



## MEMORANDUM

**To:** Michael Lindquist, City of Davis  
**From:** Martin Lewis, Cunningham Engineering Corporation  
**Date:** 12 December, 2014

**Subject: Mace Ranch Innovation Center – Preliminary Sewer Infrastructure Study**

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The purpose of this memo is to summarize the proposed sewer infrastructure improvement options for the Mace Ranch Innovation Center (Project), and document the methodologies and assumptions made in determining preliminary on-site sewer demands. This update to the November 20, 2014 memo reflects further review of unit demands, and is intended to supersede the previous memo.

### Existing Conditions

The 211-acre project site is located north of County Road 32A and I-80, and east of Mace Boulevard. The existing City of Davis sewer system is conveyed to the wastewater treatment plant located northeast of Davis and the project site. The nearest existing City sewer main is an 8” line located in Mace Boulevard, which is unlikely to have capacity to support the ultimate development of the site. As such, it is proposed that the project connect to the City’s existing 42” trunk main located just over a half-mile north of the site. An existing 21” main, servicing the El Macero development runs approximately one half mile east of the project site in County Road 105.

### Sewer Demand

Preliminary site sewer demand calculations have been performed at a planning-level of detail. Average daily demands were initially estimated based on City of Davis standard wastewater generation rates, assuming that the predominant uses will be Commercial/R&D/Office uses. Our preliminary estimates were based on per-capita usage, type of use, and expected occupancy per square foot of building area, using the City standard generation rates of 15gcd for R&D/Office, retail, manufacturing, and hotel common area uses, and 55gcd for hotel guest rooms.

However, it is noted that the City-standard unit rates were published in 1991. Since that time, plumbing codes and plumbing fixture designs have changed, generally resulting in lower flow plumbing fixtures. More specifically, the CALgreen building code requires the installation of low-flow (20% below 1992 EPA Act baseline) interior plumbing fixtures in new buildings. Assuming that the final delivery point for interior water use is via code-regulated interior plumbing fixtures, and if user behavior can be assumed not to have changed, then it might be expected that the 15 gallons per-capita per-day (gcd) unit rate could be factored down by 20%. The resulting expected generation would be 12 gcd for R&D/Office, retail,

manufacturing, and hotel common area uses, and 44 gcd for hotel guest rooms and gym facilities. For present purposes, the City has directed that the published standard rates be used, with the exception of the hotel and fitness uses, where the reduced rate of 44 gcd may be applied.

**Table 1 – Average Daily Demand by Land Use**

Land Use	Person/ Square Foot	Per Person ADD (gcd)
R&D/Office	1/425*	15
Manufacturing	1/425*	15
Hotel - Employee	50 Persons	15
Hotel – Guest Rooms	150 Rooms	44
Hotel – Convention	1/75**	15
Retail – Employee	1/500*	15
Retail Sales	1/60***	2
Retail Café	1/30***	2
Retail Fitness	1/100***	44

\*Based on BAE Urban Economics Report, December 2014

\*\*Based on California Building Code Occupancy Levels, assumed daily average of 20% of max. occ.

\*\*\*Based on California Building Code Occupancy Levels, assumed 50% use at any given time.

Populations are adjusted in demand calculations for retail uses to account for repeated occupancy throughout the day. Sales assumes a turnover of 8 (1 per hour open) and Café assume a turnover of 3 (3 high capacity peak hours). Fitness has not been factored for turnover assuming only a fraction of users will use facilities at 44 gpd.

Based on these assumptions the Average Day demand for the project at buildout will be 0.12 mgd. Applying the City standard peaking factor and infiltration and inflow rates, yields an expected peak wet weather flow of 0.39 mgd. While time-of-use is expected to be predominantly during regular business hours of Monday-Friday 8:00-5:00, the particulars of the Project’s diurnal use patterns are currently not known.

