ATTACHMENT G

TECHNICAL MEMORANDUM

To: City of Clearlake Planning Department

From: Annjanette Dodd, PhD, CA PE #77756 Exp. 6/30/2023

Date: March 7, 2022

Subject: Groundwater Hydrology Addendum – 2160 Ogulin Canyon Road, Clearlake, CA, APN 010-044-21

A Groundwater Hydrology Technical Memorandum (TM) was prepared for 2160 Ogulin Canyon Road, Clearlake, CA (APN 010-044-21) dated December 23, 2021 and submitted to the City of Clearlake Planning Department. The TM addressed groundwater recharge and cumulative impacts and concluded the project's water use would not likely have a cumulative impact on the surrounding area for the following reasons:

- The cannabis demand is only 0.12% of the usable storage capacity in the BVGB; and
- There is sufficient recharge over the project's recharge area to meet the project's demand during both average and dry years.

The purpose of the TM Addendum is to provide supplemental information regarding water demand in the Burns Valley Groundwater Basin (BVGB) and potential cumulative impacts associated with implementation of the proposed project.

GROUNDWATER USE AND TRENDS IN BVGB

Review of Google Earth Imagery shows extensive agricultural development, in the form of walnut/pear orchards and vineyards, in the BVGB since at least 1985. Existing orchards and vineyards established prior to 2003 should have been included as part of the groundwater irrigation demand in the Lake County Groundwater Management Plan, however, this does not appear to be the case. According to the Lake County Water Demand Forecast, the average annual water demand for vineyards and walnut/pear orchards in Lake County is 0.5 acre-feet per acre and 2.2 acre-feet per acre, respectively. Using current Google Earth imagery, there are roughly 450 acres of existing vineyards and 150 acres of orchards in Burns Valley. Orchard production in the valley has decreased over time. Accounting for existing vineyards and orchards, the approximate agricultural demand in the valley is about 555 acre-feet per year which is supplied via existing groundwater wells. The 2006 Lake County Groundwater Management Plan stated that the agricultural demand in the BVGB during an average year is 105 acre-feet, with 14 acre-feet of this supplied from groundwater, which appears to be an underestimate of the existing groundwater agricultural demand. The estimate of existing agricultural demand of 555 acre-feet per year is likely a high estimate because most of the orchards and some of the vineyards are likely being dry farmed.

The northern residential district of the City of Clearlake relies on groundwater wells as the main source of water. The Highlands Mutual Water Company supplies the majority of residents in the lower part of the BVGB (Figure ***8***). According to the Lake County Agency Formation Commission 2021 Report on Clearlake Water Providers (ClearlakeH20_MSR-SOI_2021EDIT-2._cl_docx_(lakelafco.org)), the Highlands Mutual Water Company serves 6,072 people with water via 2,568 services connections using water drawn from Clear Lake. Approximately 120 residential parcels are not served by HMWC and are assumed to rely on groundwater wells. According to the Environmental Protection Agency (EPA,

https://www.epa.gov/watersense/how-we-use-water), the average American family uses 300 gallons of water per day, which equates to an annual demand of 40 acre-feet per year for 120 residences.

The main sources of groundwater in the BVGB are within the *Quaternary Alluvium Formation* and the *Lower Lake Formation*. *Quaternary Alluvium* is the predominant formation the southwestern portion of the BVGB, where both residential development and well development are most dense (Figure 1 and Figure 2). The alluvium has a thickness of up to 50 feet; groundwater in this formation is unconfined and typically provides water for domestic use. Wells screened in unconfined aquifers are more directly influenced by lack of rain than those screened in deeper, confined aquifers. The *Lower Lake Formation* underlies the alluvial deposits in the BVGB. This formation has low permeability and provides water to wells at up to a few hundred gallons per minute and is the dominant source of agricultural water demand in the BVGB. Note that the existing vineyards and the existing and proposed cannabis projects are located outside of the alluvial valley in the upper half of the BVGB (Figure 1).

Fortunately, there is a California Statewide Groundwater Elevation Monitoring (CASGEM) Program well located within the BVGB that has been used to monitor long-term groundwater trends (CASGEM well ID: 39925, Lat/Long: 38.96535, -122.63186, Figure ***3***) for over 50 years. The CASGEM well is drilled 177 feet below ground surface (bgs) into the deeper *Lower Lake Formation*. Groundwater levels in the CASGEM well are measured twice annually, approximately every April and November, to visualize the fall drawdown (November) and spring recharge (April). In general, since 1952, there appears to be an increasing trend in groundwater levels in the BVGB (Figure ***4***). However, a vertical shift is apparent and occurs in about 1980. Since it is unknown if this is a natural shift in the data or a shift due to change in measurement protocol, data prior to 1980 was removed. Since 1980, the data indicate that the long-term groundwater trend has been relatively stable (Figure ***5***), with consistent recharge during each annual wet season, even during years with low annual precipitation and accounting for the existing and historical agricultural demand. In addition, according to the Statewide Summary of Household Water Supply Shortage Reportage System reports (https://mydrywell.water.ca.gov/report/publicpage), no wells have been reported as going dry in the BVGB.

Well production loss in the Alluvium Formation is not surprising as Lake County has experienced a severe drought, with driest levels occurring fall of 2021. As stated above, wells screened in the shallower, unconfined aquifer, would be more directly influenced by the lack of rain and likely to lose production or go dry. There is also a likelihood that shallow groundwater in the southern portion of Burns Valley is hydrologically coupled to surface water levels in Clear Lake. As a result of the drought, surface water levels in the lake recorded in August through October of 2021 were the lowest on record since 2000, which could have a direct impact on shallow groundwater well production (Figure ***6***). Additional monitoring and reporting within the *Quaternary Alluvium* are recommended and would be helpful in understanding shallow groundwater trends in the BVGB.

FUTURE GROUNDWATER USE AND SUPPLY

The potential cumulative effects of the project were addressed in the December 2021 Technical Memorandum prepared for 2160 Ogulin Canyon Road. However, more detailed information is presented herein to further support the conclusions made in the original Technical Memorandum.

As discussed above, the current groundwater agricultural demand in the BVGB is roughly 555 acre-feet per year. Approximately 225 acre-feet is from existing vineyards in the upper portion of the BVGB and 330 acre-feet is from orchards located within the lower portion the BVGB. The current residential demand, located in the central portion of the BVGB, is approximately 40 acre-feet per year. A summary of

proposed cannabis projects and the approximate annual water demand is provided in Table 1. All the proposed projects are located in the upper portion of the BVGB east of State Highway 53 (Figure ***1***).

Table 1. Approximate water demand of proposed cannabis projects within the BVGB (information obtained from the City of Clearlake and Lake County websites and CEQAnet Database). Refer to Figure 1 for approximate locations.

Location (jurisdiction)	APN(s)	Parcel Area (acres)	Cultivation (Acres)	Cultivation % of Parcel Area	Approximate Annual Water Demand (acre-feet)
1756 Ogulin Canyon Road (County) (Blue Oak Farms)	010-055-46	46.5	2.0	4.3	3.3
2050 Ogulin Canyon Road (County) (Lake Vista Farms)	010-053-01 & 02	302.4	15.0	5.0	24.9
2185 Ogulin Canyon Road (City)	010-044-17	21.3	0.5	2.3	1.8
2160 Ogulin Canyon Road (City)	**010-044-21**	**9.6**	**0.2**	**2.1**	**1.7**
2560 Highway 53 (City)	010-048-05	15.4	1.3	8.4	4.3
2250 Ogulin Canyon Road (City)	010-044-19	13.0	0.4	3.1	1.0
Total		408.2	19.4	n/a	37.0

Table 2: Base zones designations, total areas associated with each base zone designation, parcel count, and base zone eligibility for potential cannabis cultivation within the Burns Valley Groundwater Basin.

Zone	Description	Total Parcel Area (acres)*	# of Parcels
RL	Rural Lands	1105.9	18
RR	Rural Residential	677.3	18
Split	Combined Zoning (Dominant Zones are A and RL)	136.5	4
City	Cannabis District	242	23
*This is the total area of the parcel, not just the portion within the BVGB			

To assess the potential for additional cannabis cultivation within the BVGB, not included in Table 1, a parcel inventory analysis was completed (Figure ***7*** and Table 2) to identify those parcels that meet requirements for potential cannabis cultivation with an approved permit from the Lake County or the City of Clearlake (City).

The Lake County Zoning Ordinance allows 1-acre of outdoor canopy for each 20 acres of parcel size for these zones. There are 40 parcels that are within or intersect the BVGB with a cumulative parcel area of about 1920 acres (total parcel area, not the intersected area, was used for conservativeness). Of these parcels, 10 parcels or 596 acres are existing vineyards and 2 parcels, or 349 acres have proposed cultivation shown in Table 1. Excluding these parcels, there are 28 parcels or 975 acres of base zoning that could be eligible for outdoor cultivation with a County permit. Thus, there is the potential for up to 48 acres of potentially new outdoor cultivation (the County allows only 1-acre of cultivation for each 20 acres of parcel area). However, accounting for existing development, steep topography, waterbody setbacks, flood zones, residential setbacks, and parcel setbacks, there is limited area for development and

only approximately 10 to 20 acres of new outdoor cultivation would likely be possible. The increased irrigation demand could be up to approximately 33.1 acre-feet per year assuming 3,000 gallons per day per acre for 180 days. This does not account for the fact that the project at 2050 Ogulin Canyon Road is replacing a 13.6-acre hops farm that utilized approximately 43.6 acre-feet per year of water, creating a reduction in water use of 18.7 acre-feet per year.

The City of Clearlake Zoning Ordinance allows for mixed-light/indoor cultivation in the BVGB, with a City Cannabis Permit, on 23 parcels with a total area of 242 acres. Accounting for the proposed projects listed in Table 1, existing development, steep topography, waterbody setbacks, and flood zones, only approximately 18 to 20 acres of this area could have the potential for mixed-light/indoor cultivation. The increased irrigation demand could be up to approximately 55.2 acre-feet assuming 3,000 gallons per day per acre for 300 days.

The total potential demand from both the County and City for cannabis cultivation could be up to 125.3 acre-feet per year, which includes the proposed projects listed in Table 1 and a conservative (high) estimate of total potential cultivation.

Thus, the total potential agricultural demand within the BVGB is existing, 555 acre-feet, plus proposed, 125.3 acre-feet, is approximately 680.3 acre-feet per year, with residential demand, the total groundwater demand is approximately 720.3 acre-feet per year. The dominant demand in the BVGB is associated with residential development and orchards in the lower part of BVGB and vineyards in the upper part of the BVGB.

The estimated storage capacity of the BVGB is 4,000 AF, with a usable storage capacity of 1,400 AF. The total potential demand is 51% of the usable storage capacity. According to DWR, groundwater in the BVGB is derived from rain that falls within the 12.5 square mile Burns Valley Watershed drainage area. Recharge estimates provided in Hydrology Reports for 2160 Ogulin Canyon Road, 1756 Ogulin Canyon Road, 2185 Ogulin Canyon Road, and Lake Vista Farms demonstrated that there is sufficient recharge over each project's contributing recharge area (a small fraction of the entire Burns Valley Watershed area) to meet each project's demand during both average and dry years. Overall, the proposed projects in Table 1 represent 2.6% of the usable storage capacity in the BVGB and only 5.1% of the existing demand in the BVGB.

SUMMARY AND DISCUSSION

- A Hydrology Technical Memorandum was prepared for 2160 Ogulin Canyon Road dated December 23, 2021 and submitted to the City of Clearlake Planning Department that addressed groundwater recharge and cumulative impacts and concluded that there is sufficient recharge and supply to meet the project's demand during average and dry years.
- The existing demand associated with vineyards and orchards is likely higher than reported in the 2006 Lake County Groundwater Management Plan. The higher estimate has been incorporated herein, along with estimated residential demand.
- The main sources of groundwater in the BVGB are within the *Quaternary Alluvium Formation* and the *Lower Lake Formation*. The *Quaternary Alluvium* dominates the southwestern portion of the BVGB, where both residential development and well development are most dense. The alluvium has a thickness of up to 50 feet; groundwater in this formation is unconfined and typically provides water for domestic use. Wells screened in unconfined aquifers are more directly influenced by lack of rain than those screened in deeper, confined aquifers.

- The *Lower Lake Formation* underlies the alluvial deposits in the BVGB. This formation has low permeability and provides water to wells at up to a few hundred gallons per minute and is the dominant source of agricultural water demand in the BVGB.
- Groundwater storage capacity is estimated to be 4,000 acre-feet based on an area of 1,000 acres, a saturated thickness of 50 feet, and a specific yield of 8 percent, which represents only the *Alluvium Formation* and does not account for groundwater storage capacity in the deeper *Lower Lake Formation*. Thus, the usable storage capacity is most likely an underestimate of the overall capacity of the BVGB, which has a surface area of 2,900 acres.
- Long-term groundwater monitoring in the BVGB shows a stable trend in groundwater levels within the deeper formation, with consistent recharge during each annual wet season, even during years with low annual precipitation and accounting for the existing vineyard and orchard demand that has occurred over this time.
- No wells within the BVGB were reported to the State Water Supply Shortage Reporting System. Additional monitoring and reporting within the *Quaternary Alluvium* are recommended and would be helpful in understanding shallow groundwater trends in the basin.
- The existing vineyards and the existing and proposed cannabis projects are located outside of the alluvial valley in the upper half of the BVGB.
- The dominant demand in the BVGB is associated with residential development and orchards in the lower part of BVGB and vineyards in the upper part of the BVGB. The Highlands Mutual Water Company supplies the majority of residents in the lower part of the BVGB using surface water drawn from Clear Lake. The total groundwater demand, accounting for existing agriculture, residential use, and potential cannabis projects, is approximately 720.3 acre-feet per year. The estimated storage capacity of the BVGB is 4,000 AF, with a usable storage capacity of 1,400 AF. The total potential future agricultural demand is 51% of the usable storage capacity. Thus, there is sufficient storage capacity to meet existing and proposed demand.
- Recharge estimates provided in the Hydrology Reports for 1756 Ogulin Canyon Road (Blue Oak Farms), 2050 Ogulin Canyon Road (Lake Vista Farms), 2160 Ogulin Canyon Road, and 2185 Ogulin Canyon Road, demonstrated that there is sufficient recharge over each project's contributing recharge area (a small fraction of the entire Burns Valley Watershed area) to meet each project's demands during both average and dry years.
- Overall, the proposed projects in Table 1 represent 2.6% of the usable storage capacity in the BVGB and only 6.7% of the existing demand for irrigation of existing vineyards and orchards.
- The demand associated with 2160 Ogulin Canyon Road represents only a fraction, 0.12% of the usable storage capacity of the BVGB, 0.2% of the total potential future demand in the BVGB, the total demand associated with the proposed projects listed in Table 1 is only 2.6% of the usable storage capacity of the BVGB and 5.1% of the potential future demand in the BVGB. Thus, it is unlikely that this project, in combination the existing and proposed demand, would adversely impact existing wells in the BVGB.

ATTACHMENTS

- Figure 1. Local geology (source: https://pubs.usgs.gov/imap/2362/), cultivation well locations, and CASGEM well location. QTc = Clear Lake Cache Formation, 'tb' = nonmarine terrace deposits, and 'al' = alluvium.
- Figure 2. Map of # (n) of Well Completion Reports (WCRs) with in each Public Land Survey System (PLSS) grid along with average well depth. The Burns Valley Groundwater Basin is outlined in red. Parcel coloring is provided in Figure 7.

