Davis Active Adult Community Land Use Changes

1.0 Introduction

In August of 2017, a Water Supply Assessment (WSA) was prepared for the West Davis Active Adult Community (WDAAC). Since then, the project has been modified to account for minor land use changes and a revision to the planned scope of the commercial portions of the project. The purposes of this memorandum are to discuss the land use changes since Tully & Young, Inc. issued the WSA and determine the resulting impacts to the water demands of the West Davis Active Adult Community (WDAAC). In short, we conclude that although the land use changes increase the project's water demands, the conclusion of sufficiency remains.

2.0 Water Demand as presented in the Water Supply Assessment

The WSA derived sufficiency from two separate analyses. First, the land use and water demands were analyzed and presented in **Table 2-1** and **2-2** of the August 2017 WSA. A map of the land uses proposed in the August 2017 WSA is presented in **Figure 2-1**. Second, the UWMP water demand allocation was derived with a per acre methodology for the project site. The result of this analysis as compared to the WDAAC project was a small surplus in water supply based on the projected water demands of the proposed project as presented in the WSA. **Table 2-1**, **2-2** and **Figure 2-1** are the same as those used in the 2017 WSA and shown below.

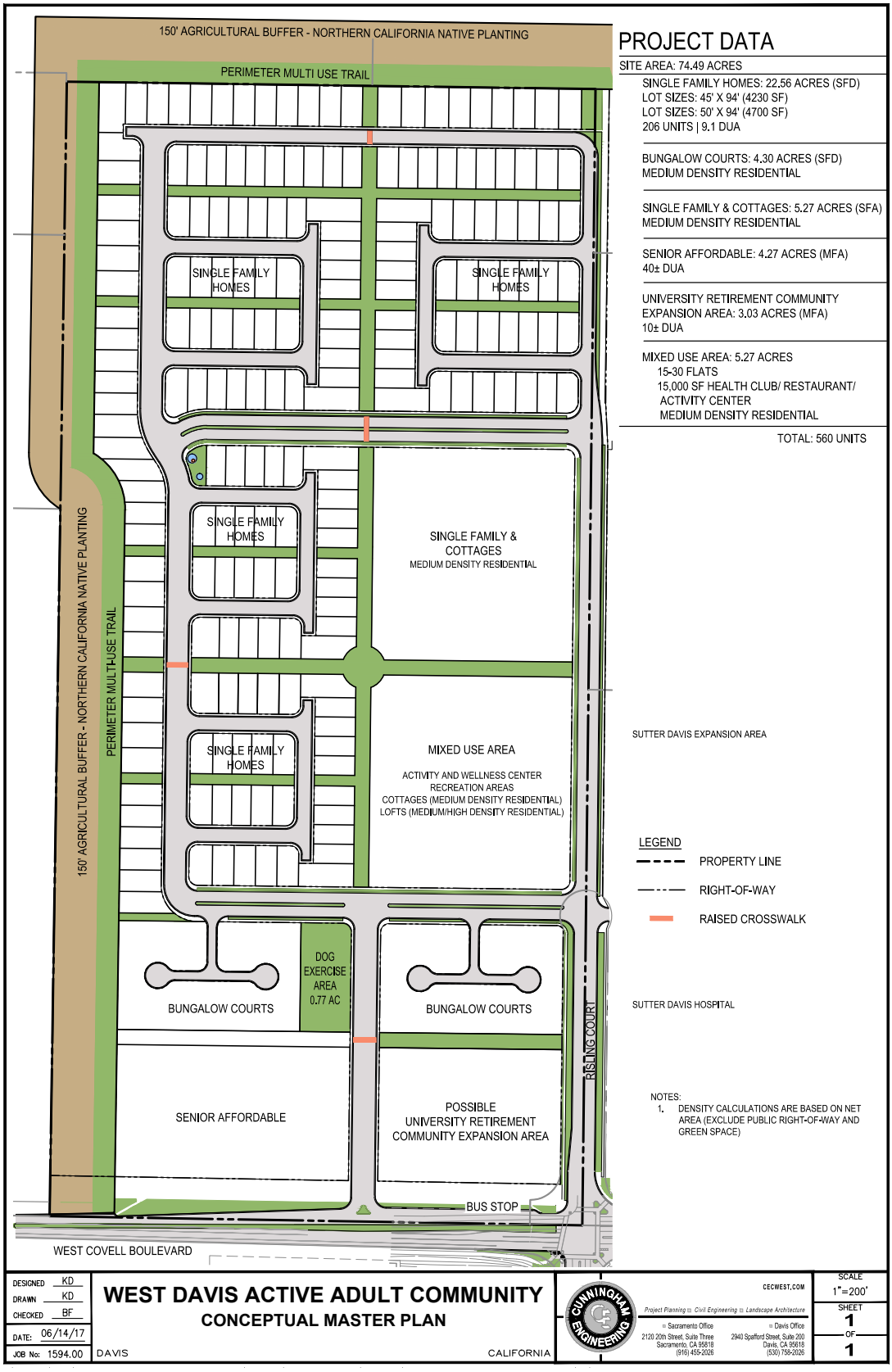
Table 2-1 – WSA Land Use

Land Use	Gross Acreage	Details
Homes, Bungalows, lots	26.78	238 Dwelling Units
Homes and Cottages	5.27	92 Dwelling Units
Continuing Care Retirement Community	3.03	30 Dwelling Units
Senior Affordable Apartments	4.36	150 Dwelling Units
Mixed Use Area	5.27	50 Dwelling Units
Dog Park	0.76	
Linear Park	4.69	
Ag Transition Area	7.19	
Right of Ways	17.59	
Total	**75**	**560 dwelling units**

Table 2-2 – Water Demands in the WSA

	Unit Count or Acreage						Demand Factor	Demand (af/yr)					
Category	Current	2020	2025	2030	2035	2040	(af/du or af/ac)	Current	2020	2025	2030	2035	2040
Residential													
Homes, Bungalows, and Builder Lots	0	0	238	238	238	238	0.19 (indoor)	0	0	45	45	45	45