### **Proposed Offsite Improvements**

While a detailed evaluation of the impact of the proposed development on the wastewater treatment plant has not been conducted herein, previous studies have confirmed hydraulic capacity at the plant beyond the current General Plan buildout. The proposed point of connection to the 42” sewer would be in the vicinity of the transition of County Road 104A to County Road 30, as indicated on Figure 1. At that location, the City’s record drawings for the 42” line indicate that the pipe is approximately 20 feet deep [ground elevation ≈26; invert elevation ≈6 (datum unconfirmed)]. A recent survey has been completed at the proposed point of connection verifying a ground elevation of 24.16 and invert elevation of 4.6. On the project site, per recent survey data, existing ground elevations range from around EL 25 to EL 30. Initial sewer capacity calculations indicate that the project flows can be serviced by one 8” main running from the northeast end of the site to the existing 42” main.

An alternate point of connection east of the project is also under consideration. This option would tie



into the 21” main in County Road 105 via a connection along the Mace Channel alignment. It is unknown at this time if there is sufficient capacity in this line for the proposed project. However, given the relative close proximity to the project site, it is recommended that a preliminary analysis be performed to further investigate the feasibility of this alternative.

### **Proposed Onsite Improvements**

Based on the above elevations, and assuming that 8” mains are used throughout the project with a minimum slope of 0.0035, it appears that an all gravity collection and conveyance system is infeasible. As such, it is likely that a sewer lift station will be incorporated at some location onsite. The lift station would discharge to either a gravity or a forcemain outfall.

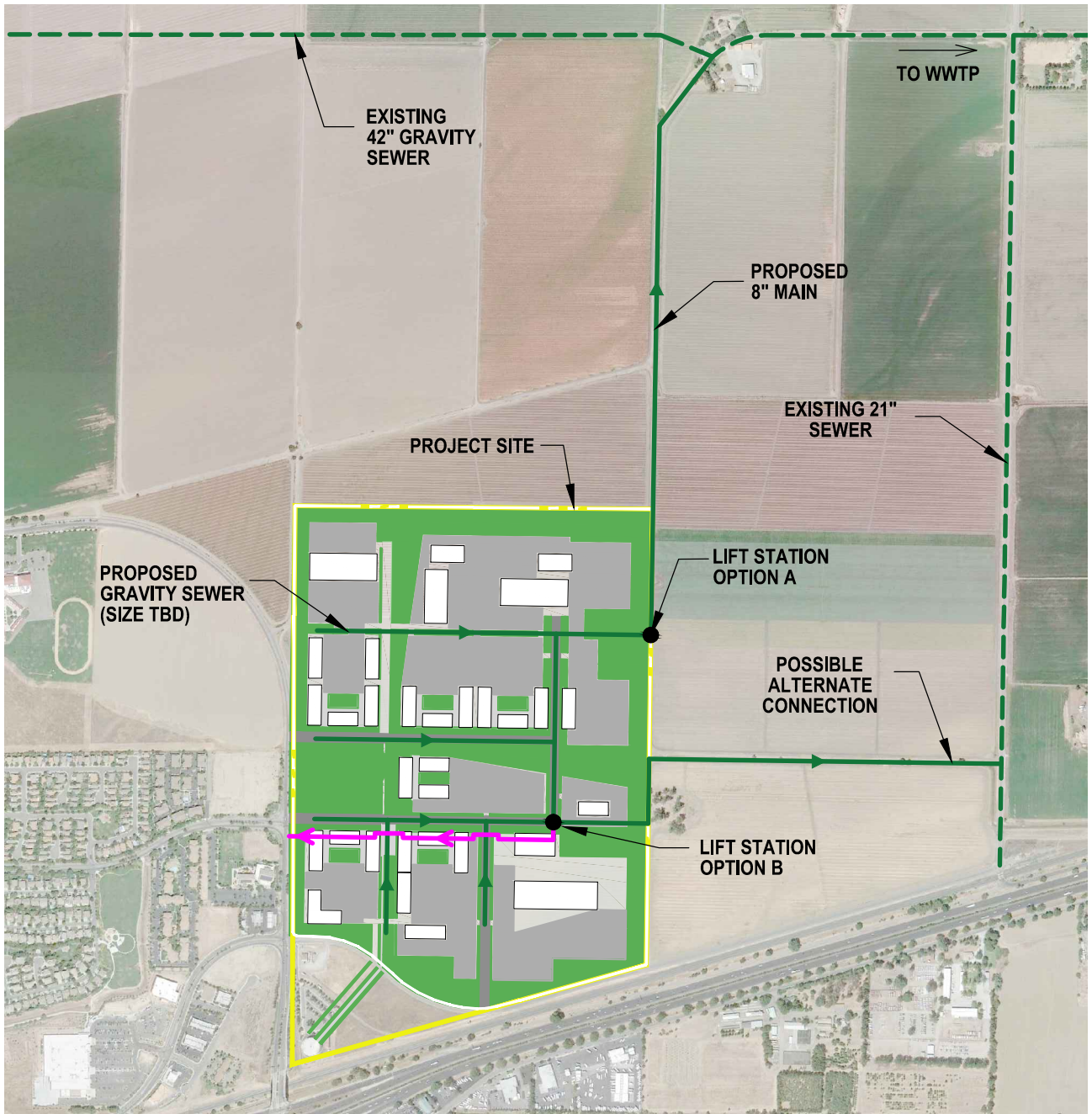
The lift station would likely be located at one of the locations shown in Figure 1. This location will be influenced by the point of connection chosen for the project site. Option A is located near the northeast corner and may be considered if the onsite flows ultimately connect to the existing 42” main north of the site. Option B near the south east side of the property and would be considered if the site sewer were to connect to the existing 21” west of the project.

