UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IX
75 Hawthorne Street
San Francisco, CA 94105-3901

March 29, 2018

Kenneth A. Harris Jr.
State Oil and Gas Supervisor
Division of Oil, Gas, and Geothermal Resources
California Department of Conservation
801 K Street, MS 18-05
Sacramento, CA 95814-3530

Re: Aquifer Exemption Request for the Elk Hills Oil Field, Phase 2 Area, Kern County, California

Dear Mr. Harris:

Based on a thorough review of the supporting documents submitted by the California Department of Conservation, Division of Oil, Gas, and Geothermal Resources and the State Water Resources Control Board, the U.S. Environmental Protection Agency (EPA) hereby approves the aquifer exemption request for the Lower Tulare Formation in the Elk Hills Oil Field, Phase 2 Area, in Kern County, California.

The approved aquifer exemption boundaries and depths, along with EPA's analyses and rationale in support of the approval, are detailed in the enclosed Record of Decision, also available at: https://www.epa.gov/pacific-southwest-media-center/epas-oversight-californias-underground-injection-control-uic-program. In accordance with applicable regulations at 40 C.F.R. Parts 144, 145, and 146, we find that this aquifer exemption request is a non-substantial program revision, and that the requested formation meets the following federal exemption criteria:

- The portion of the formation proposed for exemption in the field does not currently serve as a source of drinking water; and
- The portion of the formation proposed for exemption in the field has more than 3,000 milligrams per liter (mg/L) and less than 10,000 mg/L total dissolved solids content, and is not reasonably expected to supply a public water system.

If you have any questions, please contact David Albright, Manager, Drinking Water Protection Section, at (415) 972-3971.

Sincerely,

Tomás Torres March 29, 2018
Director, Water Division

Enclosure: Aquifer Exemption Record of Decision for Elk Hills Oil Field, Phase 2 Area

cc: Jonathan Bishop, Chief Deputy Director, State Water Resources Control Board

US Environmental Protection Agency Region 9

Underground Injection Control (UIC) Program

AQUIFER EXEMPTION RECORD OF DECISION

This Record of Decision (ROD) provides the EPA's decision to approve an aquifer exemption (AE) for the Lower Tulare Formation within the Elk Hills Oil Field Phase 2 Area, background information concerning the AE request, and the basis for the AE decision.

Primacy Agency: California Division of Oil, Gas, & Geothermal Resources (DOGGR)

Date of Aquifer Exemption Request: February 15, 2018

Exemption Criteria: DOGGR requests this exemption because it has determined that it meets the criteria at 40 CFR § 146.4(a) and § 146.4(c).

Substantial or Non-Substantial Program Revision: Non-Substantial

Although the EPA must approve all revisions to EPA-approved state UIC programs, the process differs depending on whether the EPA finds the revision to be a substantial or non-substantial program revision. The EPA determined this is a non-substantial program revision because it is associated with an active oil field and is not a state-wide programmatic change or a program revision with unique or significant implications for the State's UIC program. The decision to treat this AE request as a non-substantial program revision is also consistent with the EPA's "Guidance for Review and Approval of State Underground Injection Control (UIC) Programs and Revisions to Approved State Programs" ("Guidance 34"), which explains that the determination of whether a program revision is substantial or non-substantial is made on a case-by-case basis.

Operator: California Resources Elk Hills, LLC (CRC).

Well/Project Name: Lower Tulare Formation, Elk Hills Oil Field, Phase 2 Area.

Well/Project Permit Number: There are currently 96 active Class II disposal wells in the Elk Hills Oil Field, Phase 2 Area within the area of the aquifer proposed for exemption.

Well/Project Location: The AE is located in portions of: Sections 7 and 8, Sections 13 through 30, and Sections 34 through 36 in T. 30 South/R. 23 East; and Sections 10, 11, 13, 14, 23, 24, and 25 in T. 30 South/R. 22 East, Mount Diablo Base and Meridian (MDB&M). It is in the north and west portion of the Elk Hills Oil Field. (EPA is also approving an exemption for the Elk Hills Oil Field Phase 1 Area, which is in the south and west portion of the field, in a separate action.) [Refer to Figures 1 and 2.]

County: Kern **State:** California

Well Class/Type: Class II produced water disposal.

DESCRIPTION OF PROPOSED AQUIFER EXEMPTION

Aquifer to be Exempted: The Lower Tulare Formation below the Amnicola Claystone within the Elk Hills Oil Field, Phase 2 Area. The Phase 2 Area covers the northwest and western areas of the Elk Hills Oil Field.

Areal Extent of Aquifer Exemption: The areal extent of the proposed AE is 17,639 acres. This includes the entire extent of the Lower Tulare Formation within the Phase 2 Area of the field. DOGGR has provided GIS shape files that delineate the AE boundary at the surface, which are included in the administrative record for this ROD. Refer to Figure 2 for a depiction of the proposed exempt formation.

Lithology, Total Dissolved Solids (TDS), Depth, Thickness, Porosity, and Permeability of the Aquifer: The following table presents the lithology, TDS levels, depth, thickness, and porosity and permeability information about the aquifer proposed for exemption.

Aquifer	Lower Tulare Formation
Lithology	Interbedded fluvial and lacustrine deposits of gravel, sand, silt, clay, and limestone.
TDS (mg/L)	6,343 to 20,000 mg/L.
Depth to Top (feet)	Approximately 450 to1,250 feet below ground surface (BGS), or 980 to -650 feet mean sea level (MSL).
Thickness (feet)	Approximately 300 feet to 700 feet.
Porosity and Permeability	Porosity ranges from 24.2% to 40.8%. Permeability ranges from 7.7 to 7,446 millidarcies (mD).

Confining Zone(s): The Lower Tulare Formation within the Elk Hills Oil Field is confined above by the Amnicola Claystone and below by the shales and silts of the San Joaquin Formation. Lateral confinement is provided by pressure gradients and operational controls that will contain the injected water within the exempted area. [Refer to Figures 3.1 and 3.3.]

BACKGROUND

On February 15, 2018, the EPA received a request from DOGGR for approval to exempt the Lower Tulare Formation within the Elk Hills Oil Field, Phase 2 Area, in Kern County, California. DOGGR reviewed and concurred with the operator's request and proposed this AE based on the criteria at 40 CFR § 146.4(a): that it does not currently serve as a source of drinking water; and at 40 CFR § 146.4(c): that the TDS content of the aquifer is more than 3,000 milligrams per liter (mg/L) and less than 10,000 mg/L and it is not reasonably expected to supply a public water system. After the EPA's approval of the AE, the exempt formation would not be protected as an "underground source of drinking water" (USDW) under the Safe Drinking Water

Act (SDWA) and DOGGR would be authorized, subject to state regulatory requirements, to approve Class II injection into the identified formation.

