



MEMORANDUM

To: Terry Jue, Dianna Jensen, City of Davis

CC: David Nystrom, McCuen Properties

From: Robb Thiem, Chuck Cunningham, Cunningham Engineering Corporation

Date: 8 August 2017, *revised 28 January 2020*

Subject: University Research Park Sewer Capacity Calculations

The purpose of this memo is to describe the sewer system within and adjacent to the University Research Park project and to state the assumptions made in the preparation of the sewer capacity calculations. *These calculations have been updated to reflect number of apartments and square footage of the office/tech space as shown on the 10/22/19 Site Plan prepared by Cunningham Engineering.*

These calculations evaluate the portions of the sewer pipelines along Research Park Drive and Drew Avenue within the boundaries of the University Research Park project. Also included in the calculations is the 15" sewer main crossing under Interstate 80 north of the project. These calculations include flows from the entire sanitary sewer shed area contributing to the sewer mains within the project and the 15" main crossing the freeway. The sewer shed upstream of the project area has been divided into two sheds: the west shed which contributes to the sewer main within Research Park Drive and the east shed which contributes to the sewer main within Drew Avenue. See attached Study Shed Map.

The land uses for unit flow generations within this shed are from the City's General Plan. The domestic sewer unit generation rate is 65 gpd/cap, derived from the influent measurements at the City wastewater treatment plant, provided by Terry Jue on 10/6/2016. This value is combined with a density of 2.71 cap/lot or cap/DU for the existing single and multi-family housing, provided by Terry Jue on 10/3/2016.

The retail, commercial and business park flow rate was provided by Terry Jue to be 1,500 gpd/acre. However, this would imply, for example, that the existing 20acre PG&E facility east of L street, which has approximately 200 employees (according to the City of Davis, Comprehensive Annual Financial Report, 2011), would generate 30,000 gpd. We believe this value to be exceedingly conservative and our model instead proposes to follow the City of Davis Sewer System Management Plan, August 2012 for the retail, commercial and business park flows. The City's Plan incorporates floor area ratios and employees per square feet of building, rather than the total site area. This manual proposes 15 gpd/employee with 1 employee per 250 building square feet. The FAR for retail/commercial in the core area is 1.0 and 0.25 outside of the core area, and the FAR for business park land uses is 0.35. For all other assumptions, see attached Sewer Model Calculations.

For the areas within the proposed University Research Park project we have increase the business park

FAR to 0.44 as outlined in the Preliminary Application Diagrams dated June 2017, prepared by Pinto & Partners. To be conservative, we have included the area of the proposed mixed-use lot within the business park section of the calculations in addition to the *proposed 160 residential units* which were included within the new office/multi-family section of the calculations.

These calculations demonstrate the existing sanitary sewer pipelines within the project boundaries and including the undercrossing of Interstate 80 have the capacity to support the buildout of the General Plan, with the inclusion of the proposed University Research Park project, and that no additional sewer pipe upsizing is required.

Attachments:

