

2 SEWER

2.1 INTRODUCTION

This sewer system technical appendix provides information to support the 75 acre West Davis Active Adult Community development by Dave Taormino. The proposed site is adjacent to the City of Davis municipal sewer system, and will connect to the City system for sanitary sewer services.

2.2 EXISTING SEWER INFRASTRUCTURE

The City of Davis sewer collection system for the western portion of Davis utilizes pipe under Covell Blvd. ranging from 18" diameter on the western end to 36" diameter at the eastern edge. The Covell Blvd. truck main extends to Poleline road and ties into a 42" diameter sewer heading north and east to the City of Davis Waste Water Treatment Plant approximately 3 miles east of Pole Line Road/County Road 102.

The existing Covell Blvd. trunk main has section of pipe which are hydraulically limited due to the size/slope of the pipe and the tributary flows. The attached Sewer Shed Map identifies the existing development as well as the planned developments based on the City of Davis General Plan, which are tributary to the Covell trunk main. The domestic average flow rates for the existing/planned General Plan areas are based on current City Standards of 110 gallons per capita per day (gcd). Under this 'base condition' of the General Plan buildout, the calculations indicate that for existing peak wet weather flows the various reaches of the Covell trunk main range from 50% to 88% full by flow rate (refer to block #1 of the attached spreadsheet S1). The sections with limited capacity are within the segment of 24" pipe between Sycamore and Anderson (85% capacity used; 1.0 cfs available) and the 30" pipe between F Street and the railroad tracks (88% capacity used; 1.4 cfs available). The calculations therefore suggest that an incremental flow rate of approximately 1.0 cfs (0.67 MGD) could be accommodated based on full flow capacity within the existing sewer infrastructure without improvements to the existing pipe network. Additionally, there are two factors that suggest that more capacity may be available: 1) actual development densities have fallen below the General Plan assumptions; and 2) water conservation continues to reduce the per capita waste water generation throughout the City.

2.3 SEWER DEMAND

The City of Davis Average Day Sewer Generation Rates for Residential, Recreation, Office and Retail are summarized below:

Unit Wastewater Demand Factors		
Type of Use	Design Flow (gallons)	Unit
Single Family Residential	330	Gallons Per DU-day
Multiple Family Residential	230	Gallons Per DU-day
Country Club	55	Gallons per Member
Office (Typical)	15	Gallons per Employee
Retail (Typical)	15	Gallons per Employee

Table 2-1: City of Davis Public Works Design Standards - September 1991

These generation rates are based on 1991 typical usage within the City of Davis.

As identified in the water system technical appendix, the proposed project will pursue water efficient fixtures and water conservation throughout the development in accordance with the 2010 CAL Green Building Code Standard as adopted by the City of Davis. The project does not anticipate any high use facilities or functions that will generate a large amount of waste water. As a result of this effort, the project is pursuing an alternate to the City of Davis 1991 water demand factors and a similar reduction of 20% is proposed for the sewer generation rates. Based on a reduction to the City Standard generation rates, Table 2-2 below summarizes the proposed wastewater unit demand factors for the proposed West Davis Active Adult Community.

Unit Wastewater Demand Factors		
Type of Use	Design Flow (gallons)	Unit
Single Family Residential	264	Gallons Per DU-day
Multiple Family Residential	184	Gallons Per DU-day
Country Club	44	Gallons per Member
Office (Typical)	12	Gallons per Employee
Retail (Typical)	12	Gallons per Employee

Table 2-2: 20% reduction in City of Davis Public Works Design Standards – September 1991

2.3.1 WASTE WATER GENERATION SUMMARY

The proposed unit generation factors identified above represent the Average Day Demand for the proposed project. The Maximum Day peaking factor is based on the peaking equation ($PF=7.67 \times ADDF^{-0.093}$) in accordance with the City of Davis Public Works Design Standards. Infiltration and Inflow allowance has also been accounted for at 600 gallons per acre per day. The Peak Daily Wet Weather Flow for the proposed project is summarized in Table 2.2 below.