The Elk Hills Oil Field was discovered in 1975. Most of the oil and gas produced in the field is from the San Joaquin, Etchegoin, and Monterey Formations. Total field production through 2014 is approximately 1.4 billion barrels of oil and 3.0 trillion cubic feet of gas. In 2015, oil production at the Elk Hills Oil Field resulted in daily production of 472,918 barrels of water. Over 58 percent (276,222 barrels per day) of the produced water was used in enhanced oil recovery (EOR) projects in several Elk Hills reservoirs. EOR involves the re-injection of produced water to stimulate oil production. The remaining 42 percent (196,696 barrels per day) is injected into the Tulare Formation for disposal. In the Phase 2 Area, injection began in 2004. Approximately 145,486 barrels of water per day are injected into this area for disposal.

BASIS FOR DECISION

Regulatory Criteria under which the AE is Requested and Approved

40 CFR § 146.4(a) *It does not currently serve as a source of drinking water.*

In their concurrence on this AE package, the State Water Resources Control Board (State Water Board) determined that the Lower Tulare Formation does not currently serve as a source of drinking water and is not hydraulically connected to domestic or public water supply wells. This is based on an evaluation of information about water supply wells in the area, groundwater flow patterns, and confinement of the formation to groundwater flow. These reviews demonstrate that the aquifer identified for exemption does not currently serve as a source of drinking water because there are no existing drinking water supply wells, public or private, that currently or in the future would draw water from the Lower Tulare Formation; the formation is vertically and laterally confined (i.e., separated) from other USDWs; and no aquifers that serve as sources of drinking water are hydraulically connected to the aquifer. Further, within the water well search area (described more fully below), the Lower Tulare Formation is not currently a source of drinking water. The alluvium and undifferentiated Upper Tulare Formation (which serve as the shallow fresh water source in the area) are 1,068 to 2,409 vertical feet above the top of the Lower Tulare Formation.

Water Supply Wells: DOGGR's AE request included information about water wells in the area proposed for exemption in order to establish that no drinking water wells or other water supply wells draw from the aquifer proposed for exemption. To identify potential water supply wells, the operator performed water well database searches, reviewing well records from the California Statewide Groundwater Elevation Monitoring (CASGEM) Program, the U.S. Geological Survey, the Kern County Water Agency (KCWA), the West Kern Water District (WKWD), Kern County Public Health Services Department (KCEHSD), the Department of Water Resources, and the GeoTracker Groundwater Ambient Monitoring and Assessment (GAMA) online database.

The water supply well search area ("study area") includes the entire extent of the formation proposed for exemption in the Phase 2 Area, plus a one-mile area beyond the proposed boundary of the proposed exemption area, including an additional 3 miles within an agricultural area to the

east of the Phase 2 Area. The expanded area was selected for study (in consultation with the State Water Board) because the area is known to have several old abandoned water wells, as well as to account for uncertainties in the locations of water wells on well records, and to include an agricultural area to the east that is known to have water wells.

The water well survey identified 105 well records (See Table 1). None of these wells are located within the proposed exemption area. The 105 wells include 10 domestic wells, 42 irrigation wells, 11 observation wells, 3 oil wells, 1 drill hole, 1 industrial-irrigation well, and 1 test well; the well type of the other 36 wells is listed as unknown or no information was provided in the AE request. The AE request indicated that information to identify the total depth and completion zone was available for 80 of the 105 wells. These 80 wells are between 47 feet and 4,710 feet deep, and most (including all of the identified domestic wells) are screened within the alluvium-undifferentiated Tulare Clay (upper confining zone) or the "E" Clay lens (a thin clay lens above the Tulare Clay) and do not penetrate the Upper Tulare Formation (which is above the Amnicola Claystone – the second confining layer - refer to Figure 3.3). Therefore, it is reasonable to conclude that the water wells do not draw from formations in hydraulic connection with the formation proposed for exemption. The closest municipal water supply wells are operated by the WKWD and are located 5 miles from the Phase 2 Area and are not screened in the Lower Tulare Formation. These shallow fresh water sources are separated from the Lower Tulare Formation by 1,068 to 2,409 vertical feet of sands and impermeable clays. As a result, the water supply wells are not in hydraulic connection with the formation proposed for exemption.

DOGGR's well search investigation confirmed there are no domestic or public drinking water supply wells that draw from the Lower Tulare Formation, and that the formation proposed for exemption is not currently a source of drinking water and is not hydraulically connected to domestic or public water supply wells.

Groundwater Flow Patterns: DOGGR evaluated available hydrogeologic and other information on the aquifer proposed for exemption and the overlying formations, including local groundwater flow observations, injection volumes, and a groundwater flow model constructed for the Upper Tulare Formation in the Elk Hills Oil Field by the operator. The operator predicted that flow in the Lower Tulare Formation is negligible due to its depth, confined aquifer condition, lack of natural recharge, and absence of use as a drinking water supply. This is corroborated by the results of groundwater flow modeling performed by the operator and evaluated by the State Water Board as part of its concurrence on the AE.

Confinement of the Formation to Groundwater Flow: DOGGR's AE request included information about the vertical and lateral confinement of the Lower Tulare Formation, which is summarized below.

The Lower Tulare Formation is confined above by the Amnicola Claystone, a regionally extensive confining layer that separates the Upper and Lower Tulare Formations. The Amnicola Claystone consists of a silty claystone that averages approximately 75 to 100 feet thick. Geophysical data logs show its presence throughout the Phase 2 Area, as well as across much of the rest of the Elk Hills Oil Field and neighboring oil fields. The existence of a barrier to vertical

flow from the Lower Tulare Formation is demonstrated by permeability data, including a sample from Well 1CH-27R (located within the Phase 2 Area) that was measured to have a vertical permeability of less than 0.1 mD; this is corroborated by numerous geophysical logs across the field. In addition, in areas where injection takes place above the Amnicola Claystone, no occurrences of injected water have been observed below the Amnicola Claystone. Lower confinement is provided by the claystone of the underlying San Joaquin Formation.

Lateral confinement from USDWs is achieved by the pressure and flow characteristics in the field, as demonstrated in the results of groundwater flow modeling performed by the operator, which were reviewed by the State Water Board and DOGGR. After reviewing information regarding the location and depth of the existing drinking water supply wells, groundwater flow within the Lower Tulare Formation, and the lateral and vertical confinement of the formation as described in the AE request, the EPA concludes that the Lower Tulare Formation is not currently a source of drinking water and is not hydraulically connected to any domestic or public drinking water supply wells. Therefore, the EPA has determined that the aquifer proposed for exemption meets the criteria at 40 CFR § 146.4(a).

40 CFR § 146.4(c) *The total dissolved solids content of the groundwater is more than 3,000 and less than 10,000 mg/L and it is not reasonably expected to supply a public water system.*

DOGGR provided information on the TDS content of the Lower Tulare Formation, along with supporting information, including analytical sampling data performed by certified laboratories and log-derived TDS data that support a demonstration that the TDS content of the Lower Tulare is between 3,000 and 10,000 mg/L.

