Appendix M

Wastewater/Sewer Demand Study

February 21, 2020

City of Camarillo
601 Carmen Drive
Camarillo, CA 93010

RE: 2800 Barry Street- Affordable Housing Development
Sewer Demand Study

This letter is intended to assess the sewer demand for the proposed development located at 2800 Barry Street. The project site is located within Camarillo City limits and is serviced by the Camarillo Sanitary District.

The site is currently a vacant paved lot but was previously used as a lumber storage yard. The proposed project is a 100% affordable multi-family housing development consisting of a total of 68 units, including 60 rental apartments, and 8 for-sale condominiums.

PROPOSED DESIGN FLOW

The anticipated sewer flow was estimated using two different methods; the first method uses the unit flow factors listed in the Camarillo Sanitary District System Evaluation and Capacity Assurance Plan (SECAP) 2009 and the second method estimates sewer flow as a function of water usage. The results from both methods were compared and the larger flow rate was used to determine peak flow values.

The proposed zoning for the project is High Density Residential (RPD30U) which has a unit flow factor of 1,900 gallons per day per acre, based on Table 4-3 of the Camarillo Sanitary District SECAP. Therefore, the calculated average flow is

$$\frac{1{,}900\ gal}{acre * day} \times\ 2.58\ acres = 4{,}902\frac{gal}{day} = 0.0076\ cfs$$

It can be assumed that sewer flows from higher density projects equal approximately 85% of the water usage. The anticipated daily water demand for this project was estimated to be 9,380 gallons per day which equates to an average flow of 0.0145 cfs. Using this simplified method, the average sewer flow is

$$0.85 \times\ 0.0145\ cfs = 0.0123\ cfs$$

The simplified method yields a larger flow rate, 0.0123 cfs (0.0079 mgd), which is used to calculate peak flows.

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PEAKING FACTORS

Using the peaking factor equations from section 4-4 of the Camarillo Sanitary District SECAP, the peak dry weather flow (PDWF) is

$$2.1 \times (0.0079\, mgd)^{0.92} = 0.0245\, mgd$$

And the peak wet weather flow (PWWF) is

$$1.4 \times 0.0245\, mgd = 0.0343\, mgd$$

Sincerely,

RRM DESIGN GROUP

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Ultimate Conditions

The ultimate land use was primarily based on City's 2004 General Plan the zoning. The ultimate flow factors were classified by the General Plan zoning categories as shown in Table 4-3. The ultimate unit flow factors were increased to account for the current vacancies, future densification, and inconsistencies in the measured flow data. The ultimate tributary area includes Camarillo's Sphere of Influence area in unincorporated Ventura County, consisting of residential communities north of the City Boundary. This area currently utilizes septic systems. The Ultimate Land Use will also account for new developments such as the Springview Residential Center and the Commercial Development, north of the Camarillo Airport.

Table 4-3
Ultimate Unit Flow Factors

Zoning Category	Zoning Use Description	Density (DU/Ac)	Ultimate Unit Flow Factor (GPD/AC)
Residential Use			
R-E, RE10AC, RE-15, RE-1AC, RE-20, RE-3AC, RE40AC, RE-5AC	Rural Exclusive	1-2.5	200
R-1, R-1-10, R-1-15, R-1-8, RPD, RPD-2U, RPD-3U, RPD-4U, RPD-5U	Low Density Residential	1-5	1,350
RPD7R, RPD8U, RPD10U	Low-Medium Density Residential	6-10	1,500
RPD12U, RPD15U, RPD17U, RPD18U	Medium Density Residential	11-18	1,700
RPD-20U, RPD24U, RPD25U, RPD30U	High Density Residential	19-30	1,900
MHPD	Mobile Home Park Development	1-7	820
Commercial Uses			
COT	Camarillo Old Town		880
CPD	Commercial Planned Development		880
SC	Service Commercial Zone		880
P-O	Professional Office		880
Restaurant	Restaurant		1,500
Carwash	Carwash		6,000
Hotel	Hotel		3,000
Industrial Uses			
L-M	Limited Manufacturing		440
M-1	Light Manufacturing		440
M-2	Heavy Manufacturing		880
Public Uses			
Public	Public Facilities		880
School	School		1,200
Hospital	Hospital		2,800
Other Uses			
A-E	Agricultural		0
O-S	Open Space		0
Park	Park		200

