



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION IX

75 Hawthorne Street

San Francisco, CA 94105-3901

April 17, 2017

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 Mt. Poso Oil Field, Kern County, California

Dear Mr. Harris:

Based on a thorough review of the extensive 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 hereby provides notice of approval of a request to expand the existing aquifer exemption for the following formations in Kern County, California:

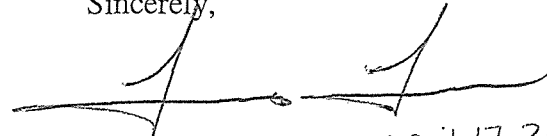
- Specified portions of the Pyramid Hill Sand and Vedder Formation in the Mt. Poso Oil Field (submitted February 15, 2017)

The approved aquifer exemption boundaries and depths, along with our 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 the request is a non-substantial program revision, and the requested formations meet federal exemption criteria:

- All portions of both formations proposed for exemption in the oil field do not currently serve as a source of drinking water;
- The portions of both formations proposed for exemption cannot now and will not in the future serve as a source of drinking water because they are commercially hydrocarbon-producing.

If you have any questions, please contact Michael Montgomery, Assistant Director, Water Division, at (415) 972-3438.

Sincerely,

A handwritten signature in black ink, consisting of a stylized 'T' followed by a horizontal line and a small flourish at the end.

Tomás Torres  
Director, Water Division

April 17, 2017

Enclosure: Aquifer Exemption Record of Decision for Mt. Poso Oil Field

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

**US Environmental Protection Agency (EPA) 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 expansion of the aquifer exemption (AE) for the Pyramid Hill Sand and the Vedder Formation of the Mount Poso Oil Field, 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, 2017

**Exemption Criteria:** DOGGR requested this exemption because it has determined that the proposed exempt formations meet the criteria at 40 CFR § 146.4(a) and § 146.4(b)(1).

**Substantial or Non-Substantial Program Revision:** Non-Substantial

Although the EPA must approve all revisions to the 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 site-specific Class II UIC well permits, is an expansion to an existing aquifer exemption in 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 whether a program revision is substantial or non-substantial is made on a case-by-case basis.

**Operators:** Macpherson Operating Company LLP, California Resources Corporation, and Pace Diversified Corporation.

**Well/Project Name:** Mount Poso Oil Field.

**Well/Project Permit Number:** There are currently 30 Class II injection wells, including water disposal and water flood and steam flood enhanced oil recovery (EOR) wells, in the area of the Mount Poso Oil Field proposed for exemption.

**Well/Project Location:** The Mount Poso Field AE, including the proposed expansion, is located in portions of Section(s) 24 of Township 26 South Range 27 East, 20, 21, 22, 27, 28, 29, 31, 32, 33 and 34 of Township 26 South Range 28 East, 1,12, and 13 of Township 27 South Range 27 East, 3, 4, 5, 6, 7, 8, 9, 10, 11, 15, 16, 17, 18, 19, 20, 21, 22, 23, 26, 27, 28, 29, 30, 31, 32, 33, 34 and 35 of Township 27 South, Range 28 East, Mount Diablo Meridian. [Refer to Figure 1.]

**County:** Kern

**State:** California

**Well Class/Type:** Class II Enhanced Oil Recovery (EOR) and Waste Disposal (WD) wells.

**DESCRIPTION OF PROPOSED AQUIFER EXEMPTION**

**Aquifers to be Exempted:** The Pyramid Hill Sand, which is the sandstone that lies in the basal portion of the Freeman-Jewett Formation, and the Vedder Formation, which lies below the Pyramid Hill Sand.

**Areal Extent of Aquifer Exemption:** The areal extent of the existing AE and the proposed expansion in the Mount Poso Oil Field (in both formations) is approximately 10,913 acres. This acreage includes the productive boundaries approved at primacy in 1983 (comprised of approximately 4,965 acres), the current oil producing area outside the boundaries approved in 1983, and planned future commercially producible areas. The lateral boundaries of the area proposed to be exempted are defined by the currently and historically oil-producing formations constrained on all sides by sealing faults except the western boundary, which is defined by the 1,700-foot total vertical subsea depth contour line of the Vedder Formation. DOGGR has provided a GIS shape file that delineates the AE boundary, which is incorporated in the administrative record for this ROD. Refer to Figures 2A and 2B for a depiction of the existing and proposed exemption areas and Figures 3A and 3B for a depiction of the areal extent of each of the aquifers proposed for exemption.

A breakdown of the proposed exempted area and the existing exempted area in the Mount Poso Oil Field, in acres, for each of the aquifers follows:

<u>Aquifer</u>	<u>Proposed (approx.)</u>	<u>Existing Exempted Area</u>
Pyramid Hill Sand	5,948	4,965
Vedder Formation	5,948	4,965

**Lithology, Total Dissolved Solids (TDS), Depth, Thickness, Porosity, and Permeability of the Aquifers:** Geochemical sampling data provided in the AE application reflects a total of 31 samples taken between 1942 and 2016 at various depths within the Pyramid Hill Sand and the Vedder Formation. The following table summarizes the lithology, TDS levels, depth, thickness, and average porosity and permeability information about the aquifers proposed for exemption.

<i>Aquifer</i>	<i>Lithology</i>	<i>TDS (mg/L)</i>	<i>Mean Depth to Base (feet below ground surface)</i>	<i>Average Thickness (feet)</i>	<i>Porosity and Permeability</i>
Pyramid Hill Sand	Silty, fine-grained sand with a basal zone of fine-grained calcareous pebbly sandstone with quartz grit and black chert pebbles, variably containing silty, fossiliferous sandstone with bentonite.	2,520 mg/L (average of 6 samples ranging from 1,300 to 4,340 mg/L)	~ 2, 200 feet	100 feet in the Main Area; 50 feet in the West Area	~ 28 to 38% ~ 20 to 90 millidarcies (mD)
Vedder Formation	Unconsolidated medium- to coarse-grained, locally tuffaceous, bluish-to greenish-gray marine sandstone with thin interbeds of pebbly conglomerate. Gray, sandy and clayey siltstones are variably present.	1,730 mg/L (average of 25 samples ranging from 881 to 2,890 mg/L)	~ 2,800 feet	550 feet in the Main Area; 750 feet in the West Area	~ 32 to 35% ~ 1.5 to 24 D

**Confining Zone(s):** The upper confining zone is the Freeman-Jewett Formation, which is 300 to 700 feet thick in the area of the aquifers proposed for exemption. The lower confining zone is the Basal Vedder Silt, which is 30 to 80 feet thick in the areas proposed for exemption. Fluids in the Main and West Areas proposed for exemption are laterally bounded by sealing faults to the north, east, and south of the field and contained in the west of the field by an eastern-directed pressure gradient. [Refer to Figures 4A through 4D.]

**Injectate Characteristics:** The injectate is water produced from the Pyramid Hill Sand and the Vedder Formation that is reinjected into the Pyramid Hill Sand as waterflood, steam enhancement, or water disposal. Additionally, some water produced from the Vedder Formation is reduced in volume in a biomass cogeneration facility and re-injected into the Vedder Formation as waterflood, steam enhancement, or water disposal.

### **BACKGROUND**

On February 15, 2017, DOGGR submitted a request for EPA Region 9 approval to expand the current AE designation for the Pyramid Hill Sand and Vedder Formation in the Mount Poso Oil Field, in an unincorporated area administered by Kern County in the Southern San Joaquin Valley, California. DOGGR reviewed the operator’s request and proposed this AE based on the criteria at 40 CFR §146.4(a): it does not currently serve as a source of drinking water; and at 40 CFR §146.4(b)(1): it cannot now and will not in the future serve as a source of drinking water because it is mineral, hydrocarbon, or geothermal energy-producing, or can be demonstrated by a permit applicant as part of a permit application for a Class II or III operation to contain minerals or hydrocarbons that considering their quantity and location are expected to be commercially producible. Subsequent to the EPA’s approval of the AE, the exempt formations would not be protected as underground sources of drinking water (USDWs) under the Safe Drinking Water Act (SDWA) and, therefore, would allow DOGGR, subject to state regulatory requirements, to

approve Class II injection into the identified formations, either for EOR and/or for disposal of fluid associated with oil and gas production.

