Preliminary Utilities Study

For

Kortum Ranch Subdivision

500 Kortum Canyon Road
Calistoga, CA
APN 011-290-007, 038, 039, 011-310-023

JN 21105
July 10, 2023

Prepared For:
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Preliminary

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1 Project Description

The Kortum Ranch Subdivision is located at 500 Kortum Canyon Road, in Calistoga south-west of Highway 128. The project proposes to subdivide 3-lots into a 22-lot subdivision for residential use. The tentative map is predicated on the resultant parcels being approved through a lot line adjustment between APN 011-310-023 & 011-290-007.

The site previously had multiple residences, stockpiles, defunct car storage, construction material storage, and various other unpermitted activities. The Kortum Ranch, LLC has cleaned and cleared all previous structures, cars, and construction material in the past year. There are currently gravel access roads and building pads that will be utilized in the proposed improved.

Water and wastewater services for the subdivision will be provided through onsite private systems that will connect to the City's infrastructure. This subdivision proposes the use of water tanks to buffer the peak daily demands on the City of Calistoga's water system. This project does not currently have any water or sewer allocation from the City's utilities. Water and Sewer allocation shall be determined by City Staff with the help of the Engineer of Record.

2 Water & Wastewater Use Calculations

The water and wastewater use calculations are based on the Standardized Use Table for Resource Management System adopted by the City of Calistoga as Resolution No. 2017-083. The table outlines the water and wastewater use based on the type of use of the building. This project proposes 22 four-bedroom homes and 6 accessory dwelling unit for residential use. This project does not currently

The average and peak water and wastewater use for a 4-bedroom residence and an ADU is shown in Table 1. The peak use is 3x the Average Unit Rate. Table 1 shows the usage for each

Table 1: Water and Wastewater Use Table from the Standardized Use Table.

	Water Demand		Wastewater Demand	
Area Designation	**Average Unit Rate (gpd/unit)**	**Peak Use (gpd/unit)**	**Average Unit Rate (gpd/unit)**	**Peak Use (gpd/unit)**
4-Bedroom	482	1,446	285	855
ADU	147	441	130	390

The total annual water and wastewater demand for the proposed subdivision is shown in Table 2 in acre-ft and gallons per year.

Table 2: Annual Water and Wastewater Use Table for the Project

	Annual Water Demand	Annual Wastewater Demand
Acre-ft/ Year	**12.87**	**7.90**
Gallons/ Year	**3,870,000**	**2,573,250**

3 Domestic Water Allocation

The domestic water use for the Kortum Ranch Subdivision will be supplied by the City of Calistoga and held onsite in a 20,000-gallon domestic water tank for distribution to the individual lots. In order to determine the minimum flow rate provided by the City, the Sequent Peak Method was used to maintain domestic water available for the project.

We have analyzed two alternatives using the sequent peak method. The first analysis uses the average daily use from the project (base demand) of 7.94-gallons per minute (gpm) with the typical municipal water usage per hour (diurnal curve). The second analysis uses the average daily use

from the project with the peak flow being three times the peak flow of the standard diurnal curve. The results are shown in

Table 3: Minimum Flow Rate from the City System

	Flow Rate
Average Daily Use	**7.94-gpm**
Average Daily Use with 3x Peak Flow	**9.00-gpm**

This analysis provides preliminary estimates of the domestic water needed for the project flowing at a constant rate. A more in-depth analysis shall be performed in order to optimize the tank volume and City's ability to provide domestic water to the site.

Appendix I

Water & Wastewater Use Calculations

Water Demand Calculations

Kortum Ranch Subdivision
July 10, 2023

22 Residences - 4 Bedroom Homes

			Water Demand				Wastewater			
Area Designation	**Use Type**	**Units (ea)**	**Units Rate (gpd/unit)**	**Average Daily Use (gpd)**	**Annual Use (ac-ft/yr)[1]**	**Peak Use (gpd)[4]**	**Units Rate (gpd/unit)**	**Average Daily Use (gpd)**	**Annual Use (ac-ft/yr)[1]**	**Peak Use (gpd)[3]**
4 Bedroom	SFD[(2)]	22	482	10,604	11.88	31,812	285	6,270	7.02	18,810
ADU	Contingency	6	147	882	0.99	2,646	130	780	0.87	2,340
Total				**11,486**	**12.87**	**34,458**		**7,050**	**7.90**	**21,150**