Figure 1 – Study Shed Map

Figure 2 – Sewer Capacity Calculations





Cunningham Engineering Corp.
2940 Spafford Street, Suite 200
Davis, CA 95616

Project: University Research Park
Project No.: 1641.01
Location: Davis, CA

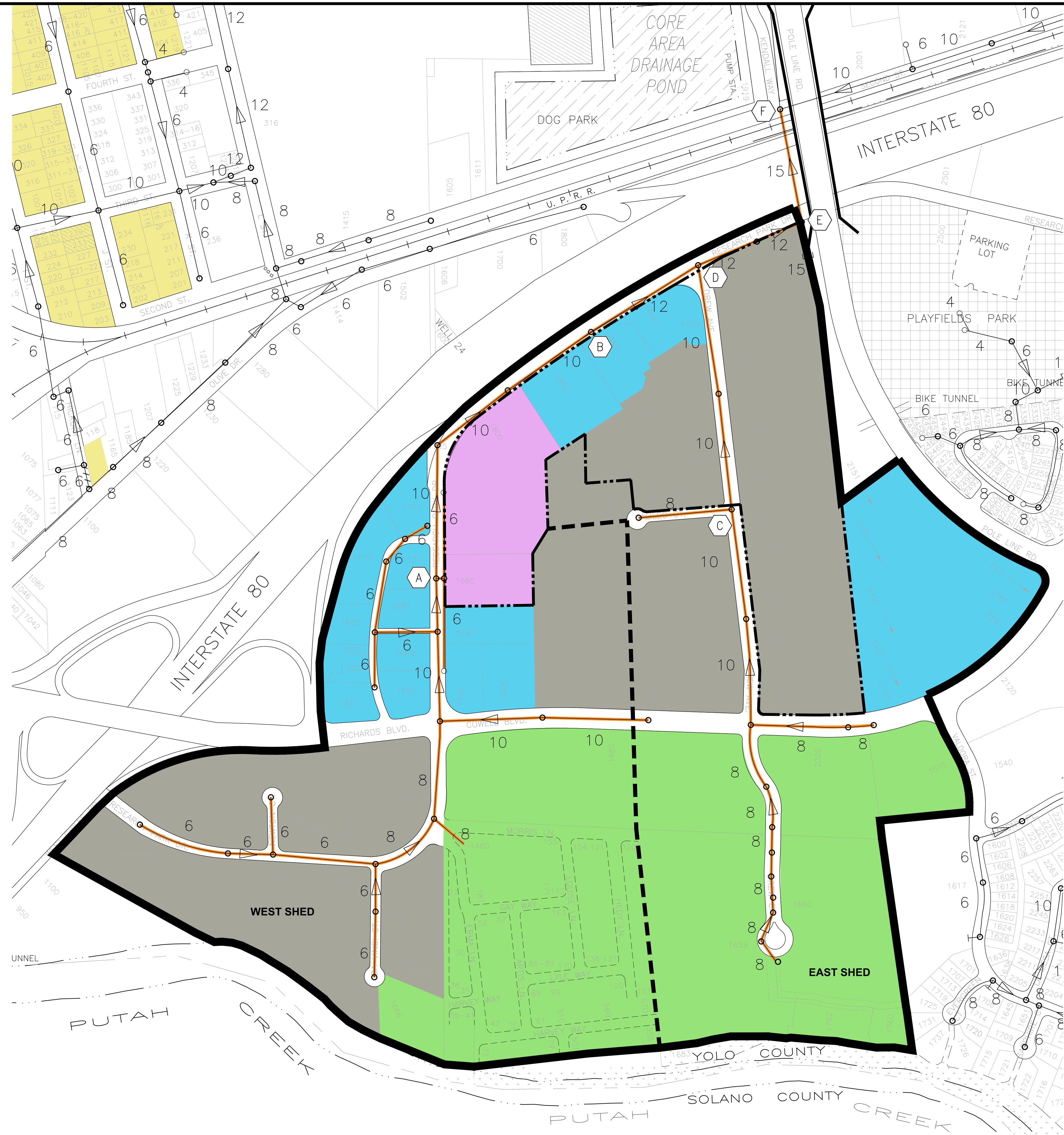
Date: 28-Jan-20
Calc By: RT
Checked By: CWC

Design Criteria:
Infiltration Rate (I+I)= 600 gal/acre/day
Mannings 'n' = 0.013
Peaking factor (PF)= see table and note 6

Pipe Reach		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)	# of EDU's	Flow Rate (gpd/EDU)	Gross Acres	FAR	Bldg area (sf)	Flow Rate (gpd/sf)	Gross Acres	FAR	Bldg area (sf)	Flow Rate (gpd/sf)	Incr ADF (mgd)	Cum 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)			
From	To																																				
West Shed Area		A	63	0	176	24.2	15	363	176	0	176	10.3	25%	112,167	0.06	28.4	35%	432,986	0.06	0.0967	0.097	2.64	0.038	0.038	0.293	0.45	10	0.0025	1.10	0.64	41.3%	0.37	44.0%	2.0	2.0		
A		B	9	0	176	0.0	15	0	176	160	176	2.0	25%	27,144	0.06	6.6	44%	126,498	0.06	0.0374	0.134	2.56	0.005	0.043	0.386	0.60	10	0.0025	1.10	0.50	54.5%	0.43	52.0%	2.1	2.0		
B		D	3	0	176	0.0	15	0	176	0	176	2.5	25%	27,225	0.06	0.0	44%	0	0.06	0.0016	0.136	2.56	0.002	0.044	0.391	0.61	12	0.0020	1.59	0.99	38.0%	0.42	42.0%	1.9	2.0		
East Shed Area		C	47	0	176	27.6	15	414	176	0	176	10.6	25%	115,434	0.06	8.9	35%	135,889	0.06	0.0890	0.088	2.66	0.028	0.028	0.262	0.41	10	0.0025	1.10	0.69	37.1%	0.35	42.0%	1.9	2.0		
C		D	22	0	176	0.0	15	0	176	0	176	0.0	25%	0	0.06	22.2	44%	425,494	0.06	0.0255	0.114	2.60	0.013	0.042	0.337	0.52	10	0.0025	1.10	0.57	47.5%	0.40	48.0%	2.0	2.0		
D		E	0	0	176	0.0	15	0	176	0	176	0.0	25%	0	0.06	0.0	44%	0	0.06	0.0000	0.249	2.41	0.000	0.086	0.688	1.06	12	0.0020	1.59	0.53	66.8%	0.59	59.0%	2.2	2.0		
E		F	0	0	176	0.0	15	0	176	0	176	0.0	25%	0	0.06	0.0	44%	0	0.06	0.0000	0.249	2.41	0.000	0.086	0.688	1.06	15	0.0016	2.58	1.52	41.2%	0.55	44.0%	2.0	2.1		
Totals			143	0		52		777		160		281,970								0.249		2.41	0.086		0.688	1.1											
ADF Totals (mgd)				0.000																0.137																	
% of Total ADF				0%																55%																	

