



# Hydrology Report to Determine Area of Influence for Cultivation Irrigation Wells

for

Lake Coco Farms

Project Site Location:

APN: 005-006-07 & 005-013-01  
3547 & 3417 Hendricks Road  
Lakeport, CA 95453

December 21, 2021

Prepared for:

Lake County  
Community Development Department  
255 North Forbes Street  
Lakeport, CA 95453





## **INTRODUCTION**

The purpose of this study is to provide adequate information of the water usage and the impacts to the surrounding area for a proposed commercial cannabis cultivation site. The site is proposing a maximum 287,320 sq.ft. (6.59 acre) of commercial cannabis canopy area.

The parcels on which the project and wells are located are owned and managed by Lake Coco Holdings LLC which is owned by Micheal Sebour and Jolene Strange.

This report estimates the amount of water available and recharge rate during a drought year from the existing well. In addition, this report estimates the radius of influence to the surrounding area and estimates the cumulative impacts where interference is with existing wells.

This report has been prepared to comply with the County of Lake Ordinance 3106, "AN URGENCY ORDINANCE REQUIREING LAND USE APPLICANTS TO PROVIDE ENHANCED WATER ANALYSIS DURING A DECLARED DROUGHT EMERGENCY" approved by the Lake County Board of Supervisors on July 7, 2021.

## **STUDY LIMITATIONS**

The yield of wells cannot be estimated with precision because of the uncertainty with the aquifer and the amount of rain percentage of rainfall that percolates through the ground. Therefore, conservative estimates and assumptions are used in this report.

This study is based on the following information and assumptions.

- Cooper - Jacob well equation
- Well Completion Reports obtained from Lake County EHD and CA Dept. of Water Resources Database
- Well Yield Test and Drillers Reports
- Rainfall for a drought year is 20% of annual precipitation
- Aquifer is uniform throughout the wells area of influence



## WELL

Well #1 is the well that will be used for irrigating the proposed cultivation project. A 1000 ft radius was placed around the radius of influence of well #1. A radius of influence was calculated for all wells that fell within the 1000 ft radius. In this case, well #2 did not have a well drillers report on file with the state or county. Therefore, an assumed conservative 300' radius was used. Well #3 fell just outside the 1000' radius but did have a well drillers report on file, so for data gathering purposes, a radius of influence was calculated for that well. See Well Area of Influence Map in Appendix B.1 and see the Surrounding Area Map in Appendix B.2. All wells were located using information gathered via site visit, the County of Lake Environmental Health Department, and the CA Department of Water Resources. See well descriptions below.

### WELL #1

- Southern vicinity of APN: 005-013-01.
- See Appendix B for well maps.
- Total drill depth of 52 feet.
- The capacity of the well is at least 120 gpm.
- Use: "Lake Coco Farms" Commercial Cannabis Irrigation.

### WELL #2

- Western vicinity of APN: 005-013-21.
- See Appendix B for well maps.
- Total drill depth is N/A.
- The capacity of the well is N/A.
- Use: Domestic.

### WELL #3

- Northwest vicinity of APN: 005-014-26.
- See Appendix B for well maps.
- Total drill depth is estimated at 300 feet.
- The capacity of the well is 10 gpm.
- Use: Domestic.



## WELL RADIUS OF INFLUENCE

The well radius of influence (cumulative impact) is estimated by the Cooper-Jacob equation:

$$R_{(well)} = \sqrt{\frac{2.24584Tt}{S}}$$

Where,

- $R_{(well)}$  = Radius of Influence (m)
- t = time (days)
- T = transmissivity (m<sup>2</sup> / day)
- S = water storage capacity (%) unitless

$$T = K * b$$

Where,

- K = 2.0 E-4 m/s for Basalt porosity
- b = (Total Drill Depth of Well) - (pump depth below clay layer)
- t = 1 day = 86,400 sec
- S = 0.15

Therefore;

- $R_{(1)}$  => 44 m = 143 feet
- $R_{(2)}$  => 91 m = 300 feet
- $R_{(3)}$  => 137 m = 449 feet

There is no intersection between the radius of influence of any well. See Well Area of Influence Map in Appendix B.1.



## WATER USAGE

The proposed project has a total canopy area of 287,320 sq.ft. (6.59 acre), 10,000 sq.ft (0.23 acre) immature plant area, and a 80'x120' processing facility for 5 employees during grow season and 10 employees during harvest season. These values were used for calculating the total water usage in gallons per year. See calculations below.

### WATER USAGE FOR WELL #1

The total water usage of the canopy area is estimated by the square footage of the canopy multiplied by the ft/year needed for a single cannabis plant. The ft/yr is estimated to be similar to a tomato plant, which is 20in/year or 1.66 ft/year. For immature plants, that value is cut in half from 1.66 ft/year to 0.83 ft/year. For processing buildings, a harvest season is defined to be a 13-week period, therefore, there is a 39-week non-harvest period per year.

$$W_{\text{Irrigation}} = A * (\text{ft/yr})$$

$$W_{\text{Irrigation}} = (6.59 \text{ acres}) * (43,560 \text{ sf/acres}) * (1.66 \text{ ft/year}) * (7.48 \text{ gal/cf})$$
$$W_{\text{Irrigation}} = \mathbf{3,564,371 \text{ gal/year}}$$

$$W_{\text{Irrigation Immature Plant}} = (0.23 \text{ acres}) * (43,560 \text{ sf/acres}) * (0.83 \text{ ft/year}) * (7.48 \text{ gal/cf})$$
$$W_{\text{Irrigation Immature Plant}} = \mathbf{62,200 \text{ gal/year}}$$

$$W_{\text{Processing Building (Harvest)}} = (10 \text{ employees}) * (15 \text{ (gals/employee)/day}) * (5 \text{ days/week}) * (13 \text{ weeks/year}) = 9,750 \text{ gal/year}$$

$$W_{\text{Processing Building (Non-Harvest)}} = (5 \text{ employees}) * (15 \text{ (gals/employee)/day}) * (5 \text{ days/week}) * (39 \text{ weeks/year}) = 14,625 \text{ gal/year}$$

$$W_{\text{Processing Building}} = 9,750 + 14,625 = \mathbf{24,375 \text{ gal/year}}$$

$$\text{Total Water Usage} = W_{\text{Irrigation}} + W_{\text{Irrigation Immature Plant}} + W_{\text{Processing Building}}$$
$$= 3,564,371 \text{ gal/year} + 62,200 \text{ gal/year} + 24,375 \text{ gal/year}$$
$$= \mathbf{3,650,946 \text{ gal/year}}$$