- Figure 3. CASGEM Monitoring well location.
- Figure 4. CASGEM Monitoring Well data from 1952 to 2020.
- Figure 5. CASGEM Monitoring Well data from 1980 to 2020.
- Figure 6. Clear Lake stage height 2000 through 2021.
- Figure 7. City of Clearlake Cannabis District and Lake County parcel base zoning designations.
- Figure 8. Water Systems within the City of Clearlake Boundary (Source: ClearlakeH20 MSR-SOI 2021EDIT-2. cl docx (lakelafco.org))

QUALIFICATIONS OF AUTHOR

I have a PhD in Water Resources Engineering. In addition, I am a registered Professional Engineer with the State of California with 30-years of experience practicing and teaching Water Resources Engineering, including over 15 years of teaching, practicing, and modeling surface and groundwater hydrology.

LIMITATIONS

The study of groundwater hydrology is very complex and often relies on limited data, especially in rural areas. Recommendations and conclusions provided herein are based on professional judgment made using information of the groundwater systems and geology in Lake County, which is limited and allows only for a general assessment of groundwater aquifer conditions and recharge. NorthPoint Consulting Group, Inc. is making analyses, recommendations, and conclusions based on readily available data, including studies and reports conducted by other professionals, Lake County, the State of California, and other consultants hired by the project proponent to prepare technical studies for the proposed project. If additional information or data becomes available for the project area, the recommendations and conclusions presented herein may be subject to change.

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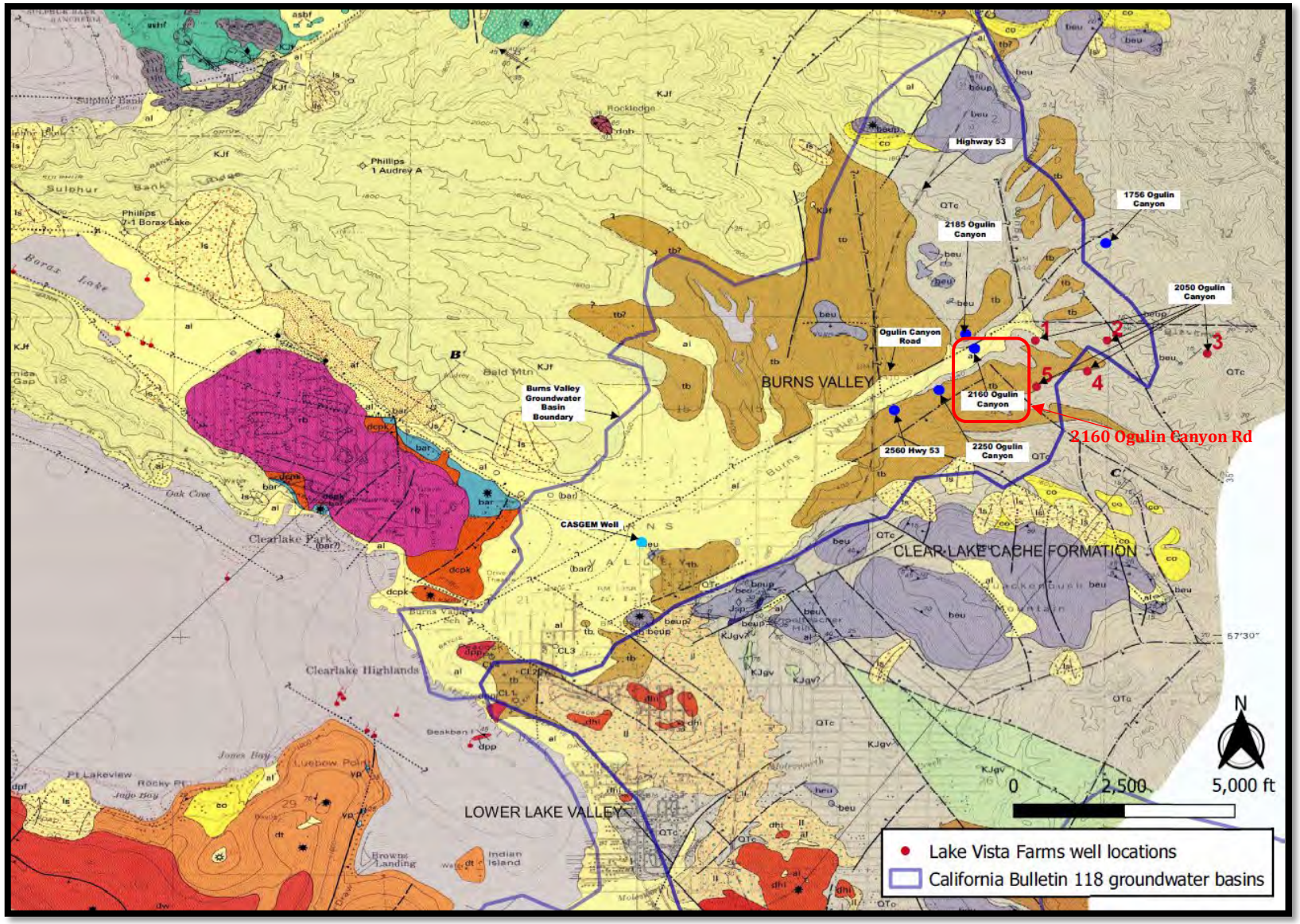
FIGURES



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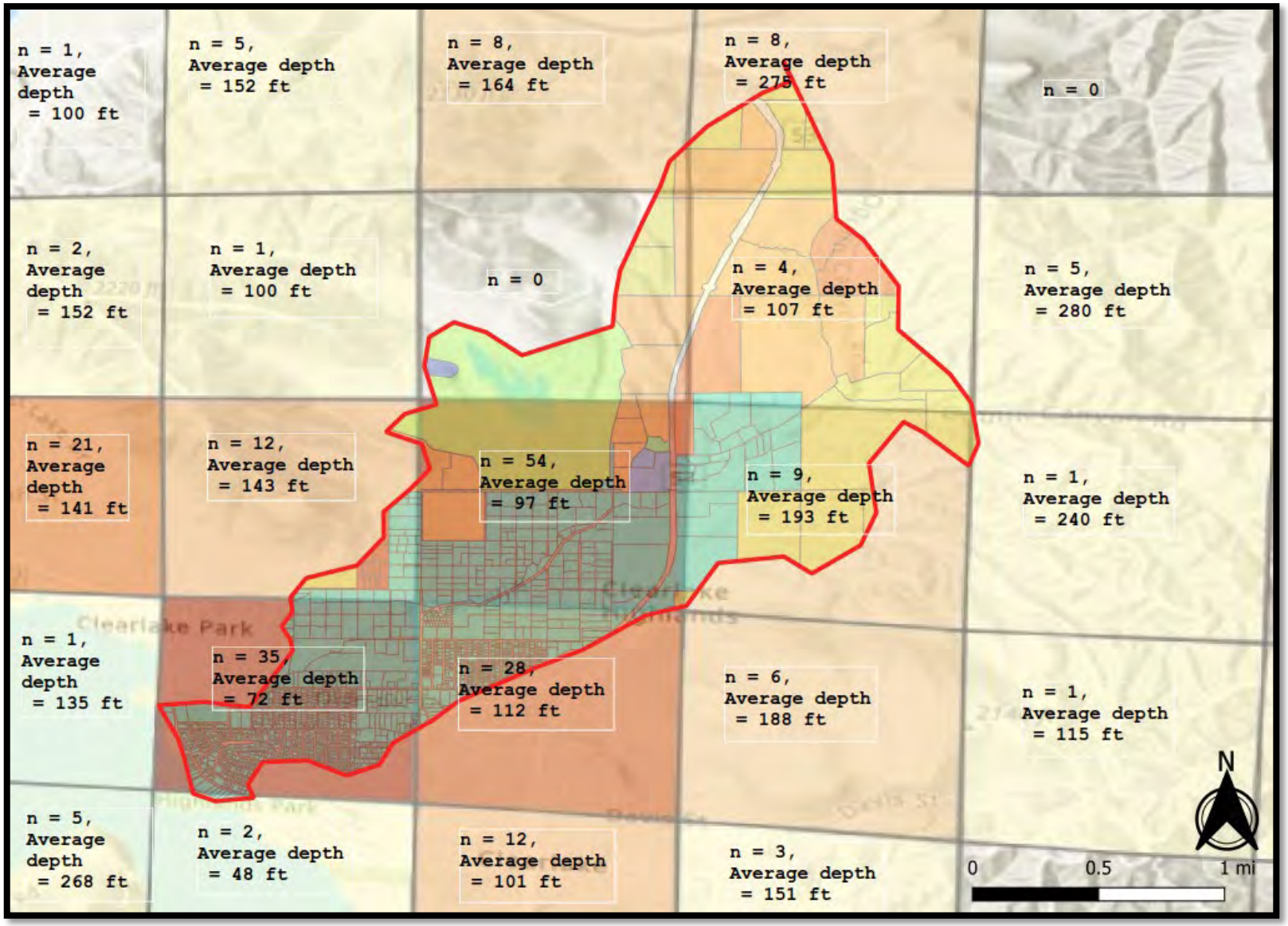

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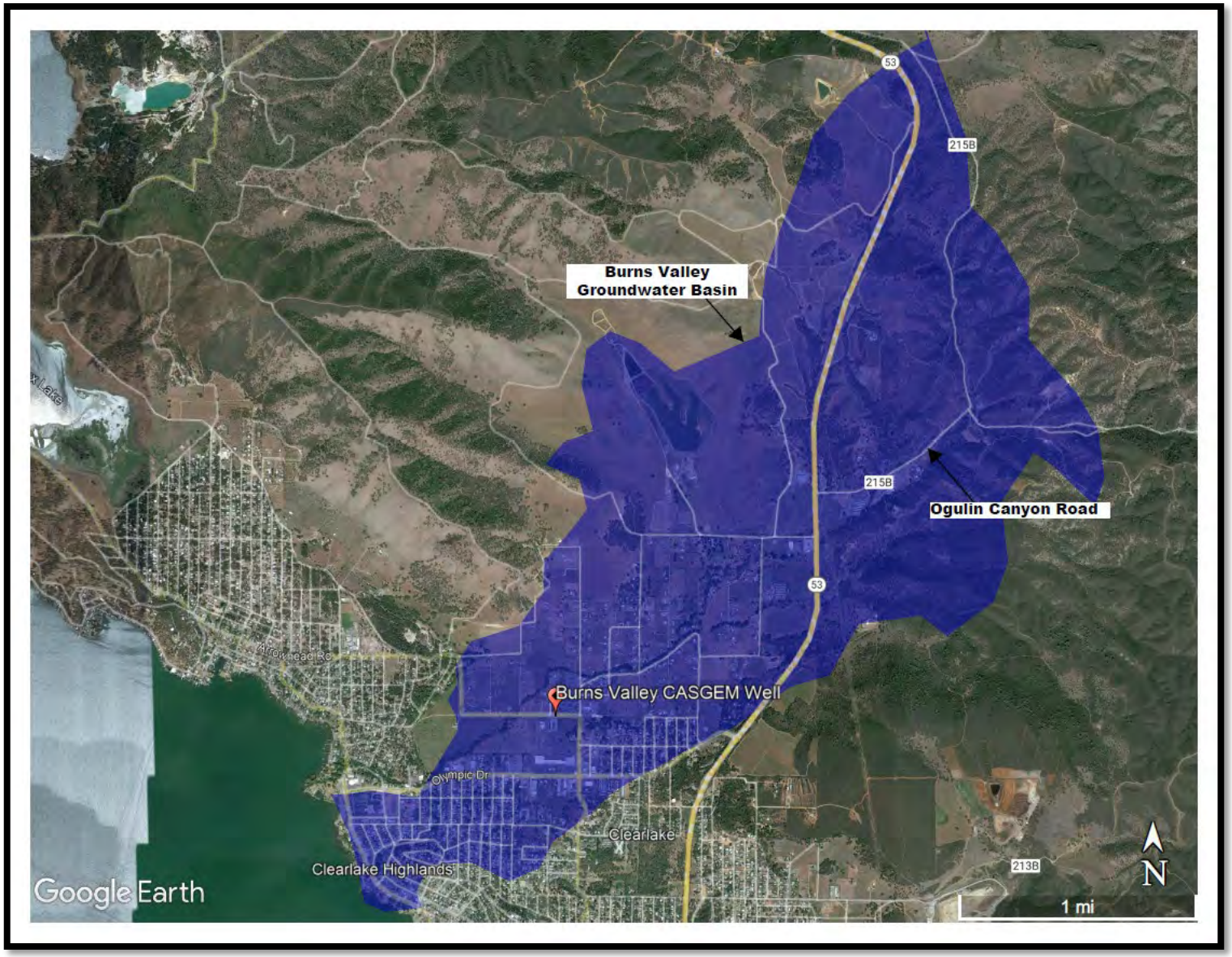

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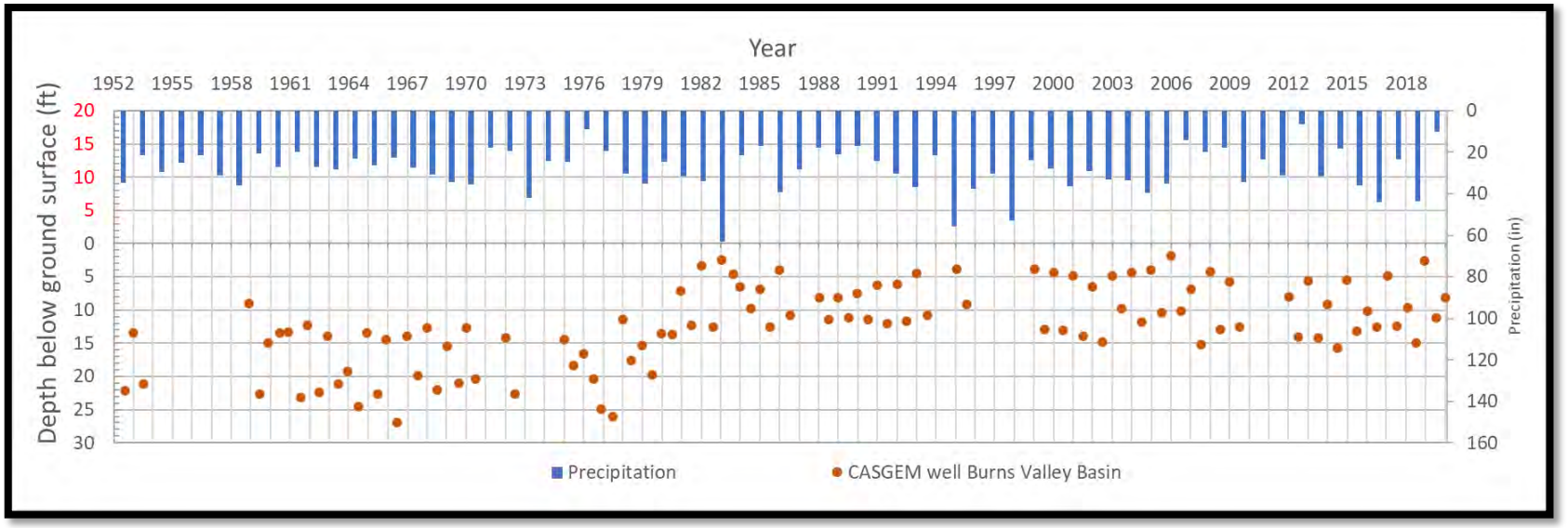