Data on the TDS content of the Lower Tulare Formation near the area proposed for exemption ranges from 6,343 mg/L to 20,000 mg/L. This data consists of the laboratory analysis of one sample from Well W57-20S, east of the Phase 2 Area boundary. In addition, results include one analytical measurement from Well 61WS-8R (within the Phase 2 Area), one measured TDS value from Well 82-2B (within the Phase 1 Area, but near the Phase 2 Area boundary), and one well-log derived TDS value from Well 371-3B (along the Phase 1/Phase 2 Area boundary). The State's submittal notes that there is a good distribution of data points in the Lower Tulare, and salinity increases with stratigraphic depth, but varies little laterally within a given stratigraphic interval. EPA concurs that the data provided in the application and reviewed by both DOGGR and the State Board demonstrate that the portion of the Lower Tulare Formation proposed for exemption is more than 3,000 and less than 10,000 mg/L TDS.

The portions of the Lower Tulare Formation where the TDS levels are greater than 10,000 mg/L do not meet the definition of a USDW and therefore are not addressed by this action.
Based on the results of chemical analyses presented in the AE package, the aquifer contains contaminants at levels that make it unlikely that it would supply a public water system. Chemical analysis of groundwater sampled from the Lower Tulare Formation and of water produced from the formation shows that the groundwater exceeds the primary maximum contaminant level (MCL) for selenium, exceeds the secondary MCLs for chloride and sulfate, and exceeds EPA lifetime health advisory levels/drinking water equivalent levels for boron and strontium. Hydrocarbons are also present in the Lower Tulare Formation at levels that, while not

commercially producible, represent an additional constituent that would require treatment. The presence of these constituents renders the groundwater in the Lower Tulare Formation unsuitable for domestic drinking water use.

DOGGR and the operator compared potential water treatment costs to local utility data to demonstrate that treating the water to remove these contaminants would be economically infeasible. The operator estimated the cost of treating Lower Tulare Formation groundwater to meet drinking water standards, based on the concentrations of constituents reported in samples taken from Well 48-9G and W57-20S (source wells for water flood operations), located east of the Phase 2 Area.

The AE request includes treatment cost estimates to pump groundwater, treat the water with reverse osmosis and mechanical vapor compression, deliver the water, and properly manage treatment residuals. The study, "Evaluation of Economic Feasibility of Treating McKittrick Area Groundwater for Use as Drinking Water," was performed based on similar concentrations of contaminants (i.e., of TDS, chloride, sulfate, and boron) that are found in Lower Tulare Formation groundwater and in groundwater of the nearby McKittrick Oil Field. The study concluded that treating this groundwater to meet federal standards could result in an annual water charge per household of $3,269, a nearly six-fold increase in the current average annual household water cost in Kern County (of $560). Further, because the Lower Tulare Formation in the proposed aquifer exemption area also contains hydrocarbons and lead, which would require additional treatment to remove, the costs for treatment could be even higher.

DOGGR also evaluated existing drinking water sources near the Elk Hills Oil Field and determined that current sources can meet local demands. Based on a review of the WKWD's Urban Water Management Plan (UWMP), which evaluated the water supply's reliability and its ability to meet future water needs through the year 2040, DOGGR concluded that the District has adequate supplies from currently developed groundwater-bearing zones to meet expected population growth.

The primary source of water for the WKWD is groundwater that is sourced from water wells in two areas to the east and northeast of the Elk Hills Oil Field. The WKWD recently added five new water wells, which improve the District's ability to meet future water needs. Additional measures to address water supply over the next 25 years include water banking and exchange programs with other agencies to bank surplus water to meet dry year water demands, and water recycling to reduce groundwater needs.

The application includes a statement from the WKWD that the Lower Tulare Formation does not currently serve as a source of drinking water and would not reasonably be expected to be used in the future in the area proposed for exemption. The Buena Vista Water Storage District (BVWSD), which serves the Buttonwillow Subdivision, 5 miles to the north of the Elk Hills Oil Field, also does not rely on the Lower Tulare Formation for public drinking water. Based on an interview with BVWSD staff that is documented in the AE request, the BVWSD relies on surface water and only uses groundwater during times of drought. As with other water suppliers

in the area, the BVWSD water supply wells are completed in the alluvium and undifferentiated Upper Tulare Formation and are stratigraphically separated from the Lower Tulare Formation.

Based on our review of all the information provided in the State's AE request, the EPA concludes that the Lower Tulare Formation in the Elk Hills Oil Field, Phase 2 Area contains between 3,000 mg/L and 10,000 mg/L TDS and is not reasonably expected to supply a public water system. As such, the EPA has determined that the aquifer proposed for exemption meets the criteria at 40 CFR § 146.4(c).

PUBLIC NOTICE AND COMMENT

DOGGR provided public notice of this proposed AE on September 11, 2017 and held a public hearing on October 24, 2017 in Bakersfield, CA. The public comment period closed on October 24, 2017. DOGGR provided the EPA a summary of the public comments, copies of the public comments submitted, a transcript of the public hearing, and their responses to the written and oral comments.

In making this decision, the EPA considered all the information submitted by the State, including all written and oral comments submitted to the State during its public comment process. Most of the issues raised in the comments to the State were addressed by DOGGR in its responses; supplemental responses are provided below.

One commenter who wrote to DOGGR requested that the EPA reject the exemption request before environmental review has occurred under the National Environmental Policy Act (NEPA). The EPA believes that the public comment and hearing procedures afforded by DOGGR and the in-depth technical analysis to protect USDWs required in the aquifer exemption proposal process under the EPA's UIC regulations and the enabling legislation in the SDWA provide a functionally equivalent environmental review for this action.

The commenter also raised concerns regarding protection of species under the federal Endangered Species Act (ESA). This issue is outside the scope of EPA's AE decision, as this action does not authorize future injection activities at the surface. Approval of this aquifer exemption pertains to groundwater that is hundreds to thousands of feet below the surface, and a review of materials submitted by the commenter indicates that there are no subsurface listed threatened or endangered species that would be affected by the EPA's approval of the AE request.

The commenter also questioned whether the current technical criteria to consider future drinking water uses are adequate given changing climate conditions and new technology available for water treatment. In considering whether the aquifer proposed for exemption cannot now and will not in the future serve as a source of drinking water, the EPA reviewed data regarding the level of contaminants in the groundwater and information on the feasibility of treatment of this water for human consumption. Even with the potential for improved treatment technology and higher demand for drinking water due to drought or scarcity, shallower aquifers than the Lower Tulare Formation would continue to provide an adequate supply of higher quality water for public water

