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January 21, 2007

Tom Lippe
329 Bryant Street, Suite 3D
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Re: DEIR for Rodgers/Upper Range Vineyard Project Conversion #02454-ECPA

Dear Mr. Lippe:

You have asked me to comment on the potential impacts of the proposed Upper Range Vineyard Project (Rodgers) conversion from oak woodland and grassland to vineyard. A Draft Environmental Impact Report (DEIR) has been prepared, dated December 2006. The DEIR gives the following overview of the project on page 2-1.

> This EIR analyzes the potential environmental impacts of implementing an Erosion Control Plan (#02-454-ECPA) for earthmoving activities associated with a new vineyard in Napa County, California. The Upper Range Vineyard Project – Rodgers Property would involve installing erosion control features and measures and the subsequent operations for a new approximately 161-acre vineyard on privately owned properties. (APNs 030-200-002, 030-130-008, 030-220-009, and 030-220-027/028/029/030 (formerly 030-220-001). The new vineyard would be situated on seven contiguous parcels totaling approximately 678 acres.
>
> The project site is located in the hills between the Silverado Trail and Lake Hennessey, about 2 miles northeast of Rutherford and 13 miles north of the City of Napa. The erosion control measures would be implemented in the proposed vineyard area, which would cover 161 acres (approximately 24 percent of the total 678 acres), while the existing site conditions would remain as is on 517 acres (approximately 76 percent of the total 678 acres). The vineyard layout was designed by the property owners to minimize the need for grading and tree removal.
>
> A new 10,000-gallon water tank and irrigation line would be installed for the vineyard. Ground water would be pumped from an existing well and be stored in the water tank. The existing well would also be shared and provide water to the Rutherford Volunteer Fire Department facility on Silverado Trail. The Rutherford Volunteer Fire facility would have their own separate 10,000-gallon water tank that would be screened from view by existing trees.

## Project Alternative

According to page 6-2 of the DEIR:

> The two alternatives to the Project discussed in this chapter include the following:

- The No Project Alternative, which assumes the continuation of existing conditions on the Project site; and
- The Resource Conservation Alternative, which would avoid disturbance of 0.26 acres native perennial grassland near Silverado Trail by reducing the size of Vineyard Block 14; and would avoid disturbance of 1.37 acres serpentine grassland by eliminating Vineyard Block 52 from development.

The project parcel is currently being grazed by cattle in spring and summer. Grazing will continue after installing the vineyards. (DEIR page 3-1).

> The Napa County Land Use Plan shows the project parcels in an area designated Agriculture, Watershed, and Open Space (AWOS) and zoned Agricultural Watershed (AW). The properties are currently grazed by cattle during spring and summer with some supplemental feed. The cattle are moved off the properties during the fall and winter to allow the vegetation to grow back. The grazing is mainly to keep vegetation in check, as the cattle provide a "natural lawn mower", and to reduce the potential for a wildfire. A reduced number of cattle would continue to be grazed on the non-vineyard portions of the properties

Trso (2006, page 15) evaluates two alternatives; ES Alternative 1 is the continuation of livestock grazing in addition to the vineyard installation; ES Alternative 2 is the phasing out of the grazing and installation of the vineyard. Trso's ES Alternative 1 is similar to the Resource Conservation Alternative discussed in the DEIR.

A reasonable project alternative, that has **not** been included in the DEIR, is the vineyard plus grazing with improved practices to reduce the water quality impacts of the grazing. TMDLs for sediment and nutrients are being prepared for the Napa River. A TMDL for pathogens was adopted by the San Francisco Bay Regional Water Quality Control Board in November 2006. Livestock grazing contributes to all three impairments, as noted on the RWQCB web page for each TMDL.

An example of an improved grazing practice would be to exclude livestock from all riparian zones. Excluding livestock from riparian zones reduces streambank erosion and reduces the chance of waste from livestock being delivered directly to a waterbody. Excluding livestock from riparian areas would be a step towards achieving the objectives of the sediment, nutrient and pathogen TMDLs. Improving the management of the livestock grazing would appear to be of significant environmental value and would improve water quality on and off-site.

By 2010, the pathogen TMDL seeks to have owners of grazing lands:

> Submit a Report of Waste Discharge to the Water Board that provides the following: a description of the facility; identification of necessary site-specific grazing management measures to reduce animal waste runoff; and an implementation schedule for identified management measures

In addition to livestock grazing being cited as a water quality problem in the three Napa River TMDLs, the DEIR notes that the Napa County Conservation and Space Element (1998) and the Napa River Watershed Owner's Manual (Napa County Resources Conservation District, 1996) call for improved grazing practices.

According to Trso (2006) three of the five drainage basins he identifies on the property are fully disconnected from the Conn Creek or Lake Hennessey. For example, the Rogers Southeast Gulch catchment is disconnected from Conn Creek by disbursing on the valley floor between Silverado Trail and Conn Creek. The flood waters of Rodgers Southeast Gulch soak into the valley floor and deposit any sediment load. However, contaminates such as nutrients and pathogens are then delivered to the subsurface where they may potentially be transported to Conn Creek. Therefore, improved grazing management practices should be implemented in all areas grazed by livestock.