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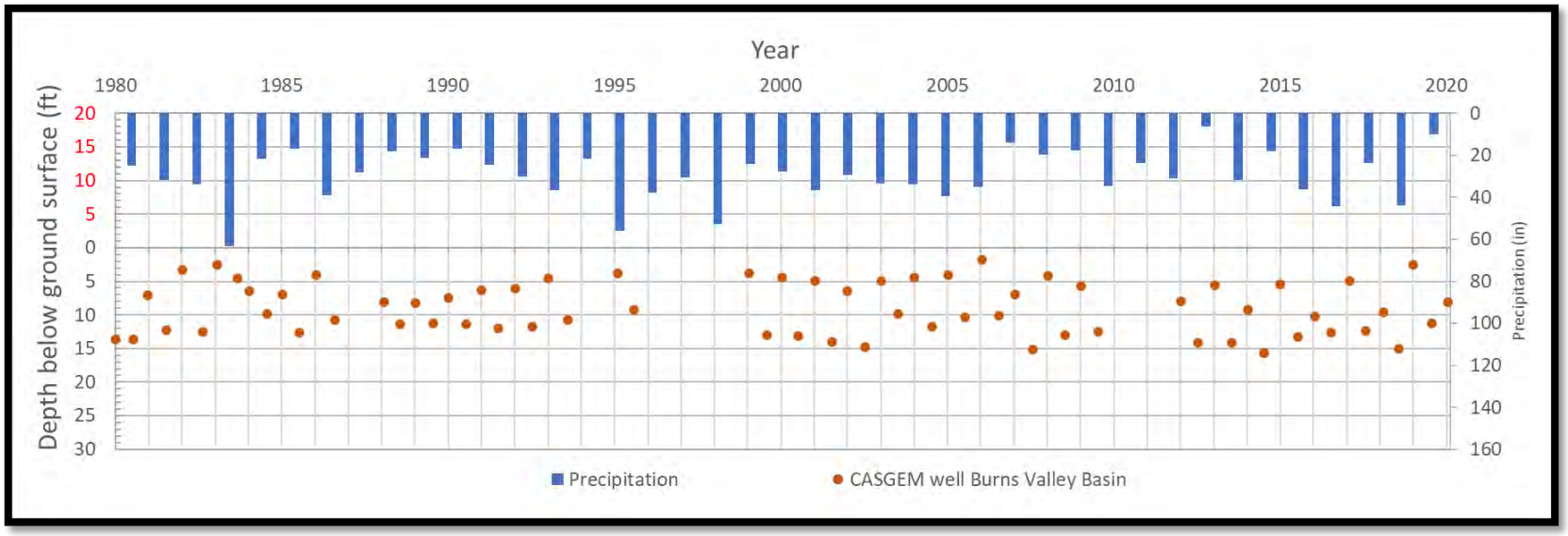

Figure 5. CASGEM Monitoring Well data from 1980 to 2020.

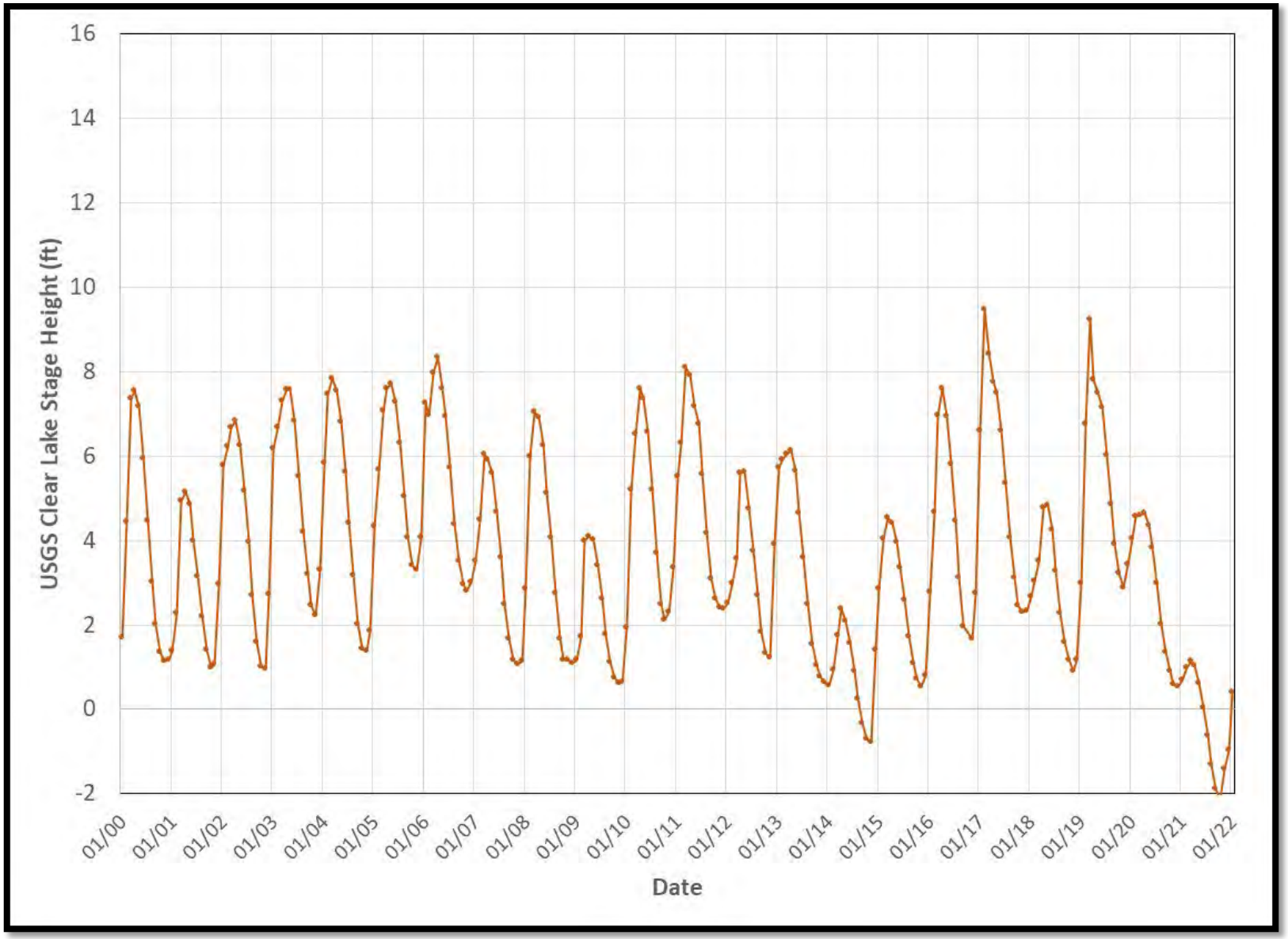

Figure 6. Clear Lake stage height 2000 through 2021.

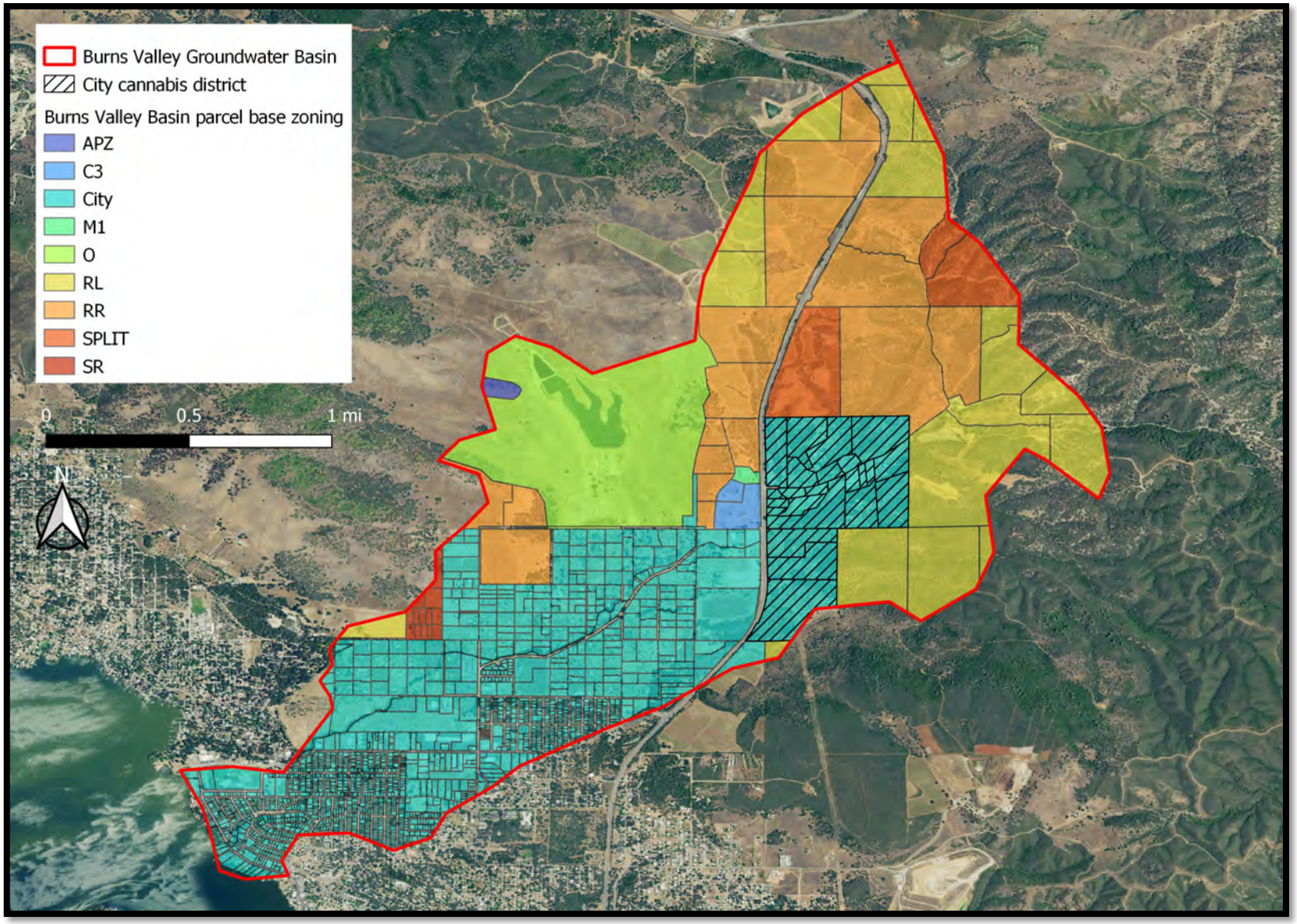

Figure 7. City of Clearlake Cannabis District and Lake County parcel base zoning designations.

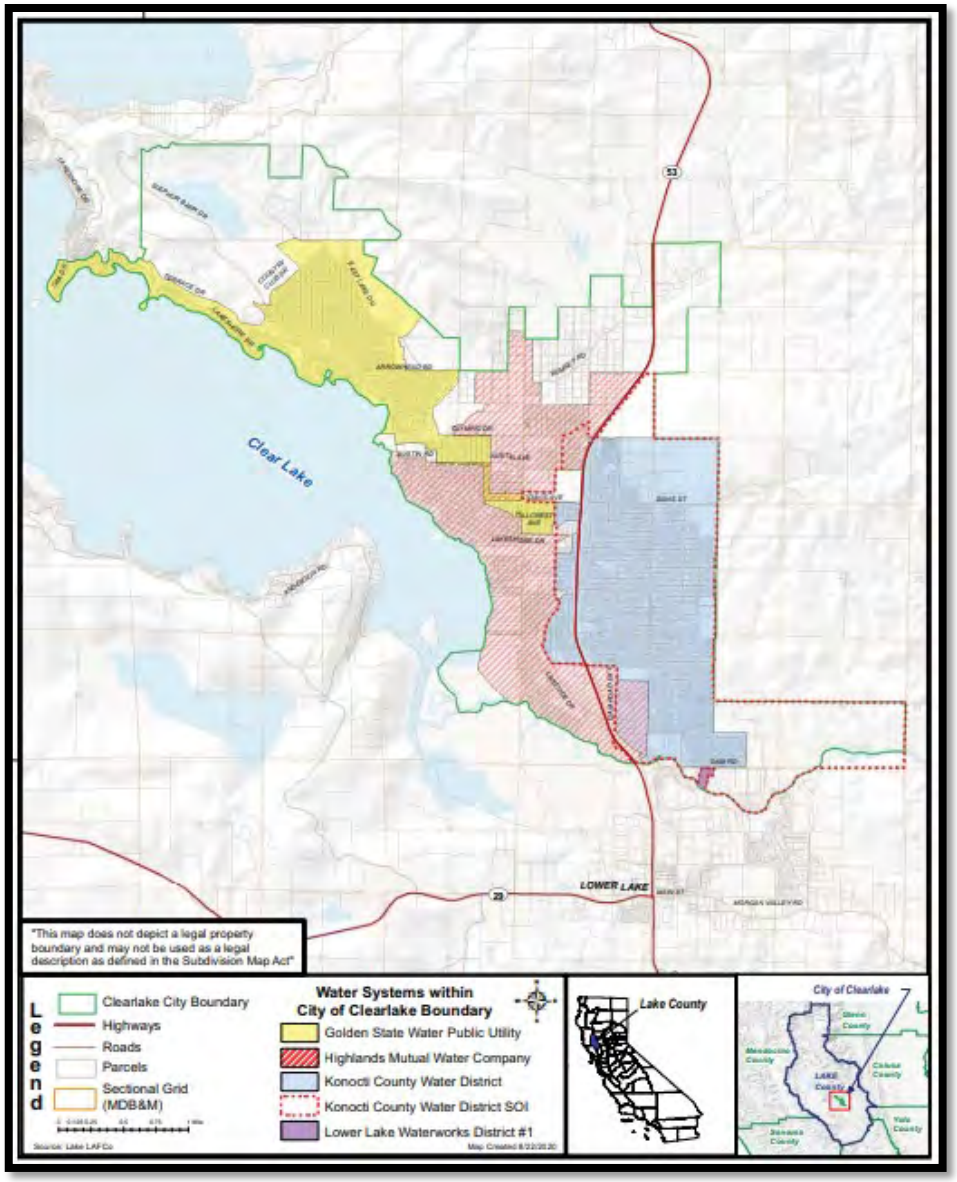

Figure 8. Water Systems within the City of Clearlake Boundary (Source: [ClearlakeH20 MSR-SOI 2021EDIT-2. cl docx (lakelafco.org)])

TECHNICAL MEMORANDUM

To: City of Clearlake

From: Annjanette Dodd, PhD, CA PE #77756 Exp. 6/30/2023

Date: January 3, 2022

Subject: Response to Appeal Comments – 2185 Ogulin Canyon Road (APN 010-044-17)

On November 15, 2021, an appeal to the Conditional Use Permits approved by the City of Clearlake (City) Planning Commission on November 9, 2021, for the proposed cannabis facilities at 2185 Ogulin Canyon Road, was submitted to the City. The appellant filed the appeal on behalf of at least 11 property owners in the Burns Valley Groundwater Basin (BVGB) area southwest of the subject property and argues the following:

1) "The subject property is within the Burns Valley Watershed. Many of the wells in Burns Valley have been adversely affected by development of property within the watershed for grape vineyards and other cannabis grow projects",
2) "The Water Availability Analysis did not discuss or analyze the cumulative effect that the use will have on the (Burns Valley) watershed nor did it address the cumulative effect of the project when combined with existing or approved projects",
3) "We feel the cumulative effect of adding this project to the existing uses should be considered prior to approval a Use Permit. On the West side there is a wine grape vineyard covering approximately 500 acres. Some of the Burns Valley property owners feel their wells were impacted by the vineyard. This year there are 2 active and permitted cannabis grow operations north of Ogulin on the East side of State Hwy 53; there is also an additional recently approved cannabis grow permit further north on Ogulin Canyon Rd from the 2185 site. The City approved a cannabis operation earlier this year at 2560 State Hwy 53 bordering Burns Valley Creek and located across from the school bus yard at Hwy 53 and Old Hwy 53. Thursday, November 18, 2021, the Lake County Planning Commission will consider a Use Permit for a cannabis grow just outside the Clearlake City Limits at 2050 Ogulin Canyon Rd; we will be attending this hearing and asking for a more extensive cumulative study of the watershed",
4) "Studies referenced in the various hydrology reports for the various projects are dated with some going back as far as 1960; the most referenced is the March 2006 Lake County Groundwater Management Plan, which is now 15 years old", and
5) "It is our feeling that a more complete hydrology study should be completed which includes the effect of this project and considering the vineyard plus the existing and approved cannabis projects to determine the impact on the water supply in the Burns Valley basin".

