
Appendix E

Lake Arrowhead Community Services District Water Supply Assessment



September 30, 2024

Ms. Catherine Cerri
General Manager
Lake Arrowhead Community Services District
P.O. Box 700
Lake Arrowhead, CA 92352

**Subject: Lake Arrowhead Community Services District
Water Supply Assessment for the Highway 173 Well Site Area**

Dear Catherine:

This letter summarizes a water supply assessment for the catchment area tributary to the Moller property (i.e., Highway 173 Well Site Area). This area has been identified as the proposed location of one or more future groundwater supply wells for Lake Arrowhead Community Services District (LACSD). The purpose of this assessment is to evaluate the potential for negatively impacting groundwater availability for surrounding wells, and specifically the existing Moller's Well.

Analysis

The maximum quantity of ground water that is available on a perennial basis is limited by the possible deleterious side effects that can be caused by pumping and operation of wells. To assess the sustainability of ground water production in the vicinity of the Highway 173 well site area, a simple water supply assessment was conducted to estimate the volume of precipitation within the local watershed that may be available for extraction. This was accomplished through use of United States Environmental Protection Agency's (USEPA's) National Stormwater Calculator (<https://swcweb.epa.gov/stormwatercalculator>), historical precipitation data, rainfall intensity, topographic slope, soil type, ground cover, and published estimates of evapotranspiration from forested areas at similar elevation, to estimate the percentage of precipitation that may infiltrate the ground surface and recharge groundwater, resulting in an estimate of groundwater recharge that may be considered representative of the sustainable yield of the watershed.

The surface area of the catchment that is tributary to the northern terminus of the Highway 173 area in the vicinity of the existing Moller's Well¹ was calculated to be approximately 83 acres (3,615,480 square feet) using GIS spatial analyst tools (see Figure 1). Average annual precipitation across this area was estimated to be approximately 42.9 inches based on data reported by the Lake Arrowhead weather station during the period from 1930 through 2003. Although the catchment area is steeply sloped, it is heavily forested, contains minimal impervious surface area, and is overlain by sandy loam soils with moderately low runoff and high drainage potential. As such, runoff from the

¹ It should be noted that the Moller Well has been referred to as the Totem Well within the available literature.

catchment is estimated to be very low (i.e., no greater than 5%), leaving the majority of water (i.e., 40.8 inches) retained within the watershed. Although highly variable, and difficult to ascertain, published estimates of transpiration rates for pine forests at similar elevation range from approximately 10 to 35 inches per year². An estimated annual evapotranspiration rate of approximately 20 inches (i.e., 123,496 gallons per day [gpd]) was assumed for this evaluation. Accounting for runoff and evapotranspiration, the resultant volume of water that is estimated to percolate as groundwater recharge is approximately 20.8 inches per year, or approximately 128,158 gpd, although it should be noted that this value may vary significantly.

Results

Based on available information for the existing Moller Well, the well was tested at an instantaneous pumping rate of 30 gallons per minute (gpm) following construction. However, total metered production from this well was 270,240 cubic feet over the period from July 9, 2015, through August 29, 2024, equating to approximately 605 gpd extracted from the catchment. Assuming two (2) new LACSD wells are installed within the Moller property bounds, each with a continuous instantaneous pumping rate of 30 gpm, and an estimated 90% duty factor, the total volume of water extracted from the area by all three (3) wells would be 78,365 gpd, equating to approximately 61% of water estimated to recharge the catchment. Actual extraction rates, operational schedules, and annual precipitation patterns may affect this assessment, and it is considered unlikely that all three (3) wells will be continuously operational throughout any given year. Consequently, negative impacts to the area from additional groundwater extraction is considered unlikely.

Recommendations

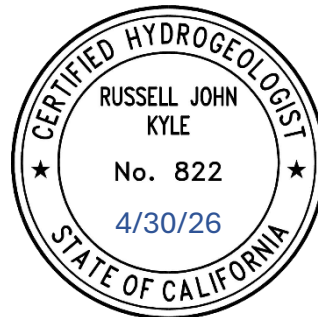
Although negative effects to the catchment are not anticipated, it is recommended that static water levels be measured and recorded within the Moller Well, prior to construction of the new wells, in order to establish baseline conditions from which to assess possible impacts. Additionally, water levels within the Moller Well should be measured and recorded on a regular basis during operation of new wells such that any negative impacts, (e.g., groundwater level decline and/or impacts to downgradient areas from reduction in ground water underflow) can be identified as they are occurring. Additionally, the magnitude of water level interference, if any, should be measured within the Moller Well during the anticipated 10-day constant-rate aquifer pumping tests to be conducted following construction each new well.

Should you have any questions or concerns, please do not hesitate to contact me.