The above discussion supports the claim that the environmentally superior alternative project would be the combination of improved grazing practices with the Resource Conservation Alternative identified in the DEIR. The Resource Conservation Alternative plus improved grazing practices is a reasonable project alternative since it will help the landowner comply with the pathogen TMDL by implementing improved grazing practices. In addition, it is presumed that the sediment and the nutrient TMDLs will also seek to improve grazing practices when they are adopted.

## ECP Narrative

The ECP Narrative that is included in the DEIR is dated October 2002 and so does not accurately reflect changes in the project made since then. For example, the proposed mechanical contouring is not described in the ECP Narrative. The DEIR does not give any information about the specific details required to implement the proposed mechanical contouring. There is no indication of the maximum fill depth required to accomplish the,

> The mechanical contouring proposed here involves the construction of subtle cross-slope outsloped terrace benches.

Will cut or fill-slopes be created by the mechanical contouring? If so will the cut or fill-slopes be a source of sediment?

## Water quality

The map on page 4.4-16 of the DEIR does not identify the location of the Napa-3 sampling site. Figure 4-1 in Appendix C, Hydrologic Evaluation, shows that Napa-3 is to the south east of Yountville.

The Napa-1 and Napa-2 sampling sites found 2, 4-DB a Chlorinated Herbicide in concentration of 0.25 ug/L and conclude that there is no problem since no standard has been set for this pollutant by the local RWQCB. However, page 4-3 of Appendix C by *HIS* notes that:

> These samples were collected near the end of the rainy season. Samples collected during the first few runoff events at the beginning of the rainy season may show more contaminants.

Besides showing more contaminates, it is likely that samples collected earlier in the rainy season would have higher concentrations of the detected contaminates. Furthermore, the fact that no standard has been set for 2, 4 DB does not demonstrate that there is no environmental impact from the chemical.

The water quality sampling methodology is not described. There is no indication of whether the samples were collected as surface grab samples or if a more rigorous sampling protocol was used. The samples are described as “storm water runoff samples” but there is no discussion of when the samples were collected relative to a storm event or the size of the storm event. For example, when were the samples collected relative to the peak in water discharge? When were they collected relative to the peak rainfall that generated the storm runoff event? There is no indication of the relative stream discharge when the samples were collected. Many contaminates have higher concentrations during flood events. Concentration of pollutants can also vary substantially during a storm event. The water quality samples that are presented in the DEIR can not be used to demonstrate that there are no water-quality problems associated with vineyards. The water quality samples do indicate that agricultural chemicals can travel from the application site to the stream channel network.

The chemical, pathogen and nutrient load of the water leaving the project property has not been discussed. Given the fact that the land is used for livestock grazing, it is likely that storm water runoff from the project property carries nutrients and pathogens in addition to sediment. After the vineyards are installed, runoff from the project may also carry agricultural chemicals. The surface flow disconnection in three of the streams may not prevent the chemical, nutrients and pathogens from the project property reaching Conn Creek. Some types of agricultural chemical, nutrients and pathogens can be transported by subsurface water. The general direction of groundwater flow is from the project property, across Silverado Trail, towards Conn Creek and the Napa River. The DEIR has not address the potential for subsurface delivery of chemicals, nutrients or pathogens to Conn Creek or the Napa River.

## Flooding

Table 2-1 *Comparative Summary of Environmental Impacts* on page 2-23 notes that:

> Peak discharge increases are predicted in two catchments, Rodgers Southeast Gulch and Sage Canyon Road Gulch, under the post-project conditions. Because of natural landforms, the Rodgers Southeast Gulch Catchment is naturally disconnected from Conn Creek and Napa River. Therefore, there would be no runoff impacts to these waterbodies. Additionally, about 20% of the predicted increase in the catchment runoff would occur **above the Rodgers South Pond, and therefore would be stored on-site.** However, Sage Canyon Road Gulch is fully connected to Conn Creek for delivery of runoff and sediment. Unless mitigated, the predicted increases within the Sage Canyon Road Gulch Catchment would be transmitted to Conn Creek and the Napa River. **Since Napa County DPW conducted maintenance operations along Silverado Trail, stormwater drainage is not an immediate concern**. (Emphasis Added)
>
> These increases in peak discharge and volume were determined to be significant due to the proximity of Silverado Trail, Conn Creek and the Napa River.

The DEIR claims that South Rodgers Pond would be able to store increased runoff generated upslope of the pond. However, the pond volume is small and so it is reasonable to expect the pond to be full prior to significant runoff events. There is no justification given for the assumption that South Rodgers Pond would be able to store substantial volumes of runoff generated during significant flood events.

According to page 2-6 of the *Draft Hydrologic Evaluation* prepared by HIS dated October 2005:

> Any increase in runoff from the western half of the property would have an adverse impact to Silverado Trail, which already floods during storm events.