A Groundwater Hydrology Technical Memorandum was prepared for 2185 Ogulin Canyon Road on November 9, 2021 and submitted to the Planning Commission that addressed groundwater recharge and cumulative impacts and concluded that there is sufficient recharge and supply to meet the project's demand during average and dry years; the project's demand is only 0.1% of the usable storage capacity of the BVGB; and the potential future cannabis demand in the basin is a fraction of the usable storage capacity of the BVGB and that the proposed project water use would have little to no cumulative impact on the surrounding area. The purpose of the current Technical Memorandum (TM) is to add to the information provided in the November 9, 2021

EXISTING AGRICULTURAL GROUNDWATER USE AND TRENDS

Review of Google Earth Imagery shows extensive agricultural development, in the form of walnut/pear orchards and vineyards, in the Burns Valley since at least 1985. The existing vineyards mentioned by the appellant were established prior to 2003 and should have been considered in the Lake County Groundwater Management Plan. According to the Lake County Water Demand Forecast, the average annual water demand for vineyards and walnut/pear orchards in Lake County is 0.5 acre-feet per acre and 2.2 acre-feet per acre, respectively. Using current Google Earth imagery, there are roughly about 450 acres of existing vineyards and 150 acres of orchards in Burns Valley. Orchard production in the valley has decreased over time. Accounting for existing vineyards and orchards, the approximate agricultural demand in the valley is about 555 acre-feet per year which is supplied via existing groundwater wells. The 2006 Lake County Groundwater Management Plan stated that the agricultural demand in the BVGB during an average year is 105 acre-feet, with 14 acre-feet of this supplied from groundwater, which appears to be an underestimate of the existing groundwater agricultural demand.

The main sources of groundwater in the BVGB are within the *Quaternary Alluvium Formation* and the *Lower Lake Formation*. The *Quaternary Alluvium* dominates the southwestern portion of the BVGB, where both residential development and well development are most dense (Figure 1 and Figure 2). The alluvium has a thickness of up to 50 feet; groundwater in this formation is unconfined and typically provides water for domestic use. Wells screened in unconfined aquifers are more directly influenced by lack of rain than those screened in deeper, confined aquifers. The *Lower Lake Formation* underlies the alluvial deposits in the BVGB. This formation has low permeability and provides water to wells at up to a few hundred gallons per minute and is the dominant source of agricultural water demand in the BVGB. Note that the existing vineyards and the existing and proposed cannabis projects are located outside of the alluvial valley in the upper half of the BVGB (Figure 1).

Fortunately, there is a California Statewide Groundwater Elevation Monitoring (CASGEM) Program well located within the BVGB that has been used to monitor long-term groundwater trends (CASGEM well ID: 39925, Lat/Long: 38.96535, -122.63186, Figure ***3***) for over 50 years. The CASGEM well is drilled 177 feet below ground surface (bgs) into the deeper *Lower Lake Formation*. Groundwater levels in the CASGEM well are measured twice annually, approximately every April and November, to visualize the fall drawdown (November) and spring recharge (April). In general, since 1952, there appears to be an increasing trend in groundwater levels in the BVGB (Figure ***4***). However, a vertical shift is apparent and occurs in about 1980. Since it is unknown if this is a natural shift in the data or a shift due to change in measurement, data prior to 1980 was removed. Since 1980, the data indicate that the long-term groundwater trend has been relatively stable (Figure ***5***), with consistent recharge during each annual wet season, even during years with low annual precipitation and accounting for the existing and historical agricultural demand.

The appellant has indicated that many of the wells in the BVGB have been adversely impacted by development, the vineyards, and other cannabis projects. However, no information was provided regarding the impacted wells. Verbal correspondence with the City and Lake County have indicated anecdotal evidence of lower well production and possibly dry wells in the BVGB, however, without specific context and data, reports of 'dry wells' are only anecdotal and cannot be adequately assessed using the available data. In addition, according to the Statewide Summary of Household Water Supply Shortage Reportage System reports (https://mydrywell.water.ca.gov/report/publicpage), no wells have been reported as going dry in the BVGB.

The anecdotal evidence regarding well production is not surprising as Lake County has been in the midst of a severe drought. As stated above, wells screened in the shallower, unconfined aquifer, would be more

directly influenced by the lack of rain and likely to go dry. There is also a likelihood that shallow groundwater in the southern portion of Burns Valley is hydrologically coupled to surface water levels in Clear Lake. As a result of the drought, surface water levels in the lake recorded in August and September of 2021 were the lowest on record since 2000, which could have a direct impact on shallow groundwater well production (Figure ***6***). Additional monitoring and reporting within the *Quaternary Alluvium* are recommended and would be helpful in understanding shallow groundwater trends in the basin.

FUTURE AGRICULTURAL GROUNDWATER USE AND SUPPLY

The potential cumulative effects and the dated nature of the Lake County Groundwater Management Plan were both addressed in the November 9, 2021 Groundwater Hydrology Technical Memorandum prepared for 2185 Ogulin Canyon Road. However, more detailed information is presented herein to further support the conclusions made in the original Groundwater Hydrology Technical Memorandum.

As discussed above, the current groundwater agricultural demand in the BVGB is roughly 555 acre-feet per year. Approximately 225 acre-feet is from existing vineyards in the upper portion of the BVGB and 330 acre-feet is from orchards located within the lower portion the BVGB. A summary of proposed cannabis projects and the approximate annual water demand is provided in Table 1. All the proposed projects are located in the upper portion of the BVGB east of State Highway 53 (Figure ***1***).

Table 1. Approximate water demand of proposed cannabis projects within the BVGB (information obtained from the City of Clearlake and Lake County websites and CEQAnet Database). Refer to Figure 1 ***for approximate locations.***

Location (jurisdiction)	APN(s)	Parcel Area (acres)	Cultivation (Acres)	Cultivation % of Parcel Area	Approximate Annual Water Demand (acre-feet)
1756 Ogulin Canyon Road (County) (Blue Oak Farms)	010-055-46	46.5	2.0	4.3	3.3
2050 Ogulin Canyon Road (County) (Lake Vista Farms)	010-053-01 & 02	302.4	15.0	5.0	24.9
2185 Ogulin Canyon Road (City)	010-044-17	21.3	0.5	2.3	1.8
2160 Ogulin Canyon Road (City)	010-044-21	9.6	0.2	2.1	1.7
2560 Highway 53 (City)	010-048-05	15.4	1.3	8.4	4.3
2250 Ogulin Canyon Road (City)	010-044-19	13.0	0.4	3.1	1.0
Total		408.2	19.4	n/a	37.0

Table 2: Base zones designations, total areas associated with each base zone designation, parcel count, and base zone eligibility for potential cannabis cultivation within the Burns Valley Groundwater Basin.

Zone	Description	Total Parcel Area (acres)*	# of Parcels
RL	Rural Lands	1105.9	18
RR	Rural Residential	677.3	18
Split	Combined Zoning (Dominant Zones are A and RL)	136.5	4

City	Cannabis District	242	23
*This is the total area of the parcel, not just the portion within the BVGB			

To assess the potential for additional cannabis cultivation within the BVGB, not included in Table 1, a parcel inventory analysis was completed (Figure ***7*** and Table 2) to identify those parcels that meet requirements for potential cannabis cultivation with an approved permit from the City or Lake County. The Lake County Zoning Ordinance allows 1-acre of outdoor canopy for each 20 acres of parcel size for these zones. There are 40 parcels that are within or intersect the BVGB with a cumulative parcel area of about 1920 acres (total parcel area, not the intersected area, was used for conservativeness). Of these parcels, 10 parcels or 596 acres are existing vineyards and 2 parcels, or 349 acres have proposed cultivation shown in Table 1.

Excluding these parcels, there are 28 parcels or 975 acres of base zoning that could be eligible for outdoor cultivation. Thus, there is the potential for up to 48 acres of potentially new outdoor cultivation (the County allows only 1-acre of cultivation for each 20 acres of parcel area). However, accounting for existing development, steep topography, waterbody setbacks, flood zones, residential setbacks, and parcel setbacks, there is limited area for development and only approximately 10 to 20 acres of new outdoor cultivation would likely be possible. The increased irrigation demand could be up to approximately 33.1 acre-feet per year assuming 3,000 gallons per day per acre for 180 days. This does not account for the fact that the project at 2050 Ogulin Canyon Road is replacing a 13.9-acre hops farm that utilized approximately 43.6 acre-feet per year of water, creating a deficit of 18.7 acre-feet. Subtracting 18.7 acre-feet from 33.1 acre-feet results in an approximate increased demand of 14.4 acre-feet per year due to potential cannabis projects approved by Lake County.

The City of Clearlake Zoning Ordinance allows for mixed-light/indoor cultivation in the BVGB, with a City Cannabis Permit, on 23 parcels with a total area of 242 acres. Accounting for the proposed projects listed in Table 1, existing development, steep topography, waterbody setbacks, and flood zones only approximately 18 to 20 acres of this area could have the potential for mixed-light/indoor cultivation. The increased irrigation demand could be up to approximately 55.2 acre-feet assuming 3,000 gallons per day per acre for 300 days. The total potential demand from both the County and City for cannabis cultivation could be up to 106.6 acre-feet per year, which includes the proposed projects listed in Table 1 and a conservative (high) estimate of total potential cultivation.

Thus, the total potential agricultural demand within the BVGB is existing, 555 acre-feet, plus proposed, 106.6 acre-feet, is approximately 661.6 acre-feet per year. The dominant demand in the BVGB is associated with residential development and orchards in the lower part of BVGB and vineyards in the upper part of the BVGB. The Highlands Mutual Water Company supplies the majority of residents in the lower part of the BVGB (Figure ***8***). According to the Lake County Agency Formation Commission 2021 Report on Clearlake Water Providers (ClearlakeH20 MSR-SOI 2021EDIT-2. cl docx (lakelafco.org)), the Highlands Mutual Water Company serves 6,072 people with water via 2,568 services connections using water drawn from Clear Lake. Thus, the overall groundwater demand is mainly from agriculture.

The estimated storage capacity of the BVGB is 4,000 AF, with a usable storage capacity of 1,400 AF. The total potential agricultural demand is 47% of the usable storage capacity. According to DWR, groundwater in the BVGB is derived from rain that falls within the 12.5 square mile Burns Valley Watershed drainage area. Recharge estimates provided in Hydrology Reports for 1756 Ogulin Canyon Road, 2060 Ogulin Canyon Road, 2160 Ogulin Canyon Road, and 2185 Ogulin Canyon Road, demonstrate that there is sufficient recharge over the project's contributing recharge area (a small fraction of the entire Burns

Valley Watershed area) to meet the projects' demands during both average and dry years. Overall, the proposed projects in Table 1 represent 2.6% of the usable storage capacity in the BVGB and only 6.7% of the existing demand for irrigation of existing vineyards and orchards.

The demand associated with 2185 Ogulin Canyon Road represents only a small fraction, 0.1% of the usable storage capacity of the BVGB, only 0.3% of the total potential future demand in the BVGB, the total demand associated with the proposed projects listed in Table 1 is only 2.6% of the usable storage capacity of the BVGB and 6% of the potential future demand in the BVGB.

SUMMARY AND DISCUSSION

- A Groundwater Hydrology Technical Memorandum was prepared for 2185 Ogulin Canyon Road on November 9, 2021 and submitted to the Planning Commission that addressed groundwater recharge and cumulative impacts and concluded that there is sufficient recharge and supply to meet the project's demand during average and dry years; the project's demand is only 0.1% of the usable storage capacity of the Burns Valley Groundwater Basin (BVGB); and the potential future cannabis demand in the basin is a fraction of the usable storage capacity of the BVGB and that the proposed project water use would have little to no cumulative impact on the surrounding area.
- The existing demand associated with vineyards and orchards is likely higher than reported in the 2006 Lake County Groundwater Management Plan. The higher estimate has been incorporated herein.
- The main sources of groundwater in the BVGB are within the *Quaternary Alluvium Formation* and the *Lower Lake Formation*. The *Quaternary Alluvium* dominates the southwestern portion of the BVGB, where both residential development and well development are most dense. The alluvium has a thickness of up to 50 feet; groundwater in this formation is unconfined and typically provides water for domestic use. Wells screened in unconfined aquifers are more directly influenced by lack of rain than those screened in deeper, confined aquifers.
- The *Lower Lake Formation* underlies the alluvial deposits in the BVGB. This formation has low permeability and provides water to wells at up to a few hundred gallons per minute and is the dominant source of agricultural water demand in the BVGB.
- Long-term groundwater monitoring in the BVGB shows a stable trend in groundwater levels within the deeper formation, with consistent recharge during each annual wet season, even during years with low annual precipitation and accounting for the existing vineyard and orchard demand that has occurred over this time.
- Although there has been anecdotal evidence of wells going dry in the BVGB, no information regarding these wells was provided so that they could be adequately assessed. It is likely these wells are located in the shallower alluvium formation and are more directly influenced by lack of rain and the low water levels in Clear Lake. No wells within the BVGB were reported to the State Water Supply Shortage Reporting System. Additional monitoring and reporting within the *Quaternary Alluvium* are recommended and would be helpful in understanding shallow groundwater trends in the basin.
- The existing vineyards and the existing and proposed cannabis projects are located outside of the alluvial valley in the upper half of the BVGB.
- The dominant demand in the BVGB is associated with residential development and orchards in the lower part of BVGB and vineyards in the upper part of the BVGB. The Highlands Mutual Water Company supplies the majority of residents in the lower part of the BVGB using surface water drawn from Clear Lake. Thus, agriculture accounts for the majority of groundwater demand. The

agriculture demand, accounting for existing agriculture and potential cannabis projects, is approximately 661.6 acre-feet per year. The estimated storage capacity of the BVGB is 4,000 AF, with a usable storage capacity of 1,400 AF. The total potential future agricultural demand is 47% of the usable storage capacity. Thus, there is sufficient storage capacity to meet existing and proposed demand.

- Recharge estimates provided in the Hydrology Reports for 1756 Ogulin Canyon Road (Blue Oak Farms), 2050 Ogulin Canyon Road (Lake Vista Farms), 2160 Ogulin Canyon Road, and 2185 Ogulin Canyon Road, demonstrate that there is sufficient recharge over each project's contributing recharge area (a small fraction of the entire Burns Valley Watershed area) to meet each project's demands during both average and dry years.
- Overall, the proposed projects in Table 1 represent 2.6% of the usable storage capacity in the BVGB and only 6.7% of the existing demand for irrigation of existing vineyards and orchards.
- The demand associated with 2185 Ogulin Canyon Road represents only a small fraction, 0.1% of the usable storage capacity of the BVGB, only 0.3% of the total potential future demand in the BVGB, the total demand associated with the proposed projects listed in Table 1 is only 2.6% of the usable storage capacity of the BVGB and 6% of the potential future demand in the BVGB. Thus, it is unlikely that these projects, in combination with the 2185 Ogulin Canyon Road project, will adversely impact wells in the lower portion of the BVGB.