## AQUIFER RECHARGE

The proposed project has an estimated total annual water usage of 3,650,946 gallons per year.

The calculations of Aquifer Recharge are based on the tributary area to the radius of influence of Well #1. Per Well Recharge Area Map shown in Appendix B.3, the total recharge area is 1,556,024 sf.

Given: Annual Precipitation, P = 32 inches per year, assume a drought year is 20% of the annual precipitation, yields 6.4" (0.54165 ft) of rainfall. (Note: Rainfall of 2021 was 9" per NOAA for Lake County)

Volume of water for recharge = Area x Drought Precipitation x Coefficient of Seepage.

$$V = (1,556,024 \text{ sf}) \times (0.54165 \text{ ft/yr}) \times (7.48 \text{ gal/cf}) \times (0.7)$$

$$V = 4,413,007 \text{ gal/year}$$

4,413,007 > 3,650,946 therefore the well is adequate to handle the 6.59 acres of cultivation in a drought year.

## CONCLUSION

Per our calculations and assumptions, the project has more than adequate water supply for the proposed irrigation use. Even in a drought year, our estimates show that the well has the capacity to handle the proposed water irrigation needs of the project, without impacting the surrounding neighbor's wells.

## DISCLAIMER

Our calculations are based on data that has been made available to Vanderwall Engineering through state and county records as of 12/21/2021. All supporting data has been provided in this report. There is no way to guarantee future conditions. If new supporting data is provided, calculations would need to be redone to take into account for said data.



## **Appendix**

A. Well Pump Test and Well Location/Plot Plans

B. Maps

- B1. Well Area of Influence Map
- B2. Surrounding Aerial Map
- B3. Well Recharge Area

# Appendix

A





**Cramer Enterprises**  
 977 20th st.  
 Lakeport, CA 95453 US  
 (707) 349-8575  
 eric.cramer@yahoo.com  
 http://www.cramerent.com

**Invoice 2622**

**WELL #1**

<b>BILL TO</b>	<b>SHIP TO</b>
Jolene Strange	Jolene Strange
Lake Coco Holdings LLC	Lake Coco Holdings LLC
4260 North State St	3547 Hendricks Rd
Ukiah, CA 95482 USA	Lakeport, CA 95453 USA

DATE 03/27/2020	<b>PLEASE PAY</b> <b>\$3,187.62</b>	DUE DATE 04/03/2020
--------------------	--	------------------------

DESCRIPTION	QTY	RATE	AMOUNT
<p>Wants us to do a well inspection. Would like to be emailed regarding whether or not the Ag suitability tests for boron, and would like to know if she needs to be on site for the inspection.</p> <p>Arrived on site on 4/2/20 and performed two well tests per realtor Iris Angeleri. She is calling customer for permission and asked for Ag suitability, nitrate, bacti, and a production test for both wells. She said that the customer would like to put a rush on the test results and doesn't care how much it costs. Started the test on Ag/House well. It is a 12" steel well that also has a 1HP pump for the main house. Used a 5HP 3 phase 230v pump for the Ag to do the test in the same well. Performed the well test at 102 Gpm and the well only drew down to 10' from a static of 7' and it fully recovered in 7 seconds.</p> <p>Well yield test log is attached</p> <p>HP: 5 hp 230 3 phase. Diameter: 12".            Static: 7'. Depth: 88'. Iron: 2.0. Hardness: 10. Ph: 6.5.</p>	1	1,200.00	1,200.00
<p>4/2/20 Went to second well to perform the other test and found that the well gives water to the guest house. It is a 12" steel well with a static of 7.6 and a draw down of only 8.7 at 30 Gpm. It is a 1 HP pump in this well and at the end of the test it fully recovered in 22 seconds.</p> <p>Well yield test log is attached</p> <p>HP: 1 hp sub. Diameter: 12. Static: 7.6.            Depth: 77'. Iron: 20. Hardness: 11. Ph: 6.8.</p>	1	650.00	650.00
Agricultural Suitability Water Analysis - Rushed	2	495.00	990.00T
Bacti water sample - Rushed	2	85.00	170.00T