Land Use Designation	Acres	Average Daily Dry Weather Flows (gpd)	Infiltration and Inflow Allowance (gpd)	Peak Daily Wet Weather Flows (gpd)
Single Family Residential	5.8	10,800	3,500	38,400
	43.72	75,000	26,200	228,700
	3.95	7,900	2,400	28,700
Multiple Family Residential	5.11	27,600	3,100	84,900
Activities Center	3.72	2,400	2,200	11,100
Ag Buffer	4.1	-	-	-
Community Green	8.6	-	5,200	5,200
Total	75	123,700	42,600	397,000

Table 2-3 – Peak Daily Wet Weather Flows

Based on the proposed peak wet weather flows for the West Davis Active Adult Community of 0.4 MGD and the available capacity within the City of Davis Covell trunk main of 0.67 MGD, no offsite sewer improvements should be necessary with the development of the project. This assumption requires confirmation by the City of Davis Public Works Department, who we understand maintains a model of the City's sewer collection and conveyance system.

Should inadequacies be found within the existing Covell trunk main, additional offsite sewer infrastructure may be required. This may include, select downstream pipe segment capacity improvements, an off-peak feed system from the project to the Covell trunk main, or a pump station and force main bypassing the hydraulically limited portions of the sewer infrastructure.

2.4 WASTE WATER TREATMENT

Waste water treatment for the project area is provided by the City of Davis Public Works Department. The City's waste water treatment plant was modified in 1989 to accommodate an average dry weather flow rate (ADWF) of 7.5 MGD and a peak hour wet weather flow (PHWWF) of 12.6 MGD. In 2014, work began on upgrading the waste water treatment plant to provide additional levels of treatment to address State regulations for higher quality wastewater effluent. These upgrades are expected to decrease the capacity of the plant to 6.0 MGD ADWF but increased the PHWWF to 18 MGDⁱ. In 2015, the 5 year average of ADWF to the plant was approximately 4.34 MGD and 5.05 MGD for General Plan Buildout, leaving an approximate remaining capacity of 0.95 MGDⁱⁱ.

2.5 SEWER INFRASTRUCTURE

Figure S2 attached identifies the preliminary sewer infrastructure layout for the proposed West Davis Active Adult Community. The sewer infrastructure onsite will utilize 8" pipes to serve the development. A future study will need to be conducted to further refine the proposed pipe sizes throughout the development in order to meet the peak flows. The triggers for the proposed infrastructure will also be defined in this future study to confirm adequate flow can be provided with each phase of the development.

Attachments:

- Figure S1 – Sewer Shed Map
- Table S1 – City of Davis Covell trunk main
- Figure S2 – Utility Infrastructure – Sewer
- Table S2 – Sewer Demand Calculations

ⁱ <http://daviswwtp.org/wp-content/uploads/2014/06/DB-Contract-WWTP-STI-Project-June-2014.pdf> (Appendix 10 - Basis of Design)

ⁱⁱ West Yost Associates. (February 27, 2015). *Impacts of Innovation Center/Nishi Property Development on Wasterwater Treatment Plant Capacity*. Prepared for Michael Lindquist, City of Davis. Accessible at <http://cityofdavis.org/home/showdocument?id=4697>

