NORTHPOINT
CONSULTING GROUP, INC.

# 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.

## REFERENCES

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# FIGURES

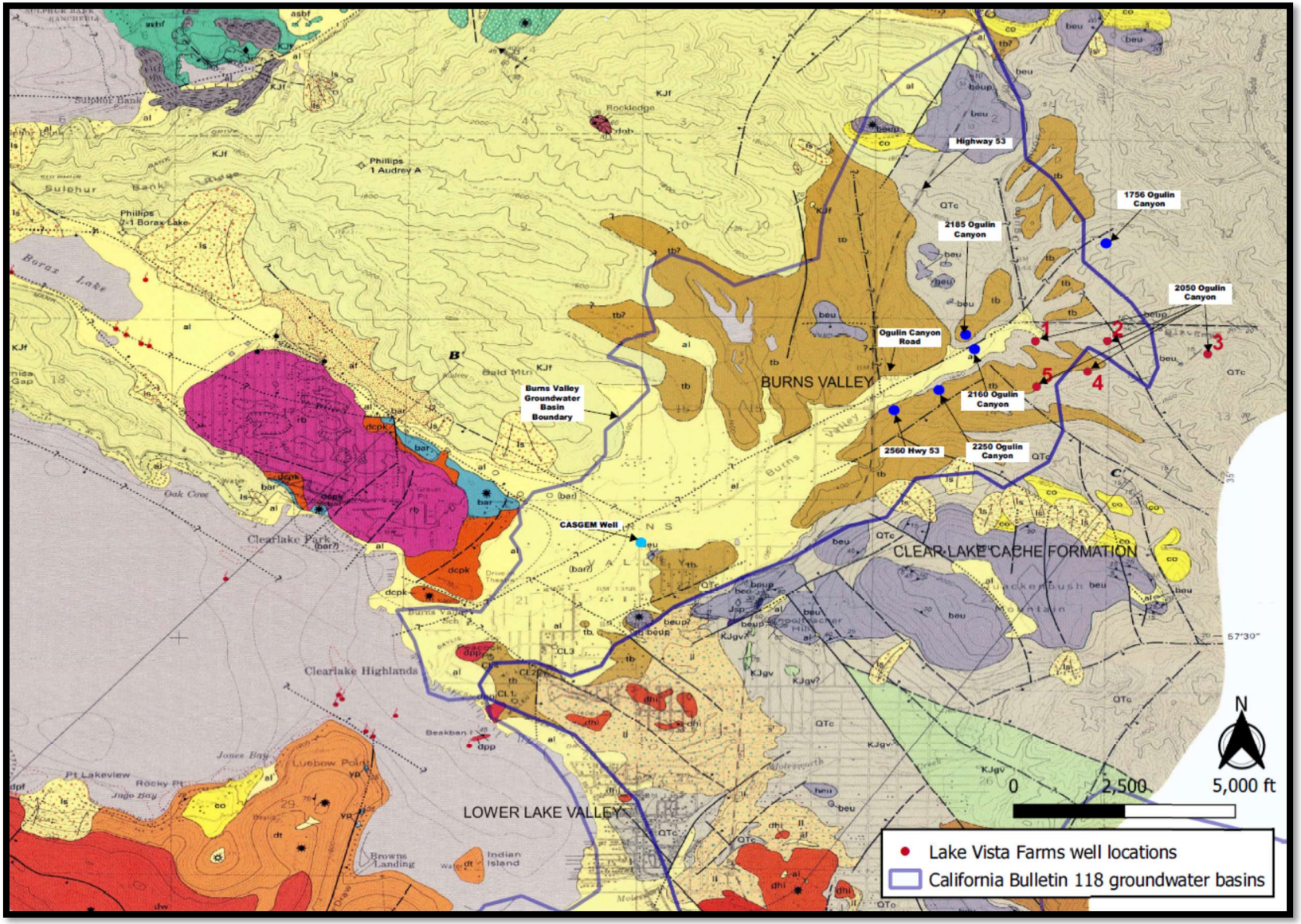


***Figure 1. Burns Valley Groundwater Basin local geology (source: https://pubs.usgs.gov/imap/2362/), cultivation well locations, and CASGEM well location. QTc = Clear Lake Cache Formation, 'tb' = nonmarine terrace deposits, and 'al' = alluvium.***