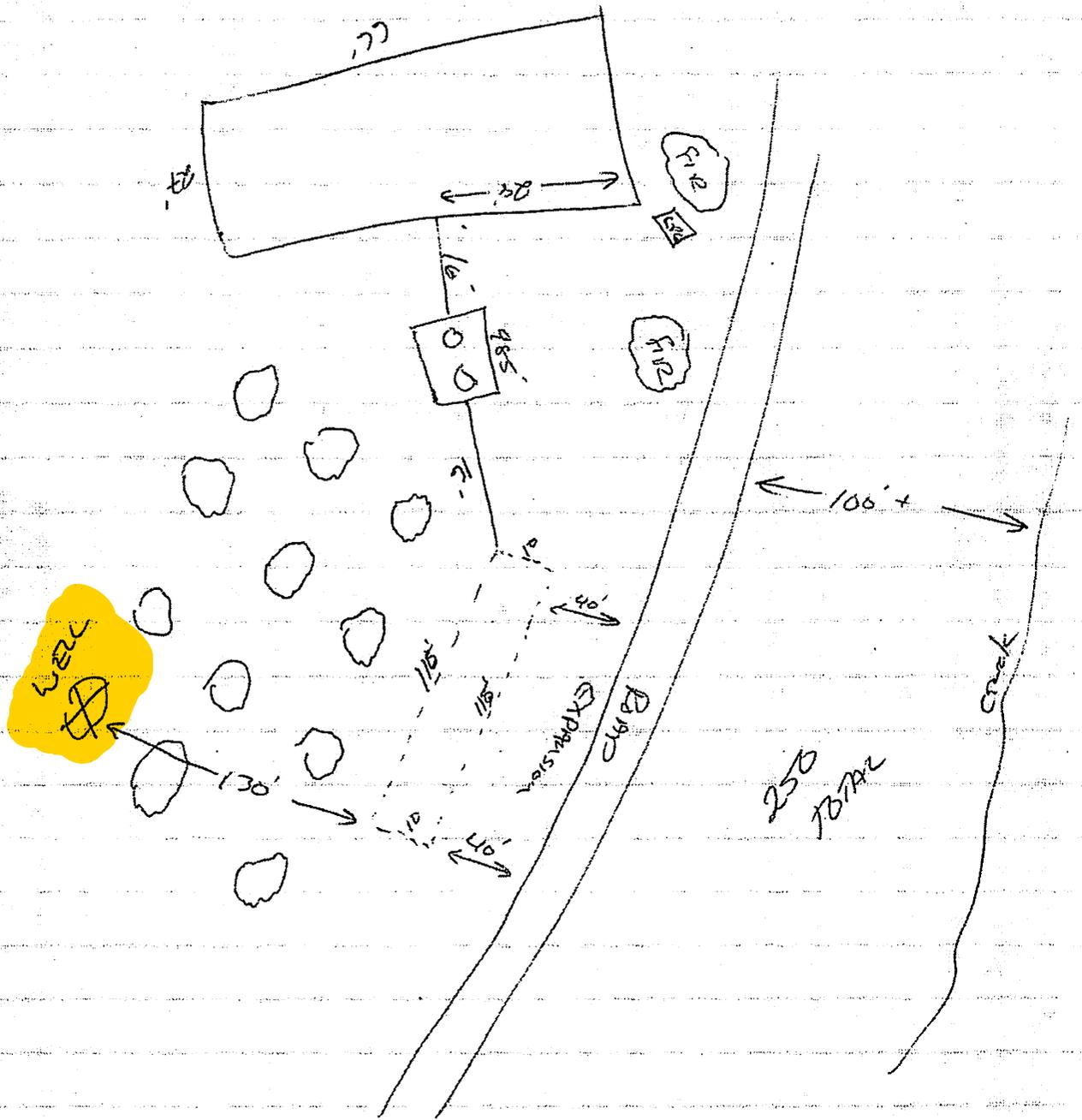
Eric Cramer -





WELL #1

~~PLAN~~



**APPROVED**  
 LAKE COUNTY HEALTH DEPT.  
 Date: 4-10-92  
*Alan Jones*  
 Environmental Health Specialist

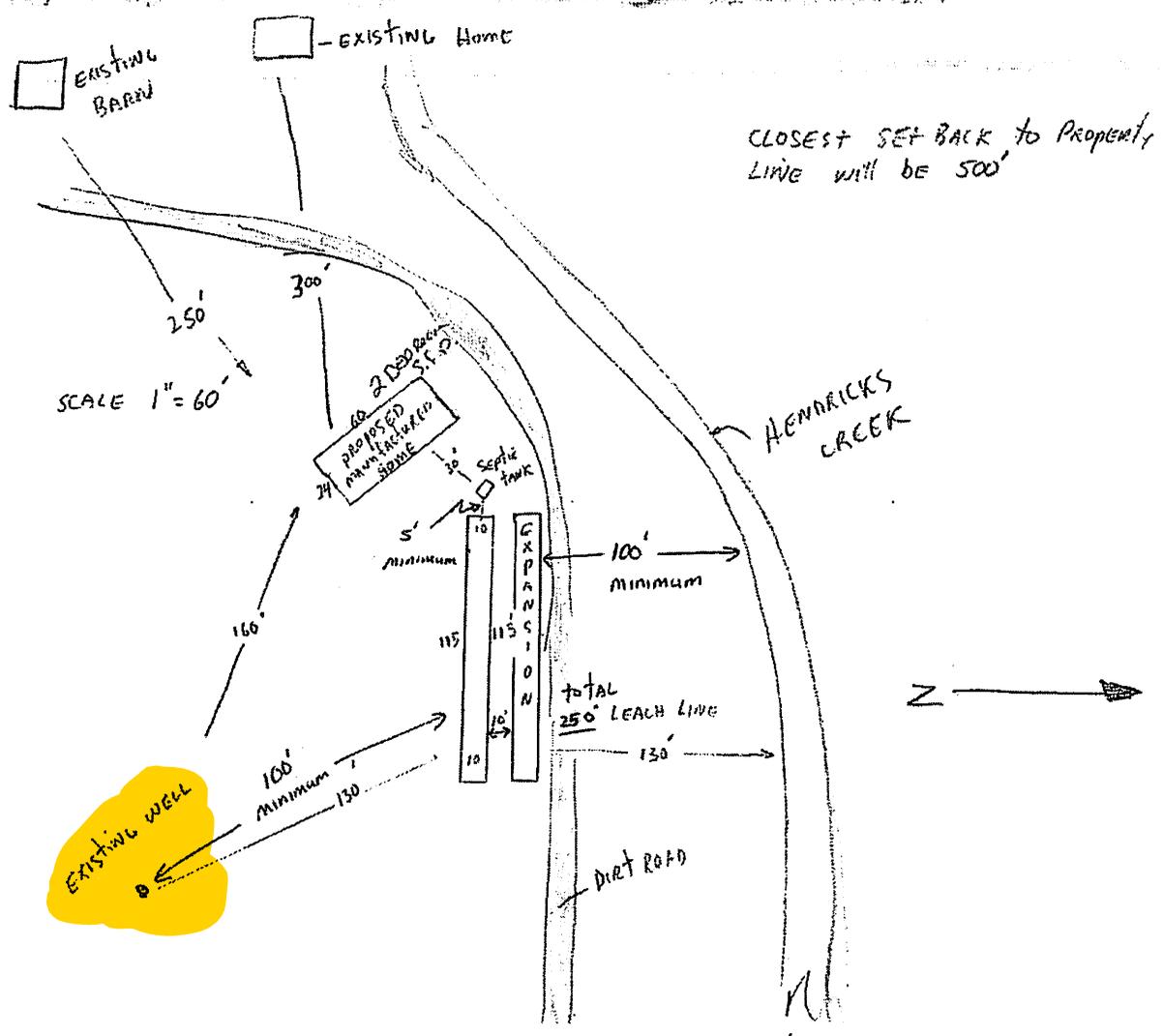
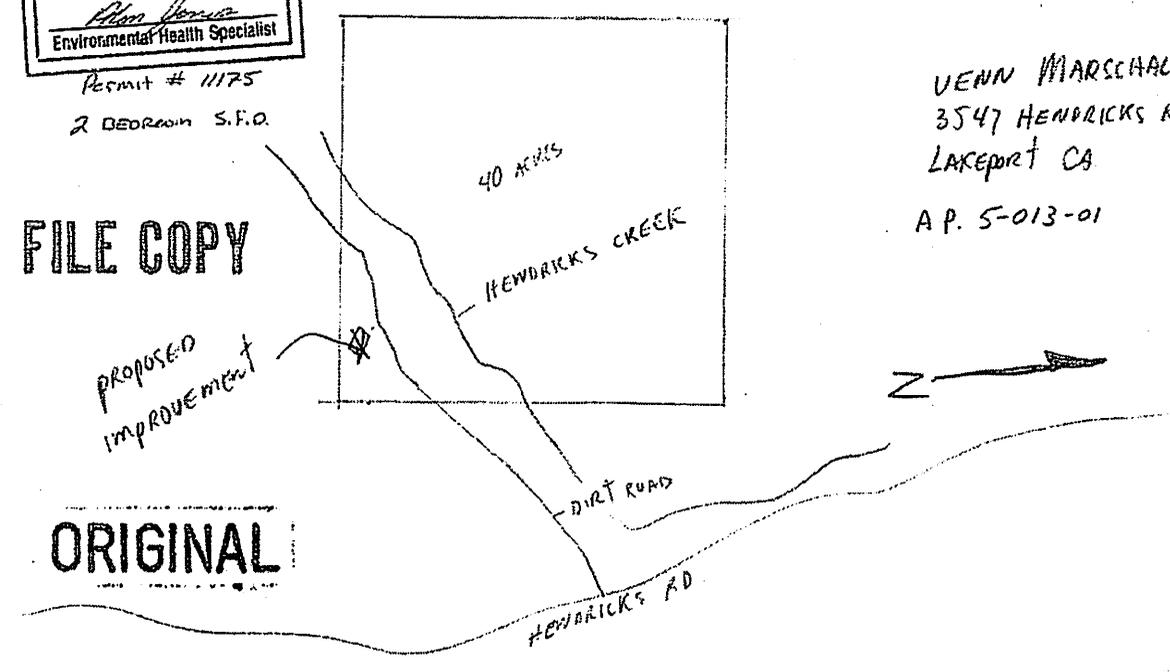
LOCATION MAP Not to SCALE

Permit # 11175  
 2 BEDROOM S.F.O.

VENN MARSHALL  
 3547 HENDRICKS RD  
 LAKEPORT CA  
 A.P. 5-013-01

FILE COPY

ORIGINAL



ORIGINAL  
File with DWR

RECEIVED

STATE OF CALIFORNIA  
WELL COMPLETION REPORT

Refer to Instruction Pamphlet

DWR USE ONLY - DO NOT FILL IN

14N/10W-10M

STATE WELL NO./STATION NO.

LATITUDE

LONGITUDE

APN/TRS/OTHER

Page \_\_\_ of \_\_\_  
