COASTLAND
CIVIL ENGINEERING - CONSTRUCTION MANAGEMENT - BUILDING DEPARTMENT SERVICES

Memorandum

Date: **July 12, 2018**

To: **Steve Mack**
General Manager
Sweetwater Springs Water District

From: **Steven Van Saun, PE**

Subject: **Guernewood Park Resort Project Impact Analysis**

At the request of the District, Coastland Civil Engineering (CCE) was asked to evaluate the hydraulic performance of the existing water system and potential impacts of the proposed Guernewood Park Resort located at 17155 Highway 116, Guerneville, CA.

The District maintains two independent water systems; Guerneville and Monte Rio. The proposed resort would be served by the Guerneville system and is comprised of thirteen pressure zones. The resort would be served by the Main Pressure Zone and our analysis pertains to this zone only. The analysis includes modeling the hydraulic capacity and water storage capacity under both existing conditions and with future resort demands. The need for improvements to the existing water system was also evaluated.

Hydraulic Modeling for Domestic and Fire Demands

The existing Main Pressure Zone was modeled using KY Pipe2008 hydraulic modeling software. Existing water system infrastructure information was obtained from the available District's GIS information, record drawings, and input from District staff. Surface elevations for the model were obtained using Google Earth software. Two scenarios were considered in the existing model; daily average demand and peak demand. District staff indicated the existing water storage tanks typically fluctuate a few feet in water surface elevation and were assumed to be at 90% capacity for modeling purposes.

Existing daily average and peak demands were derived from ten years (2007-2016) of water production data provided by the District for the entire Guerneville system. The demands for the Main Pressure Zone were allocated using a percentage of total service connections of the entire system. The entire Guerneville System has 2,725 connections with the Main Pressure Zone having 2,331 connections or 86%. Table 1 summarizes the existing average and largest peak daily demand for the past ten years. After the model was complete, CCE compared the model output and existing hydrant flow testing information and found the model results to be in substantial conformance with the field data.

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Table 1 - Existing Daily Average and Peak Demands

	Guerneville System	Main Pressure Zone
Average Daily Flow (gal)	525,833	452,216
Average Daily Demand (gpm)*	730	624
Peak Daily Flow (gal)	1,010,000	863,550
Peak Daily Demand (gpm)*	1,403	1,200

*Assuming a 12-hour day.

BKF Engineers (BKF) provided the anticipated average daily and peak demands for the resort which were added to the model at the project site. The anticipated irrigation usage was included in these demands. BKF also provided the preliminary design of the water line improvements, including hydrant locations, which were also added to the model. Again, two scenarios were analyzed in the proposed condition model; daily average demand and peak demand. Each scenario included modeling the available fire flow at the project site with both existing and proposed demands. BKF provided a required fire flow demand of 2,875 gpm for four hours and have indicated this flow rate is based on the 2016 California Fire Code. BKF has also indicated that they have confirmed these requirements with County Fire. A summary of flow demands used in the proposed model is included in Table 2.

Table 2 – Proposed Resort Demands

Average Daily Demand (gpm)*	172
Peak Daily Demand (gpm)**	227
Fire Flow (gpm for 4 hours)**	2,875

*Calculated by dividing the peak daily demand by a peaking factor of 1.5.
**Provided by BKF Engineers.

The 2016 California Fire Code requires a project to provide the required fire flow while maintaining a minimum of 20 psi of residual pressure in the water line. As stated previously the model was run for both the daily average daily and peak demand scenarios and analyzed whether sufficient fire flow is available. According to the model, the existing water system is capable of providing the required fire flow to the project site, approximately 1,500 gpm at each of the proposed hydrants for a total of 3,000 gpm. A summary of the proposed model results is included in Table 3. The proposed fire line was modeled without a double detector check valve (DDCV). The District has indicated they would not require a DDCV for this project. If a DDCV is installed, it will increase the pressure loss at the site and lower the residual pressure and further analysis of these impacts would be required.

Table 3 – Proposed Model Results

Scenario	Hydrant Location	Flowrate/Demand at Hydrant (gpm)	Residual Pressure (psi)
Average Daily Demand	Guernewood Park Resort (H-1)	1,506	41.4
	Guernewood Park Resort (H-2)	1,501	44.1
Peak Daily Demand	Guernewood Park Resort (H-1)	1,502	28.4
	Guernewood Park Resort (H-2)	1,503	30.5

Water Storage Analysis

The California Regulations Related to Drinking Water requires a public water system's water sources to have the capacity to meet both the system's maximum day demand (MDD) and four hours of peak hourly demand (PHD). The greater volume of the two will set the required volume of water storage. The water system is also required to have the required amount of volume of fire flow available.