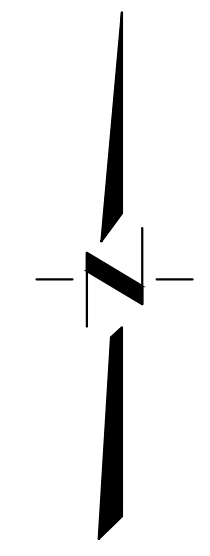
Notes and assumptions:

- Areas calculated and land use derived from City of Davis sewer, land use and zoning maps
- Existing areas within City assumed built-out per General Plan
- Node numbers and shed boundaries are shown on University Research Park Sewer Study Shed Map
- Design flow criteria:
 - Single-Family Residential 176 gpd/lot [Assume 65 gal/cap-day and 2.71 capita/lot per email from Terry Jue on 10/6/16]
 - Multi-Family Residential 176 gpd/EDU [Assume 65 gal/cap-day and 2.71 capita/EDU per email from Terry Jue on 10/6/16]
 - Multi-Family Residential density 15 DU/gross acre (COD stds)
 - New Office/Multi-Family 176 gpd/EDU [Assume 65 gal/cap-day and 2.71 capita/EDU per email from Terry Jue on 10/6/16]
 - Retail/Commercial 0.06 gpd/sf [15 gpd/employee with 1 empl per 250 sf (net), and FAR=1.0 (Core Area); FAR=0.25 (elsewhere)] (COD stds)
 - Business Park 0.06 gpd/sf [15 gpd/employee and 1 empl per 250 sf (net) and FAR=0.35] (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)

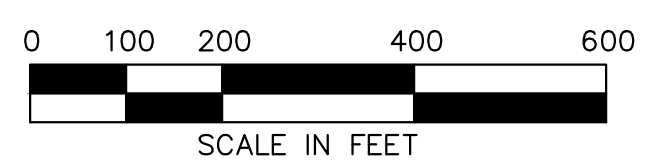


LEGEND

- MULTIPLE FAMILY
- RETAIL AND COMMERCIAL
- BUSINESS PARK
- NEW OFFICE RESIDENTIAL MIXED USE
- SHED BOUNDARY
- SUB SHED BOUNDARY
- PROJECT BOUNDARY
- A SHED PIPE NODE
- EXISTING SEWER PIPE AND SIZE WITHIN SHED



- 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: RT	DRAWN BY: RT	CHECKED BY: CWC	SCALE: 1" = 200'
APPD.	BY	REVISIONS	NO.
DATE	NO.	DATE	NO.
<p style="font-size: small;">CEOWEST.COM Project Planning - Civil Engineering - Landscape Architecture Davis Office - Davis Office - Davis Office Sacramento Office - 2120 20th Street, Suite 200, Sacramento, CA 95818 2940 Spafford Street, Suite 200, Davis, CA 95618 (916) 455-2026</p>			
<h2 style="margin: 0;">UNIVERSITY RESEARCH PARK</h2> <h3 style="margin: 0;">STUDY SHED MAP</h3>			
DAVIS			CALIFORNIA
SHEET	1		
OF	1		
DATE:	1/28/2020		
JOB NO:	1641.01		