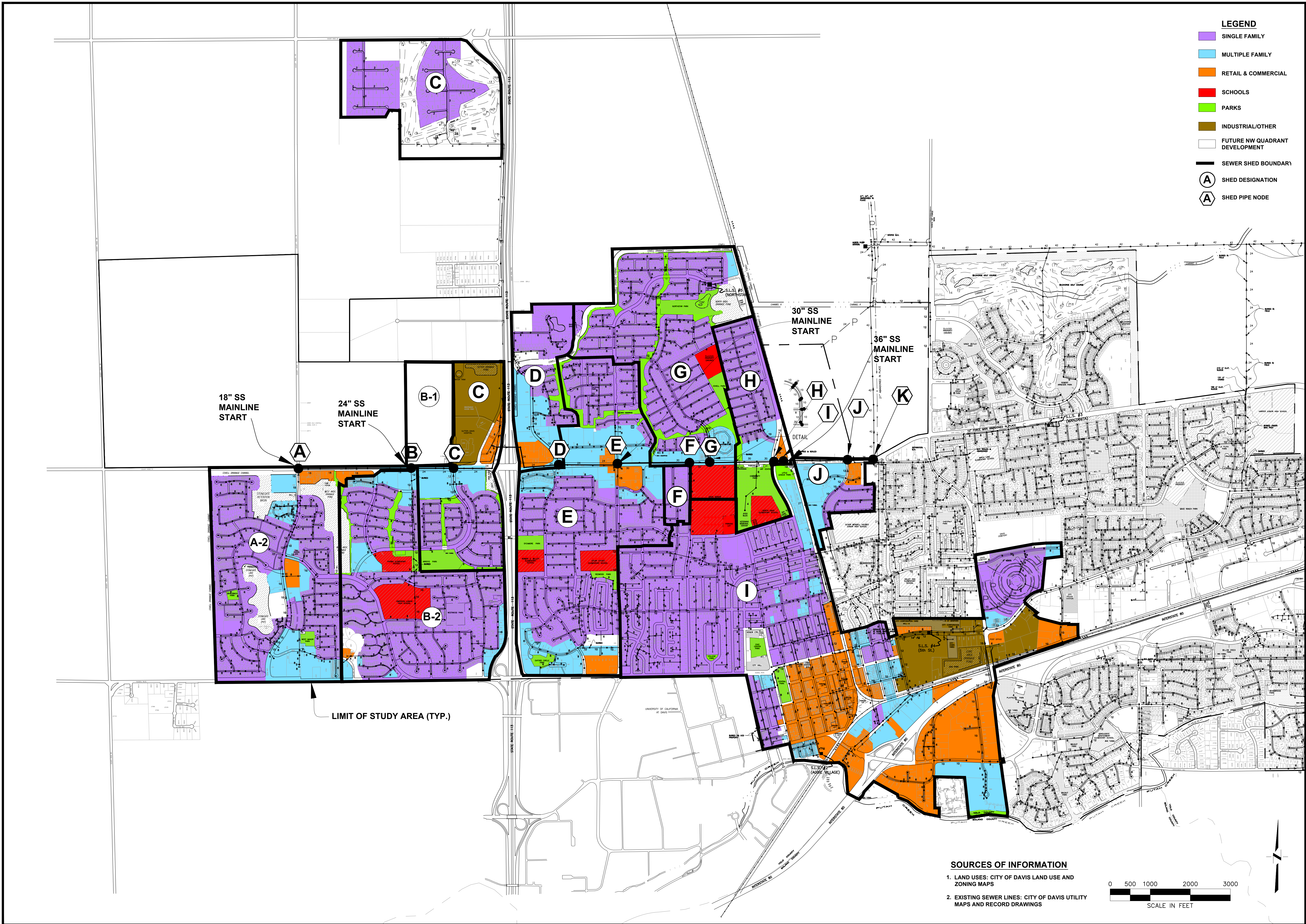


1. CITY OF DAVIS EXISTING AREAS & EXISTING COVELL BLVD SEWER

Area	Pipe Reach		SINGLE FAMILY				MULTI-FAMILY			RETAIL/COMM			PARK		SCHOOL		INDUSTRIAL/OTHER																							
	From	To	Total Area (AC)	# of Lots (EDU's)	Flow Rate (gpd/lot)	Gross Acres Multiple Fam	MF EDU/ AC	# of EDU's	Flow Rate (gpd/EDU)	Gross Acres	FAR	Bldg area (sf)	Flow Rate (gpd/sf)	# of Parks	Flow Rate (gpd/park)	# of Students	Flow Rate (gpd/student)	Gross Acres	FAR	Bldg area (sf)	Flow Rate (gpd/sf)	Incr ADF (mgd)	Cumm ADF (mgd)	PF	Incr I&I (mgd)	Cum I&I (mgd)	Peak Cum Flow (mgd)	Peak Cum Flow (cfs)	Pipe Dia. (in)	Pipe Slope (ft/ft)	Total Capacity Qcap(cfs)	Available Capacity (Qcap-Qp) (cfs)	Qp/Qcap (%)	d (ft)	d/D (%)	V (ft/s)	Vel @ Q-Full (ft/s)	Length (ft)		
A	A	B	401	1002	330	55.2	15	828	230	18.2	25%	198,198	0.06	1	55	0	21	0.0	40%	0	0.06	0.5330	0.533	2.25	0.241	0.241	1.440	2.2	18	0.0018	4.5	2.2	50%	0.7	49%	2.6	2.5	2,812		
B1			0	0	238	0.0	15	0	230	0.0	25%	0	0.06	0	55	0	21	0.0	40%	0	0.06	0.0000	0.533	2.25	0.000	0.241	1.440	2.2												
B2	B	C	361	1116	330	31.5	15	472.5	230	0.0	25%	0	0.06	1	55	1443	21	0.0	40%	0	0.06	0.5073	1.040	2.11	0.217	0.457	2.657	4.1	24	0.0009	6.8	2.7	61%	1.1	56%	2.3	2.2	1,072		
C	C	D	316	454	330	20.6	15	309	230	8.1	25%	88,209	0.06	1	55	0	21	48.0	30%	627,264	0.06	0.2639	1.304	2.07	0.190	0.647	3.347	5.2	24	0.0009	6.8	1.6	76%	1.3	65%	2.4	2.2	3,465		
D	D	E	124	177	330	26.8	15	402	230	9.4	25%	102,366	0.06	0	55	0	21	0.0	40%	0	0.06	0.1570	1.461	2.05	0.074	0.721	3.715	5.7	24	0.0009	6.8	1.0	85%	1.4	70%	2.4	2.2	1,488		