The Mount Poso Oil Field has been producing oil in the Vedder Formation since the field was discovered in 1926. Ongoing exploration through approximately 1943 led to production from the Pyramid Hill Sand and Vedder Formation within six designated productive areas: the Main, Dominion, Granite Canyon, Dorsey, Baker-Grover, and West Areas [see Figure 1]. The high water-cuts (i.e., the percent of water in the produced fluids) in the field have necessitated the use of water reinjection wells, which were introduced to the Pyramid Hill Sand and Vedder Formation in 1952, and field-wide in the early 1970s. These two formations represent the vast majority of production in the Mount Poso Oil Field. Steam flood injection for the purposes of enhanced recovery began in the Vedder Formation within the Main Area in 1977, and waterflood injection began in 2000. Both of these enhanced recovery methods continue to the present day into the Pyramid Hill Sand and Vedder Formation in the field.

Operations within the proposed exemption area of the Mount Poso Oil Field consist of 78 producing wells, 20 EOR wells (water flood and steam flood), and 10 water disposal wells. The Mount Poso Oil Field has produced over 305 million barrels of oil to date.

The prior approved aquifer exemption area was based on commercial petroleum production boundaries depicted in the document, "California Oil and Gas Fields, Vol. I, North and East Central California, 1973." The Pyramid Hill Sand and Vedder Formation in the Mount Poso Oil Field were exempted by the EPA at the time of DOGGR's Class II primacy approval in 1983 because they were oil productive formations. The exemption included all six productive areas of the Mount Poso Oil Field, approximately 4,965 combined acres of the Pyramid Hill Sand and the Vedder Formation were exempted by the EPA.

## **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 Board) determined that the portions of the Pyramid Hill Sand and Vedder Formation that the State proposed for exemption do not currently serve as sources of drinking water, and are not hydraulically connected to domestic or public water supply wells. This is based on an evaluation of the formations' properties (based on information about oil saturation through oil shows, pressure data, and permeability and porosity data), confinement of the formations to groundwater flow, and information about water supply wells in the area. The State's review demonstrated that neither the Pyramid Hill Sand nor the Vedder Formation currently serve as a source of drinking water in the area proposed for exemption because there are no identified current public or private drinking water supply wells that draw water from the aquifers within those areas. Furthermore, the Pyramid Hill Sand and Vedder Formation are vertically and laterally confined (separated) from USDWs, and no existing drinking water sources are hydraulically connected to the aquifers proposed for exemption.

**Water Supply Wells:** DOGGR’s AE proposal included information about water wells in the area proposed for exemption and confirmed that no drinking water wells draw from the Pyramid Hill Sand and the Vedder Formation. While EPA regulations require that an aquifer must not currently serve as a source of drinking water, DOGGR reviewed all beneficial use wells within the area proposed for exemption—which the State defines to include both drinking water uses and non-drinking water uses, such as irrigation. The State identified two water supply wells completed in the Vedder Formation within the area proposed for exemption, but these wells supply water to a biomass cogeneration facility, not for domestic or municipal drinking water use. DOGGR performed water well database searches, a well records review, and field inspections to identify potential water supply wells. The search area includes an area that is at least one mile around the surface boundary of the area proposed for exemption. This area was designed to include a two-mile radius surrounding the easternmost area proposed for exemption, directly west of the Main Area, to reflect the areas of potential surface recharge and coincides with or is greater than the boundaries of the hydraulically isolated area.

DOGGR and the State Board contacted the California Department of Water Resources (DWR) and the Wheeler Ridge-Maricopa Water Storage District and performed aerial imaging searches to gather information on water supply wells identified within the search area. Reported completion depths for water supply wells in the area range from 200 feet to 1,920 feet, excluding the two industrial wells supplying the cogeneration facility [see Table 1]. There is approximately 1,000 feet or more of vertical separation between the deepest drinking water wells and the top of the Pyramid Hill Sand, which is the shallowest aquifer proposed for exemption. All of the beneficial use wells identified by the State Board are screened in the Olcese Formation, the Santa Margarita Formation, the Kern River Formation, or alluvium, which are all above the formations proposed for exemption and above the Freeman-Jewett confining layer [see Figures 4A through 4D]. Thirty-one water wells were identified during the water well search, which are utilized for the following purposes: twelve for domestic purposes (including use for drinking water in some instances); five for agricultural purposes; three for industrial purposes; two test wells; and nine for unknown purposes. [See Table 1 for the complete water well inventory.] All wells for which the use/purpose is unknown were completed above the aquifers proposed for exemption. None of the drinking water wells are completed in the Pyramid Hill Sand or Vedder Formation.

**Groundwater Flow Patterns:** DOGGR evaluated available hydrogeologic information on the aquifers proposed for exemption and the overlying formations, including groundwater flow maps. [See Figures 4A through 4D for a series of cross-sections defining four transects across the Mount Poso Oil Field.] For the shallower aquifers, groundwater flow is generally from areas of surficial recharge toward areas of groundwater withdrawal. Formation fluids within the formations proposed for exemption are hydraulically isolated from surficial recharge, and flow gradients within these formations are controlled by oil production activities.

In the Pyramid Hill Sand and Vedder Formation, flow is driven by pressure gradients created by oil production and injection activities. There is a net-negative fluid balance within the aquifers proposed for exemption, which means that more fluid is withdrawn from the aquifer than is reinjected. This creates an inward pressure gradient (i.e., a “pressure sink”) that is localized

around the oil producing wells. Due to current and historic oil production, formation fluids within the Pyramid Hill Sand and Vedder Formation flow inward from the proposed exemption boundary toward the center of the field.

**Confinement of the Formations to Groundwater Flow:** Fluids in the Pyramid Hill Sand and the Vedder Formation are contained as follows: by sealing faults to the east, south, and north of the field; by the eastward pressure gradient for confinement at the western boundary of the field; by the low permeability Freeman-Jewett Formation for upper-bound containment; and by the low permeability basal portion of the Vedder Formation for lower-bound containment. The two formations proposed for exemption are stratigraphically adjacent and in hydraulic communication with one another, and are affected by the same faults and inward pressure gradients defining containment in the area proposed for exemption. Therefore, confinement of both formations are described together.

Within the area proposed for exemption, the overlying Freeman-Jewett Formation is a laterally continuous, 300 to 700 feet thick shale that serves as a barrier to upward fluid migration. The Freeman-Jewett Formation is a fine (occasionally sandy) silt- and claystone with a permeability of approximately 0.9 mD. Confinement by this formation is further demonstrated by the accumulation of oil in the Pyramid Hill Sand and Vedder Formation proposed for exemption, based on oil/water contacts that show the presence of oil within the formations proposed for exemption and the absence of oil above the Pyramid Hill Sand.

The underlying basal portion of the Vedder Formation is a silty interval at the base of the Vedder Formation that provides lower-bound confinement to fluid migration. Within the area proposed for exemption, this unit is a laterally extensive, 30 to 80 feet thick siltstone and serves as a barrier to fluid migration into the underlying Famoso and Walker Formations, which are the deepest sedimentary rocks that lie immediately atop the crystalline, granitic basement.

Both aquifers proposed for exemption are also laterally bounded by sealing faults, which serve as barriers to fluid migration beyond the eastern, southern, and northern boundaries of the area proposed for exemption. These faults are demonstrated by DOGGR to be sealing due to the following observed effects: the fault to the north of the area proposed for exemption is shown to be sealing based on differences in oil saturation across the fault; the fault to the east is demonstrably sealing based on a pressure and temperature increase in the productive Main Area of the field relative to the area east of the fault; the fault that defines the productive eastern area of the West Area of the field is demonstrated to be sealing based on a pressure increase in the western, productive block relative to the eastern fault block; and the fault to the south is shown to be sealing based on differences in groundwater levels across the fault and the accumulation of oil and gas across the fault [see Figure 5].

Containment to the west of the area proposed for exemption is primarily provided by an eastern-directed pressure gradient created by oil production in the field. Because oil production causes a greater volume of fluids to be withdrawn from the field than reinjected, an inward pressure gradient is created that is directed toward the center of the field and away from the boundaries of the area proposed for exemption.



The EPA reviewed the analyses in the AE application, as described above, and concludes that the portions of the Pyramid Hill Sand and Vedder Formation proposed for exemption do not currently serve as a source of drinking water, pursuant to 40 CFR § 146.4(a).