ATTACHMENTS

- Figure 1. Local geology (source: https://pubs.usgs.gov/imap/2362/), cultivation well locations, and CASGEM well location. QTc = Clear Lake Cache Formation, 'tb' = nonmarine terrace deposits, and 'al' = alluvium.
- Figure 2. Map of # (n) of Well Completion Reports (WCRs) with in each Public Land Survey System (PLSS) grid along with average well depth. The Burns Valley Groundwater Basin is outlined in red. Parcel coloring is provided in Figure 7.
- Figure 3. CASGEM Monitoring well location.
- Figure 4. CASGEM Monitoring Well data from 1952 to 2020.
- Figure 5. CASGEM Monitoring Well data from 1980 to 2020.
- Figure 6. Clear Lake stage height 2000 through 2021.
- Figure 7. City of Clearlake Cannabis District and Lake County parcel base zoning designations.
- Figure 8. Water Systems within the City of Clearlake Boundary (Source: ClearlakeH20 MSR-SOI 2021EDIT-2. cl docx (lakelafco.org))

QUALIFICATIONS OF AUTHOR

I have a PhD in Water Resources Engineering. In addition, I am a registered Professional Engineer with the State of California with 30-years of experience practicing and teaching Water Resources Engineering, including over 15 years of teaching, practicing, and modeling surface and groundwater hydrology.

LIMITATIONS

The study of groundwater hydrology is very complex and often relies on limited data, especially in rural areas. Recommendations and conclusions provided herein are based on professional judgment made using information of the groundwater systems and geology in Lake County, which is limited and allows only for a general assessment of groundwater aquifer conditions and recharge. NorthPoint Consulting Group, Inc. is making analyses, recommendations, and conclusions based on readily available data,

including studies and reports conducted by other professionals, Lake County, the State of California, and other consultants hired by the project proponent to prepare technical studies for the proposed project. If additional information or data becomes available for the project area, the recommendations and conclusions presented herein may be subject to change.

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FIGURES

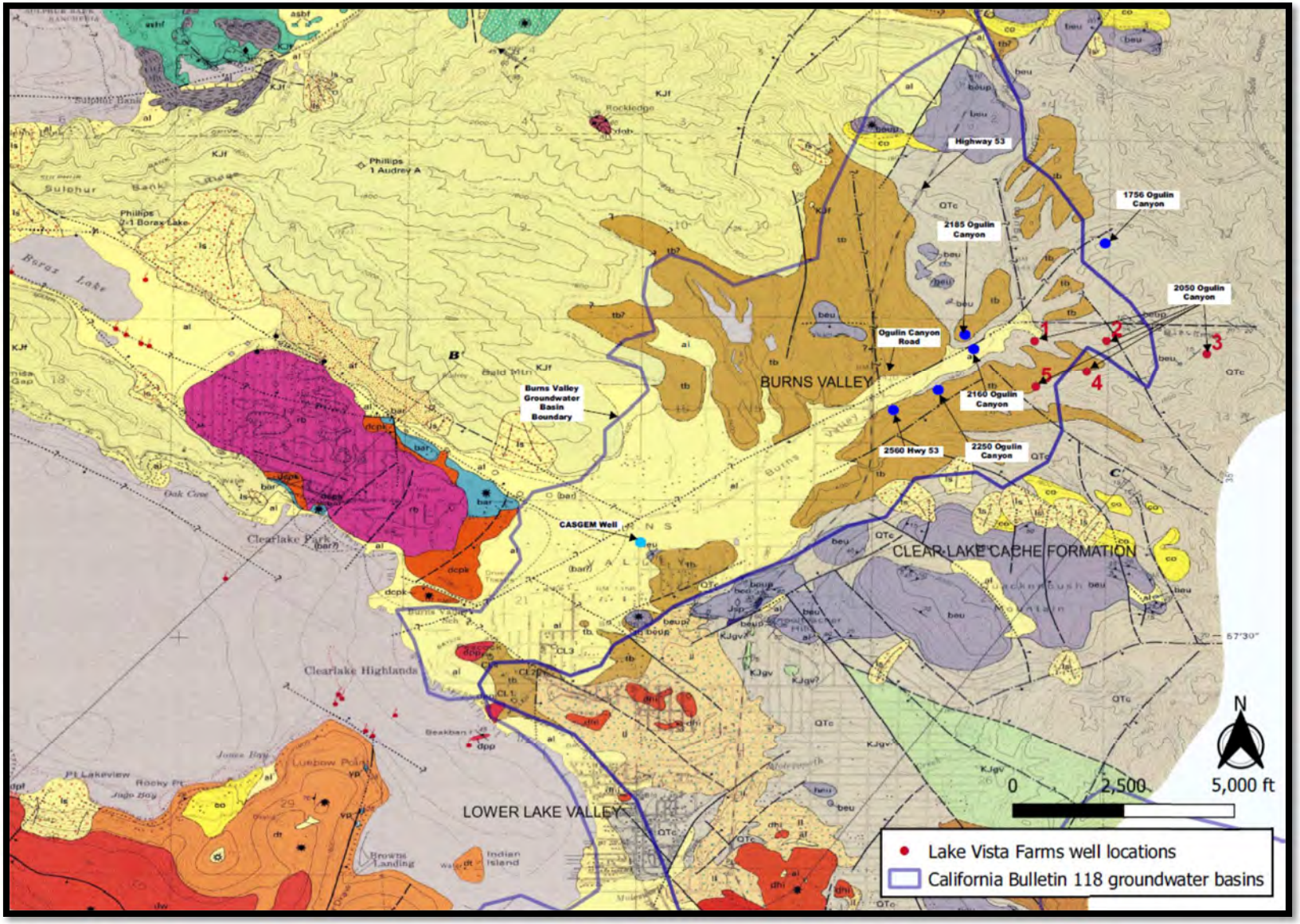


Figure 1. Burns Valley Groundwater Basin local geology (source: https://pubs.usgs.gov/imap/2362/), cultivation well locations, and CASGEM well location. QTc = Clear Lake Cache Formation, 'tb' = nonmarine terrace deposits, and 'al' = alluvium.

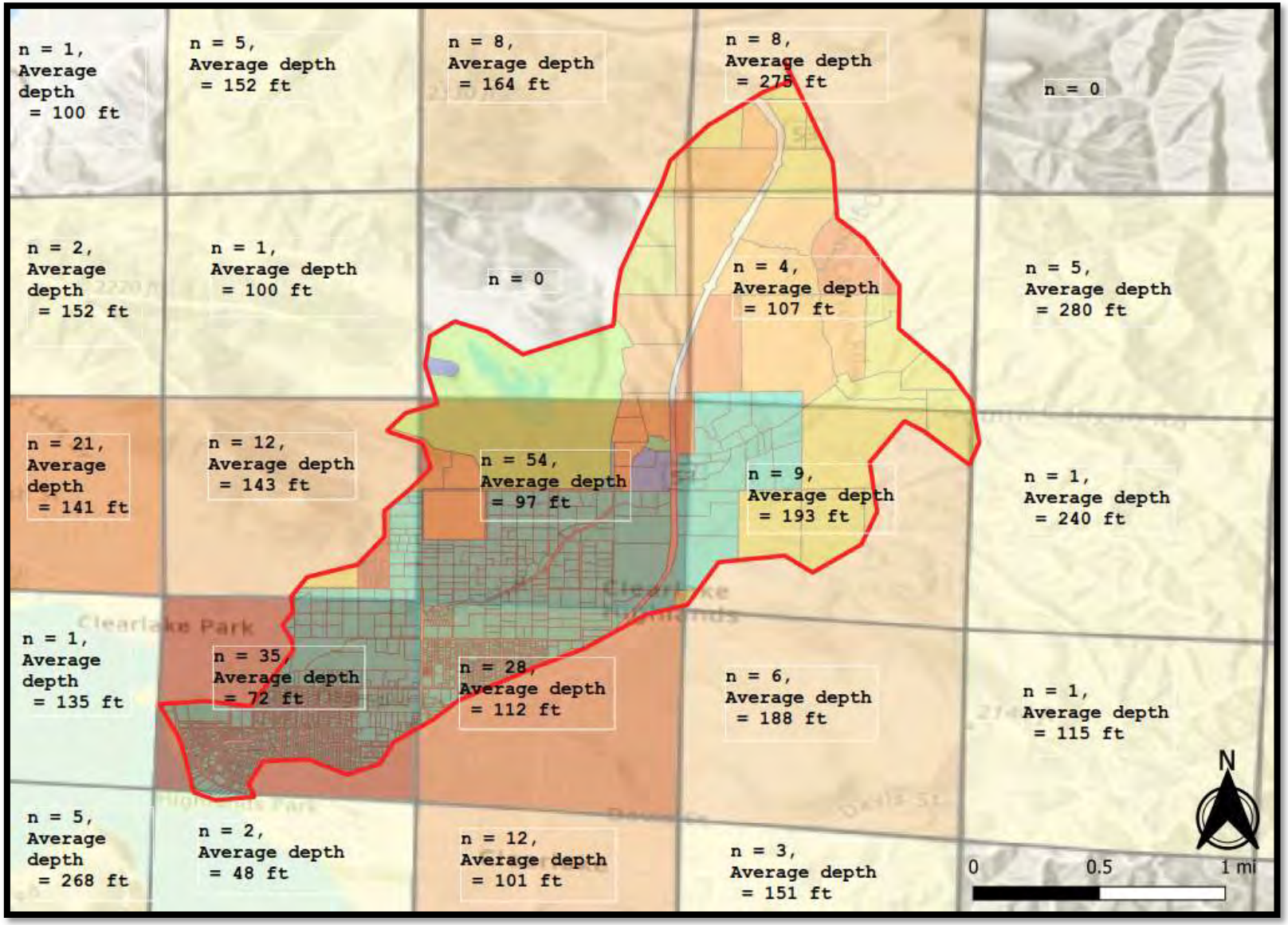


Figure 2. Map of # (n) of Well Completion Reports (WCRs) within each Public Land Survey System (PLSS) grid along with average well depth. The Burns Valley Groundwater Basin is outlined in red. Parcel coloring is provided in Figure 7.

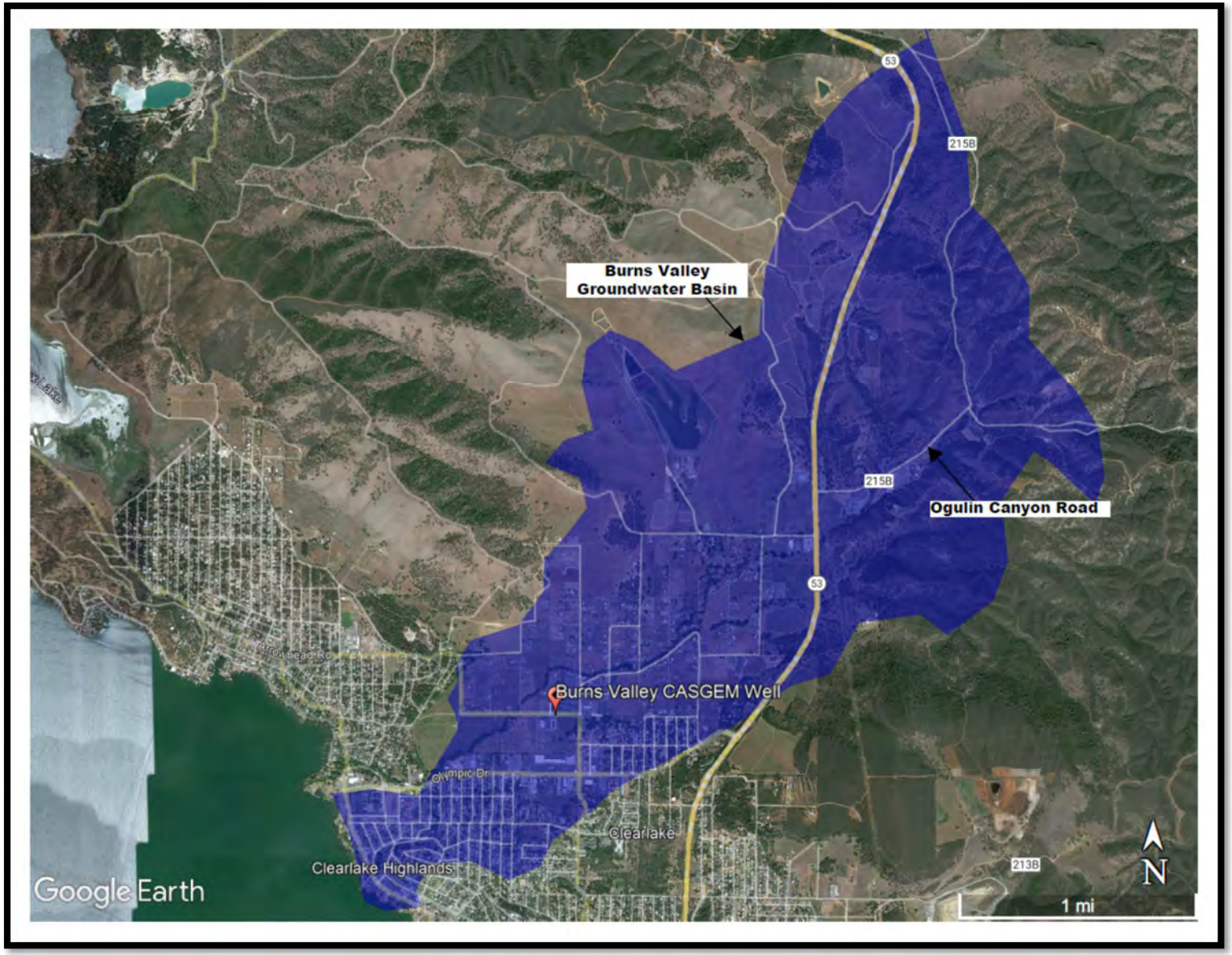


Figure 3. CASGEM Monitoring well location.

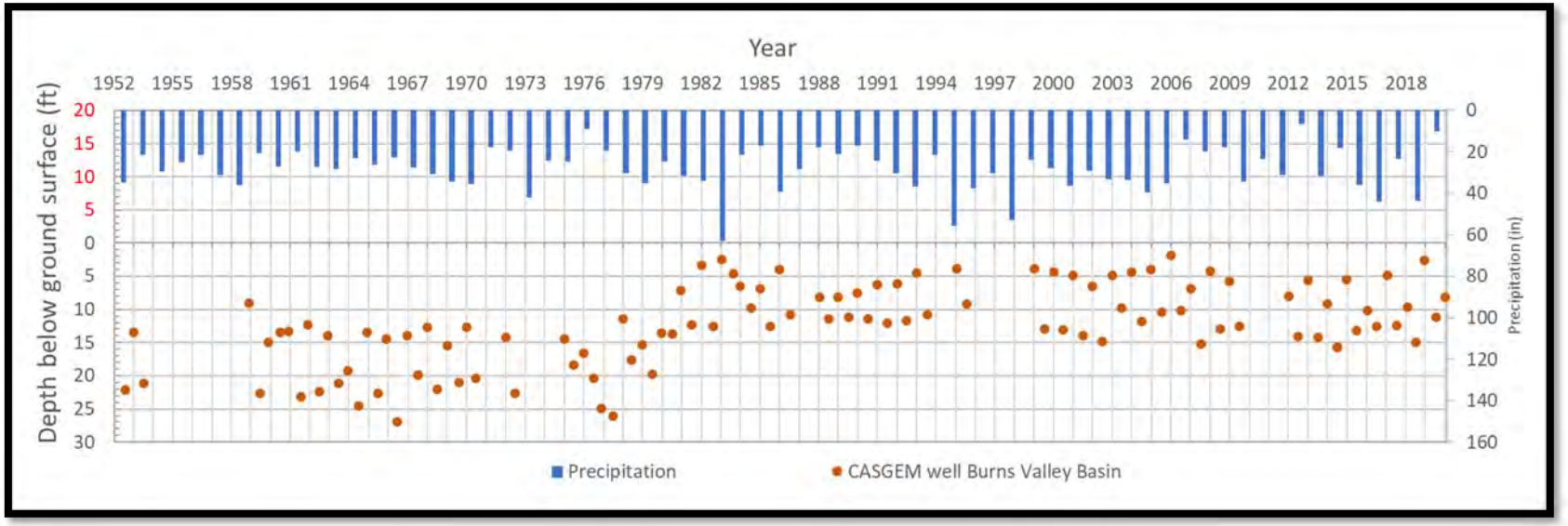


Figure 4. CASGEM Monitoring Well data from 1952 to 2020.