E	E	F	481	1256	330	74.4	15	1116	230	31.0	25%	337,590	0.06	3	55	1133	21	0.0	40%	0	0.06	0.7154	2.177	1.97	0.289	1.010	5.307	8.2	30	0.0008	11.6	3.4	71%	1.6	62%	2.6	2.4	1,782		
F	F	G	23	75	330	0.0	15	0	230	0.0	25%	0	0.06	0	55	0	21	0.0	40%	0	0.06	0.0248	2.201	1.97	0.014	1.024	5.365	8.3	30	0.0008	11.6	3.3	72%	1.6	62%	2.6	2.4	521		
G	G	H	375	948	330	11.0	15	165	230	0.0	25%	0	0.06	2	55	0	21	0.0	40%	0	0.06	0.3509	2.552	1.95	0.225	1.249	6.213	9.6	30	0.0008	11.6	2.0	83%	1.7	69%	2.7	2.4	1,594		
H	H	I	138	404	330	11.2	15	168	230	2.1	25%	22,869	0.06	1	55	530	21	0.0	40%	0	0.06	0.1845	2.737	1.93	0.083	1.331	6.620	10.2	30	0.0008	11.6	1.4	88%	1.8	72%	2.7	2.4	451		
I-1			1071	1859	330	94.9	15	1423.5	230	129.0	25%	1,404,810	0.06	2	55	1894	21	66.1	40%	1,151,726	0.06	1.1342	3.871	1.87	0.643	1.974	9.217	14.3												
I-2	I	J	0	0	330	0.0	15	0	230	38.0	100%	1,655,280	0.06	0	55	0	21	0.0	40%	0	0.06	0.0993	3.970	1.87	0.000	1.974	9.386	14.5	36	0.0007	17.6	3.1	82%	2.0	68%	2.9	2.5	1,370		
J	J	K	60	97	330	26.8	15	402	230	0.0	25%	0	0.06	0	55	0	21	0.0	40%	0	0.06	0.1245	4.095	1.86	0.036	2.010	9.632	14.9	36	0.0007	17.6	2.7	84%	2.1	70%	2.8	2.5	664		
Totals			3,350	7,388		352		5,286		236		3,809,322		11		5,000		114		1,778,990		4.095		1.86	2.0100		9.632		14.9										15,219	
ADF Totals (mgd)				2.438				1.216				0.229		0.001		0.105				0.107		4.095																		
% of Total ADF				60%			30%				6%		0%		3%				3%		100%																			

Notes and assumptions:

