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

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: Revised Aquifer Exemption Request for the Mount Poso Oil Field, Kern County, California

Dear Mr. Harris:

In response to your February 21, 2018 request, the U.S. Environmental Protection Agency (EPA) reviewed the information in your submission and hereby approves revisions to the Aquifer Exemption Record of Decision (ROD) for the Mount Poso Oil Field, originally approved by EPA on April 17, 2017. The enclosed Revised Record of Decision, effective today, supersedes the prior ROD.

The approved revisions are necessary to correct inaccuracies in the presentation of the Pyramid Hill Sand and Remaining Vedder (i.e., the Lower Vedder, Third Vedder, and Fourth Vedder Members of the Vedder Formation) exemptions within the West and Baker-Grover areas of the Mount Poso Oil Field granted at primacy, which the EPA included in the original aquifer exemption ROD. The EPA agrees such revisions are appropriate to correct the ROD and that they do not change the underlying basis for the original approval.

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

Sincerely,

Tomás Torres October 10, 2018
Director, Water Division

Enclosure: Revised Aquifer Exemption Record of Decision for Mount 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

REVISED AQUIFER EXEMPTION RECORD OF DECISION

This Revised Record of Decision (ROD) provides the EPA's decision to approve an expansion of the aquifer exemption (AE) for the Pyramid Hill Sand, the Upper Vedder, and the Remaining 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 Original Aquifer Exemption Request: January 21, 2016

Effective Date of Original ROD: April 17, 2017

Date of DOGGR's Request for Revision ("the Addendum"): February 21, 2018

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.

The revisions to this ROD are also non-substantial as they do not change the underlying basis for the approval of the original exemption. Instead, the revisions correct an error regarding the boundaries of the exempted formations and provide analyses to demonstrate these areas meet EPA's aquifer exemption criteria.

Revisions to the April 17, 2017 ROD: Several exempted aquifers were not specifically referenced in the Mount Poso aquifer exemption application submitted by DOGGR and approved by the EPA on April 17, 2017. This revision is intended to correct and clarify EPA's approval of exempt aquifers in the Mount Poso Oil Field.

The original aquifer exemptions for the Mount Poso Oil Field were based upon the hydrocarbon producing areas identified in Volume 1 of DOGGR's "California Oil and Gas Fields." Volume 1

divided the Mount Poso Oil Field into six hydrocarbon producing areas: Main, West, Baker-Grover, Granite Canyon, Dominion, and Dorsey. For each of these six areas, Volume 1 included a list and illustration of the lateral extent of the hydrocarbon producing aquifers that were exempted at Primacy. In the Main, West, and Baker-Grover areas of the field, hydrocarbons are produced from the Pyramid Hill Sand and Vedder Formation. The Vedder Formation consists of four members: the Upper Vedder, Lower Vedder, Third Vedder, and Fourth Vedder. These members comprise a single formation of highly porous and permeable sandstones that was deposited in the same, near-shore marine sequence of early Miocene time.

Although there was hydrocarbon production from all four members of the Vedder Formation, in 1983 only the Upper Vedder Member was exempted in the Baker-Grover and West areas. As shown in the table below, the hydrocarbon producing formations were not identical for all the areas of the Mount Poso Oil Field.

Area of Mount Poso Oil Field	Aquifers Exempted in 1983 (Producing Zones Listed in "CA Oil and Gas Fields," 1973)	2017 ROD	Purpose of 2018 Addendum
Main Area	Pyramid Hill, Upper Vedder, Remaining Vedder (Lower Vedder, Third Vedder, and Fourth Vedder)	Expanded the area of the Pyramid Hill, Upper Vedder, Remaining Vedder (Lower Vedder, Third Vedder, and Fourth Vedder) in the area surrounding the 1983 exemption area.	No Change
West Area	Upper Vedder	Added the Pyramid Hill, and expanded the area of the Upper Vedder and Remaining Vedder (Lower Vedder, Third Vedder, and Fourth Vedder) in the area surrounding the 1983 exemption area.	In addition to the 2017 approval, expand the Pyramid Hill and Remaining Vedder (Lower Vedder, Third Vedder, and Fourth Vedder) exemptions across the 1983, Upper Vedder exemption area.
Baker-Grover	Upper Vedder	Added the Pyramid Hill, and expanded the area of the Upper Vedder and Remaining Vedder (Lower Vedder, Third Vedder, and Fourth Vedder) in the area surrounding the 1983 exemption area.	In addition to the 2017 approval, expand the Pyramid Hill and Remaining Vedder (Lower Vedder, Third Vedder, and Fourth Vedder) exemptions across the 1983, Upper Vedder exemption area.

The 1983 aquifer exemption approvals resulted in an erroneous assumption that the Pyramid Hill Sand and the entire Vedder Formation within the West and Baker-Grover areas were exempted at Primacy. Thus, the Pyramid Hill Sand and Remaining Vedder (i.e., the Lower Vedder, Third Vedder, and Fourth Vedder Members of the Vedder Formation) within the West and Baker-Grover areas were not considered to be exempted by the 2017 ROD (as shown in the table above).

The purpose of DOGGR's Addendum to the Mount Poso AE request is to exempt the entirety of the Pyramid Hill Sand and Vedder Formation throughout the Main, Baker-Grover, and West Areas. The Addendum essentially fills in the gaps of the Pyramid Hill Sand and the Remaining Vedder Formation within the West and Baker-Grover areas of the field that were neither addressed in 1983 primacy approval nor the 2017 ROD. The AE approval within the Main Area is unchanged. See the right-hand column in the table above.