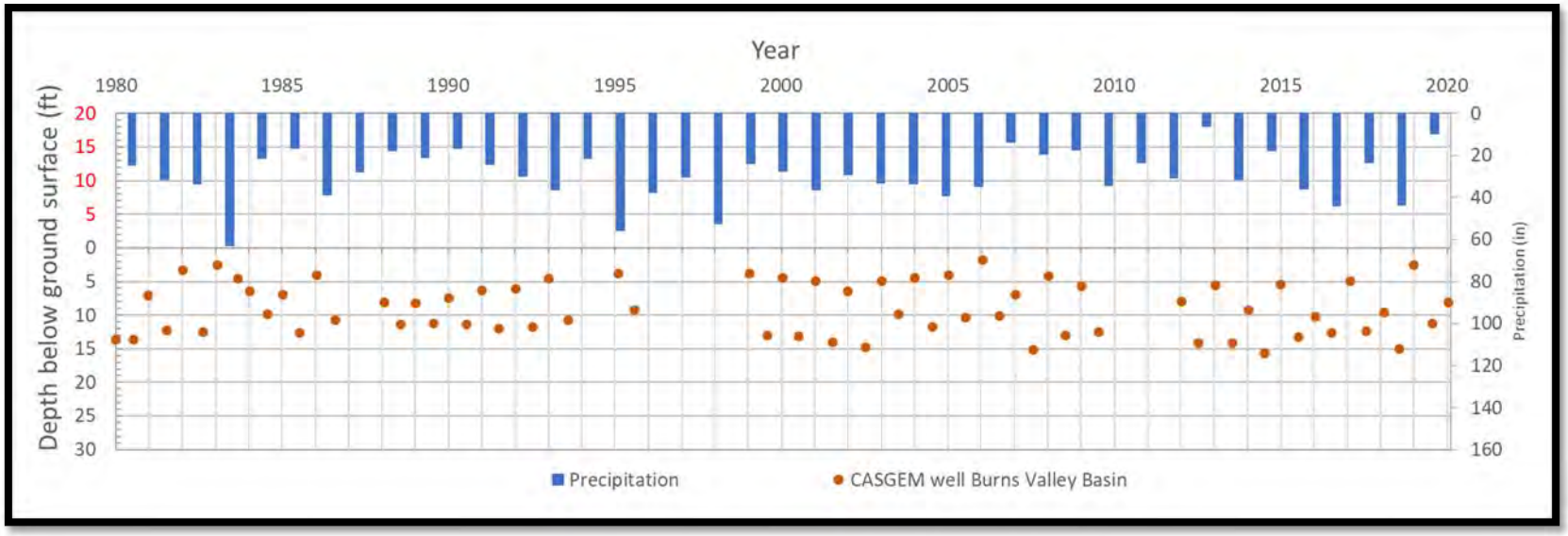


Figure 5. CASGEM Monitoring Well data from 1980 to 2020.

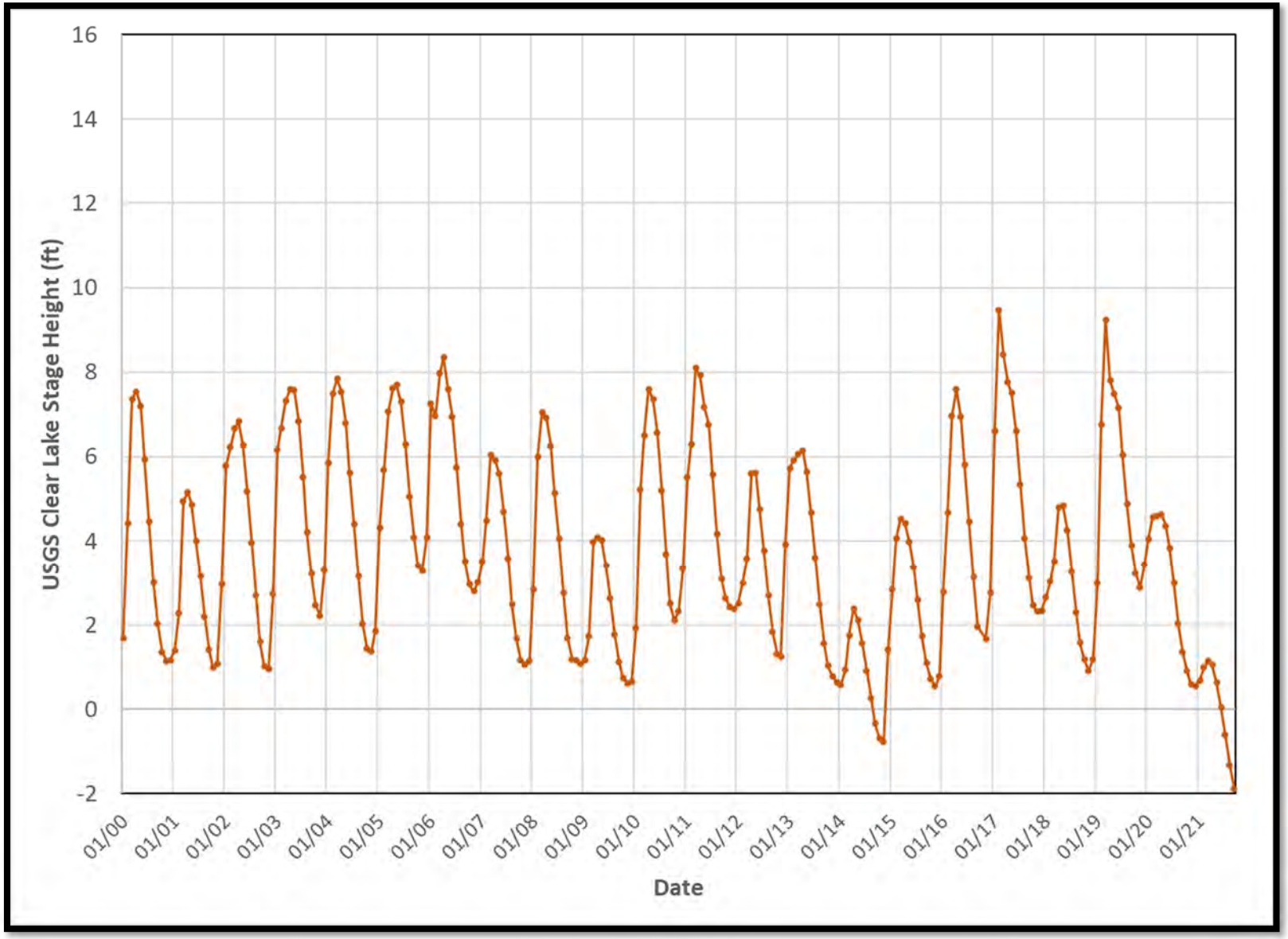


Figure 6. Clear Lake stage height 2000 through 2021.

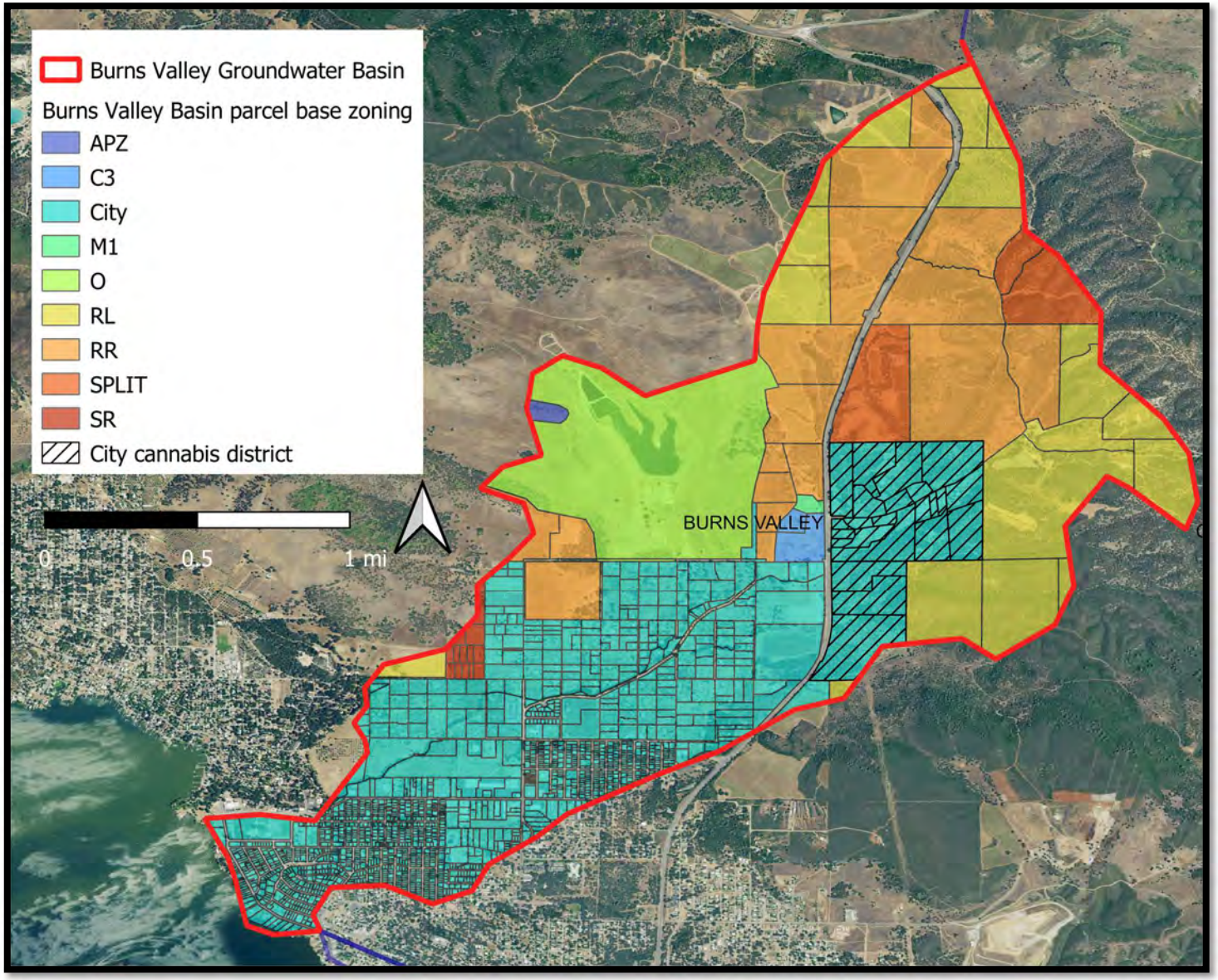


Figure 7. City of Clearlake Cannabis District and Lake County parcel base zoning designations.

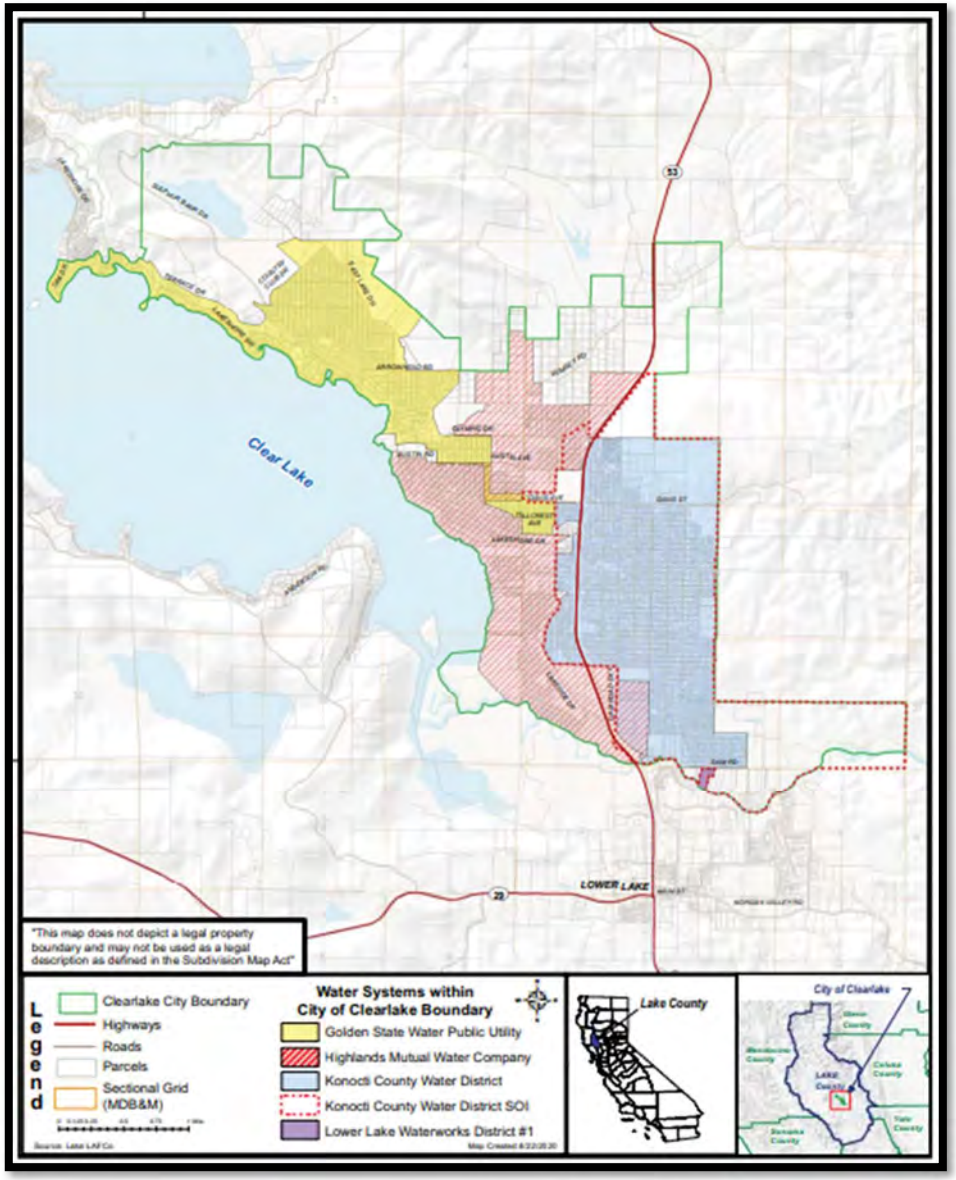


Figure 8. Water Systems within the City of Clearlake Boundary (Source: [ClearlakeH20 MSR-SOI 2021EDIT-2. cl docx (lakelafco.org)])