**40 CFR § 146.4(b)(1)** *It cannot now and will not in the future serve as a source of drinking water because it is mineral, hydrocarbon, or geothermal energy producing, or can be demonstrated by a permit applicant as part of a permit application for a Class II or III operation to contain minerals or hydrocarbons that considering their quantity and location are expected to be commercially producible.*

The Mount Poso Oil Field has been producing oil since 1926. DOGGR provided available information on historic production in the area proposed for exemption, along with supporting information such as well logs, core data, and oil shows that support a demonstration of the presence of producible oil in the Pyramid Hill Sand and Vedder Formation.

The State's AE request also provides conventional core analyses, mud log drill cutting descriptions, and geophysical well logs, along with cross-sections and a type log for the Pyramid Hill Sand and Vedder Formation. Mud logs and core analyses confirm the presence of current and residual oil in the area proposed for exemption. Oil shows also verify the presence of commercially producible quantities of oil in the area proposed for exemption.

DOGGR also provided present and cumulative oil production data from the Mount Poso Oil Field, including cumulative production volumes in both the current and proposed exempt areas. In the Main Area (which accounts for the majority of production within the Mount Poso Oil Field), the Vedder Formation and Pyramid Hill Sand have produced over 172 and 9 million barrels of oil to date, respectively. Based on this information, the EPA agrees with DOGGR's determination that the Pyramid Hill Sand and Vedder Formation will be used for continued and expanded production within the Mount Poso Oil Field. This determination is made on the basis of demonstrated historic and current production [see Table 2] and the presence of oil saturation in the Pyramid Hill Sand and Vedder Formation.

Based on a review of information such as core data, well logs, and other well tests (e.g., geophysical well logs) and given the long history of oil production, the implementation of enhanced recovery techniques, and recent trends in field production, the EPA has determined that the aquifer proposed for exemption meets the criteria at 40 CFR § 146(b)(1).

### **PUBLIC NOTICE AND COMMENT**

DOGGR provided public notice of this proposed AE on October 17, 2016. A public hearing was held on November 18, 2016 in Bakersfield, California. The written comment period closed on November 18, 2016. 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 verbal comments.

In making this decision, the EPA considered all of the information submitted by the State, including all of the written and oral comments submitted to the State during its public comment

process. 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. 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 concerns groundwater that is thousands of feet below the surface, and a review of materials submitted by the commenter indicate that there are no subsurface listed threatened or endangered species that would be affected by the EPA's approval.

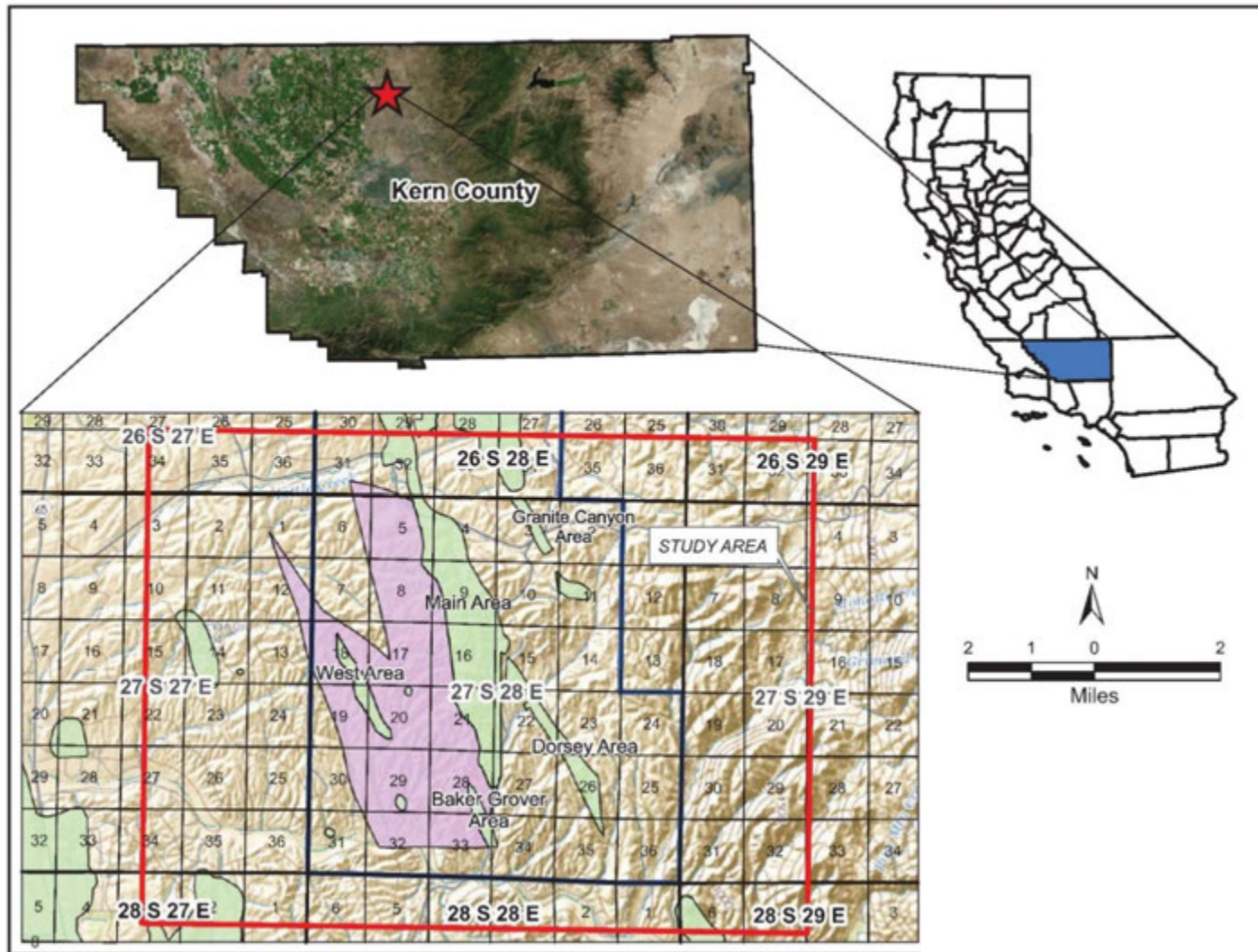
Additionally, the commenter questioned whether the current aquifer exemption criteria reflect changing climate conditions and modern water treatment technologies. In considering whether the aquifers proposed for exemption cannot now and will not in the future serve as sources of drinking water because they are hydrocarbon producing, the EPA reviewed data about hydrocarbon production in the Pyramid Hill Sand and Vedder Formation, including historic oil production. Based on a review of well logs, core data, and other well tests (e.g., geophysical well logs), the EPA believes that it is reasonable to conclude that these formations will continue to be commercially producible into the foreseeable future within the Mount Poso Oil Field and meet the requirements at 40 CFR § 146.4(b)(1).

### **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(b)(1) have been met and the EPA approves the aquifer exemption request as a non-substantial program revision.