- Areas calculated and land use derived from City of Davis sewer, land use and zoning maps
- Existing areas within City assumed built-out per Zoning Atlas
- Cannery Park project and N. Central Davis project not draining south to sewer in Covell Blvd
- Node numbers and shed boundaries are shown on Davis Innovation Center Sewer Study Shed Map
- Sutter Davis Hosp: 20 ac exist (est 200ksf hosp;40ksf MOB#1;40ksf MOB#2;30ksf clinic- FAR = 310ksf/20 ac = 0.36), + 28 ac expansion (assume FAR 0.25)
Total effective FAR over 48 ac = 20*0.36 + 28*0.25 = 0.30
- Design flow criteria:
 - New Single-Family Reside 238 gpd/unit [assume 2.5 persons/unit at 95 gcd] (City of Davis Public Wks memo 6/8/05 re: Covell Village)
 - Existing Single-Family Res 330 gpd/unit [assume 3.0 persons/unit at 110 gcd] (City of Davis stds)
 - Mobile home (off Pole Line 230 gpd/unit [equivalent to 230/330=0.70 existing single family dwelling unit]
 - Multi-Family Residential 230 gpd/unit [assume 2.1 persons/unit at 110 gcd] (COD stds)
 - Multi-Family Residential dt 15 units/gross acre (COD stds)
 - Retail/Commercial 15 gpd/employee with 1 empl per 250 sf (net), and FAR=1.0 (Core Area); FAR=0.25 (elsewhere) (COD stds)
 - Park 55 gpd/park
 - School 21 gpd/student with student populations per 2004 DJUSD data (COD stds)
 - Industrial 15 gpd/employee with 1 empl per 250 sf (net) and FAR=0.4 (COD stds)
- Infiltration and Inflow (I+I) Rate = 600 gal per acre per day (COD stds)
- Peaking Factor (PF) = 7.67*ADF^0.093 (COD stds)

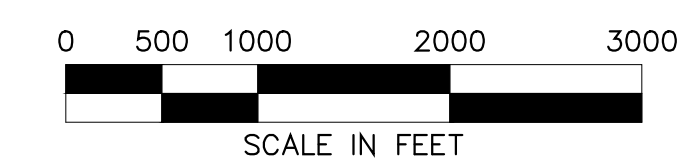


LEGEND

- SINGLE FAMILY
- MULTIPLE FAMILY
- RETAIL & COMMERCIAL
- SCHOOLS
- PARKS
- INDUSTRIAL/OTHER
- FUTURE NW QUADRANT DEVELOPMENT
- SEWER SHED BOUNDARY
- A SHED DESIGNATION
- A SHED PIPE NODE

SOURCES OF INFORMATION

1. LAND USES: CITY OF DAVIS LAND USE AND ZONING MAPS
2. EXISTING SEWER LINES: CITY OF DAVIS UTILITY MAPS AND RECORD DRAWINGS



DESIGNED BY: ML	DRAWN BY: BF	CHECKED BY: ML	SCALE: 1" = 1000'
NO. 1	DATE	REVISIONS BY	APPD.
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<p>WEST DAVIS ACTIVE ADULT COMMUNITY</p> <p>SEWER CAPACITY STUDY</p> <p>SEWER SHED MAP</p>			
			DAVIS CALIFORNIA
SHEET 1	OF 1		
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TABLE S2 Waste Water Demanc

Land Use Designation	Land Use	Acres	Dwelling Units	Average Day Generation ⁽¹⁾ (gallons per unit)	Average Dry Weather Flow (gpd)	Peaking Factor ⁽⁴⁾	Peak Dry Weather Flow (gpd)	Inflow and Infiltration Flow ⁽⁵⁾ (gpd)	Peak Wet Weather Flow (gpd)
Single Family Residential	Attached	5.8	41	264	10,800	3.23	34,900	3,500	38,400
	Detached	43.72	284	264	75,000	2.70	202,500	26,200	228,700
	URC	3.95	30	264	7,900	3.33	26,300	2,400	28,700
Multiple Family Residential	Senior Affordable	5.11	150	184	27,600	2.96	81,800	3,100	84,900
Recreation	Activities Center	3.72	-	2,400	2,400	3.72	8,900	2,200	11,100
Open Space/Landscaping	Ag Buffer	4.1	-	2,712	n/a				n/a
	Community Green	8.6	-	2,712	n/a			5,200	5,200
Total		75	505		123,700		354,400	42,600	397,000