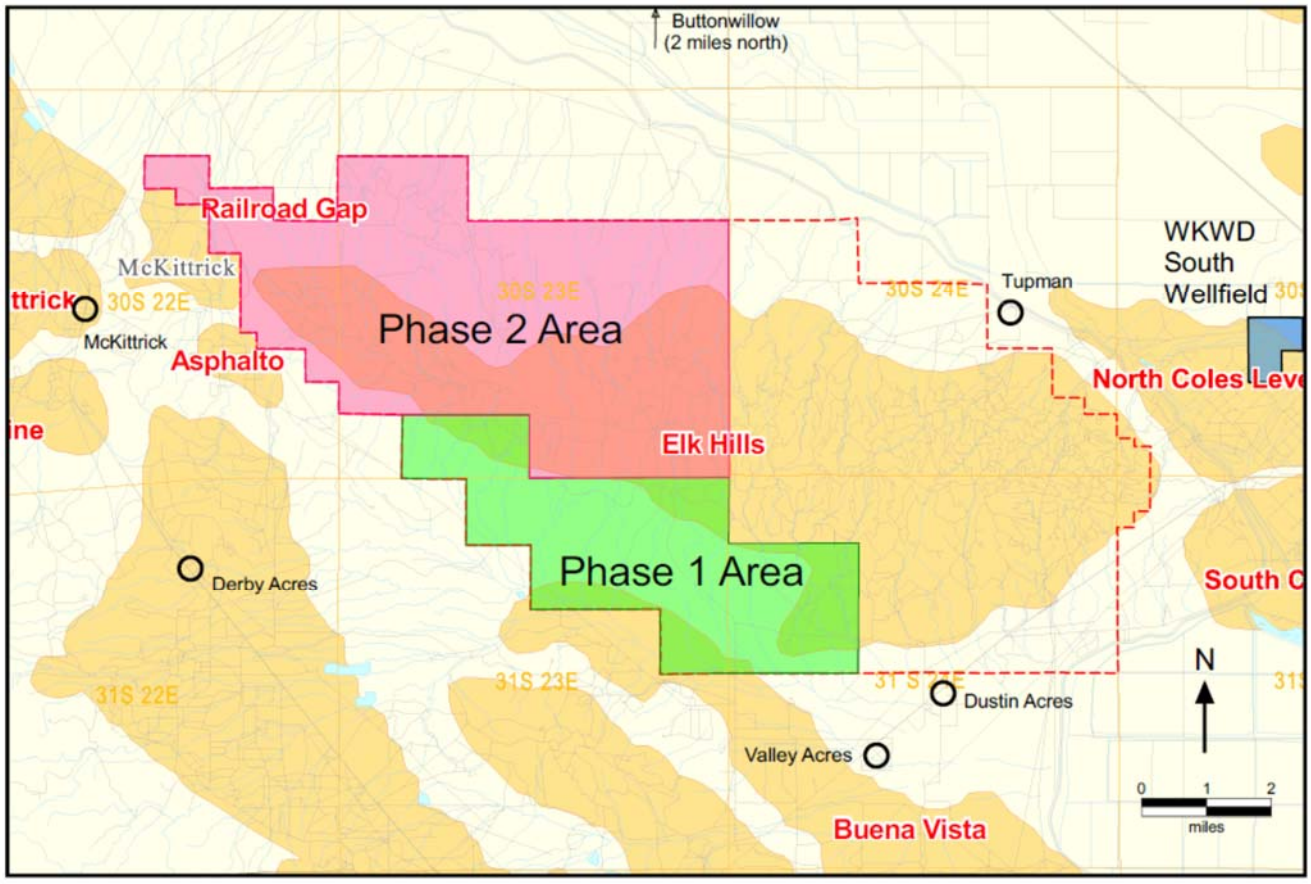
systems. As a result, the EPA concluded the aquifer is not reasonably expected to supply a public water system.

CONCLUSION AND DECISION

Based on a review of the entire record, including all the written and oral comments submitted to DOGGR during its public comment process, the EPA finds that the exemption criteria at 40 CFR § 146.4(a) and § 146.4(c) have been met and the EPA approves the aquifer exemption request as a non-substantial program revision.

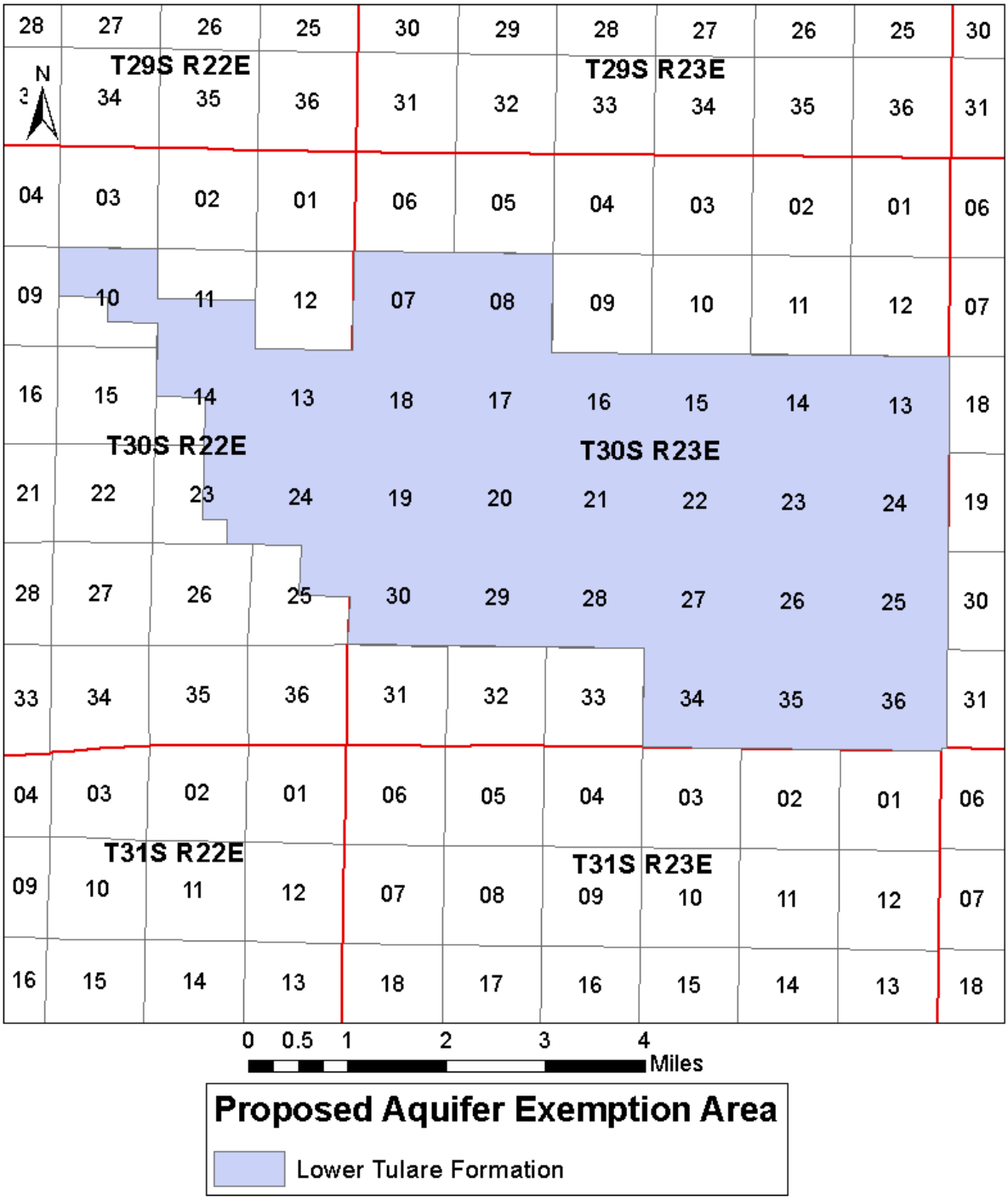
Effective Date: March 29, 2018

Figure 1: Location of the Elk Hills Oil Field - Phase 2 Area, Kern County, California