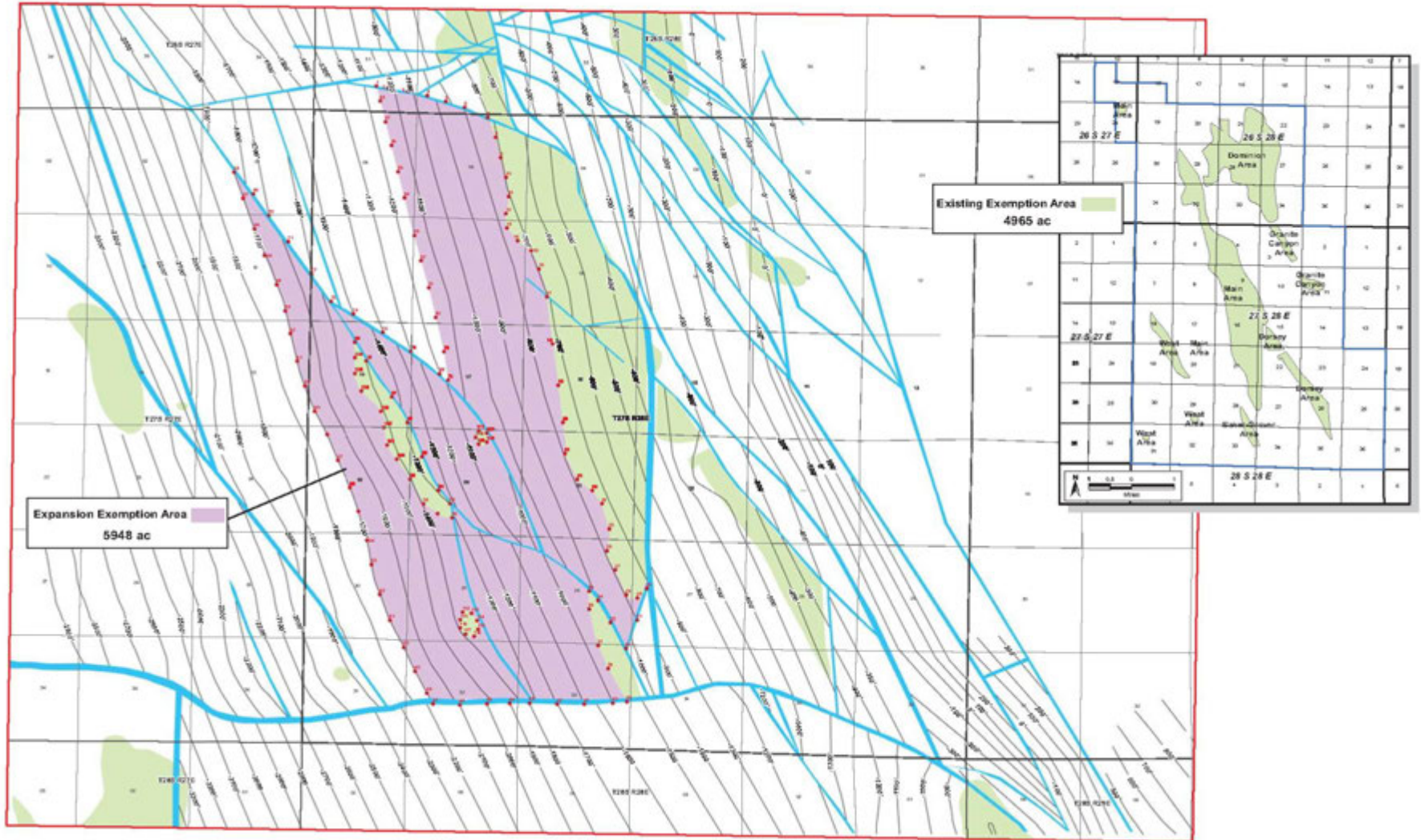
Effective Date: April 17, 2017

Figure 1: Location of the Mount Poso Oil Field, Kern County, California



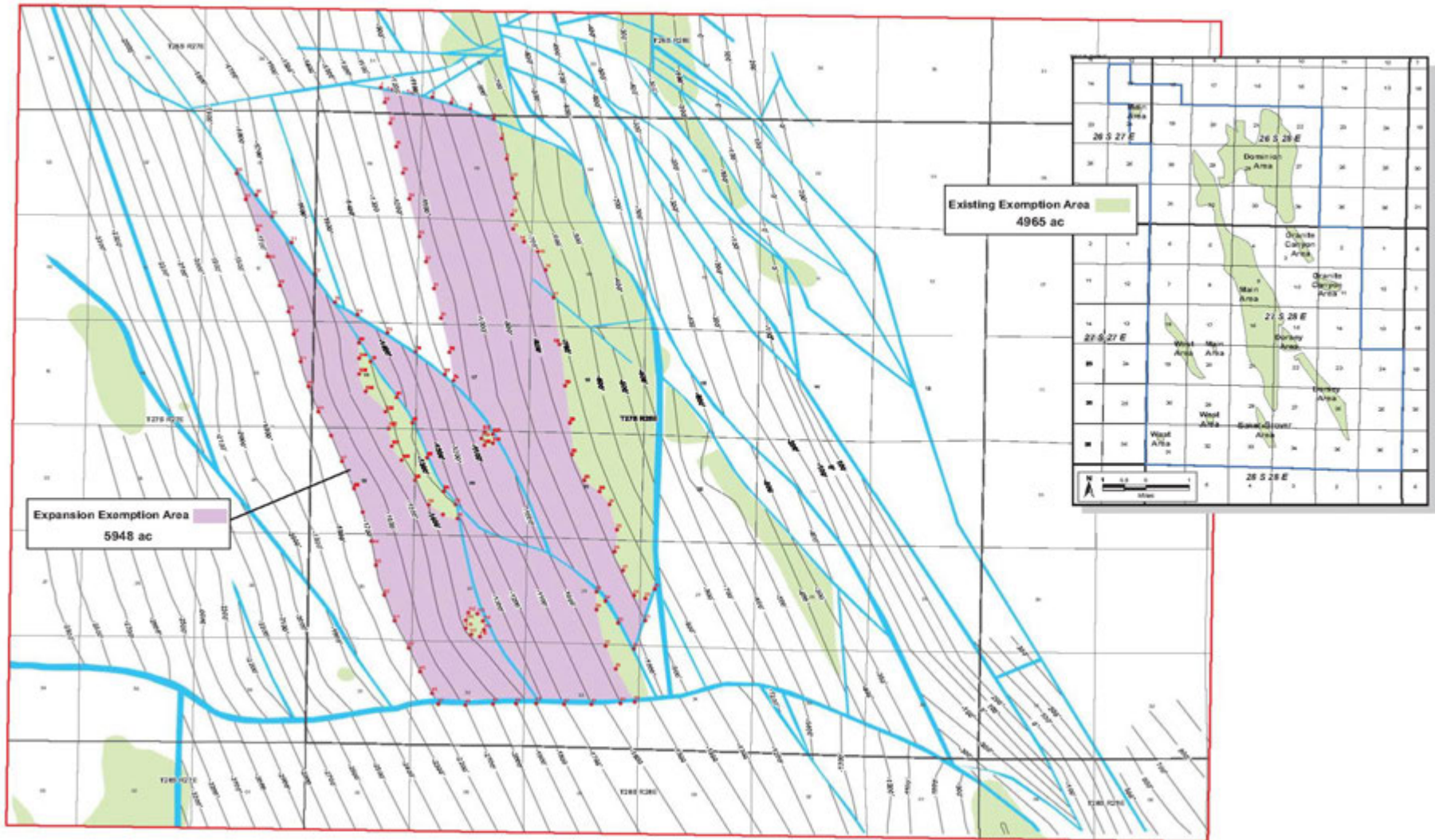
Source: Figure 2.1-1, DOGGR's Aquifer Exemption Application for the Mount Poso Oil Field

**Figure 2A: Pyramid Hill Sand Aquifer Exemption Location Map with Identifying Features, Mount Poso Oil Field, Kern County, California**



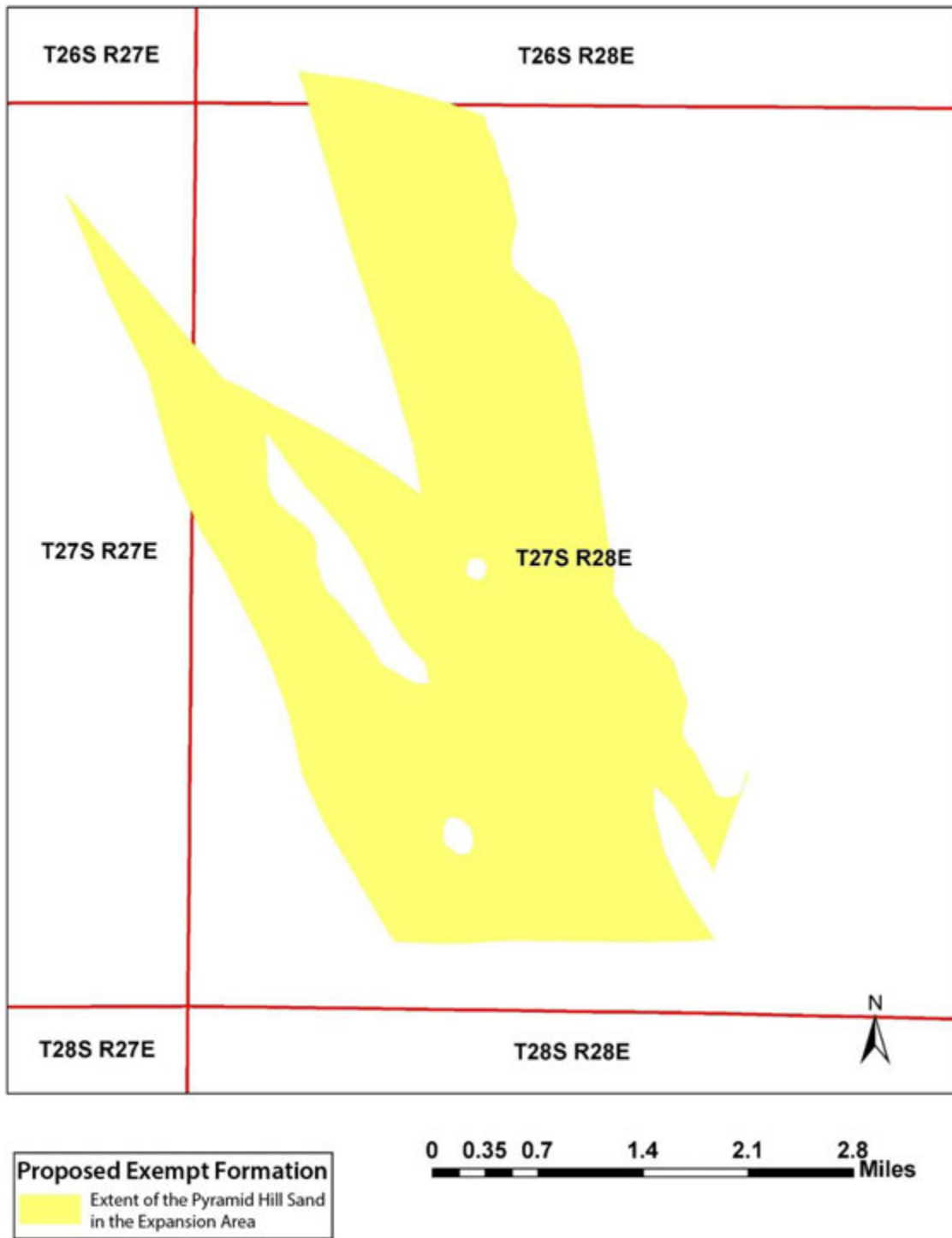
Source: DOGGR's Aquifer Exemption Application for the Mount Poso Oil Field