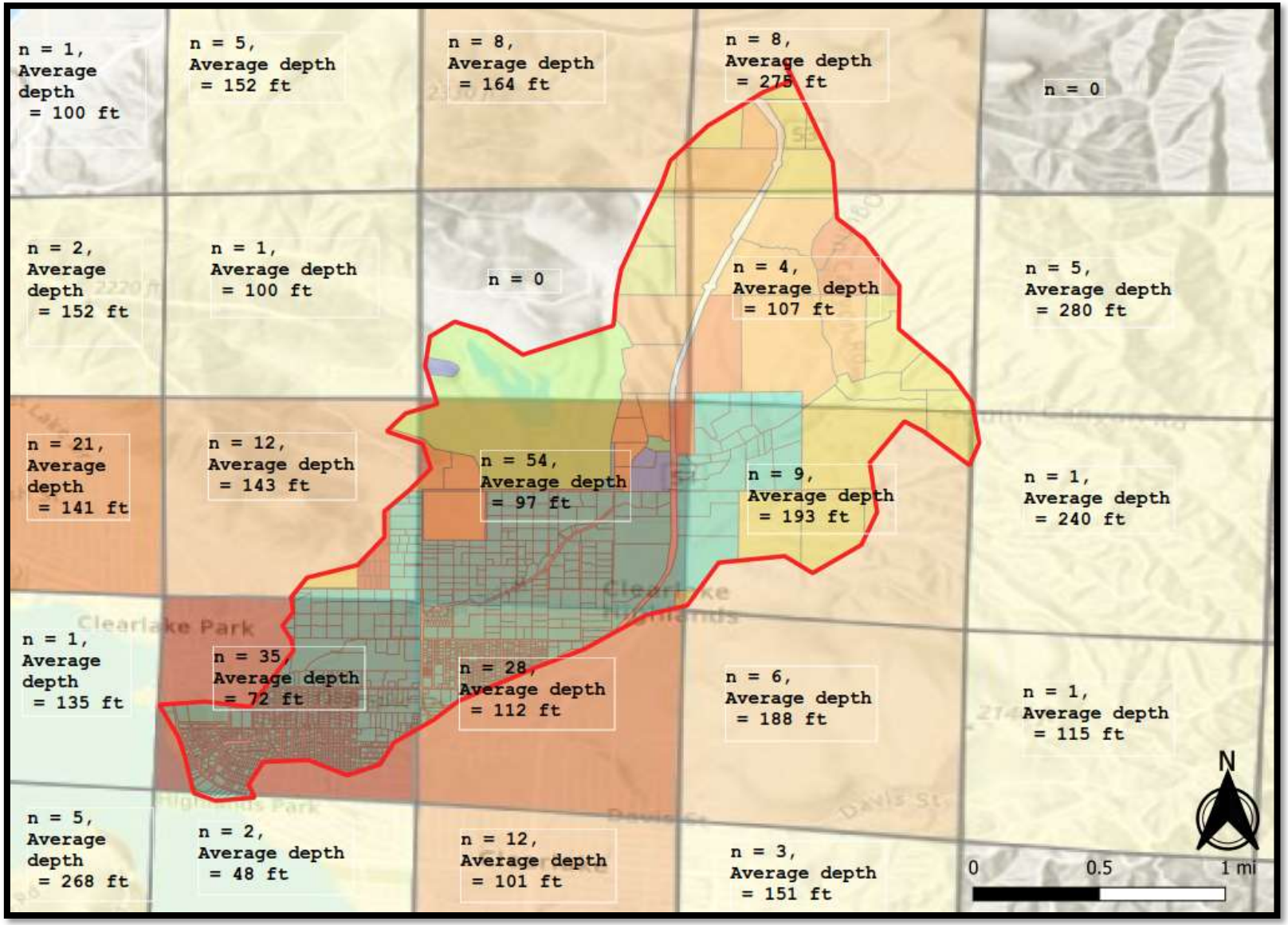


*Figure 2. Map of # (n) of Well Completion Reports (WCRs) within each Public Land Survey System (PLSS) grid along with average well depth. The Burns Valley Groundwater Basin is outlined in red. Parcel coloring is provided in Figure 7.*