Sincerely,



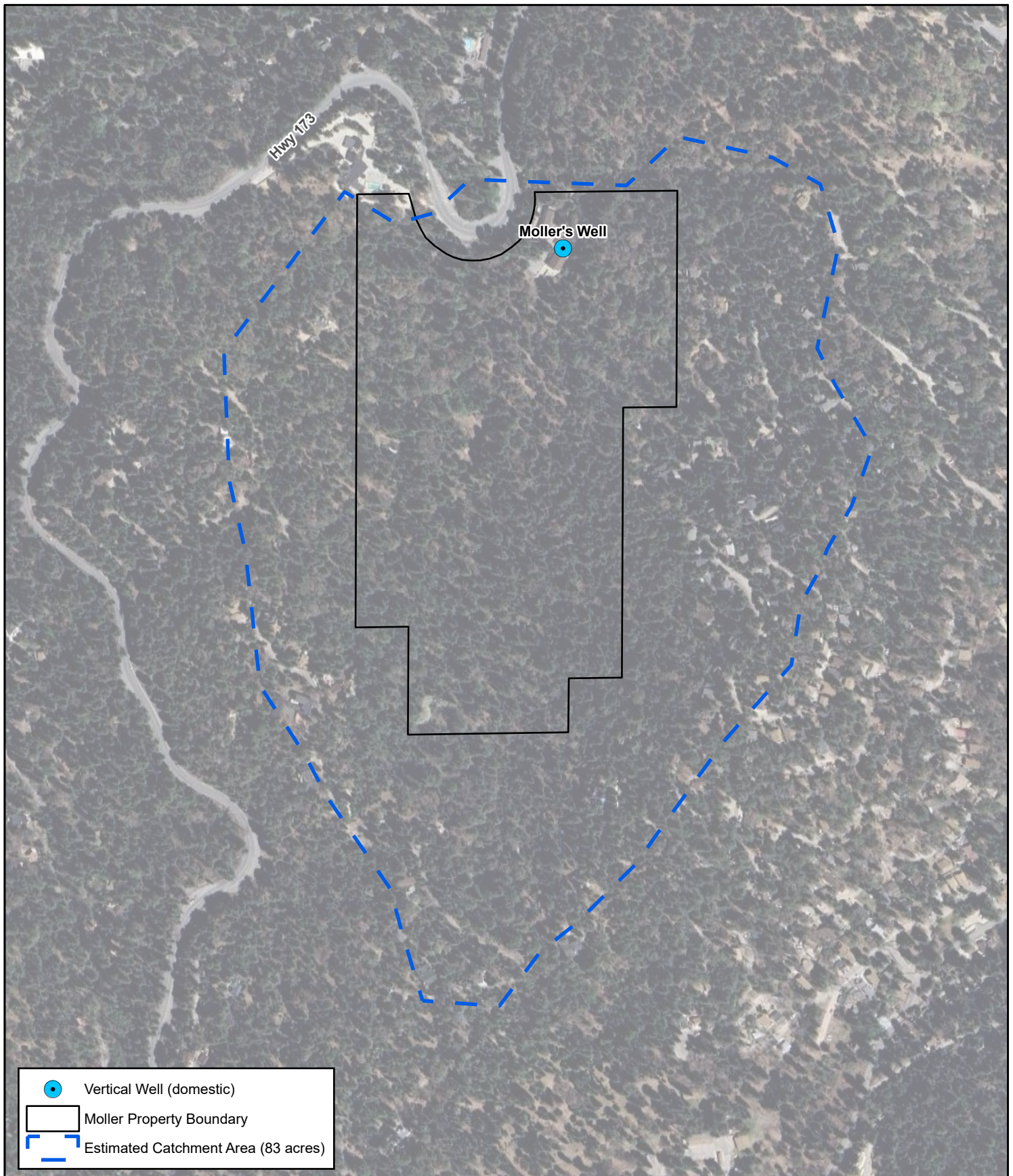
Russell John Kyle, PG, CHG
President / Principal Hydrogeologist
Enclosures



² Amatya, D.M., et. al., 2016. Forest Hydrology: Processes, Management, and Assessment. October 31, 2016.

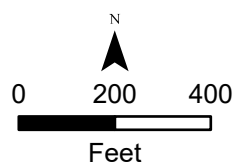
FIGURES





ESTIMATED CATCHMENT AREA - HIGHWAY 173

WATER SUPPLY ASSESSMENT FOR THE HIGHWAY 173 AREA
 LAKE ARROWHEAD COMMUNITY
 SERVICES DISTRICT
 LAKE ARROWHEAD, CALIFORNIA
 JULY 2024



PROJECT NO.
 3028.002.11

FIGURE
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