Notes:
1. 1 gallon per day = 0.00112 acre-feet per year
2. SFD = Single Family Dwelling
3. Peak Use is 3 times the Average Daily Use as obtained from City of Santa Rosa 'Sewage Peak Load Factor vs Population'

Standardized Use Table for Resource Management System[1]

Amended 7.18.17

Use Type	**Water**		**Wastewater**	
	Acre feet per year	Gallons per day	Acre feet per year	Gallons per day
Residential				
Single-family dwelling[2]				
1 - 3 bedrooms	.428	382	.224	200
4 bedrooms[3]	.540	482	.319	285
Apartment, condominium				
1 bedroom	.124	------	.073	------
2 bedrooms	.249	------	.146	------
3 bedrooms	.373	------	.220	------
Mobile home	.149	133	.125	112
Accessory dwelling unit	.165	147	.146	130
Transient lodging - Hotel, motel, resort, B&B – per living or rental unit				
	.170	152	.150	134
Commercial - Retail, office, personal service – per 1000 sq. ft. of gross floor area				
	.110	98	.099	88
Bar – per 1000 square feet of gross floor area				
	.220	196	.198	177
Restaurant - per 1000 square feet of gross floor area				
	.580	518	.524	468

[1] The Department of Public Works may reduce the expected demand upon approval of an engineered water study demonstrating/ quantifying the site-specific water usage.

[2] The adoption of Resolution No. 2017-083 amending the Standardized Use Table is not intended to affect the number of bedrooms purchased through the now-defunct Leak Detection Program. All projects that purchased leak detection water shall only be vested for the original number of bedrooms purchased.

[3] Each additional bedroom, add 100 gallons of water and 85 gallons of wastewater per day.

Source:
https://www.ci.calistoga.ca.us/home/showpublisheddocument/33183/636994714554530000

Appendix II

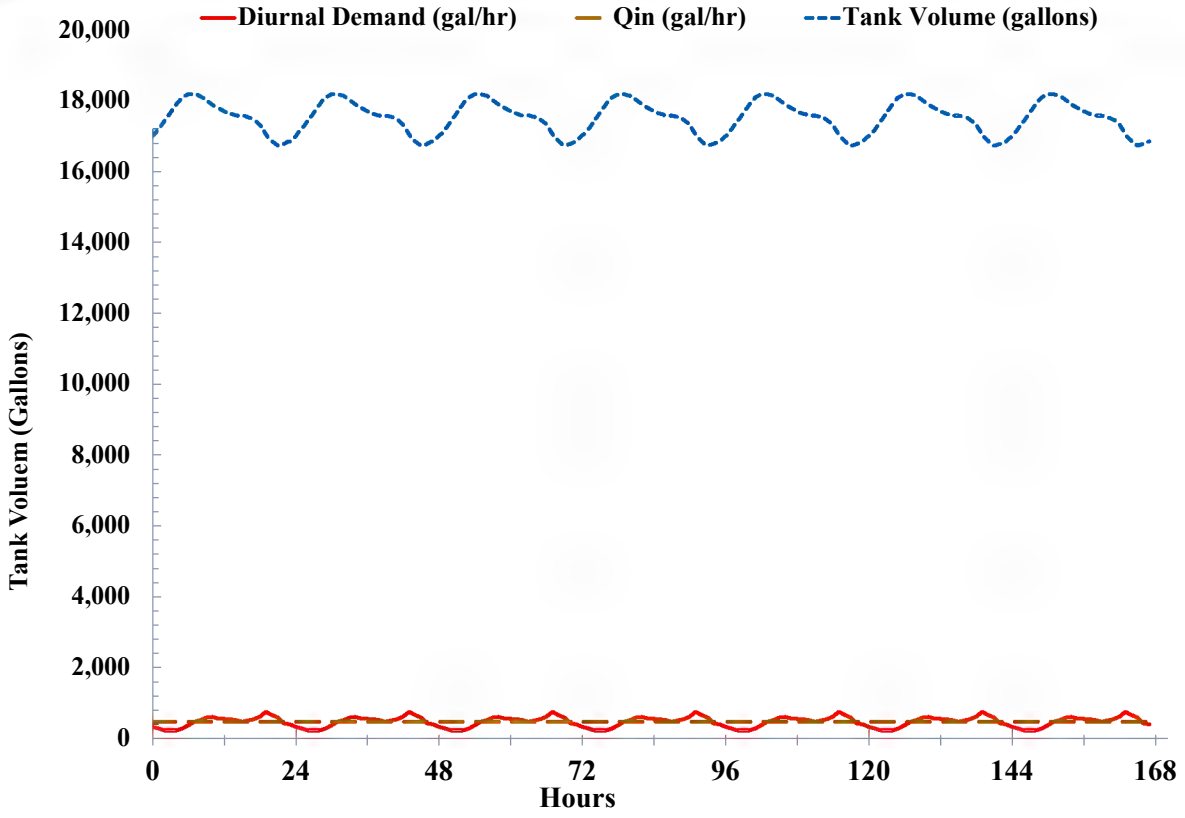
Domestic Water Tank Sizing & Diurnal Curve