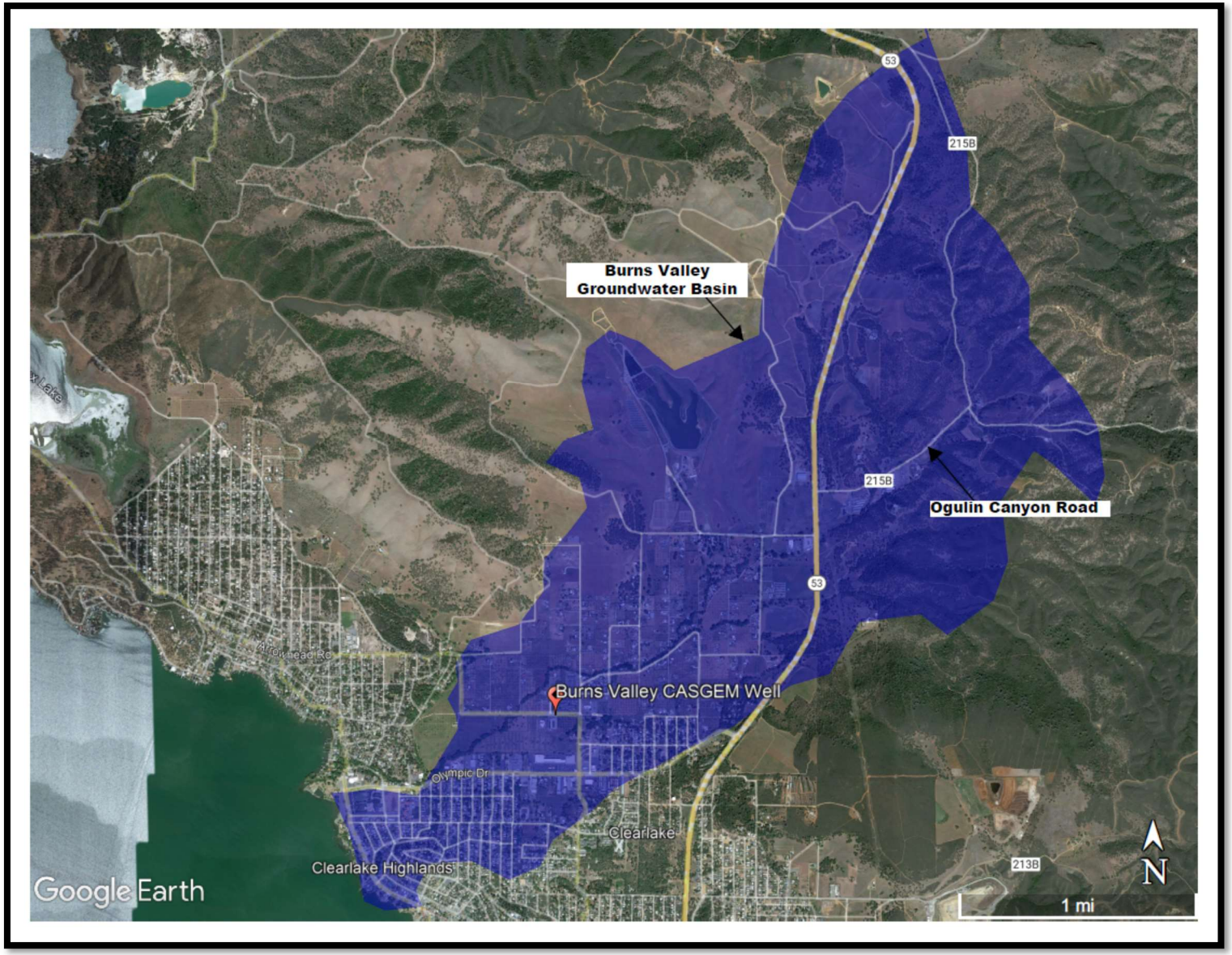


***Figure 3. CASGEM Monitoring well location.***

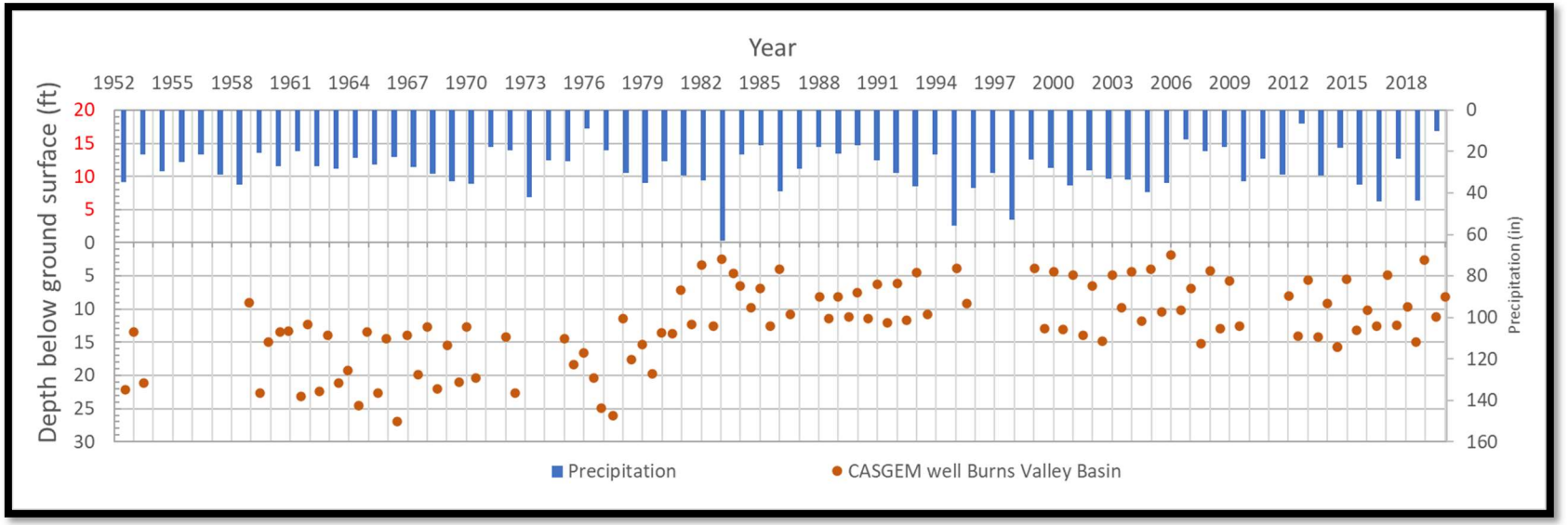