Napa County DPW appears to have cleaned the culverts and stream channels that cross Silverado Trail between October 2005 and December 2006 when the DEIR was published. Prior to the culvert/channel maintenance by Napa County DPW, there was flooding along Silverado Trail. Trso's Figure 8 on page F-65 and Figure 12 on page F-66 shows cobbles inside two 12" culverts under Silverado Trail. The presence of the cobble inside the small 12" culverts suggests that the culverts' capacity may have been significantly reduced by the cobble and may have contributed to the flooding on Silverado Trail, prior to maintenance by the County. Trso's Figure 5 on page F-65 shows a mix of gravel, sand and silt resting on the grate of a drop inlet along Silverado Trail suggesting that the pipe below the grate on the drop inlet may have lost capacity due to sediment deposition. Any increase in sediment or water discharge from the Upper Range Vineyard Project that is delivered to the culvert/channels under or near Silverado Trail are likely contribute to flooding on Silverado Trail, which would be a significant environmental impact.

Trso (2006) notes that:

> Due to the disconnectivity of the RS and RSE gulches, additional trapping of the sediment exported from the five watersheds **occurs to the west of Silverado Trail**, in the valley floor area of Napa River. The property runoff and sediment yield from these two watersheds do not reach Conn Creek. The RS Gulch runoff and sediment yield are fully disconnected from delivery to Conn Creek

> due to the presence of a wastewater treatment pond near Silverado Trail. The runoff and sediment yield from the RSE Gulch naturally fan out along the valley alluvial fan. An estimated 217.5 tons (17%) of the sediment yield from the RS and RSE gulch drainages are trapped annually to the west of Silverado Trail (Table 13). The additional 217.5 tons of sediment trapped amounts to 18.0% of the total property sediment delivery of 1,207.4 tons/yr. The combined sediment trapping by the Rodgers ponds and within the Napa River valley floor amounts to 302.1 tons/yr, or 25.0% of the total property sediment delivery, under the current conditions. (Emphasis Added)

The disconnectivity of the RS and RSE gulches currently occur downslope (to the west) of Silverado Trail. The maintenance of the culverts/channels by Napa County DPW has likely increased sediment trap efficiency of the channels where they cross Silverado Trail. Therefore, it is likely that the maintenance by Napa County DPW has shifted the site of sediment deposition from the west of Silverado Trail to the immediate vicinity of Silverado Trail: thereby increasing the potential for a project related flooding along Silverado Trail. A significant portion of the sediment load from the project will likely be trapped in the culverts/channels under or near Silverado Trail. Sediment deposition in the culverts/channels under or near Silverado Trail would decrease their capacity and eventually lead to flooding of Silverado Trail. The conclusion that stormwater drainage in the vicinity of Silverado Trail is not an immediate concern is misleading and gives the erroneous appearance that there is no environmental impact from the sediment load and storm runoff from the project.

Increased water and sediment discharge from the project would be an adverse environmental impact unless mitigated. The proposed mitigation 4.4-6 has not been adequately described and so it is not possible to determine if the mitigation is feasible or if the mitigation would cause adverse impacts. Until an adequate description is given for mitigation 4.6-6, mechanical contouring, it must be assumed that the increased water and sediment discharge from the project have not been mitigated.

There are two ponds on the property referred to as the North Rodgers Pond and the South Rodgers pond. Burke (Draft Hydrologic Evaluation, 2005) says, on page 1-3, that the two ponds each cover 0.25 acres. Trso (2006, page 13) states that:

> Additionally, about 20% of the predicted increase in the catchment runoff would occur above the Rodgers South Pond, and therefore would be stored on-site.

No proof is offered that South Rodgers Pond has sufficient volume to contain all flood runoff generated upslope of the pond under all conditions. In doing a flood analysis the conservative approach is to assume that the pond would be filled prior to significant storm events and that all flood runoff would be passed downstream. Significant storm events tend to occur in wet years with multiple events. Therefore, the conservative assumption of the pond being full at the start of a storm event is reasonable. The pond would capture coarse sediment from only 7% of the watershed area of Rodgers Southeast Gulch (Trso 2006, page 3).

Without mitigation, the project will result in increased water and sediment discharges at Silverado Trail. The DEIR proposes to use mechanical contouring as a mitigation to reduce runoff. Mechanical contouring is proposed for areas within the Sage Canyon Road Gulch and Rodgers Southeast Gulch watersheds, as shown on Figure 47 of Trso, 2006. No information is give about the design of the mechanical contouring. The maximum depth of fill or cuts required for the mechanical contouring is not presented, the grade of the planting surface is not given, the grade of the cut and fill faces are not given.

The DEIR (Table 2-1 on page 2-23 and on page 4.4-22) describes the mechanical contouring as follows; note the lack of design details.