							0.21 (outdoor)	0	0	49	49	49	49
Cottages	0	0.0	92	92	92	92	0.19 (indoor)	0	0	17	17	17	17
							0.13 (outdoor)	0	0	12	12	12	12
Mixed Use	0	0.0	50	50	50	50	0.15 (indoor)	0	0	8	8	8	8
							0.05 (outdoor)	0	0	3	3	3	3
Senior Affodable Apartments	0	0.0	150	150	150	150	0.15 (indoor)	0	0	23	23	23	23
							0.02 (outdoor)	0	0	3	3	3	3
University Retirement Expansion	0	0.0	30	30	30	30	0.15 (indoor)	0	0	5	5	5	5
							0.19 (outdoor)	0	0	6	6	6	6
DU Total	**0**	**0**	**560**	**560**	**560**	**560**							
							Indoor Subtotal	0	0.0	97	97	97	97
							Outdoor Subtotal	0	0.0	73	73	73	73
Non-Residential													
Mixed Use	0	0	5.3	5.3	5.3	5.3	2.80	0	0	15	15	15	15
							Indoor Subtotal	0	0.0	14.8	15	15	15
Public													
Dog Park	0	0	1	1	1	1	4.01	0	0	3	3	3	3
Linear Park	0	0	2	5	5	5	4.01	0	0	9	19	19	19
Agricultural Transition Area	0	0	7	0	0	0	2.81	0	0	20	0	0	0
Right of Way Landscaping	0	0	18	18	18	18	0.19	0	0	3	3	3	3
							Outdoor Subtotal	0	0.0	36.0	25	25	25
Other Miscellaneous Uses													
Construction Water	0	0	1	0	0	0	1	0	0	1	0	0	0
							Outdoor Subtotal	0	0	1	0	0	0
							Indoor Total	0	0	112	112	112	112
							Outdoor Total	0	0	110	99	99	99
							Total	0	0	222	211	211	211
							Outdoor Non-revenue water 11%	0	0	12	11	11	11
							Indoor Non-revenue water 11%	0	0	12	12	12	12
							Total Indoor	0	0	124	124	124	124
							Total Outdoor	0	0	123	110	110	110
							Total Proposed Project Demand	**0**	**0**	**247**	**234**	**234**	**234**

Figure 2-1 – WSA Land Use Map



The WSA concluded that the pre-loss demands totaled 211 acre-feet.[1] Specifically, the WSA stated:

> *The City of Davis' 2015 UWMP included a number of "Proposed Developments" in analyzing supply reliability for the City. One of the analyzed developments was the "Davis Innovation Center." The Davis Innovation Center was the previous project planned for the site of the new Proposed Project. The UWMP accounted for 619 acre-feet for the entire Innovation Center's 207 acres which is approximately 2.99 acre-feet per acre. Thus, the Proposed Project's area, a mere 75 acres of the original 207 acres, is budgeted in the UWMP for approximately 221 acre-feet.*[2]