***Figure 4. CASGEM Monitoring Well data from 1952 to 2020.***

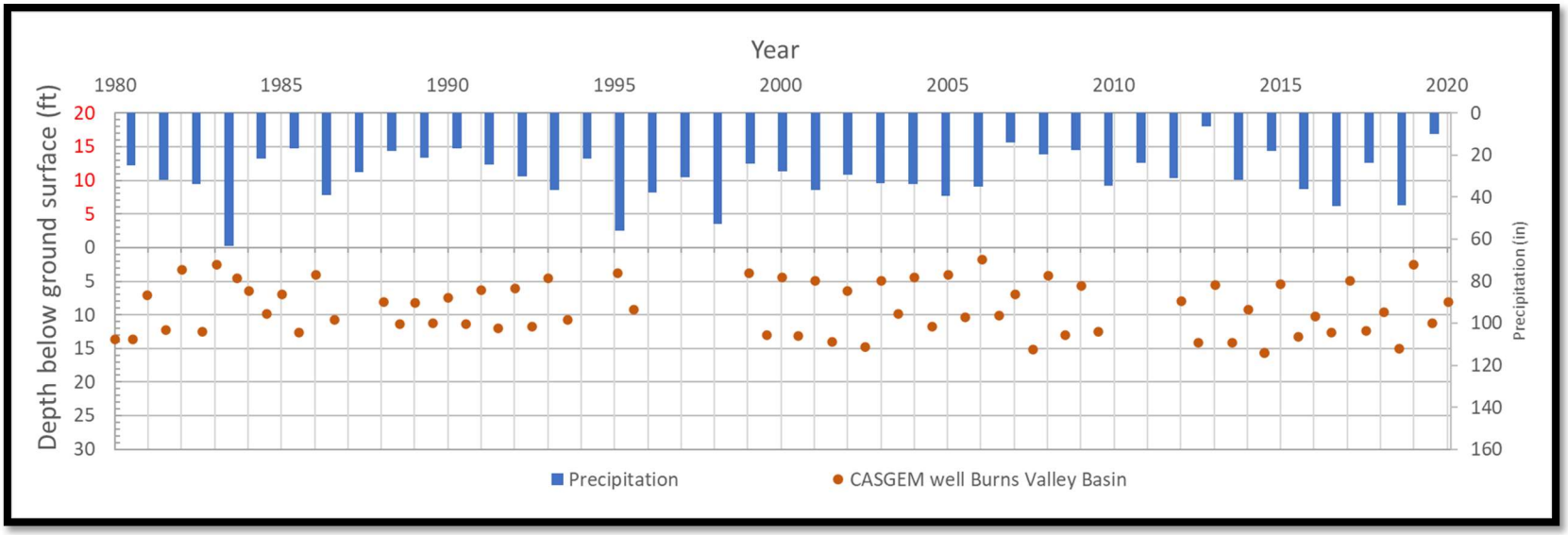


***Figure 5. CASGEM Monitoring