TECHNICAL MEMORANDUM

To: Mr. Brian Pensack

From: Annjanette Dodd, PhD, CA PE #77756

Date: November 9, 2021

Subject: Groundwater Hydrology – 2185 Ogulin Canyon Road, Clearlake, CA

PURPOSE AND BACKGROUND

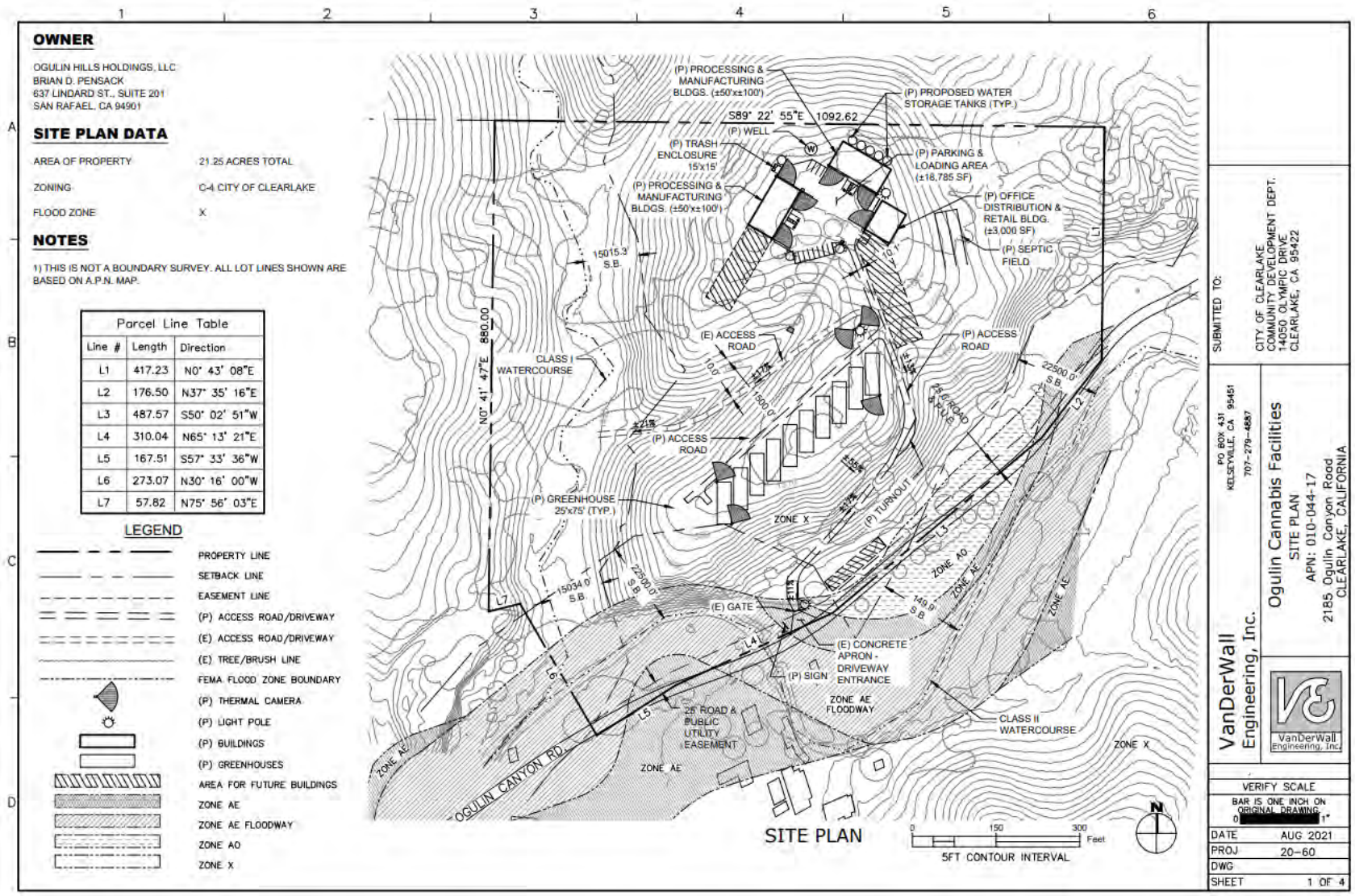
The purpose of this Technical Memorandum is to provide an evaluation of the potential impacts the proposed project would have on the surrounding groundwater resources. The project is located at 2185 Ogulin Canyon Road, Clearlake, Lake County, California. The project proposes 0.5-acres of mixed-light cannabis cultivation, 10,000 sq. ft. of manufacturing, processing, and distribution, and a 3,000 sq. ft. office, retail, and delivery building (Figure 1). A Water Availability Analysis (WAA) was prepared for the project in June 2021 by Richard Knoll Consulting and submitted to the City of Clearlake.

The estimated project water demand for cultivation (300-day cultivation period) was estimated in the WAA using standard industry values for cultivation (3,000 gallons per acre per day, or 2.1 gallons per minute) and warehouse demand (0.85 gallons per square foot, or 11,000 gallons per month). The project proposes ten employees, water demand based on the number of employees is equivalent to sanitary sewer generation for factories with shower facilities. According to the Lake County Rules and Regulations for On-Site Sewage Disposal (Lake County, 2010), the demand would be 35 gallons per day, per person. Thus, the proposed project employee demand would be 350 gallons per day or about 10,500 gallons per month, which corroborates the employee estimate provided in the WAA. The total estimated water demand for the proposed project provided in the WAA is 582,000 gallons per year or 1.8 acre-feet per year. The daily demand is about 1.3 gallons per minute (gpm).

WATER SOURCE AND SUPPLY

There is one (1) existing, permitted groundwater well (Permit Number: WE 5569AG) that will be used for cultivation (Lat/Long 38.983147, -122.604709). The well is approximately 375 feet deep and was drilled in March 2021. The well is screened between 280- and 375-feet below the ground surface. During the drilling of the well, the depth of first water was at 280-feet below the ground surface (bgs) and the static water level was estimated to be 280-feet bgs (Attachment 1 – Well Log).

The well was estimated to have a yield of 80 gpm (129.0 acre-feet per year). The potential daily demand of 1.3 gpm represents approximately 1.6% of the well yield and 2.5% of the annual well production in acre-feet.


OWNER
OGULIN HILLS HOLDINGS, LLC
BRIAN D. PENSACK
637 LINDARD ST., SUITE 201
SAN RAFAEL, CA 94901
SITE PLAN DATA
AREA OF PROPERTY 21.25 ACRES TOTAL
ZONING C-4 CITY OF CLEARLAKE
FLOOD ZONE X
NOTES
1) THIS IS NOT A BOUNDARY SURVEY. ALL LOT LINES SHOWN ARE BASED ON A.P.N. MAP.
Parcel Line Table
Line # | Length | Direction
L1 | 417.23 | N0° 43' 08"E
L2 | 176.50 | N37° 35' 16"E
L3 | 487.57 | S50° 02' 51"W
L4 | 310.04 | N65° 13' 21"E
L5 | 167.51 | S57° 33' 36"W
L6 | 273.07 | N30° 16' 00"W
L7 | 57.82 | N75° 56' 03"E
LEGEND
PROPERTY LINE
SETBACK LINE
EASEMENT LINE
(P) ACCESS ROAD/DRIVEWAY
(E) ACCESS ROAD/DRIVEWAY
(E) TREE/BRUSH LINE
FEMA FLOOD ZONE BOUNDARY
(P) THERMAL CAMERA
(P) LIGHT POLE
(P) BUILDINGS
(P) GREENHOUSES
AREA FOR FUTURE BUILDINGS
ZONE AE
ZONE AE FLOODWAY
ZONE AO
ZONE X
(P) PROCESSING & MANUFACTURING BLDGS. (±50'x±100')
(P) PROPOSED WATER STORAGE TANKS (TYP.)
S89° 22' 55"E 1092.62
(P) WELL
(P) TRASH ENCLOSURE 15'x15'
(P) PARKING & LOADING AREA (±18,785 SF)
(P) PROCESSING & MANUFACTURING BLDGS. (±50'x±100')
(P) OFFICE DISTRIBUTION & RETAIL BLDG. (±3,000 SF)
(P) SEPTIC FIELD
150 15.3' S.B.
N0° 41' 47"E 880.00
CLASS I WATERCOURSE
(E) ACCESS ROAD
(P) ACCESS ROAD
(P) GREENHOUSE 25'x75' (TYP.)
(P) TURNOUT
ZONE X
ZONE AO
ZONE AE
(E) GATE
(E) CONCRETE APRON - DRIVEWAY ENTRANCE
(P) SIGN
ZONE AE FLOODWAY
25' ROAD & PUBLIC UTILITY EASEMENT
CLASS II WATERCOURSE
OGULIN CANYON RD.
SITE PLAN
0 150 300 Feet
5FT CONTOUR INTERVAL
N
SUBMITTED TO:
CITY OF CLEARLAKE
COMMUNITY DEVELOPMENT DEPT.
14050 OLYMPIC DRIVE
CLEARLAKE, CA 95422
VanDerWall Engineering, Inc.
PO BOX 431
KELSEYVILLE, CA 95451
707-279-4857
Ogulin Cannabis Facilities
SITE PLAN
APN: 010-044-17
2185 Ogulin Canyon Road
CLEARLAKE, CALIFORNIA
VERIFY SCALE
BAR IS ONE INCH ON ORIGINAL DRAWING
DATE AUG 2021
PROJ 20-60
DWG
SHEET 1 OF 4

GROUNDWATER BASIN INFORMATION AND HYDROGEOLOGY

The well site is in the Burns Valley Groundwater Basin (Basin #5-17). According to the California Department of Water Resources (DWR), almost all the groundwater in the Burns Valley Basin is derived from rain that falls within the 12.5 square mile Burns Valley Watershed drainage area (DWR Bulletin 118).

The Burns Valley Basin is within the Burns Valley Watershed. The Franciscan Formation borders the Burns Valley Basin on the north, Clear Lake borders the basin on the west, and the Cache Formation borders the basin on the south and east. The valley is drained by Burns Valley Creek, flowing southwest, and eventually into Clearlake. There are three water bearing formations in the Burns Valley Basin, the Quaternary Alluvium, Quaternary Terrace Deposits, and Lower Lake Formation. The *Quaternary Alluvium* located in the valley lowlands in the southern end of the valley are composed of silt, sand, and gravel with a thickness up to 50 feet. Groundwater in this formation is unconfined and typically provides water for domestic use. *Quaternary Terrace Deposits* have been deposited on the sides of the alluvial plain in the Burns Valley Basin. The terrace deposits are approximately 15 feet above the valley floor and slope up the valley to a similar elevation as the foothill exposures of the Cache Formation. Groundwater in this formation is not well understood. The *Lower Lake Formation*, consisting of lake deposits, underlies the alluvial and terrace deposits in the basin. The formation consists of fine sands, silts, and thick interbeds of marl and limestone, and has a maximum thickness of 200 feet. The formation has low permeability and provides water to wells at up to a few hundred gallons per minute. Based on the depth of the well, it is likely in the deeper, higher yielding, water bearing formation. The California Department of Water Resources (DWR) estimated a storage capacity of the Burns Valley Basin as 4,000 AF with a usable storage capacity of 1,400 AF. Well depths mostly range between 25- and 425-feet. (CDM 2006 and California DWR 2003, 2021)

The Burns Valley Groundwater Basin has not been identified by the California Department of Water Resources (DWR) as critically overdrafted basins. Critically overdrafted is defined by DWR as, “A basin subject to critical overdraft when continuation of present water management practices would probably result in significant adverse overdraft-related environmental, social, or economic impacts." In addition, as part of the California Statewide Groundwater Elevation Monitoring (CASGEM) Program, DWR created the CASGEM Groundwater Basin Prioritization statewide ranking system to prioritize California groundwater basins in order to help identify, evaluate, and determine the need for additional groundwater level monitoring. California’s groundwater basins were classified into one of four categories high-, medium-, low-, or very low-priority. The Burns Valley Groundwater Basin is ranked as very low-priority basins by the CASGEM ranking system. (DWR, 2021)

RECHARGE RATE

The annual recharge can be estimated using a water balance equation, where recharge is equal to precipitation (P) less runoff (Q) and abstractions that do not contribute to infiltration (e.g., evapotranspiration). A simple tool that can be used to estimate runoff and abstractions, that uses readily available data, is the Natural Resources Conservation Service (NRCS) Curve Number (CN) Method (NRCS, 1986). Determination of the CN depends on the watershed’s soil and cover conditions, cover type, treatment, and hydrologic condition. The CN Method runoff equation is

$$Q = \frac{(P - I_a)^2}{(P - I_a) + S}$$

Where,

Q = runoff (inches)
P = rainfall (inches)
S = potential maximum retention after runoff begins (inches) and
I_a = initial abstraction (inches)

The initial abstraction (I_a) represents all losses before runoff begins, including initial infiltration, surface depression storage, evapotranspiration, and other factors. The initial abstraction is estimated as $I_a = 0.2S$. S is related to soil and cover conditions of the watershed through the CN, determined as $S = 1000/CN - 10$. Using these relations, the runoff equation becomes:

$$Q = \frac{(P - 0.2S)^2}{(P + 0.8S)}$$

The CN is estimated based on hydrologic soil group (HSG), cover type, condition, and land use over the area of recharge, which is estimated as the area of the Burns Valley Watershed. However, to be conservative, the project parcel area of 21.3 acres was used as the recharge area.

The recharge area soils are classified into four HSGs (A, B, C, and D) according to the soils ability to infiltrate water; where HSG A has the highest infiltration potential and HSG D has the lowest infiltration potential. HSGs are based on soil type and can be determined from the NRCS Web Soil Survey (Attachment 2). The recharge area is comprised of HSG C. The land use is undeveloped with a cover type of woods with grassland in fair condition (50% to 75% ground cover) and has a CN of 76 for HSG C.

The PRISM Climate Group gathers climate observations from a wide range of monitoring networks and provides time series values of precipitation for individual locations (https://prism.oregonstate.edu/explorer/). Using the annual precipitation from 1895 to 2020, as predicted by PRISM, the annual average precipitation over this period is 27.6 inches and the minimum precipitation over this period is 6.5 inches (Attachment 3).

Using the above information, and assuming that 50% of the initial abstraction infiltrates and the remainder is evapotranspiration (0.31 inches or 0.56 AF), the estimated annual recharge over the recharge area of 21.3 acres is 5.6 AF during an average year and 4.2 AF during a dry year (Table 1).

Table 1. Estimated annual recharge over the recharge area of the project's well.

Recharge Area (acres)	P (inches)	CN	S (inches)	I_a (inches)	Q (inches)	Recharge = $P - Q - 0.5*I_a$ (inches)	Recharge (AF)
21.3	6.5	76	3.16	0.63	3.81	2.37	4.2
21.3	27.6	76	3.16	0.63	24.17	3.14	5.6

CUMULATIVE IMPACT TO SURROUNDING AREAS

Annual water demand of the proposed project is approximately 1.8 AF per year. The demand represents

approximately 32% and 43% of the annual recharge during an average and dry year, respectively. Recharge in the Burns Valley Groundwater Basin is derived from rain that falls within the 12.5 square mile Burns Valley Watershed. The area used to estimate the recharge for the proposed project is only 0.3% of the entire recharge area. Thus, the recharge estimate is a conservative (low) estimate of the available recharge over the entire recharge area. Overall, there is sufficient recharge, on an annual basis, to meet the project's demand during both a dry year and average year.