Sequent Peak Method Computations
Domestic Tank Sizing - Kortum Ranch Subdivions
Annual Average Daily Demand

Peak Demand =	**12.7**	**gpm**
Base Demand =	**7.94**	**gpm**
Tank Volume =	**20,000**	**gallons**

Supply =	**7.94**	**gpm**
Net 24-hr Volume =	**11,434**	**gallons**

Hour	Base Demand (gal/hr)	Diurnal Factor	Dirunal Demand (gal/hr)	Inflow (gal/hr)	Mass Flow (In-Out)	Mass Flow < 0 (gpm)	Mass Flow > 0 (gpm)	Instantneous Tank Volume (gallons)
0	476	0.70	333	476	143	0	143	17000
1	476	0.60	286	476	191	0	191	17191
2	476	0.50	238	476	238	0	238	17429
3	476	0.50	238	476	238	0	238	17667
4	476	0.50	238	476	238	0	238	17905
5	476	0.60	286	476	191	0	191	18096
6	476	0.80	381	476	95	0	95	18191
7	476	1.00	476	476	0	0	0	18191
8	476	1.10	524	476	-48	48	0	18143
9	476	1.25	596	476	-119	119	0	18024
10	476	1.28	610	476	-133	133	0	17891
11	476	1.20	572	476	-95	95	0	17796
12	476	1.18	562	476	-86	86	0	17710
13 (1)	476	1.16	553	476	-76	76	0	17634
14 (2)	476	1.10	524	476	-48	48	0	17586
15 (3)	476	1.00	476	476	0	0	0	17586
16 (4)	476	1.08	515	476	-38	38	0	17548
17 (5)	476	1.15	548	476	-71	71	0	17476
18 (6)	476	1.30	619	476	-143	143	0	17333
19 (7)	476	1.60	762	476	-286	286	0	17048
20 (8)	476	1.40	667	476	-191	191	0	16857
21 (9)	476	1.25	596	476	-119	119	0	16738
22 (10)	476	0.90	429	476	48	0	48	16786
23 (11)	476	0.85	405	476	71	0	71	16857