### **Phase 1 Improvements**

Preliminary phasing has been proposed for the project. Phase 1A and 1B include approximately 460,000 sf. of manufacturing space, 100,000 sf. of retail space and 40,000 sf. of office space. This portion of the development is estimated to generate an Average Day demand of 0.04 mgd and peak wet weather flow of 0.12 mgd.

While it is assumed that the existing 8” sewer line in Mace Boulevard does not have capacity for the project demands at buildout, it is possible that this existing line may service the Phase I improvements in an interim condition. This is based on the theory that several contributing neighboring land uses have not been developed at the densities originally intended in the City’s master plan. A preliminary sewer study will be required to determine what, if any, capacity remains in the existing Mace Boulevard line. Assuming there is surplus capacity in the Mace Boulevard line, the Phase I flows may be pumped via a lift station and forcemain in the interim condition to Mace Boulevard, as shown in Figure 1. At buildout, upon completion of the offsite sewer connection, this flow may be redirected with the remainder of the site sewer.



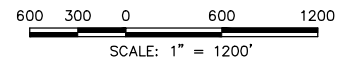
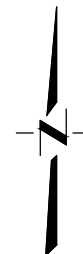


**LEGEND**

- |   |                      |   |                            |
|---|----------------------|---|----------------------------|
|  | PROPOSED BUILDING    |  | PROPOSED ROAD              |
|  | PROPOSED PARKING     |  | PROPOSED PAVED OPEN SPACE  |
|  | PROPOSED GREEN SPACE |  | PHASE 1 OPTIONAL FORCEMAIN |

**NOTES:**

1. SITE AERIAL IMAGERY TAKEN IN 2014 AND WAS ACQUIRED JUNE 10, 2014 FROM GOOGLE EARTH PRO.



DESIGNED	ML
DRAWN	KM
CHECKED	ML
DATE:	11/20/14
JOB No:	1239.04

CITY OF DAMS

**MACE RANCH INNOVATION CENTER  
SANITARY SEWER  
FIGURE 1**

CALIFORNIA



CECWEST.COM  
 Project Planning ■ Civil Engineering ■ Landscape Architecture  
 Sacramento Office Davis Office  
 2120 20th Street, Suite Three 2340 Spafford Street, Suite 200  
 Sacramento, CA 95818 Davis, CA 95618  
 (916) 455-2026 (530) 758-2026