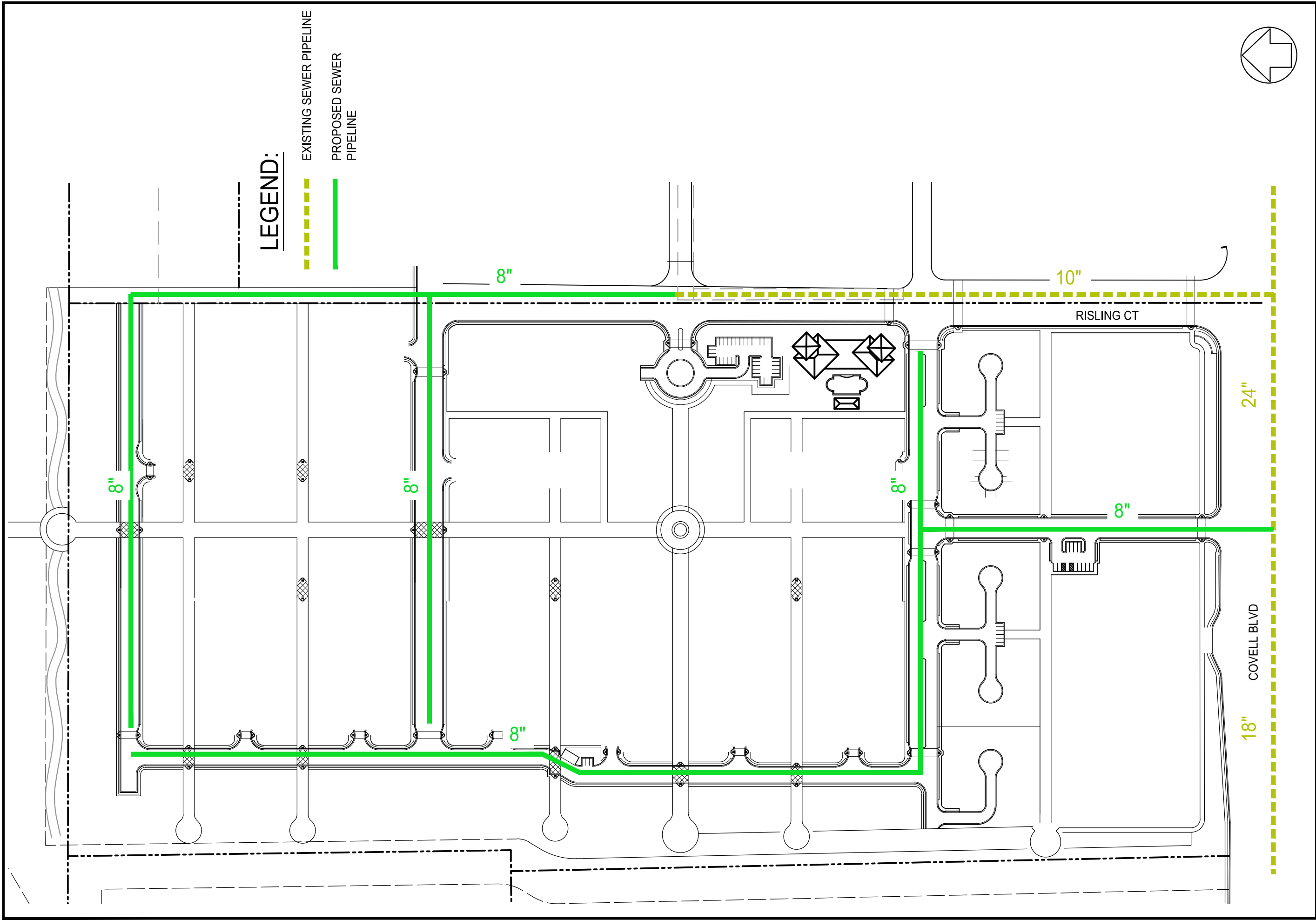
(1) Based on City of Davis Design Standards, Section VII.C.1&2, assumes 3 residents per SFR unit and 2.1 residents per MFR unit at 110 gpd/person, plus 20% reduction

(2) Based on at least 50% of the Condo-Bungalow Units being three bedroom or smaller

(3) Activities Center flows based on number of members at 55 gpd/member per City of Davis Design Standards, Section VII.C.5, plus 20% reduction

(4) City of Davis Design Standards, Section VII.E.a; $PF = 7.67 * ADDF^{0.093}$

(5) City of Davis Design Standards, Section VII.F; I&I = 600 gallons per gross acre per day



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**WEST DAVIS ACTIVE ADULT COMMUNITY
SEWER INFRASTRUCTURE EXHIBIT**

DAVIS CALIFORNIA

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CHECKED	BF
SCALE	1" = 200'
FIGURE	S2
DATE:	10/25/16
JOB No:	1594.01