



SUMMIT ENGINEERING INC.

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December 8, 2011

John McDowell
Napa County Conservation, Development & Planning Department
1195 Third Street, Room 210
Napa, CA 94559

Re: Aetna Springs
1600 Aetna Springs Road, Pope Valley
Project Number 2011084

Dear John:

We understand that you have requested clarification regarding potential impacts to the groundwater and surface water flows based on proposed water use and reuse at Aetna Springs resort and golf course. The following is our response to that request.

RUNOFF ESTIMATION

We have made a conservative estimate of the drainage area contributing to the groundwater basin of 2,275 acres. We anticipate that a portion of the storm water that falls on this area has a potential to contribute to the storm water recharge. It is assumed that the drainage area contains approximately 95% pervious (undeveloped) surface. We have divided the drainage area into 2 sub-areas (758 acres of slopes below 10% and 1517 acres of slopes up to 75%). Napa County Public Works Road and Street Standards method for determining runoff was utilized for determining the anticipated recharge rate. The volume of water that falls on the area which does not produce surface runoff or evaporate was considered to infiltrate and recharge the ground water supply. The area receives approximately 40" of rainfall per year.

Anticipated runoff for steep slopes:

1517 acres

40" (3.33') annual rainfall

0.30 weighted C value for runoff

0.70 weighted non-runoff rate (assumed)

Non-runoff volume: $1517 \times 3.33 \times 0.70 = 3,536$ ac-ft/yr

Anticipated runoff for valley floor:

758 acres

40" (3.33') annual rainfall

0.15 weighted C value for runoff

0.85 weighted non-runoff rate (assumed)

Non-runoff volume: $758 \times 3.33 \times 0.85 = 2,146$ ac-ft/yr

Therefore, the rainfall for the drainage area that does not produce runoff is $3,536 + 2,146 = 5,682$ acre feet per year.

Evapotranspiration potential between November and March when rainfall is anticipated is assumed to be 34% of the non-runoff volume or 1,932 acre feet per year per Zone 8 Inland San Francisco Bay Area, typical rainfall year, CIMS, DWR, 2001.

Therefore the volume anticipated to infiltrate and contribute to the ground water supply is:
 $5,682 - 1,932 = 3,750$ acre feet per year.

The groundwater extraction rate as determined by the Water Availability Analysis for the project, is anticipated to be 42.65 ac/ft/yr.

Based on the assumptions utilized and information presented above, we believe that it can be reasonably assumed that the anticipated groundwater extraction rate will not adversely impact the groundwater basin. This is because the anticipated groundwater extraction rate is less than the anticipated recharge rate. Therefore, it is our opinion that the proposed system will not have an adverse impact on the groundwater and surface water flows in the area.

SURFACE AND SUBSURFACE DISPOSAL OF TREATED WASTEWATER

In addition to the analysis above, the manner in which water is planned to be managed on site will further enhance groundwater recharge.

The Irrigation System for the resort property is proposed to operate in the following manner:

1. Groundwater will supply the domestic water system at the resort
2. Domestic water used at the resort will be collected in the sanitary sewer system and directed to the sanitary treatment system
3. The sanitary wastewater will be treated and directed to a treated effluent storage tank before being directed to one of the following two processes
 - a. Disposed of through a subsurface system during wet weather conditions or
 - b. Reused for golf course and landscape irrigation in and around the resort when wet weather conditions do not occur.

Surface and subsurface disposal of treated wastewater is not anticipated to have an impact on the quality of the surface or ground water due to the following measures:

- The sanitary effluent will be treated using a Membrane Bioreactor (MBR) or equivalent system and will provide a high quality effluent prior to being placed into the proposed storage tank.
- The resulting treated wastewater will be of irrigation quality, as the treatment will meet the requirements of Title 22 standards.
- Irrigation will not take place within the setbacks of existing wells and surface water as established by the State Regional Water Quality Control Board (RWQCB).
- Groundwater monitoring in the vicinity of the disposal areas following the guidelines outlined by RWQCB will be incorporated into the operation of the system.

The treatment method and conforming to state mandated guidelines will minimize the possibility of impacts to the surface water from the treated effluent.

This Irrigation System will considerably diminish the effective groundwater extraction rate for the following reasons:

- The water that is used and treated will be reused or disposed of onsite and have the opportunity to recharge the groundwater table.
- The reuse of treated effluent for golf course irrigation will decrease the reliance on surface water. The majority of the golf course irrigation is currently provided by the existing irrigation reservoir which is filled with storm water runoff during the winter months.

CONCLUSIONS

Based on the analysis and explanation above, we can reasonably conclude that the projected groundwater extraction rate will not adversely impact the groundwater basin, and thus will have no adverse effect on surface water flows.

Per your direction extensive studies, data collection, and analysis by a licensed hydrogeologist is not required for this site. Summit Engineering, Inc. does not provide or practice hydrogeology; therefore the findings are approximate in nature due to the assumptions utilized.

Sincerely,

A handwritten signature in blue ink, appearing to read 'Jasper L. Gehring', with a long horizontal flourish extending to the right.

Jasper Lewis-Gehring, P.E.
CIVIL DIVISION MANAGER

cc: Mohammad Javanbakht – Aetna Preserve