 Owner's Well No. MAR 29 1999  
 Date Work Began 10-10-98 Ended 10-15-98 No. 705635  
 Local Permit Agency Lake County Environmental Health  
 Permit No. WE1599 Permit Date 10-9-98

GEOLOGIC LOG

ORIENTATION ( )  VERTICAL  HORIZONTAL  ANGLE (SPECIFY)

DRILLING METHOD Rotary FLUID Air

DEPTH FROM SURFACE		DESCRIPTION
Ft.	to Ft.	
0	4	Brn. Gravelly Soil
4	63	Red Gravelly Clay
63	80	Blue Shale
80	92	Purple Shale
92	115	Blue-gray + Black Shale
115	145	Hard Gray Shale
145	156	Purple Shale
156	222	Green Shale
222	226	Blue-gray gritty clay
226	268	Purple Shale
268	300	Gray + Green Shale

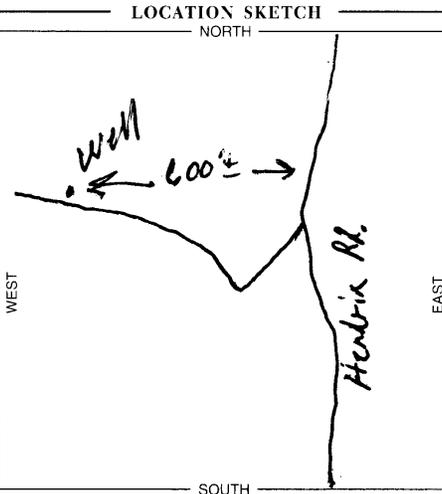
Describe material, grain size, color, etc.