3.0 Revised Land Use

Since the completion of the WSA draft, the land use plan has changed. The primary change was related to the replacement of the large multi-use facility with 50 mixed use apartments with a small community center and a 109 condos. Additionally there were some increases in the amount of expected irrigated landscaping as the linear park and agricultural transition area was better defined. It should be noted that the total number of housing units has not changed but has shifted. Specifically, the number of smaller homes and cottages were decreased, from 92 to 33, and the mixed use area apartments were replaced with a greater number of condos, from 50 to 109. **Table 2-1A** presents the revised land use plan.

Table 2-1A – Revised Land Use

Land Use	Gross Acreage	Details
Homes, Bungalows, lots	26.70	238 Dwelling Units
Cottages	3.05	33 Dwelling Units
Continuing Care Retirement Community	3.03	30 Dwelling Units
Senior Affordable Apartments	4.26	150 Dwelling Units
Condos/Unassigned/Wellness Center	6.16	109 Dwelling Units
Dog Park	1.10	
Linear Park	8.16	
Ag Transition Area	4.24	
Right of Ways	17.79	
Total	**74**	**560 dwelling units**

Table 2-2A presents the revised water demand projection.

[1] Note that the loss occurring will be on the City system side and very little will be occurring within the project boundary.

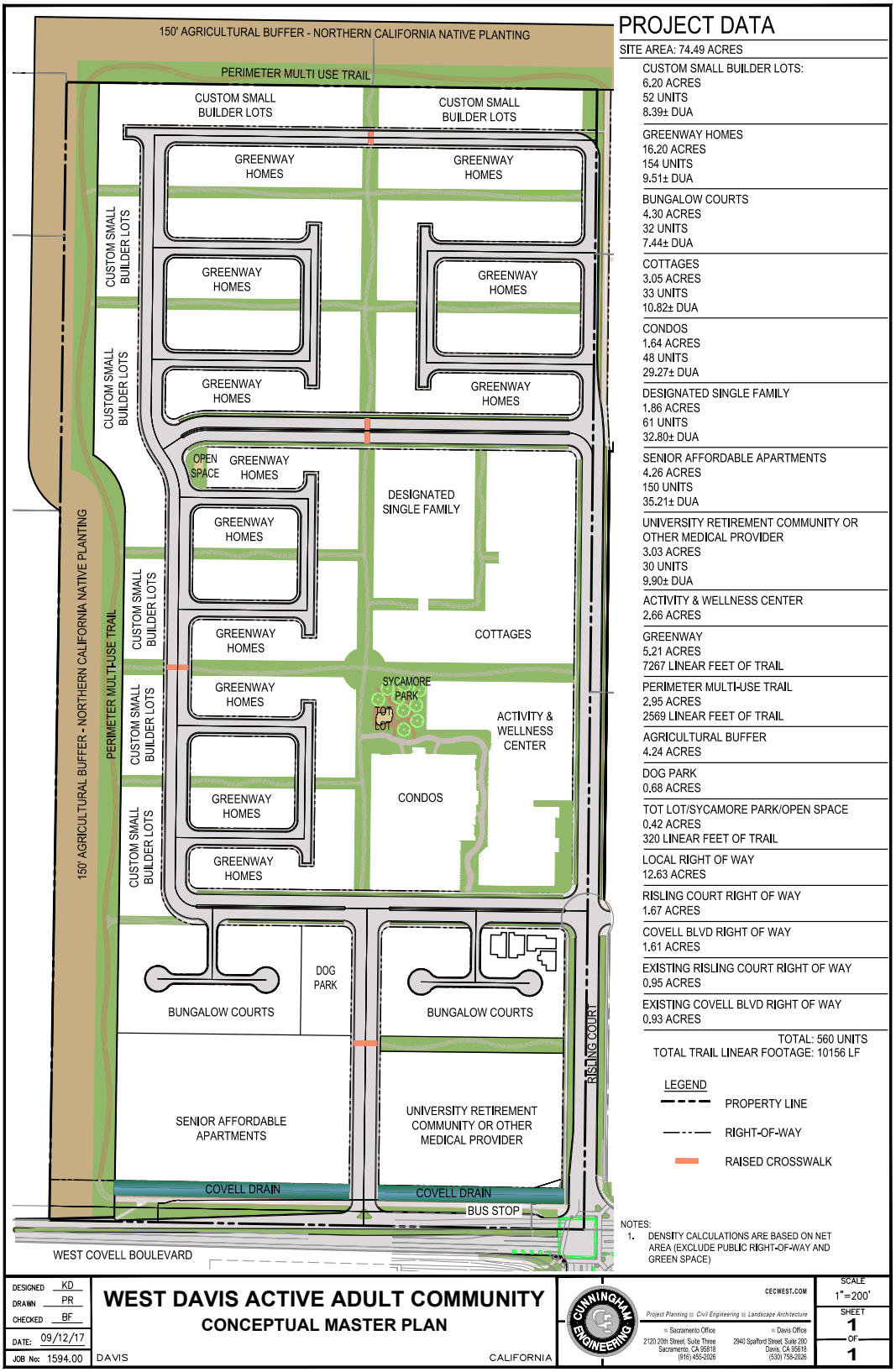
[2] Text from page 4-1 of the August 2017 Water Supply Assessment for the West Davis Active Adult Community project.