**Mitigation Measure 4.4-6. Mechanical Contouring**

> To mitigate for increased volume and peak flow runoff within the Rodgers Southeast Gulch and the Sage Canyon Road Gulch Catchments, the applicant will incorporate mechanical contouring techniques for portions of the proposed vineyard blocks within the relevant catchments (Figure 4.4-3). Mechanical contouring involves the construction of subtle cross-slope, outsloped terrace benches. Such features prevent the concentration of runoff and promote infiltration. In addition, the soil would be amended to ensure the effectiveness of mechanical contouring in reducing volume and peak flow runoff. Assuming that the contouring would take place within the relevant catchment portions of the proposed vineyard blocks, two additional WinTR-55 model runs were performed. These model runs predicted there would be a zero increase in peak flow discharge within and off these two catchments, under the post-project conditions. The results of the peak flow discharge calculations, assuming installation of mitigation measures, are summarized in Tables 4.4-8 and 4.4-9.
>
> As Table 4.4-8 details, a slight decrease in peak flows would occur within the Rodgers Southeast Gulch Catchment, as the curve number for that catchment would decrease from 85 to 84 following the development of the vineyard. The decrease would range from 1.4% (the 100-year storm peak runoff) to 4.6% (the 2-year storm peak runoff). As shown in Table 4.4-9, within the Sage Canyon Road Gulch Catchment, peak flows would not change from existing conditions following the implementation of mitigation measures.

Footnote 10 on page 13 of Trso (2006) gives the area of the proposed mechanical contouring in the Sage Canyon Road Gulch and the Rodgers Southeast Gulch catchment:

> [10] The total acreages of the catchment portions of the relevant proposed vineyard blocks are: 6.1 acres within the Sage Canyon Road Gulch catchment, and 59.5 acres within the Rodgers Southeast Gulch catchment.

Mitigation measure 4.4-6 proposes to mechanically contour 59.5 acres of the 107.8 acres in the Rodgers Southeast Gulch watershed which represents 55% of the RSEG watershed. A total of 6.1 acres within the Sage Canyon Road Gulch watershed would be mechanically contoured which is about 30% of the Sage Canyon Gulch watershed. A total of 65.6 acres will be mechanically contoured which is about 54% of the entire 121 acre vineyard conversion. Thus the mechanical contouring represents a significant amount of grading, far more than is implied by the claim in the DEIR that grading would be minimized.

Page 2-2 and 2-3 of the DEIR state that:

> The vineyard layout was designed by the property owners to minimize the need for grading and tree removal.

Implementation of the proposed mechanical contouring mitigation would appear to nullify the claim that the vineyard layout minimizes the need for grading.

The total area that will be mechanically contoured suggests that significant adverse environmental impacts are likely to occur through implementation of Mitigation Measure 4.4-6. Mitigation 4.4-6 is not adequately described. The magnitude of any required cuts and fills are not given. A total of 65.6 acres of vineyard would be mechanically contoured or 54% of the total 121 acres of vineyard. It seems likely that such a significant amount of grading would have substantial cut and fill slopes which would be subject to erosion. It is likely that a significant volume of the material eroded from the cut and fill slopes would be delivered to the stream channel network. Therefore, the proposed mitigation is likely to have a significant adverse impact.

## Groundwater Recharge Rates

Burke (Draft Hydrologic Evaluation, October 2005) estimates the annual groundwater recharge rate for the entire Rodgers parcel. The calculation is based on rainfall data from the Department of Water Resources; runoff data from the USGS and evaporation data from the UC Farm Advisor. Burke calculates that the annual groundwater recharge is 5.4 inches per year or 0.45 acre-feet per year per acre. The entire Rodgers parcel is 678 acres thus, the entire parcel provides 305 acre-feet of groundwater recharge per year.

Burke (2005) estimates that the annual consumptive water use for the project based on the Suscol Springs North Project estimated water use rates of 0.75 acre-feet per year for hillside vineyards. Burke uses 175 acres of vineyard and the 0.75 acre-feet per year per acre of hillside vineyard to estimate the project water demand of 131 acre-feet per year. The project analyzed in the DEIR has 161 acres of vineyard which results in consumptive water use of 121 acre-feet per year.

On the scale of the entire Rodgers property the groundwater recharge rate exceeds the annual consumptive use. However, only a small portion of the property will provide groundwater recharge to the Rodgers production well. Burke's Zone 1 drains to Lake Hennessey and his Zone 2 drains to the portion of Conn Creek that runs along the northwest edge of the property. Therefore, it is very unlikely that groundwater recharge from either Zone 1 or Zone 2 will supply the pumping demand from the Rodgers well which is located in Zone 3. Burke's Zone 3 is a series of small watersheds that drain to Silverado Trail. Only a fraction of Zone 3 will supply groundwater recharge to the project supply well.

The well appears to be located in Rodgers Southeast Gulch (RSEG) which has a drainage area of 107.8 acres (Trso, 2006, page 3). The expected groundwater recharge from the Rodgers Southeast Gulch, assuming that the entire RSEG watershed is upslope of the well, would be:

0.45 acre-feet per acre per year x 107.8 acres = 48.51 acre-feet per year.

The well is to supply all of the water for the entire 161 acres of vineyard which, was estimated to be 121 acre-feet per year. The annual water use for the 161 acres of vineyard is about 2.5 times the estimated annual groundwater recharge of the Rodgers Southeast Gulch watershed.