**Figure 2B: Vedder Formation Aquifer Exemption Location Map with Identifying Features, Mount Poso Oil Field, Kern County, California**



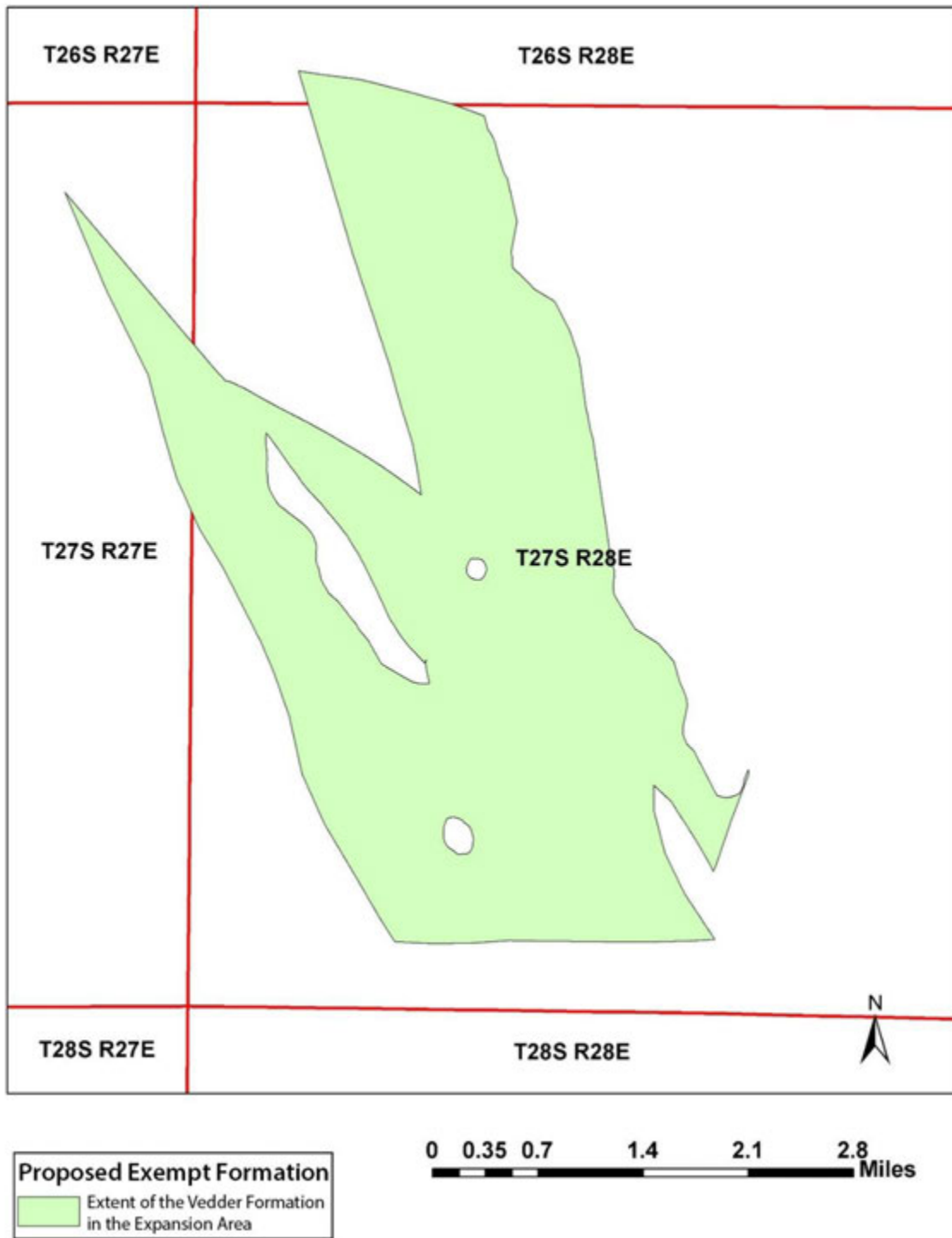
Source: DOGGR's Aquifer Exemption Application for the Mount Poso Oil Field

**Figure 3A: Areal Extent of Proposed Pyramid Hill Sand Aquifer Exemption**



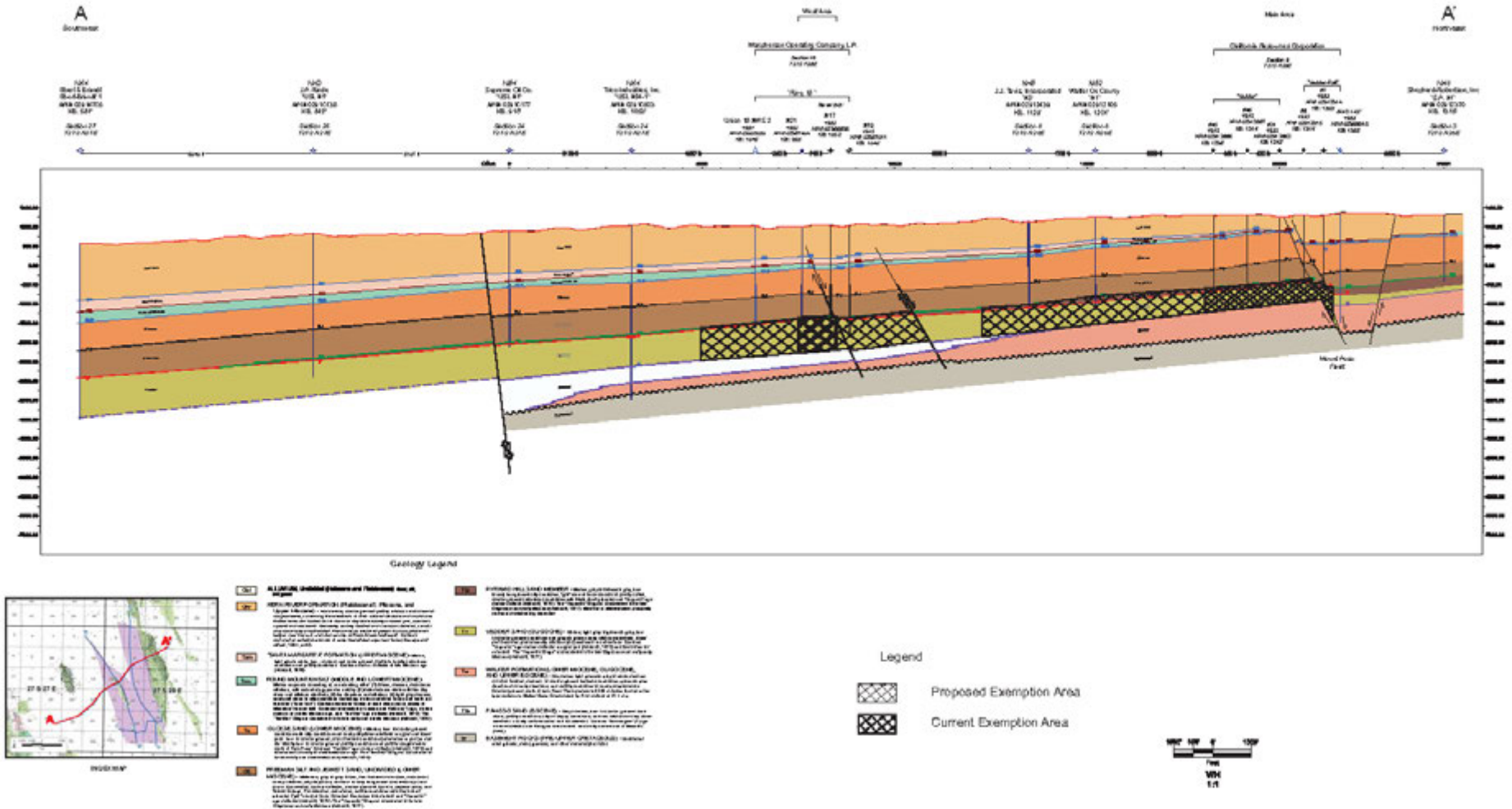
This map displays the lateral extent of the Pyramid Hill Sand in the Mount Poso Oil Field AE expansion. Cross section diagrams in Figures 4A through 4D should be reviewed for additional information on exemption depth and the stratigraphic relationship among the formations.