TOTAL DEPTH OF BORING 300 (Feet)  
 TOTAL DEPTH OF COMPLETED WELL 300 (Feet)

WELL #3

WELL LOCATION

Address 3075 Hendrix Rd.  
 City Lakeport  
 County Lake  
 APN Book 005 Page 014 Parcel 26  
 Township 14N Range 10W Section 10  
 Latitude \_\_\_\_\_ NORTH Longitude \_\_\_\_\_ WEST  
 DEG. MIN. SEC. DEG. MIN. SEC.



ACTIVITY ( )

NEW WELL

MODIFICATION/REPAIR

Deepen

Other (Specify) \_\_\_\_\_

DESTROY (Describe Procedures and Materials Under "GEOLOGIC LOG")

PLANNED USES ( )

WATER SUPPLY

Domestic  Public

Irrigation  Industrial

MONITORING

TEST WELL

CATHODIC PROTECTION

HEAT EXCHANGE

DIRECT PUSH

INJECTION

VAPOR EXTRACTION

SPARGING

REMEDIATION

OTHER (SPECIFY) \_\_\_\_\_

Illustrate or Describe Distance of Well from Roads, Buildings, Fences, Rivers, etc. and attach a map. Use additional paper if necessary. PLEASE BE ACCURATE & COMPLETE.

WATER LEVEL & YIELD OF COMPLETED WELL

DEPTH TO FIRST WATER 280 (Ft.) BELOW SURFACE

DEPTH OF STATIC WATER LEVEL \_\_\_\_\_ (Ft.) & DATE MEASURED \_\_\_\_\_

ESTIMATED YIELD 10 (GPM) & TEST TYPE Air Lift

TEST LENGTH 1 (Hrs.) TOTAL DRAWDOWN \_\_\_\_\_ (Ft.)

\* May not be representative of a well's long-term yield.

DEPTH FROM SURFACE	BORE-HOLE DIA. (Inches)	CASING (S)							
		TYPE ( )				MATERIAL / GRADE	INTERNAL DIAMETER (Inches)	GAUGE OR WALL THICKNESS	SLOT SIZE IF ANY (Inches)
		BLANK	SCREEN	CON-DUCTOR	FILL PIPE				
0	63	9	X			PVCF480	4 1/2	SDR26	
63	260	7	X			PVC F480	4 1/2	SDR26	
260	300	7	X			PVCF480	4 1/2	SDR26	2 X 1/8

DEPTH FROM SURFACE	ANNULAR MATERIAL			
	TYPE			
	CE-MENT ( )	BEN-TONITE ( )	FILL ( )	FILTER PACK (TYPE/SIZE)
0	21	X		
21	300			Pea Gravel

MAR 30 1999

ATTACHMENTS ( )

Geologic Log

Well Construction Diagram

Geophysical Log(s)

Soil/Water Chemical Analyses

Other \_\_\_\_\_

ATTACH ADDITIONAL INFORMATION, IF IT EXISTS.

CERTIFICATION STATEMENT

I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief.

NAME Don Mc Muller Well Drilling  
 (PERSON, FIRM, OR CORPORATION) (TYPED OR PRINTED)

ADDRESS 1487 Old Long Valley Rd. Charles Oaks CA 95423  
 CITY STATE ZIP

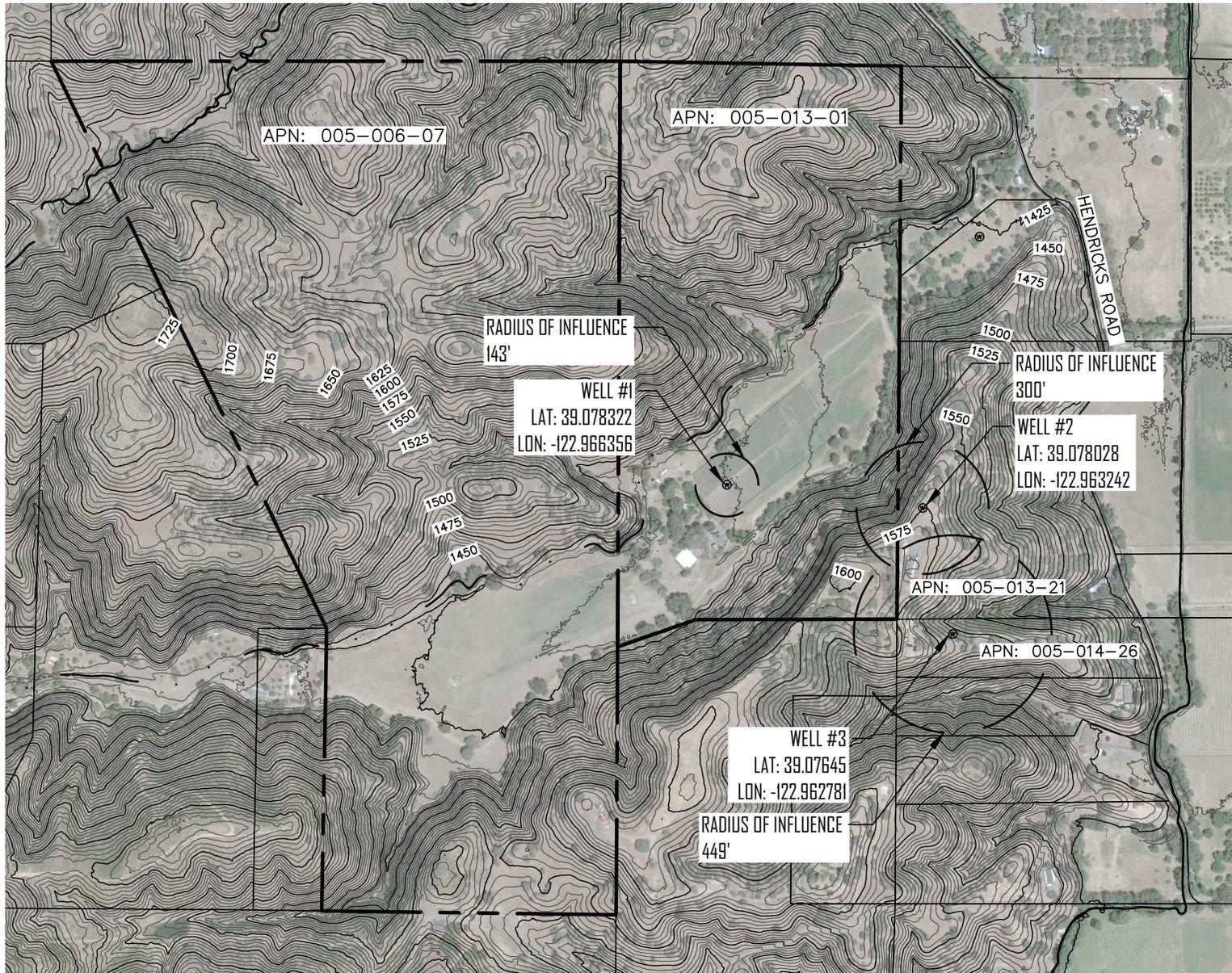
Signed Don Mc Muller DATE SIGNED 11-20-98 537152  
 WELL DRILLER/AUTHORIZED REPRESENTATIVE C-57 LICENSE NUMBER