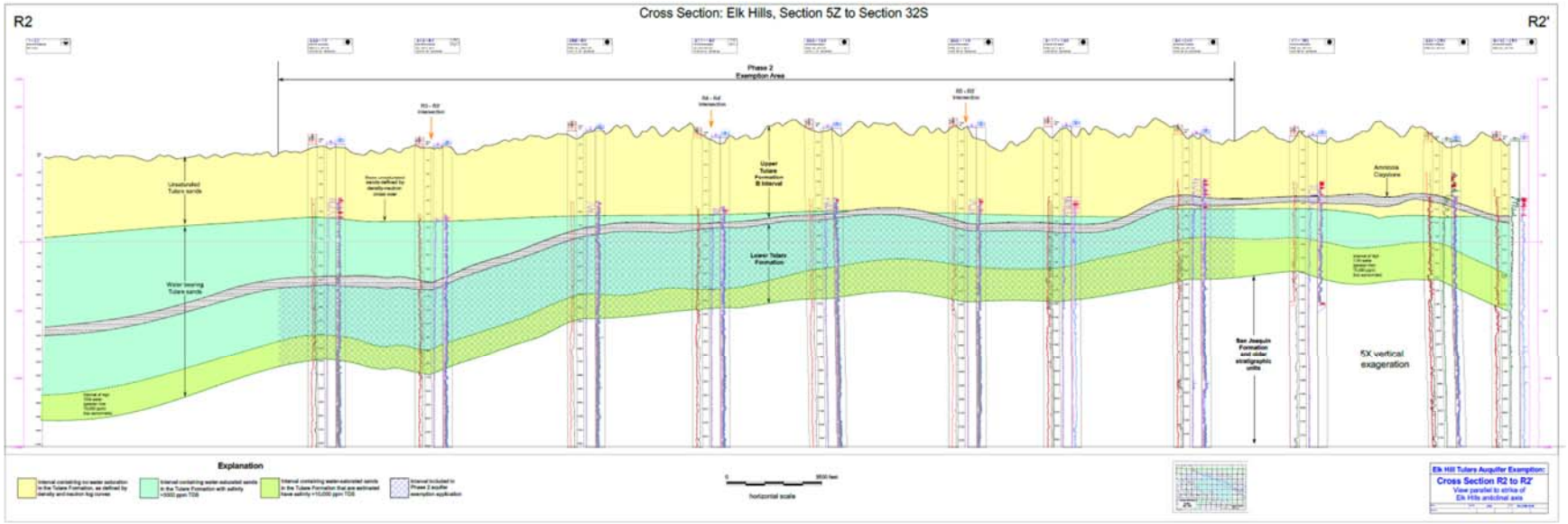
Source: Figure 2, DOGGR's Aquifer Exemption Application for the Elk Hills Oil Field - Phase 2 Area

Figure 2: Lower Tulare Formation Aquifer Exemption Location Map, Elk Hills Oil Field - Phase 2 Area, Kern County, California



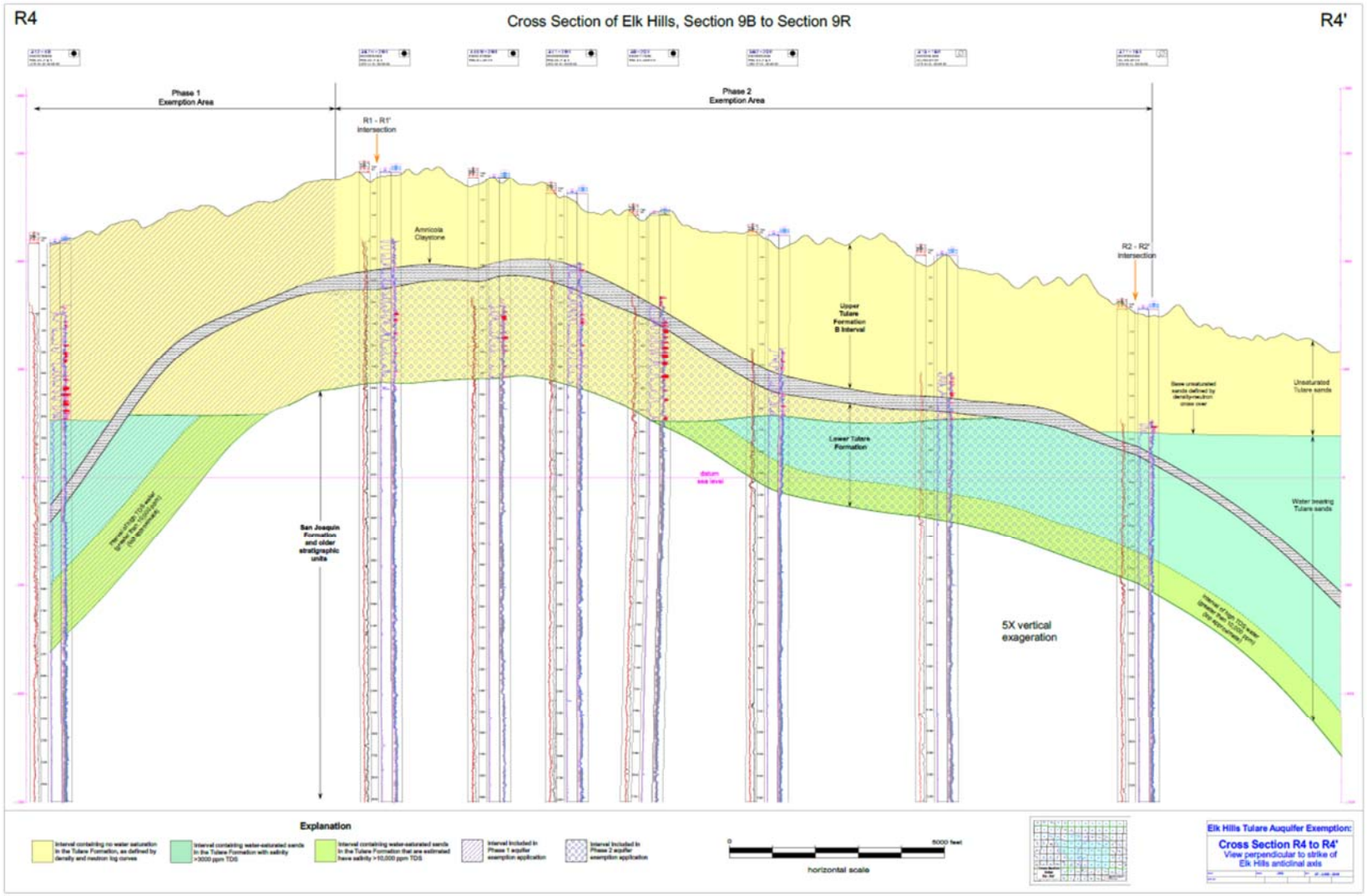
Source: DOGGR's Aquifer Exemption Application for the Elk Hills Oil Field - Phase 2 Area