**Figure 3B: Areal Extent of Proposed Vedder Formation Aquifer Exemption**



This map displays the lateral extent of the Vedder Formation in the Mount Poso Oil Field AE expansion. Cross section diagrams in Figures 4A through 4D should be reviewed for additional information on exemption depth and the stratigraphic relationship among the formations.

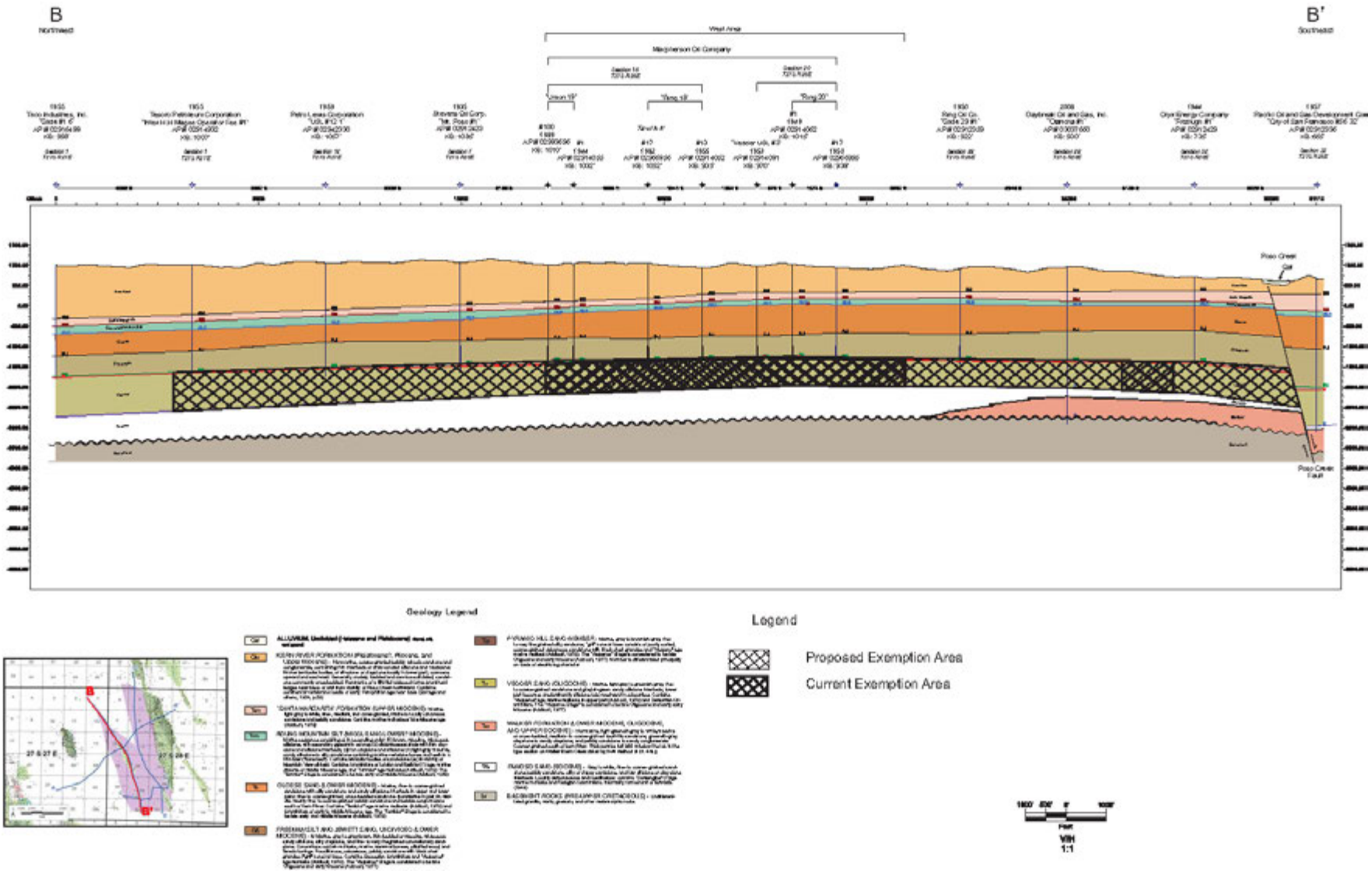
Figure 4A: Cross Section A – A' across the Proposed Exemption Area



Source: Figure 1.2-1, DOGGR’s Aquifer Exemption Application for the Mount Poso Oil Field