The water budget for the RSEG watershed, which will actually supply groundwater recharge to the well, suggests that groundwater pumping to supply the proposed vineyard will result in a decline in local groundwater levels and will substantially interfere with groundwater recharge. Lowering local groundwater levels and interfering with recharge are both significant adverse environmental impacts according to CEQA Appendix G. On page 2-4 of the *Draft Hydrologic Evaluation*, Burke notes:

> b) Would the project substantially deplete groundwater supplies or interfere substantially with groundwater recharge?
>
> Significance Criteria
>
> Based on CEQA criteria, the project would have significant environmental impact if it were to:
>
> > 1) consume groundwater in excess of natural groundwater recharge rates, lowering local groundwater levels,

2) change recharge over large areas due to alteration of the infiltration characteristics of the land surface, lowering local groundwater levels,

3) reduce shallow flow to wetlands or summer base flows in nearby streams,

4) intercept shallow groundwater flow moving to seeps, wetlands, and waterways, or

5) affect the performance of nearby wells.

Burke's Figure 5-1 shows that there are three wells that appear to be located downslope of the Rodgers well. These wells appear to be at risk of significant adverse impact from the project since the Rodgers well is expected to pump about 2.5 times the estimated annual groundwater recharge delivered to the well from the RSEG watershed.

The DEIR does not present any mitigation to deal with the potential adverse environmental impacts from groundwater pumping.

## Water Availability Test

The Department of Public Works *Water Availability Analysis: Policy Report*, August 2003 describes the Phase II Water Availability Analysis as follows:

> The phase two analysis is commonly called an aquifer test or well test. It requires the pumping of the project well(s) at the maximum rate needed to meet project water demands and at the same time requires the monitoring of the immediate effects of groundwater pumping on a neighboring or monitoring well(s). The following requirements must be met when performing a phase two analysis:
>
> - An approved hydrogeologist, a list of which is on file with the Department of Public Works, must develop the test procedure. Upon approval of test procedures, the hydrologist will supervise the test and submit a report to the Department evaluating the impacts to neighboring static water levels.
> - A licensed well drilling contractor must perform the actual testing and monitor static and dynamic water levels of the project well and monitoring wells during the duration of the test, including the recovery phase of the project well and monitoring wells.
> - The test must be conducted long enough to stabilize the dynamic water level of the project well or include an analysis of what the impact of the continued pumping would have.
> - The applicant or agent must notify the Department at least 48 hours prior to conducting the test.
>
> Impact is unique to each project and will be evaluated on a case by case basis by the Department of Public Works.
>
> Any projects requiring a phase two analysis may also be required to install water meters to measure the actual amount of water consumed, and be required to find alternate water sources if their actual groundwater use exceeds the threshold for their property (see Appendix D).

It is not clear if the test was done according to the above criteria. Page 5-1 of the Draft Hydrologic Evaluation (Burke, 2005) states that,

> The water levels in the Rodgers, Pina, and Riboli wells were monitored periodically by Mr. Lincoln of Lincoln Agriculture Engineer LLC.

It is not clear if Mr. Lincoln is a licensed well drilling contractor in addition to being an engineer.

Driscoll (1986, p 534) gives the following discussion of well tests and aquifer tests. Definitions of terms follow the quote from Driscoll.

> Pumping tests may be conducted to determine (1) the performance characteristics of a well and (2) the hydraulic parameters of the **aquifer**. For a well-performance test, yield and **drawdown** are recorded so that the **specific capacity** can be calculated. These data, taken under controlled conditions, give a measure of the productive capacity of the completed well and also provide information needed for the selection of pumping equipment. An accurate test of a well before the pump is purchased pays for itself by assuring selection of a pump that will minimize power and maintenance costs. Many times, high pumping costs and unsatisfactory pump performance are erroneously charged to the well when these conditions really stem from an improperly selected pump.
>
> The second purpose of pumping tests is to provide data from which the principal factors of aquifer performance – **transmissivity** and **storage coefficient** – can be calculated. This type of test is called an aquifer test because it is primarily the aquifer characteristics that are being determined, even though the specific capacity of the well can also be calculated. Aquifer tests will predict (1) the effect of new withdrawals on existing wells, (2) the drawdowns in a well at future times and different discharges, and (3) the **radius of the cone of influence** for individual or multiple wells.

The following definition of terms is taken from Driscoll (1986).