# Appendix

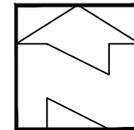
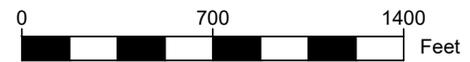
## B

# Well Area of Influence Map

## APPENDIX B.1



5' MINOR AND 25' MAJOR CONTOUR INTERVAL



SUBMITTED TO:  
LAKE COUNTY COMMUNITY  
DEVELOPMENT DEPT.  
COUNTY OF LAKE  
LAKEPORT, CA

PO BOX 431  
KELSEYVILLE, CA 95451  
707-279-4887

**VanderWall**  
Engineering, Inc.

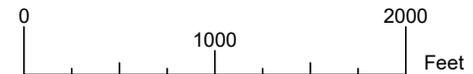
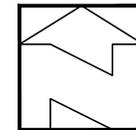
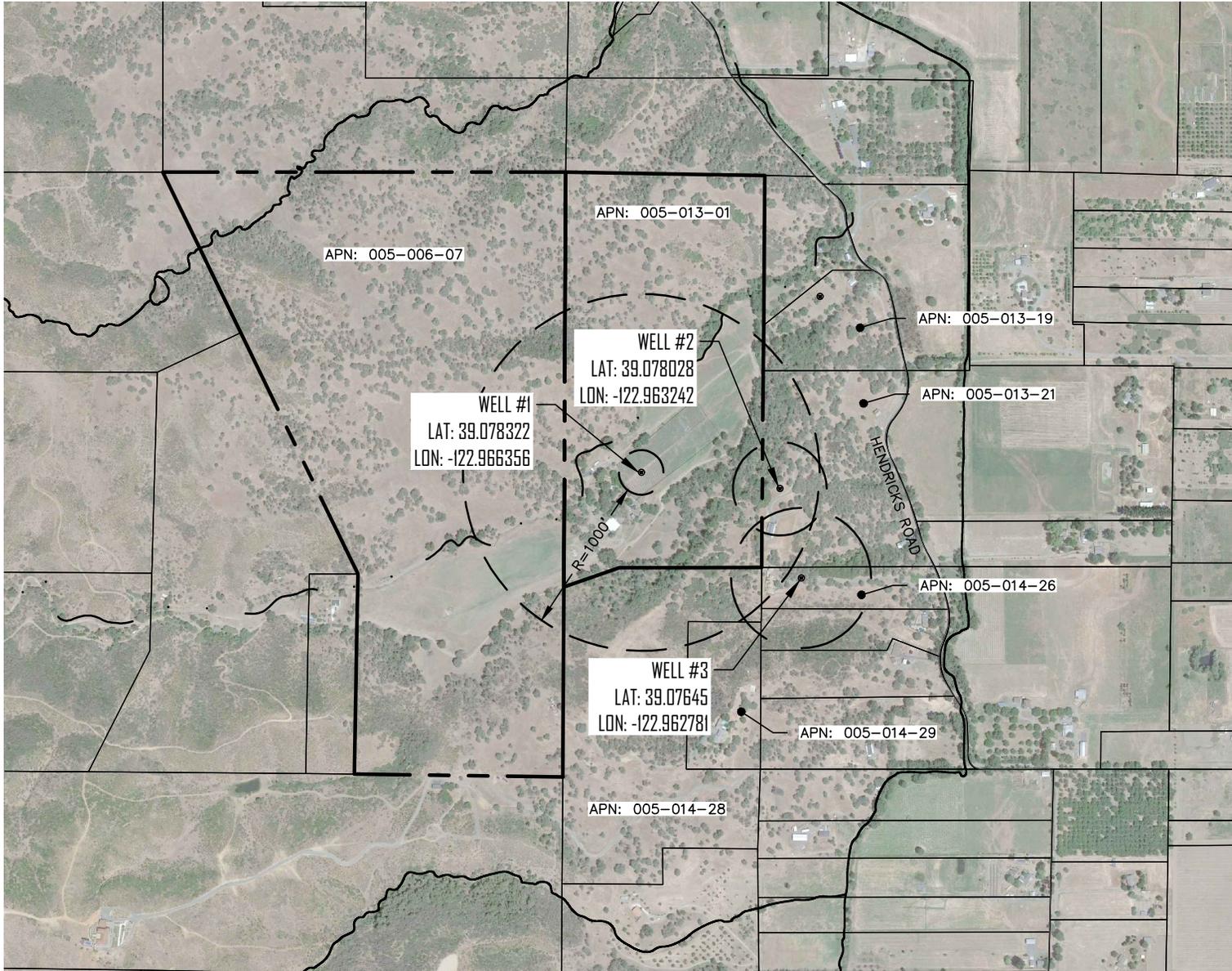