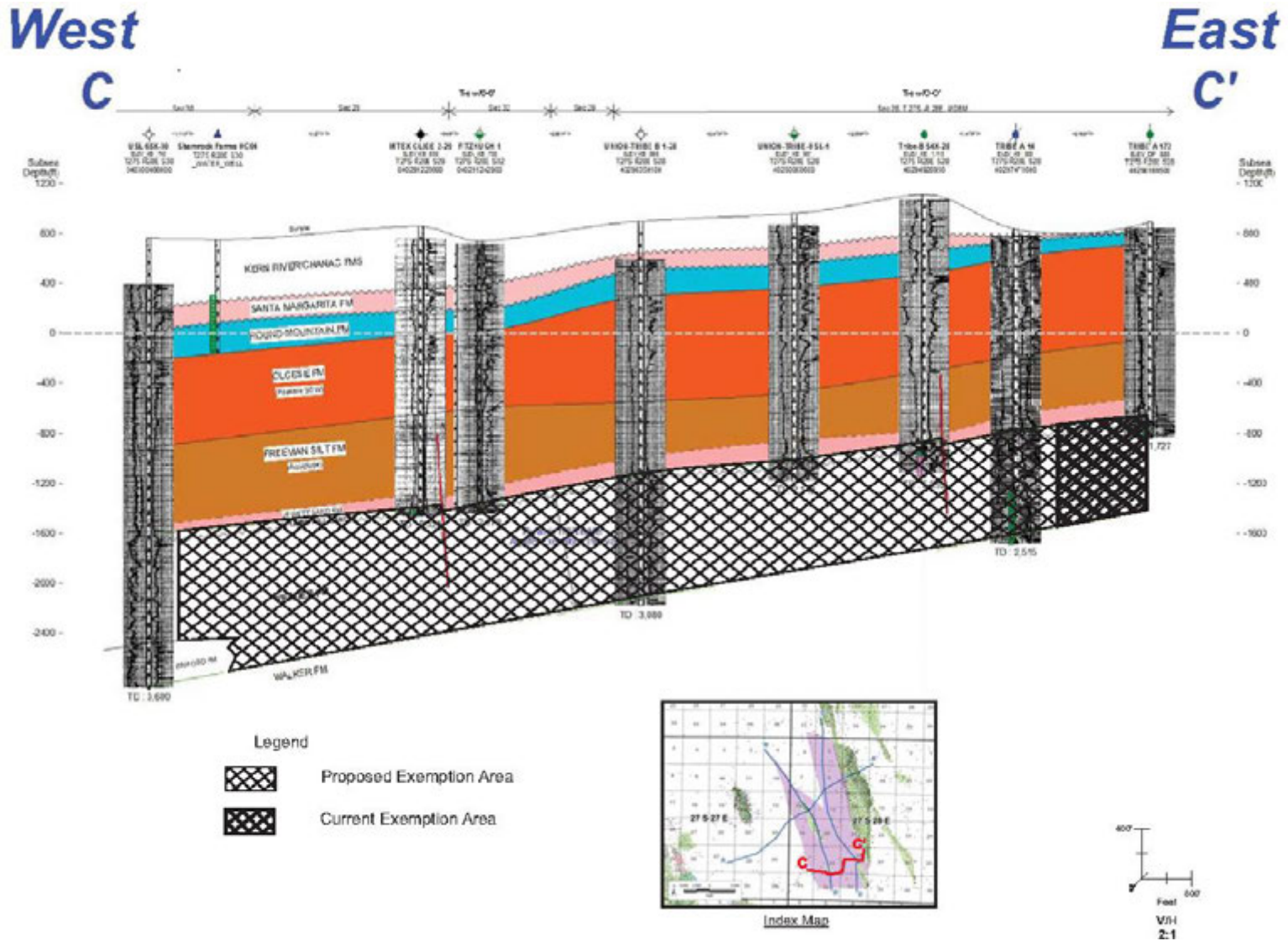


Figure 4B: Cross Section B – B' across the Proposed Exemption Area



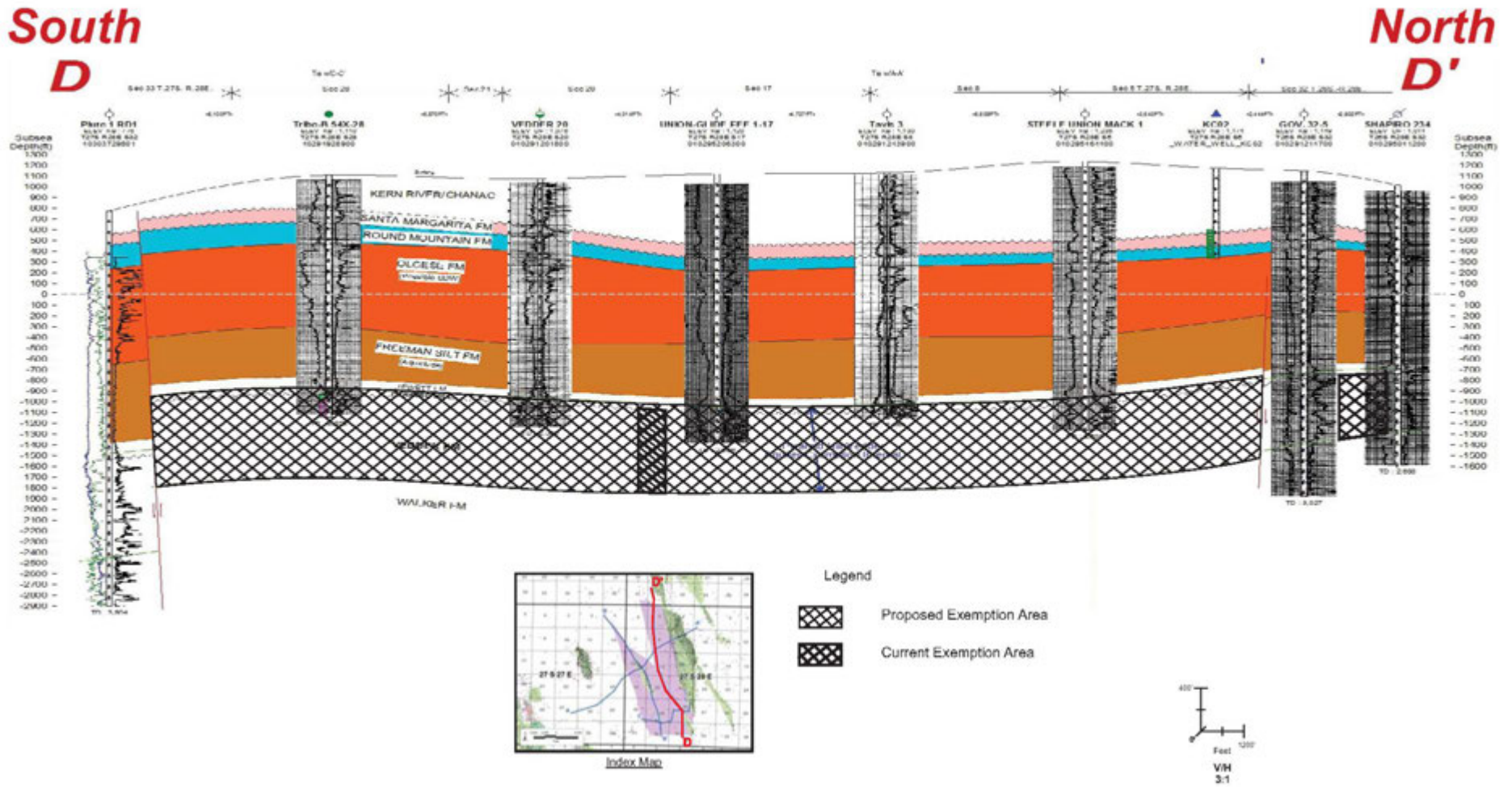
Source: Figure 1.2-2, DOGGR’s Aquifer Exemption Application for the Mount Poso Oil Field

Figure 4C: Cross Section C – C' across the Proposed Exemption Area



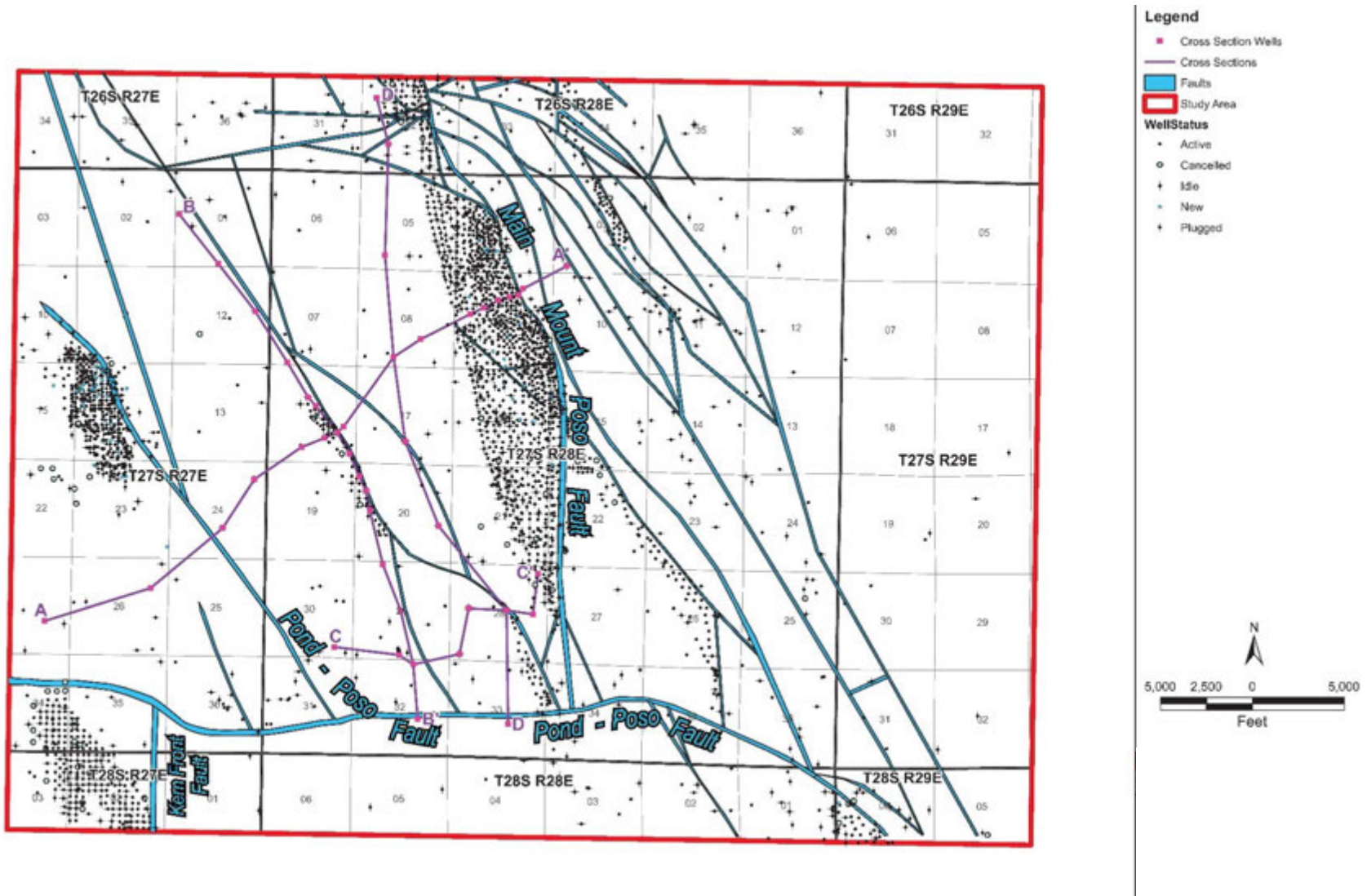
Source: Figure 1.2-3, DOGGR’s Aquifer Exemption Application for the Mount Poso Oil Field