Table 2-2A – Revised Water Demands

	Unit Count or Acreage						Demand Factor	Demand (af/yr)					
Category	Current	2020	2025	2030	2035	2040	(af/du or af/ac)	Current	2020	2025	2030	2035	2040
Residential													
Homes, Bungalows, and Builder Lots	0	0	238	238	238	238	0.19 (indoor)	0	0	45	45	45	45
							0.23 (outdoor)	0	0	54	54	54	54
Cottages	0	0.0	33	33	33	33	0.19 (indoor)	0	0	6	6	6	6
							0.22 (outdoor)	0	0	7	7	7	7
Mixed Use	0	0.0	109	109	109	109	0.15 (indoor)	0	0	16	16	16	16
							0.01 (outdoor)	0	0	1	1	1	1
Senior Affodable Apartments	0	0.0	150	150	150	150	0.15 (indoor)	0	0	23	23	23	23
							0.03 (outdoor)	0	0	5	5	5	5
University Retirement Expansion	0	0.0	30	30	30	30	0.15 (indoor)	0	0	5	5	5	5
							0.19 (outdoor)	0	0	6	6	6	6
DU Total	**0**	**0**	**560**	**560**	**560**	**560**							
							Indoor Subtotal	0	0.0	95	95	95	95
							Outdoor Subtotal	0	0.0	73	73	73	73
Non-Residential													
Mixed Use	0	0	2.7	2.7	2.7	2.7	2.80	0	0	7	7	7	7
							Indoor Subtotal	0	0.0	7.4	7	7	7
Public													
Dog Park	0	0	1	1	1	1	4.01	0	0	4	4	4	4
Linear Park	0	0	4	8	8	8	4.01	0	0	16	33	33	33
Agricultural Transition Area	0	0	4	0	0	0	2.81	0	0	12	0	0	0
Right of Way Landscaping	0	0	18	18	18	18	0.19	0	0	3	3	3	3
							Outdoor Subtotal	0	0.0	36.1	41	41	41
Other Miscellaneous Uses													
Construction Water	0	0	1	0	0	0	1	0	0	1	0	0	0
							Outdoor Subtotal	0	0	1	0	0	0
							Indoor Total	0	0	102	102	102	102
							Outdoor Total	0	0	110	114	114	114
							Total	0	0	213	216	216	216
							Outdoor Non-revenue water 11%	0	0	12	13	13	13
							Indoor Non-revenue water 11%	0	0	11	11	11	11
							Total Indoor	0	0	114	114	114	114
							Total Outdoor	0	0	123	127	127	127
							Total Proposed Project Demand	**0**	**0**	**236**	**240**	**240**	**240**

The changes between **Table 2-2** and **Table 2-2A** include the unit counts for the Cottages and Mixed Use in the Residential category. In the Non-Residential category, the Mixed Use acreage was adjusted to reflect the land use change. For the Public category, acreages for the Dog Park, Linear Park, and Agricultural Transition Area were all adjusted.

Figure 2-1A – Revised Land Use Map



4.0 Conclusion of Sufficiency

The net impacts of the land use changes increase the net water demands from 211 acre-feet to 216 acre-feet before loss. With loss included, total demands from the demands analyzed in the August 2017 WSA increase by 6 acre-feet. The addition of this demand still results in a project demand below the UWMP allocation. Thus, despite the demand changes, there is sufficient water supply to serve the Proposed Project and the conclusion of sufficiency stated in the WSA is still valid after considering the impacts of land use changes.