**WELL AREA OF INFLUENCE MAP**  
APN's: 005-006-07 & 005-013-01  
3547 & 3417 HENDRICKS ROAD  
LAKEPORT, CALIFORNIA

VERIFY SCALE	
BAR IS ONE INCH ON ORIGINAL DRAWING.	
DATE	DEC 2021
PROJ	21-79
DWG	
APPENDIX	B.1

# Surrounding Area Map

## APPENDIX B.2



SUBMITTED TO:  
LAKE COUNTY COMMUNITY  
DEVELOPMENT DEPT.  
COUNTY OF LAKE  
LAKEPORT, CA

**VanDerWall**  
Engineering, Inc.

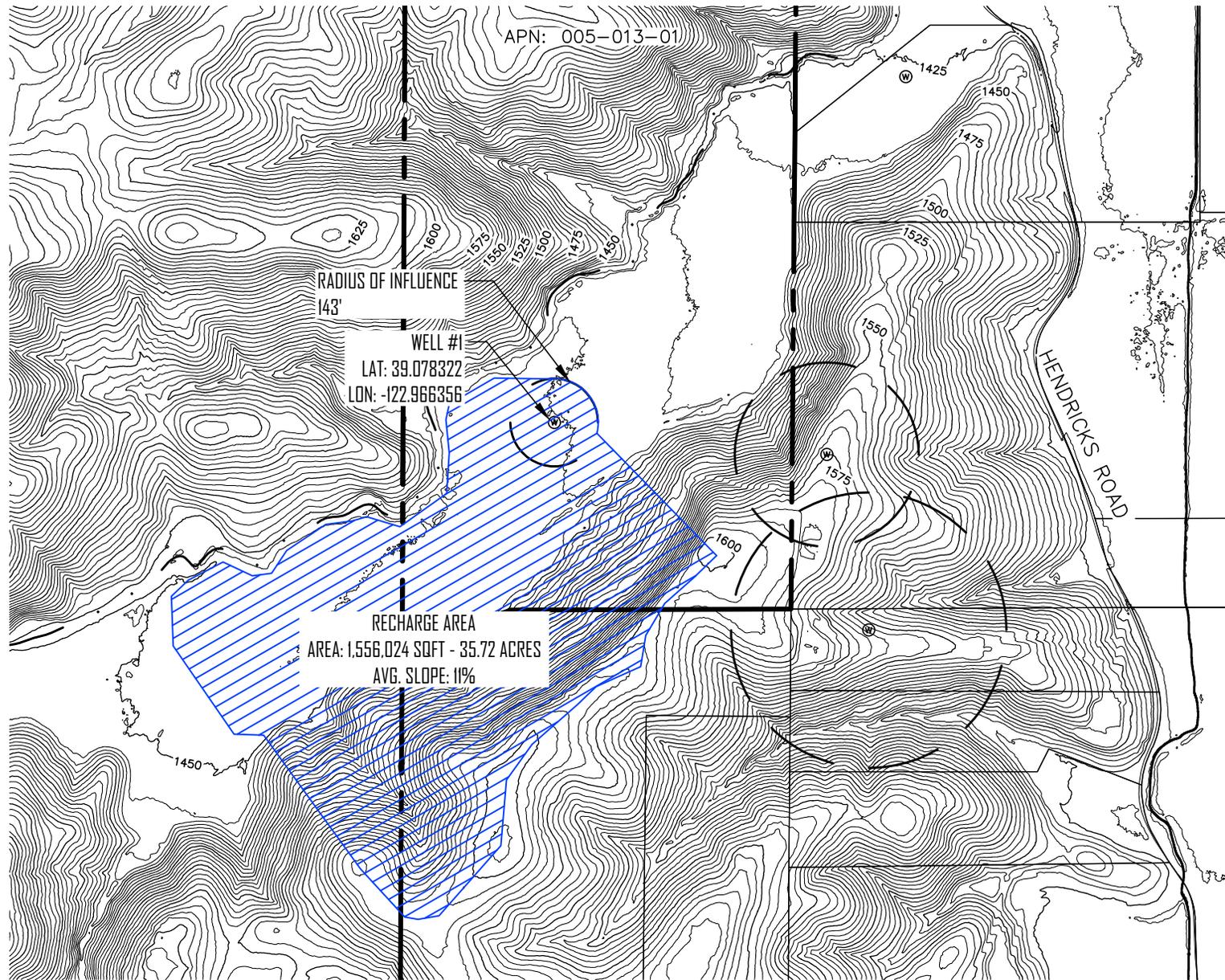
**SURROUNDING AREA MAP**  
APN's: 005-006-07 & 005-013-01  
3547 & 3417 HENDRICKS ROAD  
LAKEPORT, CALIFORNIA



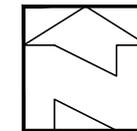
VERIFY SCALE	
BAR IS ONE INCH ON ORIGINAL DRAWING.	
DATE	DEC 2021
PROJ	21-79
DWG	
APPENDIX	B.2