**FIGURE 2**

**Mace Ranch Innovation Center**  
**Preliminary Sewer Demands**

Prepared by Cunningham Engineering Corporation  
 11/20/14      Revised 12/12/14

**Sewer Loading**

	Floor Area (SF)	Population Ratio (person/sf)	Sewered Population Employee (person)	Sewered Population Other (person)	Per Person ADD (gpd)	Total ADD (gpd)	Total ADD (mgd)
<b>RD/Office</b>	1,510,000	0.0024	3,553		15	53,294	0.05
<b>Manuf.</b>	884,000	0.0024	2,080		15	31,200	0.03
<b>Hotel</b>	160,000		50		15	750	0.00
Guest Rooms				150	44	6,600	0.01
Convention	50,000	0.0133		667	15	10,000	0.01
<b>Retail</b>	100,000	0.0020	200		15	3,000	0.00
Sales	80,000	0.0444		3,556	2	7,111	0.01
Café	4,000	0.1000		400	2	800	0.00
Fitness	16,000	0.0100		160	44	7,040	0.01
	2,654,000		5883	4932		<b>119,795</b>	<b>0.12</b>

Total ADDF      **0.12** mgd  
 PF=[7.67\*(ADDF)^-0.093]      2.59  
 PDWF=ADDF\*PF      **0.31** mgd

**Infiltration and Inflow**

Land Area (ac)	Per unit I&I (gpd/ac)	Total I&I (gpd)	Total I&I (mgd)	
133	600	79,920	0.08	21%

**PWWF = PDWF + I&I      0.39 mgd**

**NOTES**

- 1 Population Ratios for RD/Office and Retail obtained from BAE Urban Economics Report, dated December 2014. Ratios for other uses derived from California Uniform Building Code Occupancy Levels and City of Davis Standards. Convention center ratios have been reduced to 20% of maximum occupancy with the assumption that maximum capacity events do not occur on a daily basis. Retail uses assume occupancy at any given time is 50% of maximum occupancy. Retail sales occupancy is based on 1/60 persons per sqft at any given time with a population turnover of 8 per day. It is also assumed that costumers will occupy 1/3 of the total floor area with remaining area dedicated to product storage, display, and employee spaces. Retail Cafe use assumes 1/30 persons per sqft at any given time with a population turnover of 3 peak times per day. Retail fitness assumes 1/100 persons per sqft at any given time. No turnover factor has been applied, assuming only a fraction of users will be using facilities at the rate of 44 gpd.
- 2 Per person ADD based on City standard sewer unit generation rates, with a 20% reduction applied for Hotel Guest Room and Retail-fitness uses, based on the CALGreen building code requirements for low-flow interior plumbing fixtures.
- 3 Peaking factor equation per City of Davis standards
- 4 I&I unit flows are per City of Davis standard values and do not include
- 5 "Hotel - Guest Rooms" space is estimated based on 150 rooms.

**FIGURE 3**

**Mace Ranch Innovation Center  
Preliminary Sewer Demands - Phase 1**

Prepared by Cunningham Engineering Corporation  
11/20/14 Revised 12/12/14

<b>Sewer Loading</b>							
	Floor Area (SF)	Population Ratio (person/sf)	Sewered Population Employee (person)	Sewered Population Other (person)	Per Person ADD (gpd)	Total ADD (gpd)	Total ADD (mgd)
<b>RD/Office</b>	40,000	0.0024	94		15	1,412	0.00
<b>Manuf.</b>	460,000	0.0024	1,082		15	16,235	0.02
<b>Retail</b>	100,000	0.0020	200		15	3,000	0.00
Sales	80,000	0.0444		3,556	2	7,111	0.01
Café	4,000	0.1000		400	2	800	0.00
Fitness	16,000	0.0100		160	44	7,040	0.01
	600,000		1376	4116		<b>35,598</b>	<b>0.04</b>

Total ADDF	<b>0.04</b> mgd
PF=[7.67*(ADDF)^-0.093]	2.89
PDWF=ADDF*PF	<b>0.10</b> mgd

<b>Infiltration and Inflow</b>				
Land Area (ac)	Per unit I&I (gpd/ac)	Total I&I (gpd)	Total I&I (mgd)	
28	600	16,980	0.02	14%

**PWWF = PDWF + I&I** **0.12** mgd

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