Figure 3.1: Cross Section R2-R2' across the Lower Tulare Formation Aquifer Exemption Area
Elk Hills Oil Field - Phase 2 Area, Kern County, California



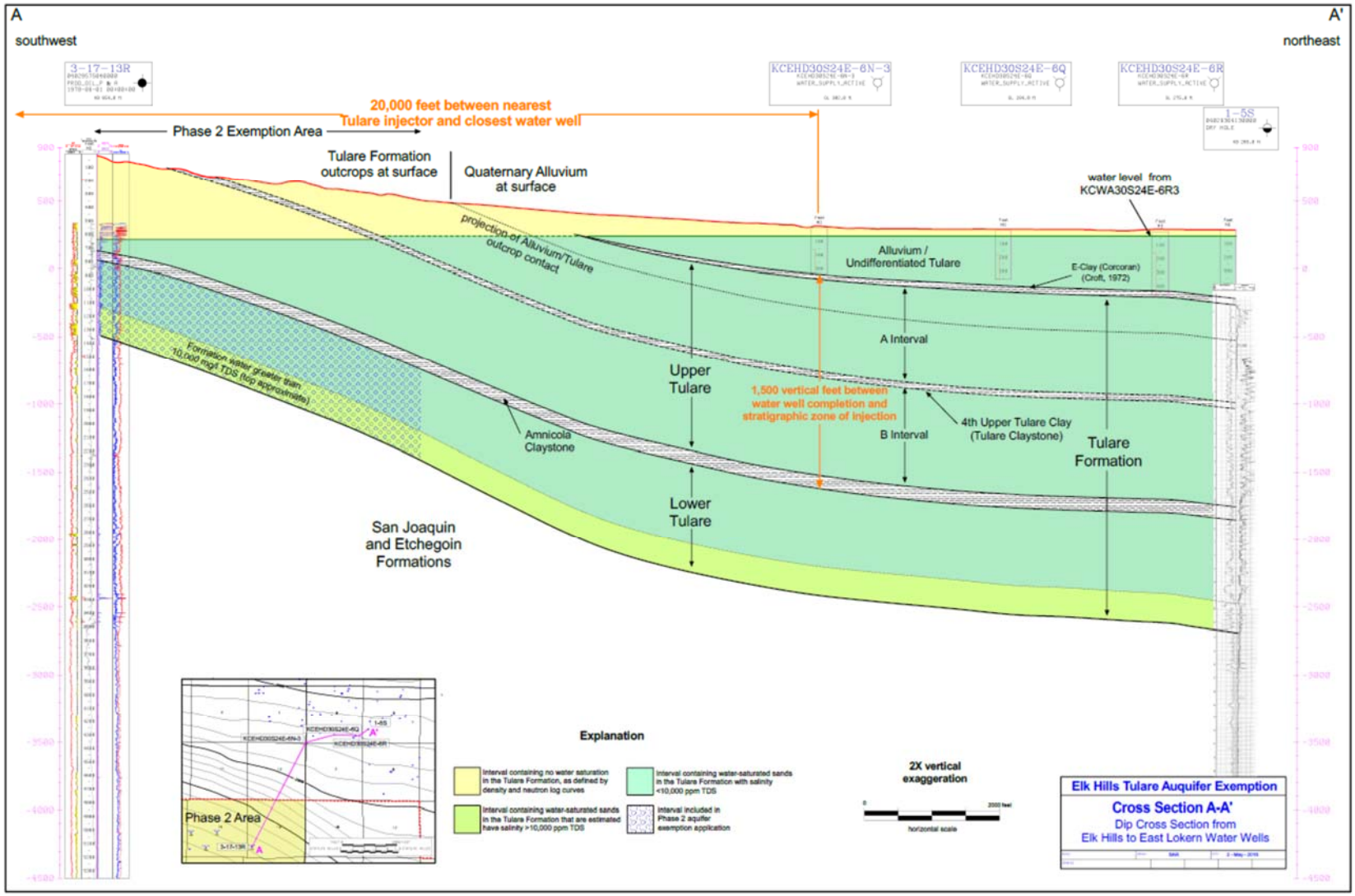
Source: Figure 10b, DOGGR's Aquifer Exemption Application for the Elk Hills Oil Field - Phase 2 Area

Figure 3.2: Cross Section R4-R4' across the Lower Tulare Formation Aquifer Exemption Area
Elk Hills Oil Field - Phase 2 Area, Kern County, California



Source: Figure 10d, DOGGR's Aquifer Exemption Application for the Elk Hills Oil Field - Phase 2 Area

Figure 3.3: Cross Section A-A' showing correlations between Elk Hills and the Water Well Study Area
Elk Hills Oil Field - Phase 2 Area, Kern County, California



Source: Figure 12, DOGGR's Aquifer Exemption Application for the Elk Hills Oil Field - Phase 2 Area