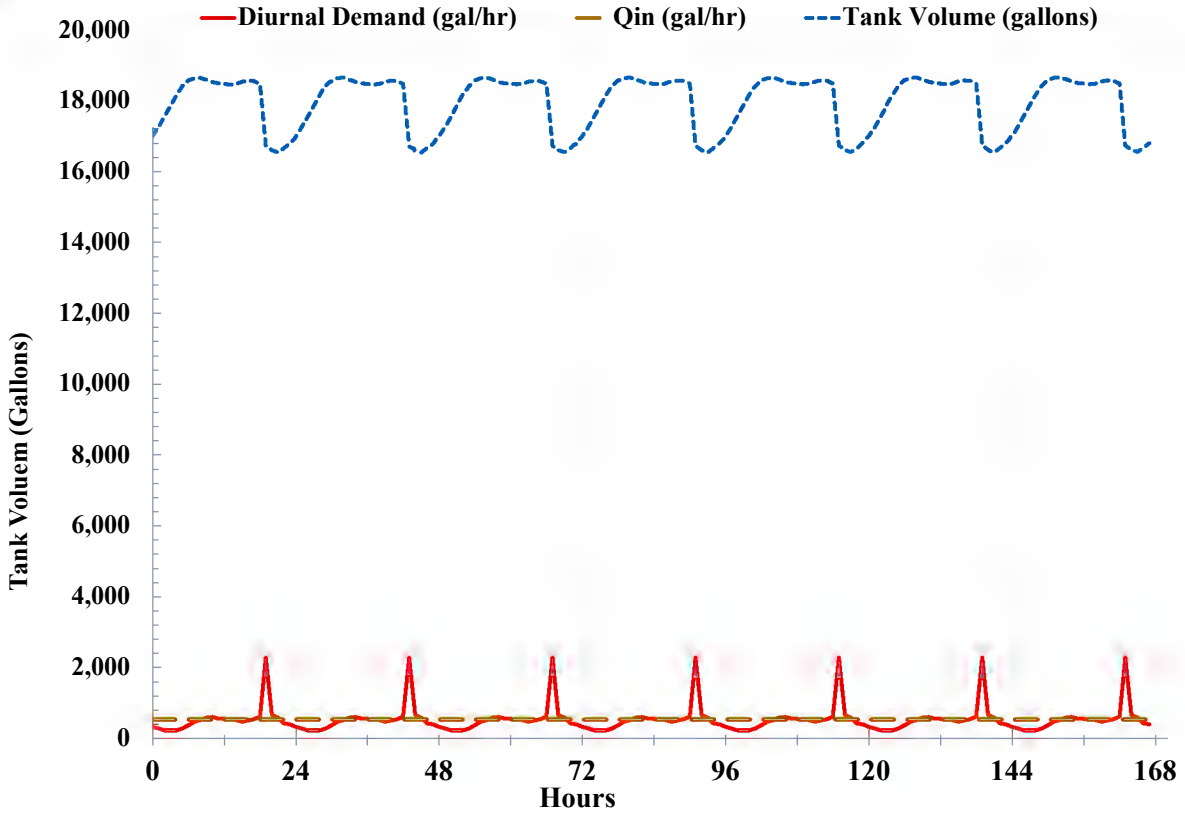


Sequent Peak Method Computations
Domestic Tank Sizing - Kortum Ranch Subdivions
Annual Average Daily Demand - With High Peak Use

Peak Demand =	12.7	gpm
Base Demand =	7.94	gpm
Tank Volume =	20,000	gallons

Supply =	9.00	gpm
Net 24-hr Volume =	12,958	gallons

Hour	Base Demand (gal/hr)	Diurnal Factor	Dirunal Demand (gal/hr)	Inflow (gal/hr)	Mass Flow (In-Out)	Mass Flow < 0 (gpm)	Mass Flow > 0 (gpm)	Instantneous Tank Volume (gallons)
0	476	0.70	333	540	207	0	207	17006
1	476	0.60	286	540	254	0	254	17260
2	476	0.50	238	540	302	0	302	17562
3	476	0.50	238	540	302	0	302	17864
4	476	0.50	238	540	302	0	302	18165
5	476	0.60	286	540	254	0	254	18419
6	476	0.80	381	540	159	0	159	18578
7	476	1.00	476	540	64	0	64	18642
8	476	1.10	524	540	16	0	16	18658
9	476	1.25	596	540	-56	56	0	18602
10	476	1.28	610	540	-70	70	0	18533
11	476	1.20	572	540	-32	32	0	18501
12	476	1.18	562	540	-22	22	0	18479
13 (1)	476	1.16	553	540	-13	13	0	18466
14 (2)	476	1.10	524	540	16	0	16	18482
15 (3)	476	1.00	476	540	64	0	64	18546
16 (4)	476	1.08	515	540	25	0	25	18571
17 (5)	476	1.15	548	540	-8	8	0	18563
18 (6)	476	1.30	619	540	-79	79	0	18484
19 (7)	476	4.80	2287	540	-1747	1747	0	16737
20 (8)	476	1.40	667	540	-127	127	0	16610
21 (9)	476	1.25	596	540	-56	56	0	16555
22 (10)	476	0.90	429	540	111	0	111	16666
23 (11)	476	0.85	405	540	135	0	135	16801