Well data from 1980 to 2020.***

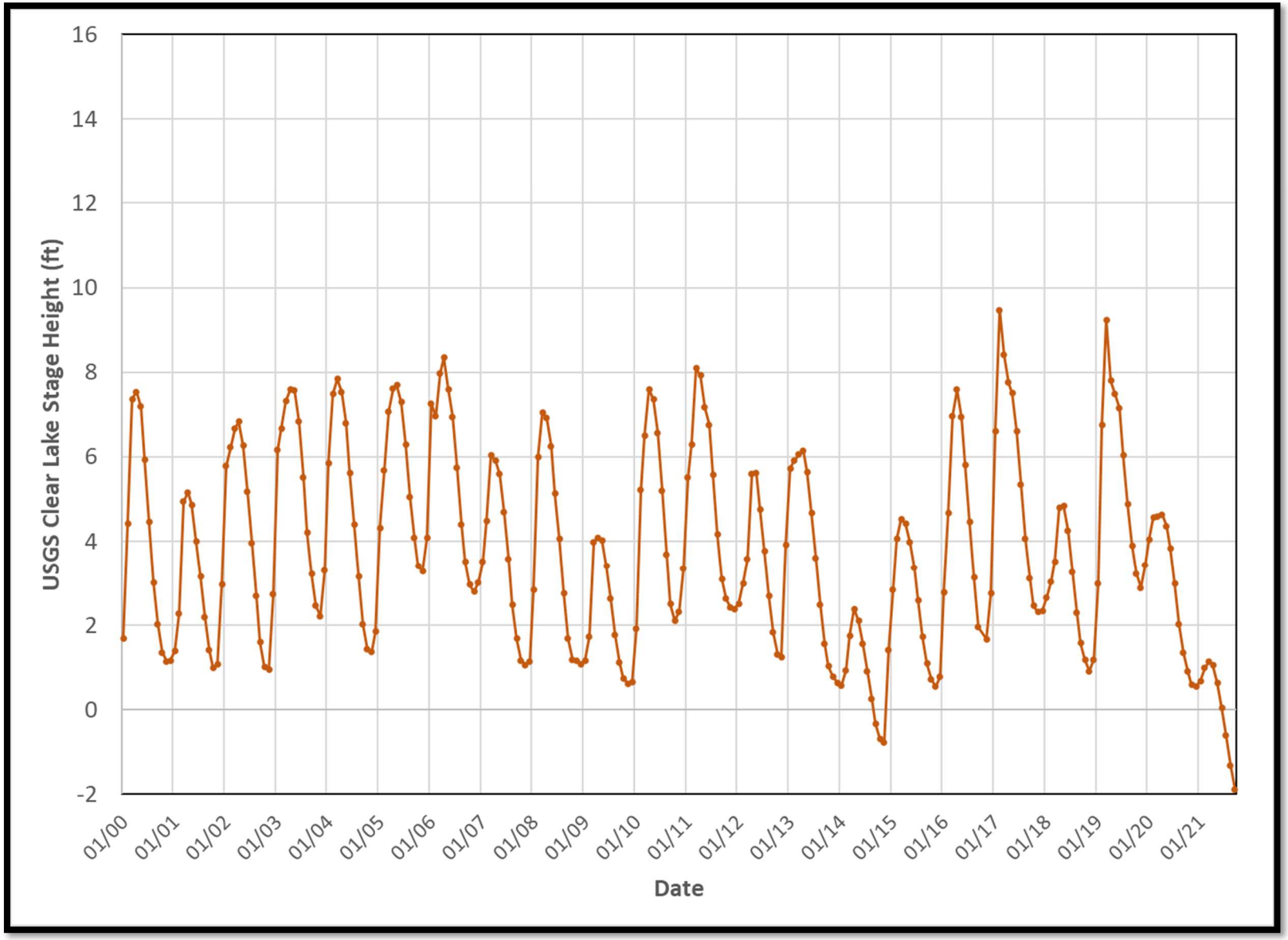


***Figure 6. Clear Lake stage height 2000 through 2021.