- **Aquifer**: An aquifer is a saturated bed, formation, or group of formations which yield water in sufficient quantity and quality to be economically useful.
- **Confined Aquifer**: A confined aquifer is a formation in which the groundwater is isolated from atmospheric pressure at the point of discharge by impermeable geologic formations; confined groundwater is generally subject to pressure greater than atmospheric.
- **Coefficient of Storage**: The coefficient of storage represents the volume of water released from storage per unit of aquifer storage area per unit change in head. Head is the energy contained in water from elevation, pressure or velocity. The coefficient of storage is dimensionless.
- **Drawdown**: Drawdown is the difference, measured in feet or meters, between the static water level and the pumping water level.
- **Radius of the Cone of Influence**: The radius of influence is the horizontal distance from the center of the pumping well to the point where the drawdown from the pumping well becomes negligible.
- **Static Water Level**: This is the level at which water stands in a well when no water is being removed from the aquifer either by pumping or free flow. Generally, it is expressed as the distance from the ground surface (or from a reference point near the ground surface) to the water level in the well.
- **Specific Capacity**: Specific capacity of a well is its yield per unit of drawdown, usually expressed as gallons per minute per foot of drawdown, after a given time has elapsed, usually 24 hours.
- **Transmissivity**: The rate at which water is transmitted through a unit width of an aquifer under a unit hydraulic gradient. Transmissivity values are given in gallons per minute through a vertical section of an aquifer one foot wide and extending the full saturated height of the aquifer under a hydraulic gradient of 1.0 in the English Engineering system.

- **Unconfined Aquifer**: The water table of an unconfined aquifer is exposed to the atmosphere through openings in the overlying materials. An unconfined aquifer is also called a water table aquifer.

A well test is done to select the proper pump for the well and to determine the specific capacity of the well. A well test can not determine if the pumping well will cause environmental impacts.

An aquifer test is done to determine the principle factors of aquifer performance, also called aquifer characteristics. These factors can then be used to estimate the drawdown in the pumping well for any discharge and at any time in the future and determine if aquifer boundaries are present within the radius of influence of the well. These calculations would show if the aquifer has a sufficient volume of water and a sufficient rate of delivery to the well to satisfy the project water demand. For example, a properly conducted aquifer test could determine the drawdown in the Rodgers well after 6 months of pumping at 200 gpm to supply irrigation water for the proposed vineyard between May and October. In addition, a properly conducted aquifer test would detect if there were any boundaries in the aquifer which would limit flow to the well indicating a potentially insufficient volume of water.

Aquifer characteristics can also be used to estimate the drawdown in neighboring wells, caused by the pumping well, at any time in the future. The aquifer characteristics can also be used to estimate the radius of influence of the pumping well at any time.

A constant-rate aquifer test is done by pumping the well at a constant rate of discharge for 24 hours for a confined aquifer or for 72 hours for an unconfined aquifer (Driscoll, 1986). During this time, periodic drawdown measurements are taken in the pumped well and in observation wells. Measurement of barometric pressure is also done if the aquifer is confined. Fluctuation in barometric (atmospheric) pressure causes the static water surface in a well in a confined aquifer to rise or fall. So, drawdown in a well that penetrates a confined aquifer must be corrected for changes in barometric pressure. Recovery of the water surface should also be recorded after the pump is shut off at the conclusion of the test. Drawdown data are plotted versus the time since pumping began. Drawdown data from observation wells can be plotted against time since pumping began or against distance from the pumped well.

A step-drawdown test is done by progressively increasing the pumping rate at regular intervals. For example, the well may be pumped at 100 gpm for 2 hours, then at 200 gpm for 2 hours and then at 300 gpm for 2 more hours. Typically, three different pumping levels are tried but more steps can be done. The aquifer characteristics can be determined from the first pumping step. Driscoll (1986) notes that,

> … the validity of these values may be doubtful because they are based on data taken over such a short time. The real value in a step-drawdown test is that it shows the reduction in specific capacity with increasing yields.

Walton (1987) suggests the following procedure for a typical aquifer test for a confined aquifer:

- Day 1. water level measurements to establish antecedent trend.
- Day 2. 1-hour trial test to adjust equipment followed by a 1-hour recovery period; 3-hour step drawdown test to determine production well well-loss coefficient followed by a 20-hour recovery period.
- Day 3. 24-hour constant rate test to determine aquifer system hydraulic characteristics and boundary conditions.

- Day 4. 24-hour recovery test to verify aquifer system hydraulic characteristics and boundary conditions.

For an unconfined aquifer (water table aquifer) Walton's procedure would be modified by changing the 24-hour constant discharge test and the 24-hour recovery test to 72-hour tests.

The Rodgers/Upper Range Vineyard groundwater pumping test was a mix of a step-drawdown test and a constant-rate discharge test. However, instead of progressively *increasing* discharge, as in a standard step-drawdown test, the step-drawdown portion of the Rodgers/Upper Range pumping test was done by successively *decreasing* the discharge.

Standard texts such as Driscoll (1986) or Walton (1987) recommend that the pumping should have stopped after the step-drawdown test to allow the water surface to recover to the pre-test level prior to conducting the constant-rate discharge test. Driscoll (1986) notes that:

> Beginning a pumping test when the static water level is below normal may eliminate early data that show discharge or recharge boundaries. Without the early drawdown data, it may be impossible to obtain the correct transmissivity and storage parameters for the aquifer.

The phrase, "when the static water level is below normal" means when the water level in the well has not recovered to the pre-pumping level.