The estimated storage capacity of the Burns Valley Basin is 4,000 AF, with a usable storage capacity of 1,400 AF. According to DWR, the groundwater in the Burns Valley Basin is derived from rain that falls within the 12.5 square mile Burns Valley Watershed drainage area. The project's demand is only 0.1% of the usable storage capacity of the Burns Valley Groundwater Basin.

According to the Lake County Groundwater Management Plan, there are 86 domestic wells and 9 irrigation wells in the Burns Valley Groundwater Basin and the agricultural demand in the basin during an average year is 105 AF per year; of this, 14 AF is supplied from groundwater. The Groundwater Management Plan is dated 2006, and does not include the demand from additional proposed cannabis cultivation projects in the Burns Valley Groundwater Basin. The total additional proposed cannabis cultivation is unknown. Assuming there is the potential for approximately 20 to 40 acres of new cannabis cultivation, the annual agricultural demand could increase by an additional 66.3 AF. Cumulatively, with the proposed project at 2185 Ogulin Canyon Road, the annual demand could increase to 82.1 AF or up to 6.0% of the usable storage capacity of the Burns Valley Basin. However, the demand of the proposed project is only 2% of the potential future demand.

Since there is sufficient recharge and supply to meet the project's demand during average and dry years; the project's demand is only 0.1% of the usable storage capacity of the Burns Valley Groundwater Basin; and the potential future cannabis demand in the basin is a fraction of the usable storage capacity. Thus, the proposed project water use would have little to no cumulative impact on the surrounding area.

Additionally, if needed in the future to create water redundancy for the project, the project could install storage for rainwater catchment. The project proposes 31,750 sq. ft. of footprint that could be utilized as rainwater catchment. The rainwater catchment potential is approximately 0.39 acre-feet (129,000 gallons) during a dry year and up to 1.7 acre-feet (546,000 gallons) during a wet year.

QUALIFICATIONS OF AUTHOR

I have a PhD in Water Resources Engineering. In addition, I am a registered Professional Engineer with the State of California with 30-years of experience practicing and teaching Water Resources Engineering, including over 15 years of teaching, practicing, and modeling surface and groundwater hydrology.

LIMITATIONS

The study of groundwater hydrology is very complex and often relies on limited data, especially in rural areas. Recommendations and conclusions provided herein are based on professional judgment made using information of the groundwater systems and geology in Lake County, which is limited and allows only for a general assessment of groundwater aquifer conditions and recharge. NorthPoint Consulting Group, Inc. is making analyses, recommendations, and conclusions based on readily available data, including studies and reports conducted by other professionals, Lake County, the State of California, and

other consultants hired by the project proponent to prepare technical studies for the proposed project. If additional information or data becomes available for the project area, the recommendations and conclusions presented herein may be subject to change.

ATTACHMENTS

1. Well Completion Report
2. NRCS Soil Survey Results
3. PRISM Climate Precipitation 1985-2020

REFERENCES

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ATTACHMENT 1

PROJECT'S WELL COMPLETION REPORT

COUNTY OF LAKE
HEALTH SERVICES DEPARTMENT
Division of Environmental Health
922 Bevins Court, Lakeport, CA 95453-9739
Telephone 707/ 263-1164 FAX: 263-1681

SEAL WITHOUT WITNESS

Permit Number: WE 5569 AG

Site Address: 2185 Ogulin Canyon Rd. clearlake CA

Assessor's Parcel No: 010 - 044 - 17

Owner Name: Ogulin Hills Holdings

Date: 4-1-21

REASON FOR SEAL WITHOUT WITNESS:

☐ **Emergency Seal – Explain:**

☒ **Inspector unable to witness**

☐ **Other:**

IMPERMEABLE LAYER in which annular space terminates:

2" **at a depth of** 23' **feet.**

SEALANT USED: Bentonite clay with concrete cap
METHOD OF PLACEMENT: Poor Down Hole Mix concrete cap

I hereby certify that I have installed the annular seal in accordance with the provisions of the Lake County Well Ordinance and unless otherwise specified in the Lake County Well Ordinance, with the California Department of Water Resources Bulletin 74-81 or as modified by subsequent revisions or supplements.

DRILLING CONTRACTOR SIGNATURE:

COMPANY: Will Peterson Well Drilling **LICENSE NO:** 1009053

*The free Adobe Reader may be used to view and complete this form. However, software must be purchased to complete, save, and reuse a saved form.

File Original with DWR

Page 1 of 1

State of California
Well Completion Report

Refer to Instruction Pamphlet

No. XXXXXX

Owner's Well Number 1

Date Work Began 3/24/2021 Date Work Ended 3/25/2021

Local Permit Agency Environmental Health

Permit Number WE 5569 AG Permit Date 2/22/2021

DWR Use Only – Do Not Fill In

State Well Number/Site Number

Latitude N Longitude W

APN/TRS/Other

Geologic Log

Orientation ● Vertical ○ Horizontal ○ Angle Specify

Drilling Method Air Rotary Drilling Fluid na

Depth from Surface Feet	to Feet	Description: Describe material, grain size, color, etc
0	40	Brown Clay, some gravel
40	380	cemented Franciscan gravels

Total Depth of Boring 380 Feet

Total Depth of Completed Well 375 Feet

Well Owner

Name Oguln Hills Holdings

Mailing Address 637 Lindaro St. Ste 201

City San Rafael State CA Zip 94901

Well Location

Address 2185 Oguln Canyon Rd.

City Clearlake County Lake

Latitude Deg. Min. Sec. N Longitude Deg. Min. Sec. W

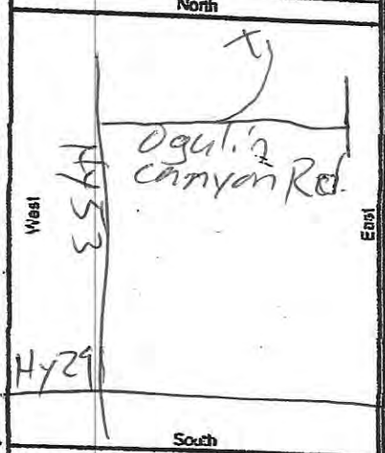
Datum Dec. Lat. Dec. Long.

APN Book 010 Page 044 Parcel 17

Township Range Section

Location Sketch

(Sketch must be drawn by hand after form is printed.)



Illustrate or describe distance of well from roads, buildings, fences, rivers, etc. and attach a map. Use additional paper if necessary. Please be accurate and complete.

Activity

● New Well
○ Modification/Repair
○ Deepen
○ Other
○ Destroy
Describe procedures and materials under "Other"

Planned Uses

● Water Supply
☐ Domestic ☐ Public
☒ Irrigation ☐ Industrial
○ Cathodic Protection
○ Dewatering
○ Heat Exchange
○ Injection
○ Monitoring
○ Remediation
○ Sparging
○ Test Well
○ Vapor Extraction
○ Other

Water Level and Yield of Completed Well

Depth to first water 280 (Feet below surface)

Depth to Static Water Level 280 (Feet) Date Measured 3/25/21

Estimated Yield * 80 (GPM) Test Type Air Lift

Test Length 2 (Hours) Total Drawdown (Feet)

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

Casings

Depth from Surface Feet	to Feet	Borehole Diameter (Inches)	Type	Material	Wall Thickness (Inches)	Outside Diameter (Inches)	Screen Type	Slot Size If Any (Inches)
0	280	9	F480	PVC	1/4"	4 1/2	na	na
280	375	9	F480	PVC	1/4"	4 1/2	PERF	.035

Annular Material

Depth from Surface Feet	to Feet	Fill	Description
0	1	Concrete	seal
1	23	bentonite	seal
23	375	5/16 pea	gravel pack

Attachments

☐ Geologic Log
☐ Well Construction Diagram
☐ Geophysical Log(s)
☐ Soil/Water Chemical Analyses
☐ Other

Attach additional information, if exists

Certification Statement

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

Name Will Peterson Well Drilling
Person, Firm or Corporation

P.O. Box 1095 Kelseyville CA 95451
Address City State Zip

Signed [signature]
C-57 Licensed Water Well Contractor

4-1-21
Date Signed

1009053
C-57 License Number

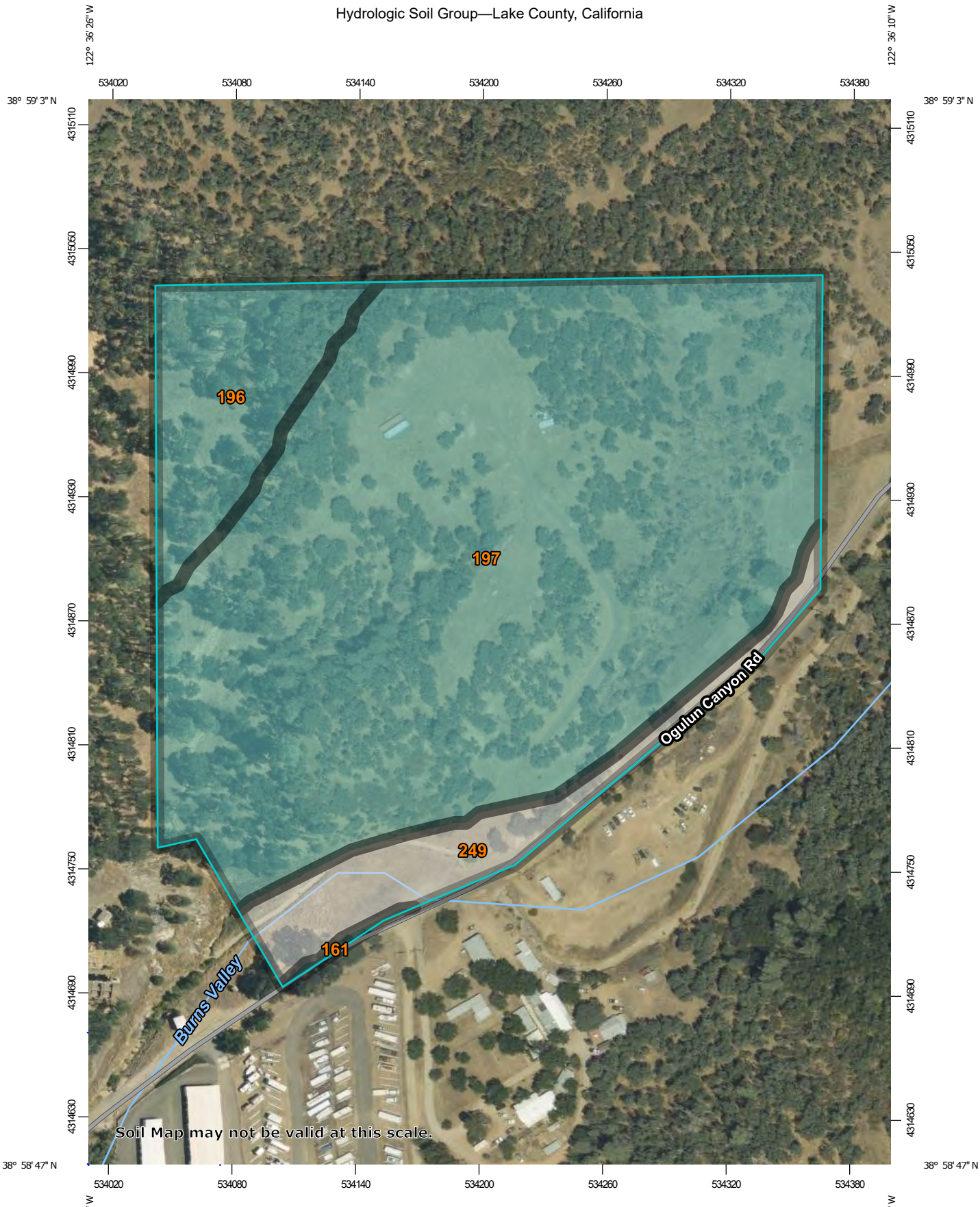
DWR 188 REV 1/2005

IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

ATTACHMENT 2

NRCS SOIL SURVEY RESULTS

HYDROLOGIC SOIL GROUPS



Map Scale: 1:2,510 if printed on A portrait (8.5" x 11") sheet.

N

0 35 70 140 210 Meters

0 100 200 400 600 Feet

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 10N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Soil Rating Lines

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Soil Rating Points

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Lake County, California
Survey Area Data: Version 18, Sep 6, 2021

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jul 2, 2019—Jul 5, 2019

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
161	Manzanita loam, 15 to 25 percent slopes	C	0.0	0.2%
196	Phipps complex, 15 to 30 percent slopes	C	2.2	10.4%
197	Phipps complex, 30 to 50 percent slopes	C	17.2	81.1%
249	Xerofluvents-Riverwash complex		1.8	8.3%
Totals for Area of Interest			**21.3**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

ATTACHMENT 3

PRISM PRECIPITATION 1895-2020

PRISM Time Series Data
Location: Lat: 38.9831 Lon: -122.6047 Elev: 1637ft
Climate variable: ppt
Spatial resolution: 4km
Period: 1895 - 2020
Dataset: AN81m
PRISM day definition: 24 hours ending at 1200 UTC on the day shown
Grid Cell Interpolation: On
Time series generated: 2021-Nov-08
Details: http://www.prism.oregonstate.edu/documents/PRISM_datasets.pdf

Date	ppt (inches)
1895	33.63
1896	39.53
1897	26.55
1898	15.13
1899	36.1
1900	24.89
1901	26.27
1902	34.58
1903	26.84
1904	42.96
1905	23.18
1906	43.17
1907	35.74
1908	18.81
1909	45.51
1910	17.48
1911	33.96
1912	20.53
1913	26.29
1914	31.26
1915	35.72
1916	30.02
1917	12.99
1918	20.6
1919	23.04
1920	29.98
1921	24.18
1922	27.47
1923	14.73
1924	21.14
1925	26.24
1926	34.63
1927	28.51
1928	20.62
1929	15.3
1930	17.4

	Precip (inches)
Average	27.63
Minimum	6.49

1931	25.04
1932	12.78
1933	20.87
1934	18.96
1935	25.54
1936	25.52
1937	34.47
1938	31.9
1939	12.63
1940	46.05
1941	45.26
1942	32.35
1943	21.27
1944	26.51
1945	29.28
1946	14.21
1947	16.82
1948	23.43
1949	16.82
1950	34.39
1951	29.8
1952	34.49
1953	21.26
1954	29.45
1955	25.1
1956	21.25
1957	30.95
1958	35.77
1959	20.73
1960	27.2
1961	20.06
1962	27.13
1963	28.56
1964	23.1
1965	26.06
1966	22.75
1967	27.62
1968	30.56
1969	34.16
1970	35.49
1971	17.75
1972	19.43
1973	41.8
1974	24.09
1975	24.41
1976	8.7
1977	19.25

1978	30.31
1979	35.17
1980	24.72
1981	31.37
1982	33.74
1983	62.67
1984	21.4
1985	16.78
1986	38.8
1987	27.96
1988	17.74
1989	21.03
1990	16.9
1991	24.2
1992	30.08
1993	36.42
1994	21.42
1995	55.55
1996	37.21
1997	30.34
1998	52.68
1999	23.66
2000	27.61
2001	36.24
2002	28.87
2003	33.08
2004	33.64
2005	39.25
2006	34.93
2007	13.8
2008	19.43
2009	17.73
2010	34.1
2011	23.25
2012	30.53
2013	6.49
2014	31.39
2015	18.19
2016	35.97
2017	43.71
2018	23.67
2019	43.27
2020	10