Table 1: List of Water Supply Wells

WELL	Reference Number to Maps	Section	Township	Range	Lat	Long	Year Constructed	Well Type	Well Status	Total Depth	Depth to Water	Standing Water	Screen Interval	Completion Type	Lithology	Zone at Total Depth
KCWA29S23E-28J	1	28	29	23			3/3/1951	Irrigation		500	30'	30'	--			CORCORAN
KCWA29S23E-29Q1	2	29	29	23			9/25/1968	Observation		52	Dry	Dry	18'-38'			ALLUVIUM/ UNDIFF TULARE
KCWA29S23E-29Q2	3	29	29	23			9/24/1968	Observation		52	Dry	Dry	18'-38'			ALLUVIUM/ UNDIFF TULARE
KCWA29S23E-33M	4	33	29	23			3/5/1959	Drill hole		135	--	123.0'	--			ALLUVIUM/ UNDIFF TULARE
KCWA29S23E-34A1	5	34	29	23			--	Irrigation		239	--	--	16.5'-190.5'			ALLUVIUM/ UNDIFF TULARE
KCWA29S23E-34F1	6	34	29	23						47	Dry	Dry				ALLUVIUM/ UNDIFF TULARE
KCWA29S23E-34J	7	34	29	23			--	Irrigation		630	--	--	240'-630'			U TULARE INTERVAL A
KCWA29S23E-34L1	8	34	29	23			5/13/1995	Observation		52	--	--	--			ALLUVIUM/ UNDIFF TULARE
KCWA29S23E-34P	9	34	29	23			5/19/1952	Domestic		351	29'	29'	312'-348'			ALLUVIUM/ UNDIFF TULARE
USGS029S023E34A001M	10	34	29	23	35.36635105	-119.48539600				n/a						UNKNOWN
KCWA29S23E-35B1	11	35	29	23			3/24/1961	Irrigation		252			126'-252'			ALLUVIUM/ UNDIFF TULARE
KCWA29S23E-35B2	12	35	29	23			4/30/1974	Domestic		305	--	--	258'-300'			ALLUVIUM/ UNDIFF TULARE
KCWA29S23E-35B3	13	35	29	23			7/17/1988	Domestic		250	80'	80'	180'-250'			ALLUVIUM/ UNDIFF TULARE
KCWA29S23E-35F	14	35	29	23			3/14/1974	Irrigation		485	--	--	210'-480'			ALLUVIUM/ UNDIFF TULARE
KCWA29S23E-35G1	15	35	29	23			--	--		182	--	--	--			ALLUVIUM/ UNDIFF TULARE
KCWA29S23E-35K	16	35	29	23			--	--		554	--	--	--			U TULARE INTERVAL A
KCWA29S23E-35K2	17	35	29	23			3/22/1969	Observation		200	--	--	--			ALLUVIUM/ UNDIFF TULARE
KCWA29S23E-35K3	18	35	29	23			3/22/1969	Observation		60	Dry	--	--			ALLUVIUM/ UNDIFF TULARE
KCWA29S23E-35L1	19	35	29	23			3/22/1969	Observation		608	102.5'	--				U TULARE INTERVAL A
KCWA29S23E-35P	20	35	29	23			2/537	--		192	--	--	60'-192'			ALLUVIUM/ UNDIFF TULARE
KCWA29S23E-35P1	21	35	29	23			9/24/1968	Observation		52	Dry	--	18'-38'			ALLUVIUM/ UNDIFF TULARE
KCWA29S23E-35-1	22	35	29	23			12/28/1966	Irrigation		300	--	--	150'-300'			ALLUVIUM/ UNDIFF TULARE
KCWA29S23E-35-2	23	35	29	23			5/19/1976	Irrigation		320	--	--	140'-300'			ALLUVIUM/ UNDIFF TULARE
USGS029S023E35F002M	24	35	29	23	35.36162887	-119.47622900				n/a						UNKNOWN
USGS029S023E35G001M	25	35	29	23	35.36301770	-119.47428450				n/a						UNKNOWN
KCWA29S23E-36-1	26	36	29	23			8/27/1971	Irrigation		400	--	--	150' (or 200')-400'			ALLUVIUM/ UNDIFF TULARE
KCWA29S23E-36C	27	36	29	23			6/25/1990	Irrigation		362	--	--	215'-360'			ALLUVIUM/ UNDIFF TULARE
KCWA29S23E-36H	28	36	29	23			6/13/1960	Irrigation		324	58'	58'	144'-324'			ALLUVIUM/ UNDIFF TULARE
KCWA29S23E-36J1	29	36	29	23			2/14/1959	Irrigation		300	45'	45'	136'-156'; 162'-300'			ALLUVIUM/ UNDIFF TULARE
KCWA29S23E-36J2	30	36	29	23			9/14/1959	Domestic		438	42'	42'	391'-434'			ALLUVIUM/ UNDIFF TULARE
KCWA29S23E-36J3	31	36	29	23			6/23/1988	Irrigation		420	--	--	160'-400'			ALLUVIUM/ UNDIFF TULARE
KCWA29S23E-36J4	32	36	29	23			11/25/1996	Domestic		630	--	--	463'-525'			U TULARE INTERVAL A
KCWA29S23E-36E	33	36	29	23			5/11/1961	Irrigation		402	47'	47'	105'-402'			ALLUVIUM/ UNDIFF TULARE
CASGEM29S23E36H002M	34	36	29	23	35.3628	-119.4485	<9/23/1969	Unknown	Active	n/a	227.190					UNKNOWN
CASGEM29S23E36R061M	35	36	29	23	35.3547	-119.4488	<8/1/2003		Active	n/a	0.000					UNKNOWN
USGS029S023E36R001M	36	36	29	23	35.35690660	-119.44983920				n/a						UNKNOWN
USGS029S023E36R002M	37	36	29	23	35.35523997	-119.44789470				n/a						UNKNOWN
CASGEM29S24E31B001M	38	31	29	24	35.3656	-119.4342	<2/5/1970	Unknown	Active	n/a	228.180					UNKNOWN
KCWA30S23E-01	39	1	30	23			12/5/1961	Irrigation		324	55'	--	102'-324'			ALLUVIUM/ UNDIFF TULARE
KCWA30S23E-1C1	40	1	30	23			9/14/1934	--		234	--	--	--			ALLUVIUM/ UNDIFF TULARE
KCWA30S23E-1H	41	1	30	23			7/9/1994	Irrigation		370	--	--	140'-360'			ALLUVIUM/ UNDIFF TULARE
KCWA30S23E-1L1	42	1	30	23			9/25/1968	Observation		52	Dry	Dry	--			ALLUVIUM/ UNDIFF TULARE
KCWA30S23E-1L2	43	1	30	23			9/25/1968	Observation		52	Dry	Dry	--			ALLUVIUM/ UNDIFF TULARE
CASGEM30S23E01D001M	44	1	30	23	35.3536	-119.461	<10/1/1999	Unknown	Active	n/a	207.800					UNKNOWN
USGS030S023E01C001M	45	1	30	23	35.35357340	-119.46206190				n/a						UNKNOWN
USGS030S023E01C002M	46	1	30	23	35.35274009	-119.46206190				n/a						UNKNOWN
USGS030S023E01L003M	47	1	30	23	35.35274008	-119.46067290				n/a						UNKNOWN
KCWA30S23E-03	48	3	30	23			10/1/2005	Industrial-Irrigation		1160	370'	370'	720'-780'; 820'-860'; 900'-920'; 980'-1,020'; 1,040'-1,140'			U TULARE INTERVAL A
KCWA30S23E-6Q	49	6	30	23			1929?	Oil		2012	--	--	--			SAN JOAQUIN
KCWA30S24E-5-1	50	5	30	24			2/26/1975	Irrigation		507	--	--	200'-500'			ALLUVIUM/ UNDIFF TULARE