The observed drawdown in one of the neighboring wells (Riboli) was about 1.5 feet at the end of the pump test, approximately 31 hours and 20 minutes after the end of pumping. The drawdown began in the Riboli well sometime between 28 and 48 hours after the start of pumping. It is unknown if this is the maximum drawdown in the Riboli well since no further measurements were made. The report compares the 1.5 foot drawdown in the neighboring well to the 260 foot drawdown in the production well and concludes that there is no problem but they do not cite any County criteria for their claim of no significance.

Burke's (2005) water balance procedure estimates that the 161 acres of vineyards would require 121 acre-feet of water per year. The constant-discharge portion of the well test was done at approximately 200 gpm. A pumping rate of 1.0 acre-feet per day is equivalent to 226.3 gpm. Therefore, to produce a total volume of 121 acre-feet would take:

Days to pump 121 ac-ft = (121 ac-ft)/ ((200gpm) x (1.0 ac-ft/day)/ (226.3 gpm)) = 136.9 days

which is equivalent to 4.6 months.

The question that needs to be answered is, "will the drawdown in the Riboli well, after 4.6-months of continuous pumping of the Rodgers well, be significant?"

The drawdown data from an aquifer test can be used to estimate the drawdown after several months of pumping. Such a procedure would give a much better indication of whether the Rodgers well would have an adverse impact on the neighboring wells. Why was this not done?

Furthermore, the significance of the drawdown in the Riboli well, induced by pumping the Rodgers well, needs to be considered in light of the total drawdown that the Riboli well currently experiences, including drawdown caused by the operation of the Beckstoffer well and the Pina well. No information is given concerning the total drawdown in the Riboli well when all the neighboring wells are pumping. In addition, no information is given on the depth to the pump in the Riboli well which determines the maximum drawdown the well can experience and still produce.

No discussion is presented to explain why the water level in Riboli well increased just prior to the end of the test.

Standard texts on the design and analysis of aquifer tests such as Driscoll (1986) and Walton (1987) recommend that drawdown data be collected at frequent intervals early in the test and then at progressively longer intervals during the course of the test.

Table 1. Driscoll, page 553, recommends the following measurement intervals for the pumping well.

| Time Since Pumping Started | Time Interval Between Measurements minutes |
|---|---|
| 0 - 10 | 0.5 - 1 |
| 10 - 15 | 1 |
| 15 - 60 | 5 |
| 60 -300 | 30 |
| 300 - 1440 | 60 |
| 1440 - end of test | 480 (8 hours) |

Table 2. Driscoll, page 553, recommends the following drawdown measurement intervals for observation wells.

| Time Since Pumping Started | Time Interval Between Measurements minutes |
|---|---|
| 0 - 60 | 2 |
| 60 - 120 | 5 |
| 120 - 240 | 10 |
| 240 -360 | 30 |
| 360 - 1440 | 60 |
| 1440 - end of test | 480 (8 hours) |

Appendix C of Burke (2005) presents data from the aquifer test. The exact time pumping began is not presented in Appendix C. The exact time when pumping stopped is not presented in Appendix C either. According to the drawdown data presented in Appendix C, the first measurement of the water level in the Rodgers production well, recorded by the pressure transducer attached to the data logger, was about 6.5 hours after pumping began. Failure to give the exact time pumping began makes it impossible for reviewers to construct graphs of drawdown versus time since start of pumping. The pressure transducer/data-logger then measured the water level above the sensor at 5 minute intervals. A total of 12 depth-to-water measurements were apparently made during the 6.5 hours between the start of pumping and the first measurement made by the pressure transducer/data-logger. Table 1 indicates that a minimum of 32 drawdown measurements should be made in the pumping well during the first 6 hours of a test. According to Driscoll, the most important drawdown data comes from the early part of the test. Therefore, the frequency of drawdown (which can be calculated from the depth-to-water measurements)

measurements was not sufficient to accurately characterize the production well drawdown in the early portion of the aquifer test.

A total of 15 spot measurements from the Riboli well are presented in Appendix C of Burke (2005). Table 2 indicates that a total of 57 measurements should be made in the observation well during the pumping portion of the test. The discussion of the aquifer test indicates that a pressure transducer/data-logger was installed in the Riboli well that was programmed to collect water level data every five minutes. The data from the pressure transducer/data-logger is not presented in Appendix C. The final water level measurement of the Riboli well that is presented in Appendix C is 36.5 feet which 1.5 feet below the initial water level in the Riboli well. Since no additional measurements were made in the Riboli well, it is unknown how long it took for the water level in the Riboli well to recover to pre-test levels.

Water level recovery data can be used to verify the results of an aquifer test. For water level recovery data, drawdown is graphed versus the time since pumping stopped. Drawdown data during the water level recovery period should be collected at the same frequency as shown in Table 1. The heading “Time Since Pumping Started” would be changed to “Time Since Pumping Stopped” for the water level recovery data.