***

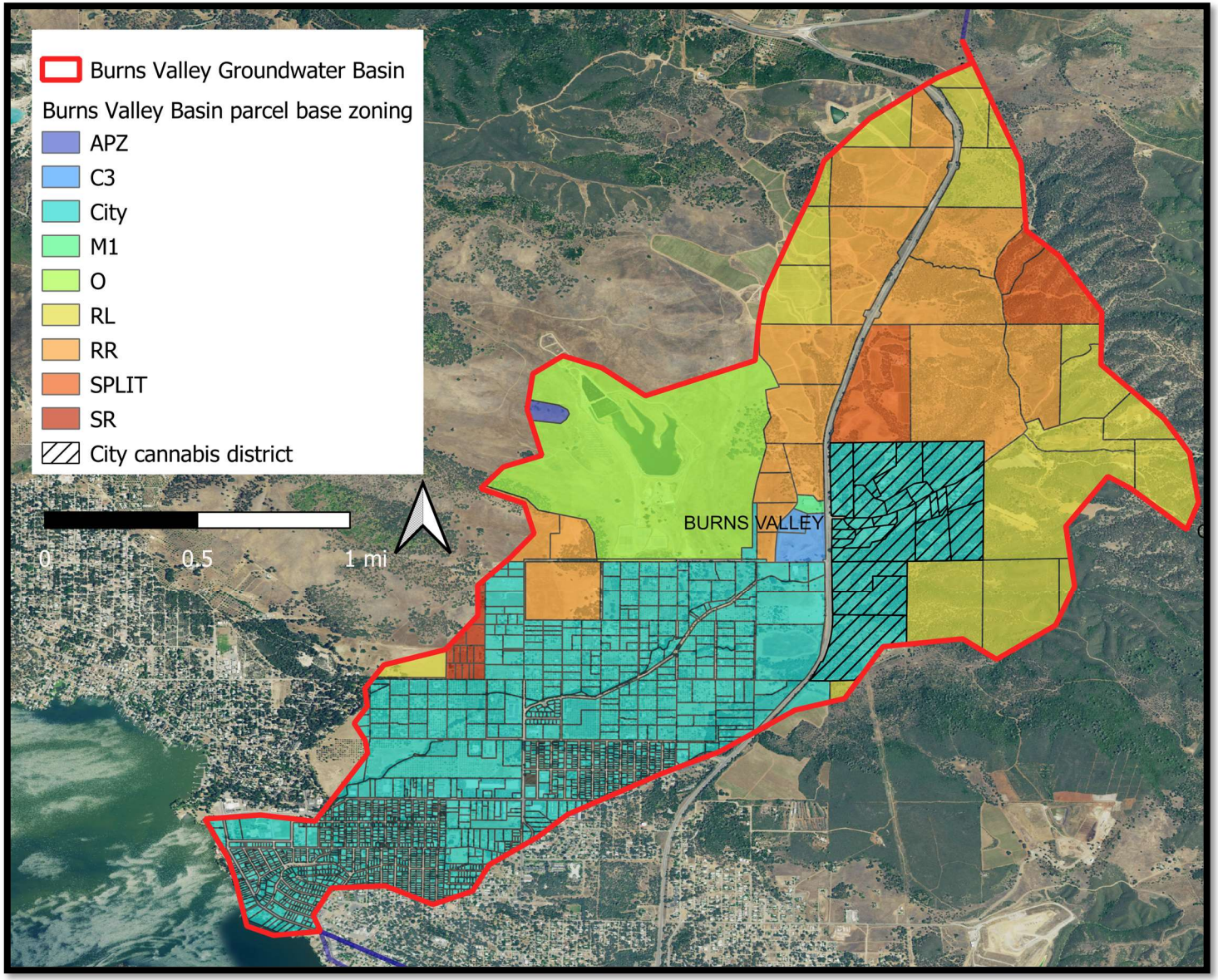


*Figure 7. City of Clearlake Cannabis District and Lake County parcel base zoning designations.*