4-4 PEAKING FACTORS

Peak Dry Weather

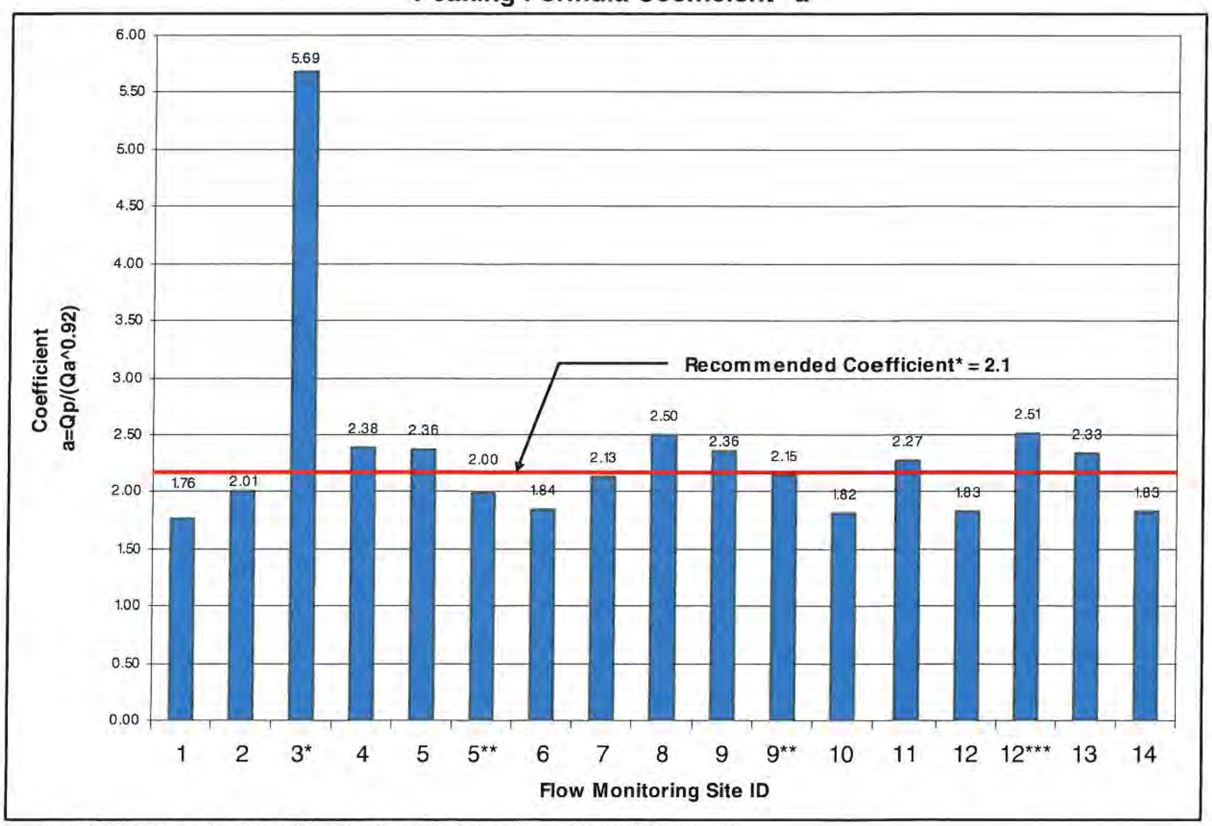
The wastewater unit flow factors discussed in Section 4-3 are used to generate average dry weather flows (ADWF) entering the collection system. However, the adequacy of a sewage collection system is based upon its ability to convey the peak flows. At any individual point in the system, the peak dry weather flow (PDWF) is estimated by converting the total average flow upstream of that point to the peak dry weather flow by an empirical peak-to-average relationship.

The peaking formula commonly used in sewerage studies is of the following form:

$Q_{peak} = a \times Q_{ave}^{\ b}$ where Q_{peak} = Peak Dry Weather Flow
Q_{ave} = Average Dry Weather Flow
a, b = Peaking Formula Coefficients

The temporary flow monitoring data was reviewed to develop peaking relationships at each site. As expected, these relationships varied from site to site depending upon the makeup and size of the tributary land use. Coefficient "b" is typically found to be in the range of 0.91 to 0.92 based on empirical studies. Using a coefficient "b" of 0.92, the resulting coefficient "a" can be calculated from the measured flow data. The calculated coefficient "a" for each flow monitoring site is shown graphically on Figure 4-3.

Figure 4-3
Peaking Formula Coefficient "a"



* *Disregarding the High Peaking Coefficient at Flow Monitoring Site #3*
** *Flow Monitoring performed in January 2007 and July 2008*
****Two Distinct patterns at the same flow monitoring site*

The following peaking relationship was selected for this study:

$$Q_{peak}\,(mgd) = 2.1 \times Q_{ave}(mgd)^{0.92}$$

The measured flow at Site No 3 was disregarded in establishing the peak flow coefficient. While the sum of the measured flows at Site No. 3 and Site No. 4 appear reasonable, the flow data at Site No. 3 includeed sudden extreme highs and lows which would result in a peaking factor that is overly conservative and not practical for planning purposes.

Peak Wet Weather

The peak wet weather flow (PWWF) has two components: peak dry weather flow (PDWF) and rainfall dependent inflow/infiltration (I/I) as expressed by the following equation:

PWWF = PDWF + I/I

Inflow and infiltration is discussed further in Subsection 4-5.

There were not any significant rainfall events during the flow monitoring effort that could be used in developing a data based wet weather peaking criterion. Until sufficient wet weather flow data can be collected, it is recommended that the peak wet weather flow be estimated as follows:

Peak Wet Weather Flow = 1.40 x Peak Dry Weather Flow

Although the PWWF/PDWF factor of 1.40 may not cover all situations, it is not reasonable or feasible to design the sewer system to carry the flows that would result from the use of a larger ratio. Instead, it is recommended that the City concentrate on projects such as replacing manhole covers, installing plugs in manhole covers, and replacing or relining cracked pipes to reduce inflow and infiltration.

4-5 INFLOW AND INFILTRATION

Inflow is the surface water that typically gains entry into the sewer system through perforated or unsealed manhole covers during rainfall events. Infiltration is defined as water entering the collection system from the ground through defective pipes, pipe joint connections, or manhole walls. The sewer system design capacity must include allowances for these extraneous flow components, which inevitably become a part of the total wastewater flow. The amount of inflow and infiltration (I/I) that enters the system typically depends upon the availability and location of the storm water drainage facilities, age and condition of structures, materials and methods of construction, the location of the groundwater table, and the characteristics of the soil. In the absence of flow monitoring data, many regulating agencies utilize commonly accepted practices for estimating I/I. For example, I/I is often estimated based on the diameter and length of pipeline (100 to 400 gpd/ in. dia/ mile) or as a percentage of the peak flow or pipeline capacity.

AKM's experience from other master planning studies and review of limited flow monitoring information available during severe rainfall events indicate that the peak wet weather flow can vary from 10 percent of average dry weather flows in steeper areas with adequate drainage facilities, to over 400 percent of average dry weather flows in flat areas that lack significant drainage facilities.