Drawdown is calculated as the difference between the water level during pumping and the trend of the water surface defined by the before-pumping and after-pumping water level measurements. Therefore, several water level measurements should be made before and after the well is pumped to accurately define any trend in water surface. The water level measurements in Appendix C of Burke, 2005, only show two measurements were made prior to the start of the test and only one measurement was made after the cessation of pumping. Such few measurements are not enough to accurately establish if there is any trend in the water surface level.

Barometric pressure data should also have been presented in Appendix C since the Rodgers well apparently affected the drawdown in the Riboli well which is about 1,000 feet away, indicating that the aquifer tapped by the Rodgers well is not a water table aquifer.

The Groundwater Pumping Analysis section in Burke 2005 does not present the drawdown data in technically useful way such as a graph of the drawdown versus time in the pumping well and monitoring well with time on a logarithmic scale. Aquifer test theory assumes that the drawdown from the pumping well will fall on a straight line when presented on a semi-logarithmic graph with time on the logarithmic scale and drawdown on the arithmetic scale. Deviations from a straight line offer important clues about the nature of the aquifer. Also the distance between all the wells is not given.

The drawdown data presented in Appendix C of Burke (2005) show that the well test was done between November 14 and November 19 of 2004. Aquifer analysis theory assumes that there is no recharge to the well (Driscoll, 1986) during the period of the test. Since the test was conducted in November, precipitation records for the month prior to the aquifer test should have been included.

Much more information about the affect of the project well could be presented than is given in the DEIR. The analysis presented in the DEIR does not appear to be sufficiently rigorous, according to standard texts such as Driscoll (1986) and Walton (1987), to support the conclusion of no significant adverse impact. The pumping test data is presented in a way that makes it impossible for a reviewer to determine if there is a potential for impact.

The DEIR has not demonstrated that the project complies with Appendix G of the CEQA Guidelines regarding a lowering of the groundwater table or interfering with the operation of neighboring wells.

## Cumulative Effects

On page 4.4-14 of the Draft EIR they discuss the criteria derived from Appendix G of the CEQA Guidelines. One of the criteria is:

> Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table.

The discussion of *Groundwater Recharge Rates,* presented above, demonstrates that the project well has the potential to cause a net deficit of the aquifer underlying the RSEG watershed and lower the static water level in neighboring wells.

The analysis does not address the cumulative impact of groundwater pumping on the North Valley Groundwater Basin to the west centered along the Napa River. The aquifer that the project well is tapping has not been described and it is unknown if that aquifer is connected to the North Valley Groundwater Basin. No analysis has been presented in the DEIR to demonstrate if the project well would have a cumulative adverse impact on the North Valley Groundwater Basin.

## Summary

The DEIR is seriously flawed. Review of the water budget calculation presented in Burke (2005) shows that the volume water needed to irrigate the vineyard is about 2.5 times the groundwater recharge expected from the Rodgers Southeast Gulch watershed which recharges the production well. The DEIR does not propose mitigation for this significant impact.

The Phase 2 Water Availability Analysis may not have been done to County standards since monitoring well data may have been collected by someone other than a licensed well drilling contractor.

The aquifer test data presented in Appendix C of Burke (2005) is incomplete. The data presented are not sufficient to support the aquifer test analysis as presented in standard texts such as Driscoll (1986) or Walton (1987). The analysis of the aquifer test data is not adequate to answer the question of whether pumping the Rodgers well at 200 gpm, for the 4.6 months required to produce the 121 acre-feet of water required to irrigate the proposed vineyard, will impact the neighboring wells.

The aquifer test analysis also does not establish if the aquifer can produce the required 121 acre-feet of water. That is, the test data were not analyzed to determine if there are any boundaries that would restrict the flow of groundwater near the well.

The DEIR did not consider the effect of the reduction of groundwater recharge from the property on the North Valley Groundwater Basin.

Mitigation 4.4-6 is not adequately described. The magnitude of any required cuts and fills are not given. A total of 65.6 acres of vineyard would be mechanically contoured or 54% of the total 121 acres of vineyard. It seems likely that such a significant amount of grading would have substantial cut and fill slopes which would be subject to erosion. It is likely that a significant volume of the material eroded from the cut and fill slopes would be delivered to the stream channel network. Therefore, the proposed mitigation is likely to have a significant adverse impact.

The DEIR says that the two ponds on the property will capture the storm runoff generated upslope. However, the small ponds on the property have not been demonstrated to have sufficient capacity, during significant storm events, to capture any storm runoff.

The water quality sampling demonstrates that agricultural chemicals can be transported to streams. The water quality sampling was done late in the rainy season. Therefore, it is likely that the concentration of the chemicals reported by the sampling may have been higher during earlier storms. Also, other pollutants may have been detected if the sampling was done during early season storms. Overall, the water quality sampling raises concern about the project contributing agricultural chemicals to the Napa River system.

Implementing improved grazing management practices, such as excluding riparian zones from grazing, in addition to the proposed vineyard was not considered. Implementation of improved grazing practices in addition to the proposed vineyard is an environmentally superior alternative to the project that was not considered by the DEIR.

Sincerely,

Dennis Jackson
Hydrologist

## References


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