The PHD was calculated assuming the maximum daily demand of 863,550 gallons would occur over a twelve-hour day and multiplied by a peaking factor of 1.5. The PHD was calculated to be 1,799 gpm. Four hours of the PHD flow would require 431,775 gallons. The volume is less than the MDD, therefore the required water storage is controlled by the MDD.

The required fire flow volume was calculated assuming the District's wells would not have full power in an emergency event for an added factor of safety. The District does have backup power that is capable of running one well with an output of approximately 550 gpm. For comparison analysis a required fire flow of 2,000 gpm for two hours was used for existing conditions. When considering the backup power being able to provide 550 gpm, a fire flow rate of 1,450 gpm for two hours was used to compute the required fire flow volume. Using this reduced fire flow, a volume of 174,000 gallons was computed.

When considering the resort's fire flow demand, the backup well flow was also considered. The 2,875 gpm provided by BKF was reduced to 2,325 gpm for four hours. Using this reduced fire flow, a volume of 558,000 gallons was computed.

As noted previously water production data from the last ten years (2007-2016) was analyzed to determine the values of the maximum day demand and average day demand, summarized in Table 1. Within the main pressure zone there are currently eleven water storage tanks, of various volumes. The existing tanks and corresponding volumes are included in Table 4.

Table 4 – Existing Storage Facilities

Name	Capacity (gal)
Highland # 1	380,000
Highland # 2	355,000
Drake / AKA Redwood Lane	130,000
Gonfotti # 1	70,000
Gonfotti # 2	70,000
Hay Lane	10,000
Canyon 4	50,000
Canyon 6	15,000
Rio Nido Tank / Canyon 7	10,000
Park Avenue	17,000
Eagles Nest	10,400
Total:	1,117,400

The available water storage was evaluated for both the existing conditions and after the resort is constructed. The existing conditions and resort demands are summarized in Table 5. Under existing conditions, the available water supply is adequate for the main pressure zone with a

surplus of 79,850 gallons. When considering the future resort demands, the existing water supply is inadequate with a deficit of 325,956 gallons. The required storage evaluation is summarized in Tables 6 and 7 below.

Table 5 – Water Demands – Guerneville System

	Existing*		Resort Demands	
	Overall System	Main Pressure Zone	Guernewood Park Resort**	Main Pressure Zone Total
Maximum Day Demand (GPD)	1,010,000	863,550	21,806	885,356
Average Day Demand (GPD)	525,833	449,587	21,806	471,393

*Based on past 10 years of flow data from Sweetwater Springs Water District

**Demands provided by BKF Engineers

Table 6 - Existing Storage Analysis

Scenario	Maximum Daily Demand (MDD)	Fire Flow*	Total Req. Volume, Gallons	Existing Tank Volume, Gallons	Deficit/ Surplus, Gallons
Existing	863,550	174,000	1,037,550	1,117,400	79,850

*1,450 gpm for 2 hours (2,000 gpm for 2 hours reduced by 550 gpm assuming one well is running on backup power)

Table 7 - Required Storage Analysis

Scenario	Maximum Daily Demand (MDD)	Fire Flow**	Total Req. Volume, Gallons	Existing Tank Volume, Gallons	Deficit/ Surplus, Gallons
Existing & Resort Demands	885,356	558,000	1,443,356	1,117,400	-325,956

**Required fire flow provided by BKF Engineers (2,875 gpm for 4 hours reduced by 550 gpm assuming one well is running on backup power)

Conclusions

Our analysis of the existing water system indicates that the existing water improvements are sufficient to provide the required fire flow to the project site while providing a minimum of 20 psi of residual pressure. Before the project can be approved the onsite water improvements must be submitted and approved by both the District, Sonoma County PRMD, and County Fire.

The analysis also found the existing water storage supply as being inadequate to support the proposed resort. In order to provide sufficient storage a new water storage tank or tanks will be required within the main pressure zone. This analysis indicates a new tank or tanks will need to have a volume exceeding 325,956 gallons. Currently there are no planned capital improvement projects within the District to increase the available water storage capacity.