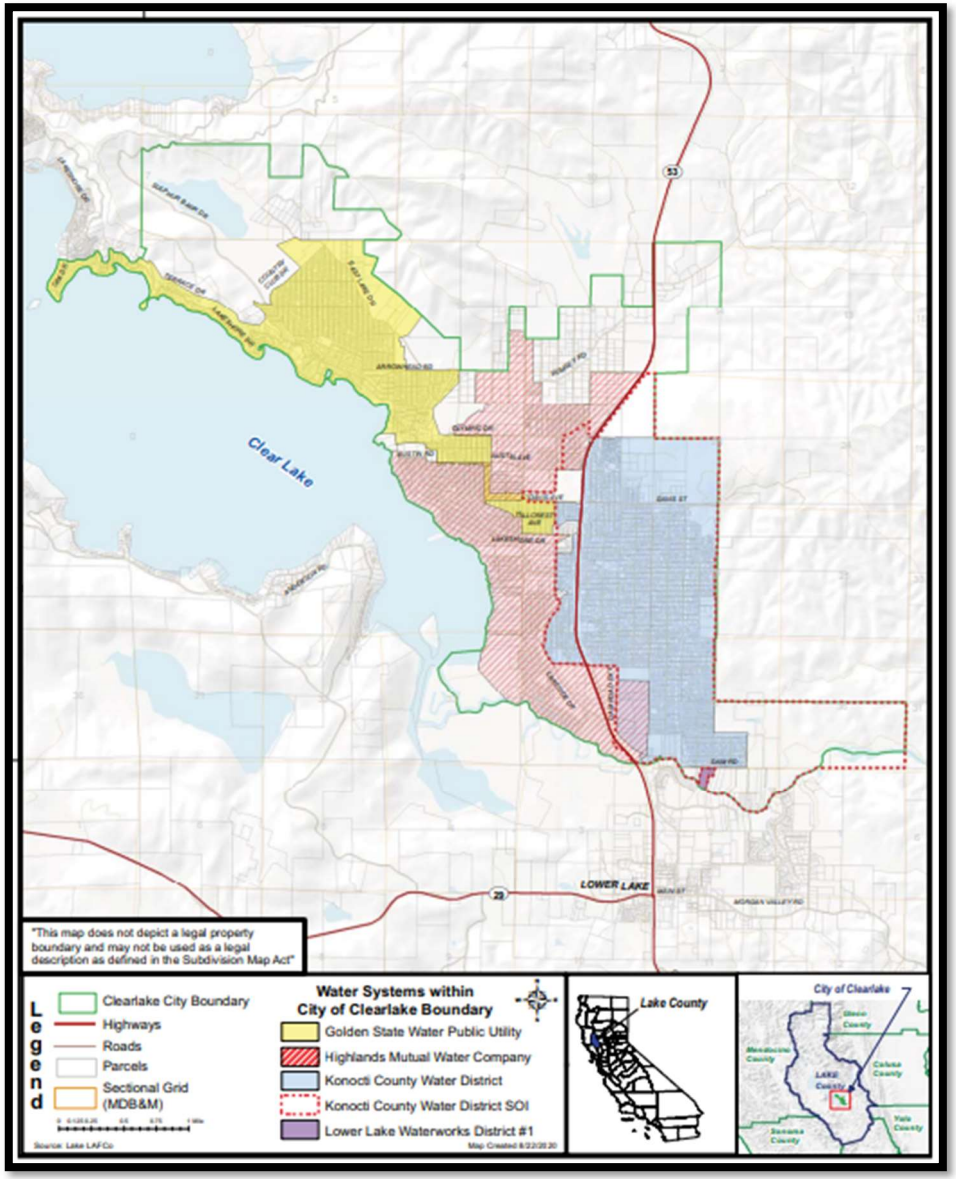


*Figure 8. Water Systems within the City of Clearlake Boundary (Source: [ClearlakeH20 MSR-SOI 2021EDIT-2. cl docx (lakelafco.org)])*