U.S. Fire Administration

Water Supply Systems and Evaluation Methods

Volume II: Water Supply Evaluation Methods

October 2008

FEMA

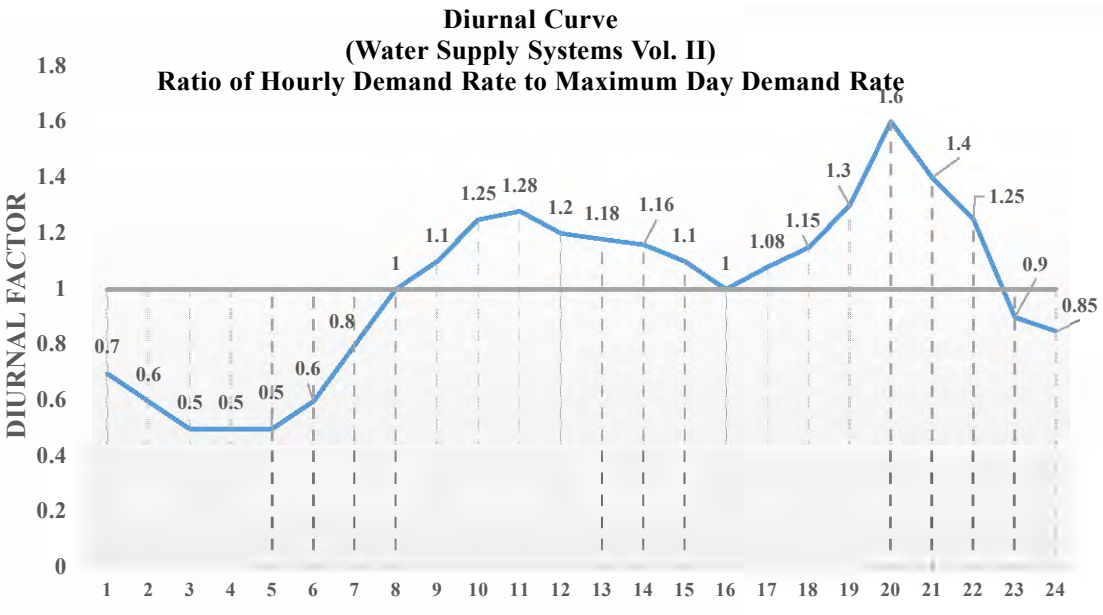
Table 4-1

Water Use and Storage Depletion of Maximum Day in a Typical Municipality

Hour	Ratio of Hourly Demand Rate To Maximum Day Demand Rate	Hourly Variation in Distribution Storage Reserve *mil gal*	Cumulative Storage Depletion *mil gal*
7-8 a.m.	1.00	-0.00	0.00
8-9	1.10	-0.10	0.10
9-10	1.25	-0.25	0.35
10-11	1.28	-0.28	0.63
11-12	1.20	-0.20	0.83
12-1 p.m.	1.18	-0.18	1.01
1-2	1.16	-0.16	1.17
2-3	1.10	-0.10	1.27
3-4	1.00	-0.00	1.27
4-5	1.08	-0.08	1.35
5-6	1.15	-0.15	1.50
6-7	1.30	-0.30	1.80
7-8	1.60	-0.60	2.40
8-9	1.40	-0.40	2.80
9-10	1.25	-0.25	3.05**
10-11	0.90	+0.10	2.95
11-12	0.85	+0.15	2.80
12-1 a.m.	0.70	+0.30	2.50
1-2	0.60	+0.40	2.10
2-3	0.50	+0.50	1.60
3-4	0.50	+0.50	1.10
4-5	0.50	+0.50	0.60
5-6	0.60	+0.40	0.40
6-7	0.80	+0.20	0.20

*Average day, 16 mil gal; maximum day, 25 mil gal; constant hourly supply rate (at maximum day demand rate), 24 mgd or 1 mil gal/h.
**Maximum storage depletion.

Rarely can distribution storage be justified economically in an amount greater than will take care of normal daily variations and provide the needed reserve for fire protection and **minor** emergencies. In systems of moderate size, the amount of water storage available for equalizing water production is 30 to



Hour	Diurnal Factor	Base Factor
0	0.70	1
1	0.60	1
2	0.50	1
3	0.50	1
4	0.50	1
5	0.60	1
6	0.80	1
7	1.00	1
8	1.10	1
9	1.25	1
10	1.28	1
11	1.20	1
12	1.18	1
13	1.16	1
14	1.10	1
15	1.00	1
16	1.08	1
17	1.15	1
18	1.30	1
19	1.60	1
20	1.40	1
21	1.25	1
22	0.90	1
23	0.85	1