KCWA30S24E-5-2	51	5	30	24			8/17/1977	Irrigation		520	--	--	210'-515'			ALLUVIUM/ UNDIFF TULARE
KCWA30S24E-5A	52	5	30	24			3/13/1958	--		234	54'	54'	120'-234'			ALLUVIUM/ UNDIFF TULARE
KCWA30S24E-5C	53	5	30	24			4/28/1965	Domestic		480	80'	--	400'-480'			ALLUVIUM/ UNDIFF TULARE
KCWA30S24E-5D	54	5	30	24			1/8/1966	Irrigation		422	--	50'	138'-422'			ALLUVIUM/ UNDIFF TULARE
KCWA30S24E-5G	55	5	30	24			2/7/1962	Irrigation		508	58'	--	180'-504'			ALLUVIUM/ UNDIFF TULARE
KCWA30S24E-5J2	56	5	30	24			--	?		257	--	--	66'-286'			ALLUVIUM/ UNDIFF TULARE
KCWA30S24E-5K1	57	5	30	24			12/22/1950	Irrigation		298	28'	28'	76'-298'			ALLUVIUM/ UNDIFF TULARE
KCWA30S24E-5L1	58	5	30	24			--	Irrigation		170	--	--	--			ALLUVIUM/ UNDIFF TULARE
KCWA30S24E-5M	59	5	30	24			--	Oil		4710	--	--	--			ETCHEGOIN
KCWA30S24E-5N1	60	5	30	24			10/28/2028	--		65	--	--	--			ALLUVIUM/ UNDIFF TULARE
KCEHD30S24E-05B	61	5	30	24			12/20/1994	Irrigation		460	--	--	±160'-460'			ALLUVIUM/ UNDIFF TULARE
USGS030S024E05B001M	62	5	30	24	35.35218434	-119.41844910				n/a						UNKNOWN
USGS030S024E05J001M	63	5	30	24	35.34662889	-119.41844920				n/a						UNKNOWN
USGS030S024E05L002M	64	5	30	24	35.34662890	-119.42372710				n/a						UNKNOWN
KCWA30S24E-6E2	65	6	30	24			3/9/1990	Irrigation		340	--	--	140'-320'			ALLUVIUM/ UNDIFF TULARE
KCWA30S24E-06B2	66	6	30	24			1/14/1993	Observation		720	--	--	550'-650'			U TULARE INTERVAL A
KCWA30S24E-06B3	67	6	30	24			--	Observation		n/a	--	--	370'-450'			UNKNOWN
KCWA30S24E-06E1	68	6	30	24			1/28/1957	Domestic		342	31'	31'	300'-339'			ALLUVIUM/ UNDIFF TULARE
KCWA30S24E-6A	69	6	30	24			12/9/1961	Irrigation		450	58'	--	186'-450'			ALLUVIUM/ UNDIFF TULARE
KCWA30S24E-6C	70	6	30	24			8/11/1980	Irrigation		400	--	--	200'-400'			ALLUVIUM/ UNDIFF TULARE
KCWA30S24E-6C2	71	6	30	24			4/9/1981	Domestic		400	--	--	300'-400'			ALLUVIUM/ UNDIFF TULARE
KCWA30S24E-6E	72	6	30	24			6/8/1966	Irrigation		300	--	--	100'-300'			ALLUVIUM/ UNDIFF TULARE
KCWA30S24E-6E3	73	6	30	24			7/21/1994	Irrigation		370	--	--	140'-360'			ALLUVIUM/ UNDIFF TULARE
KCWA30S24E-6H	74	6	30	24			5/9/1991	Irrigation		400	--	--	160'-400'			ALLUVIUM/ UNDIFF TULARE
KCWA30S24E-6K	75	6	30	24			2/18/1988	Irrigation		530	--	--	240'-510'			CORCORAN
KCWA30S24E-6L	76	6	30	24			5/28/1955	Irrigation		352	38'	38'	100'-148' & 154'-352'			ALLUVIUM/ UNDIFF TULARE
KCWA30S24E-6M2	77	6	30	24			3/27/1953	Domestic		270	32'	32'	237'-267'			ALLUVIUM/ UNDIFF TULARE
KCWA30S24E-6R	78	6	30	24			1923	Oil		1455	--	--	--			U TULARE INTERVAL B
KCWA30S24E-6R3	79	6	30	24			6/6/1956	Irrigation		250	40'	40'	172'-250'			ALLUVIUM/ UNDIFF TULARE
CASGEM30S24E06B001M	80	6	30	24	35.3522	-119.4385	<10/7/1987	Unknown	Active	n/a	205.180					UNKNOWN
CASGEM30S24E06N001M	81	6	30	24	35.3403	-119.4471	<4/14/1987	Unknown	Active	n/a	0.000					UNKNOWN
KCEHD30S24E-6E2	82	6	30	24			3/9/1990	Irrigation		340	--	--	140'-320'			ALLUVIUM/ UNDIFF TULARE
KCEHD30S24E-6H	83	6	30	24			5/9/1991	Irrigation		400	--	--	160'-400'			ALLUVIUM/ UNDIFF TULARE
KCEHD30S24E-6M	84	6	30	24			1/8/1992	Irrigation		300	--	--	±180'-300'			ALLUVIUM/ UNDIFF TULARE
KCEHD30S24E-6N-1	85	6	30	24			3/3/2003	Irrigation		380	--	--	±180'-380'			ALLUVIUM/ UNDIFF TULARE
KCEHD30S24E-6N-2	86	6	30	24			3/16/2001	Irrigation		360	--	--	±180'-360'			ALLUVIUM/ UNDIFF TULARE
KCEHD30S24E-6N-3	87	6	30	24			11/14/1985	Irrigation		340	--	--	±160'-340'			ALLUVIUM/ UNDIFF TULARE
KCEHD30S24E-6Q	88	6	30	24			6/6/1984	Irrigation		360	--	--	±180'-360'			ALLUVIUM/ UNDIFF TULARE
KCEHD30S24E-6R	89	6	30	24			5/14/2007	Irrigation		460	--	--	±160'-460'			ALLUVIUM/ UNDIFF TULARE
USGS030S024E06A001M	90	6	30	24	35.35412880	-119.43428300				n/a						UNKNOWN
USGS030S024E06A002M	91	6	30	24	35.35357327	-119.43456080				n/a						UNKNOWN
USGS030S024E06E001M	92	6	30	24	35.34996229	-119.44650580				n/a						UNKNOWN
USGS030S024E06M001M	93	6	30	24	35.34440685	-119.44872800				n/a						UNKNOWN
USGS030S024E06R003M	94	6	30	24	35.34162906	-119.43261640				n/a						UNKNOWN
KCWA30S24E-8-1	95	8	30	24			2/24/1981	Irrigation		301	--	--	151'-301'			ALLUVIUM/ UNDIFF TULARE
KCWA30S24E-8-2	96	8	30	24			8/13/1975	Irrigation		280	--	--	140'-260'			ALLUVIUM/ UNDIFF TULARE
KCWA30S24E-8-3	97	8	30	24			10/25/1976	Irrigation		303	--	--	120'-302'			ALLUVIUM/ UNDIFF TULARE
KCWA30S24E-8E1	98	8	30	24			6/24/63	Test Well		215	51'	70'	158'-168'			ALLUVIUM/ UNDIFF TULARE
KCWA30S24E-8E2	99	8	30	24			6/16/1989	Domestic		460	--	140'	400'-460'			ALLUVIUM/ UNDIFF TULARE
KCWA30S24E-8H	100	8	30	24			12/16/1954	Irrigation		462	27'	27'	120'-204' 210' 462'			ALLUVIUM/ UNDIFF TULARE
KCWA30S24E-8H1	101	8	30	24			6/20/1939	Irrigation	destroyed	231	--	--	16.5'-178.5'			ALLUVIUM/ UNDIFF TULARE
KCWA30S24E-8J	102	8	30	24			6/6/1990	Irrigation		365	--	--	203'-363'			ALLUVIUM/ UNDIFF TULARE
CASGEM30S24E08P001M	103	8	30	24	35.3211	-119.4241	<1/7/1988	Unknown	Active	n/a	201.690					UNKNOWN
KCEHD30S24E-8-1	104	8	30	24			10/16/2007	Irrigation		500	--	--	±200'-500'			CORCORAN
USGS030S024E08D001M	105	8	30	24	35.33940685	-119.42761620				n/a						UNKNOWN

Source: Table 3, DOGGR's Aquifer Exemption Application for the Elk Hills Oil Field - Phase 2 Area