# Well Recharge Area Map

## APPENDIX B.3



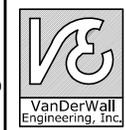
5' MINOR AND 25' MAJOR CONTOUR INTERVAL



SUBMITTED TO:  
LAKE COUNTY COMMUNITY  
DEVELOPMENT DEPT.  
COUNTY OF LAKE  
LAKEPORT, CA

PO BOX 431  
KELSEVILLE, CA 95451  
707-279-4887

**VanderWall**  
Engineering, Inc.



**WELL RECHARGE AREA MAP**  
APN's: 005-006-07 & 005-013-01  
3547 & 3417 HENDRICKS ROAD  
LAKEPORT, CALIFORNIA

VERIFY SCALE	
BAR IS ONE INCH ON ORIGINAL DRAWING	
DATE	DEC 2021
PROJ	21-79
DWG	
APPENDIX	B.3

# DROUGHT MANAGEMENT PLAN

## LAKE COCO FARMS

The Urgency Ordinance approved by the Lake County Board of Supervisors on July 27<sup>th</sup>, 2021 (Ordinance No. 3106) requires applicants to provide a plan depicting how the applicants plan to reduce water use during a declared drought emergency. The proposed commercial cannabis cultivation operation would be composed of five A-Type 3 “Medium Outdoor” Lake County License Types, with up to 205,800 ft<sup>2</sup> of combined cannabis canopy. All water for the proposed cultivation operation would come from an existing onsite groundwater well located at Latitude 39.07832° and Longitude -122.96637° on APN 005-013-01. The proposed cultivation operation would have an annual water use requirement of approximately 9.7 to acre-feet (3,165,866 gallons).

Per the Water Conservation and Use requirements outlined in the State Water Resources Control Board’s Cannabis General Order, the Applicant shall implement the following Best Practical Treatment and Control (BPTC) measures to conserve water resources:

- Regularly inspect the entire water delivery system for leaks and immediately repair any leaky faucets, pipes, connectors, or other leaks;
- Apply weed-free mulch in cultivation areas that do not have ground cover to conserve soil moisture and minimize evaporative loss;
- Implement water conserving irrigation methods (drip or trickle and micro-spray irrigation);
- Maintain daily records of all water used for irrigation of cannabis. Daily records will be calculated by using a measuring device (inline water meter) installed on the main irrigation supply line between the water storage area and cultivation area(s);
- Install float valves on all water storage tanks to keep them from overflowing onto the ground.

With the Water Conservation and Use requirements outlined above, the proposed cultivation operation would efficiently use water resources at all times. Additionally, Article 27 Section 27.11 of the Lake County Zoning Ordinance requires commercial cannabis cultivators using water from a groundwater well to install a water level monitor on their water supply well, and to regularly record readings from the continuous water level monitor. Well water level monitoring and reporting shall be performed as follows:

### **Seasonal Static Water Level Monitoring**

Seasonal monitoring of well water levels provides information regarding long-term groundwater elevation trends. The water level in the onsite groundwater well shall be measured and recorded prior to the start of the cultivation season (April/May), and once in the fall (November) after the cultivation season has ended. Data reported to the Lake County Community Development Department as part of the Project’s annual reporting requirements shall include a hydrograph plot of all seasonal water level measurements for the onsite groundwater well.

### **Water Level Monitoring During Extraction**

The purpose of monitoring the water level in a well during extraction is to evaluate the performance of the well to determine the effect of the pumping rate on the water source during each cultivation season. This information can be used to determine the capacity and yield of the onsite groundwater well for determining pump rates and the need for water storage. The frequency of water level monitoring will depend on the source, the source's capacity, and the pumping rate. It is recommended that initially the water level be monitored twice per week or more, and that the frequency be adjusted as needed depending on the impact the pumping rate has on the well water level. Data reported to the Lake County Community Development Department as part of the Project's annual reporting requirements shall include a hydrograph plot of the water level readings during the cultivation season.

In addition to the monitoring and reporting described above, the Project's annual report shall include an analysis of the water level monitoring data, demonstrating whether or not use of the onsite groundwater well is causing significant drawdown and/or impacts to the surrounding area and what measures were taken to reduce impacts. If there are impacts, a revised Water Management Plan shall be prepared and submitted to the Lake County Community Development Department, for review and approval, demonstrating how the project will mitigate the impacts in the future.

### **DROUGHT EMERGENCY RESPONSE**

When a drought emergency has been declared for the area of the proposed cultivation operation, the Applicant may implement the following additional measures, as needed or appropriate to the site, to reduce water use and ensure both success of the cultivation operation and decreased impacts to surrounding areas:

- Install moisture meters to monitor how much water is in the soil at the root level and reduce watering to only what is needed to avoid excess;
- Cover the soil and drip lines with removable plastic mulch to reduce evaporation;
- Irrigate only in the early morning hours or before sunset;
- Cover plants with shaded meshes during peak summer heat to reduce plant stress and water needs;
- Add a soil amendments/ingredients to growing medium that retains water in a way to conserve water and aid plant growth/health. Soil amendments/ingredients such as peat moss, coco coir, compost, perlite, and vermiculite retain water and provide a good environment for cannabis to grow.

Additionally, to ensure both success and decreased impacts to the surrounding areas, the Applicant plans to reduce the aggregate canopy area and water usage by 10 percent or more, when a drought emergency has been declared for the region. To reduce water usage by 10 percent or more, the Applicant will not plant 20,580 ft<sup>2</sup> or more of the proposed canopy areas. The canopy areas to be left fallow will depend on when a drought emergency is declared (before or after the proposed canopy areas have been planted), and the Applicant will prioritize the preferred canopy areas over less desirable canopy areas, based on cultivation experience. By implementing the Drought Management Plan outlined above, the estimated annual water demand for the proposed cultivation operation would be reduced from approximately 3,165,866 gallons to 2,849,279 gallons during periods of drought.