Figure 4D: Cross Section D – D' across the Proposed Exemption Area



Source: Figure 1.2-4, DOGGR’s Aquifer Exemption Application for the Mount Poso Oil Field

Figure 5: Location of Faults in the Mount Poso Oil Field



Source: Figure 3.3-12, DOGGR's Aquifer Exemption Application for the Mount Poso Oil Field

**Table 1: Water Well Inventory in the Mount Poso Oil Field**

Location	Well number	Kern County Reference Well Number	Date Drilled	Depth Drilled (feet)	Depth Completed (feet)	Water Depth (feet)	Screened Interval (feet)	Proposed use	Zone	Source
Wells Located in Township 26 S, Range 28E										
Section 32, 26S, 28E	32B01	KC21	2005	1007	970	na	810-970	Domestic	Kern River/ Santa Margarita/ Olcese	DWR
Wells Located in Township 27 S, Range 27E										
Section 1, 27S, 27E	01R01	KC05	1992	610	600	450		Domestic	Kern River	DWR
Section 3, 27S, 27E	03A01	KC08	1967	878	878	na	na	Test Well	Kern River	DWR
Section 3, 27S, 27E	03D01	KC09	1975	1900	1900	na	900-1900	Irrigation	Kern River/ Etchegoin	DWR
Section 11, 27S, 27E	11K01	KC10	1964	1100	1100	na	na	Test Well	Kern River	DWR WL
Section 14, 27S, 27E	14D01	KC06	1979	976	976	na	575-976	Domestic	Kern River/Santa Margarita	DWR
Section 14, 27S, 27E	14P01	KC07	na	na	na	na	na	na	na	DWR WL
Section 27, 27S, 27E	27H01	KC11	1951	483	477	25	327-477	na	Kern River	DWR
Section 26G, 27S, 27E	5349	KC30	1974	1920	1920	30	871-1920	Irrigation	Kern River	DWR
Wells Located in Township 27S, Range 28E										
Section 5, 27S, 28E	05D01	KC01	na	1005	na	na	na	na	Kern River/ Santa Margarita/ Olcese	KCWA Water Quality
Section 5, 27S, 28E	05E/F	KC02	2002	835	835	722	575-835	Domestic	Kern River/Santa Margarita	DWR
Section 10, 27S, 28E	10A01	KC13	1967	600	600	dry	320-600	other	Kern River	DWR
Section 10, 27S, 28E	10A02	KC14	1967	1010	1000	dry	na	cattle	Kern River	DWR
Section 10, 27S, 28E	10	KC15	1966	250	250	na	200-250	Domestic	Kern River	DWR
Section 28, 27S, 28E	28P01	KC03	na	na	na	na	na	na	na	DWR WL
Section 30, 27S, 28E	SE/4	KC04	1981	900	900	na	450-900	Irrigation	Kern River	DWR
Wells Located in Township 28S, Range 28E										
Section 2, 28S, 28E	2F	RM-4	1986	800	505	15	145-485	Industrial	Olcese	DWR
Section 2, 28S, 28E	2F	RM-5		NA	802	NA	NA	NA	Olcese	KCWA
Section 4, 28S, 28E	4C01	RM-7		NA	1100	NA	NA	NA	KR/SM/Olcese	KCWA
Section 4, 28S, 28E	4F01	KC16	1966	200	200	na	120-200	Domestic	Kern River	DWR
Section 4, 28S, 28E	4H01	KC17	1998	545	540	265	285-540	Domestic	Kern River/SM	DWR
Section 4, 28S, 28E	4M01	RM-10	2006	830	840	70	450-830	Domestic	Kern River/SM	DWR
Section 6, 28S, 28E	6K01	KC18	2014	800	800	582	400-800	Domestic	Kern River	DWR
Section 8, 28S, 28E	8C	RM-11		820	813	700	540-560 & 610-813	Domestic	Kern River	DWR
Section 8, 28S, 28E	8E	RM-12	2004	975	975	840	715-975	Domestic	Kern River	DWR
Section 8, 28S, 28E	8F	RM-13	2007	940	900	700	800-900	Domestic	Kern River	DWR
Section 8, 28S, 28E	8G	RM-14		840	840	752	720-828	Stock	Kern River	DWR
Section 8, 28S, 28E	8G	RM-15		NA	980	NA	NA	NA	Kern River	DWR
Section 17, 28S, 28E	16D	RM-18		NA	NA	1200	NA	NA	Kern River	DWR
DOGGR Registered Water Source Wells- not considered to be beneficial use wells by RWQCB										
Section 18, 27S, 28E	WS1	WS1	1992	2749	2749	na	2659-2742	Industrial	Vedder	DOGGR API #025989773
Section 18, 27S, 28E	WS2	WS2	1997	2716	2707	na	2654-2704	Industrial	Vedder	DOGGR API #03002050
ft are in feet below ground surface										
NA- Not Available										
NR- Not Reported										
DWR- Department of Water Resources										
DWR WDL- Department of Water Resources Water Data Library										
KCEH- Kern County Environmental Health										
KCWA- Kern County Water Agency										

Source: Table 3.4-1, DOGGR’s Aquifer Exemption Application for the Mount Poso Oil Field (Rev.)

**Table 2: Cumulative Production and Injection Volumes for Pyramid Hill Sand and Vedder Formation Wells  
(Life of the field through September 30, 2015)**

Table: Cumulative Fluid Balance, bbl (CRC, 2016)					
Zone(s)	Production		Injection		Total
	Pyramid Hill	Vedder	Pyramid Hill	Vedder	
<b>Production (bbl)</b>					
<b>Main:72 bdy</b>					
Oil	(9,377,940)	(165,605,128)			
Water	(21,013,733)	(3,007,664,744)			
<b>Total</b>	<b>(30,391,673)</b>	<b>(3,173,269,873)</b>			<b>(3,203,661,546)</b>
<b>Main: Ext 1</b>					
Oil	(103,844)	(7,221,179)			
Water	(608,105)	(716,394,495)			
<b>Total</b>	<b>(711,949)</b>	<b>(723,615,674)</b>			<b>(724,327,623)</b>
<b>Water Injection (bbl)</b>					
<b>Main:72 bdy</b>					
Water			6,070,572	720,647,270	
Steam				284,546,400	
<b>Total</b>			<b>6,070,572</b>	<b>1,005,193,670</b>	<b>1,011,264,242</b>
<b>Main: Ext 1</b>					
Water			0	804,729,227	
Steam			0	28,954,396	
<b>Total</b>			<b>0</b>	<b>833,683,623</b>	<b>833,683,623</b>
<b>Main Area Combined Balance (Injection-Production)</b>					
<b>Total</b>	<b>(31,103,621)</b>	<b>(3,896,885,547)</b>	<b>6,070,572</b>	<b>1,838,877,293</b>	<b>(2,083,041,303)</b>

Source: Appendix 4-IV, DOGGR's Aquifer Exemption Application for the Mount Poso Oil Field