This revised ROD approves an expansion of the Pyramid Hill Sand and Remaining Vedder Formation exemptions in the areas where only the Upper Vedder Formation was exempted in 1983 (see Figures 2.1 through 2.3).

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 aquifers proposed for exemption in the Mount Poso Oil Field are located in portions of Sections 31 and 32 of Township 26 South Range 28 East; Sections 1, 12, and 13 of Township 27 South Range 27 East; and Sections 5, 6, 7, 8, 9, 16, 17, 18, 19, 20, 21, 27, 28, 29, 30, 31, 32, 33, and 34 of Township 27 South Range 28 East, Mount Diablo Base and Meridian [Refer to Figures 1, 2.1, 2.2, and 2.3].

County: Kern **State:** California

Well Class/Type: Class II EOR and Waste Disposal (WD) wells.

DESCRIPTION OF PROPOSED REVISED AQUIFER EXEMPTION

Aquifers to be Exempted: Portions of the Pyramid Hill Sand; the Upper Vedder, which lies below the Pyramid Hill Sand; and the Remaining Vedder, which consists of the Lower Vedder, Third Vedder, and Fourth Vedder Members.

Areal Extent of Aquifer Exemption: The areal extent of the existing AE and the proposed expansion in the Mount Poso Oil Field is shown in the table below. This acreage includes the productive boundaries approved at primacy in 1983, 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 boundaries in the Main Area Fault Block and in the West Area Fault Block. In the Main Area Fault, the western boundary is defined by the 1,150-foot total vertical subsea depth contour of the top of the Vedder Formation. In the West Area Fault Block, the western boundary is the 1,700-foot total vertical subsea depth contour line of the top 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 revised ROD. Refer to Figures 2.1, 2.2 and 2.3 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:

Aquifer	Existing Exempted Area (approx. acres)	Proposed Exempted Area (approx. acres)
Pyramid Hill Sand	4,965	6,434
Upper Vedder Formation	4,965	6,104
Remaining Vedder Formation	3,998	6,434

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.

Aquifer	*Lithology*	*TDS (mg/L)*	*Approximate Depth to Top (feet)*	*Average Thickness (feet)*	*Porosity and Permeability*
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).	160 to 2,000 feet below ground surface or 1,000 to -2,300 feet from mean sea level.	60 to 100 feet in the Main Area; 40 to 60 feet in the West Area; 55 to 90 feet in the Baker Grover Area.	Porosity ranges from 28% to 38%. Permeability ranges from 20 to 90 millidarcies (mD).
Upper 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).	590 to 4,240 feet below ground surface or 300 to -3,300 feet from mean sea level.	100 to 200 feet in the Main Area; 200 to 250 feet in the West Area; 220 feet in the Baker-Grover Area.	Porosity ranges from 32% to 35%. Permeability ranges from 1.5 to 24 D.
Remaining 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).	810 to 4,380 feet below ground surface or 0 to -3,500 feet from mean sea level.	400 to 700 feet in the Main Area; 500 to 550 feet in the West Area; 570 to 710 feet in the Baker-Grover Area.	Porosity ranges from 32 % to 35%. Permeability ranges from 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 3.1 through 3.4].

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

Following EPA's April 17, 2017 approval of an exemption of the Pyramid Hill Sand and Vedder Formation, DOGGR became aware that the Remaining Vedder Formation was not specifically referenced in the aquifer exemption application it submitted to EPA on January 21, 2016. Therefore, on February 21, 2018, DOGGR submitted an Addendum to clarify and correctly identify the exempt aquifers in the Mount Poso Oil Field.

The Mount Poso Oil Field has been producing oil in the Upper and Remaining Vedder Formations 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 water-flood injection began in 2000. Both of these enhanced recovery methods continue to the present day into the Pyramid Hill Sand and the 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.

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 the Upper and Remaining Vedder Formations 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 Upper and Remaining Vedder Formations 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 Upper and Remaining Vedder Formations 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 Upper and Remaining Vedder Formations. 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), the Oildale Mutual Water Company, and the Kern County Public Health Services Department, 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 3.1 through 3.4]. 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 Upper and Remaining Vedder Formations.

Groundwater Flow Patterns: DOGGR evaluated available hydrogeologic information on the aquifers proposed for exemption and the overlying formations, including groundwater flow maps [see Figures 3.1 through 3.4 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 Upper and Remaining Vedder Formations, 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 Upper and Remaining Vedder Formations 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 Upper and Remaining Vedder Formations 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 Upper and Remaining Vedder Formations for lower-bound containment. The 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 the Pyramid Hill Sand and the Upper and Remaining Vedder 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 Upper and Remaining Vedder Formations 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 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 that 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.

The 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 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 4].

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 the Upper and Remaining Vedder Formations 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 Upper and Remaining Vedder Formations.

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 Upper and Remaining Vedder Formations and Pyramid Hill Sand have produced over 172 and 9 million barrels of oil to date, respectively [see Table 2]. Based on this information, the EPA agrees with DOGGR's determination that there are commercially producible hydrocarbons within the formations proposed for exemption in the Mount Poso Oil Field. This determination is made on the basis of demonstrated historic and current production, and the presence of oil saturation in the Pyramid Hill Sand and Upper and Remaining Vedder Formations.

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 aquifers proposed for exemption meet the criteria at 40 CFR § 146.4(b)(1).

PUBLIC NOTICE AND COMMENT

DOGGR provided public notice of the initial AE request 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. A supplemental public comment period was held from November 22, 2017 to December 7, 2017. The supplemental information provided to the public during this period included updated information on the boundaries and thickness of the formations proposed for exemption. 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 to revise the original ROD, 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. The following is a summary of the comments received during the initial public comment period: 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 Upper and Remaining Vedder Formations, 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).

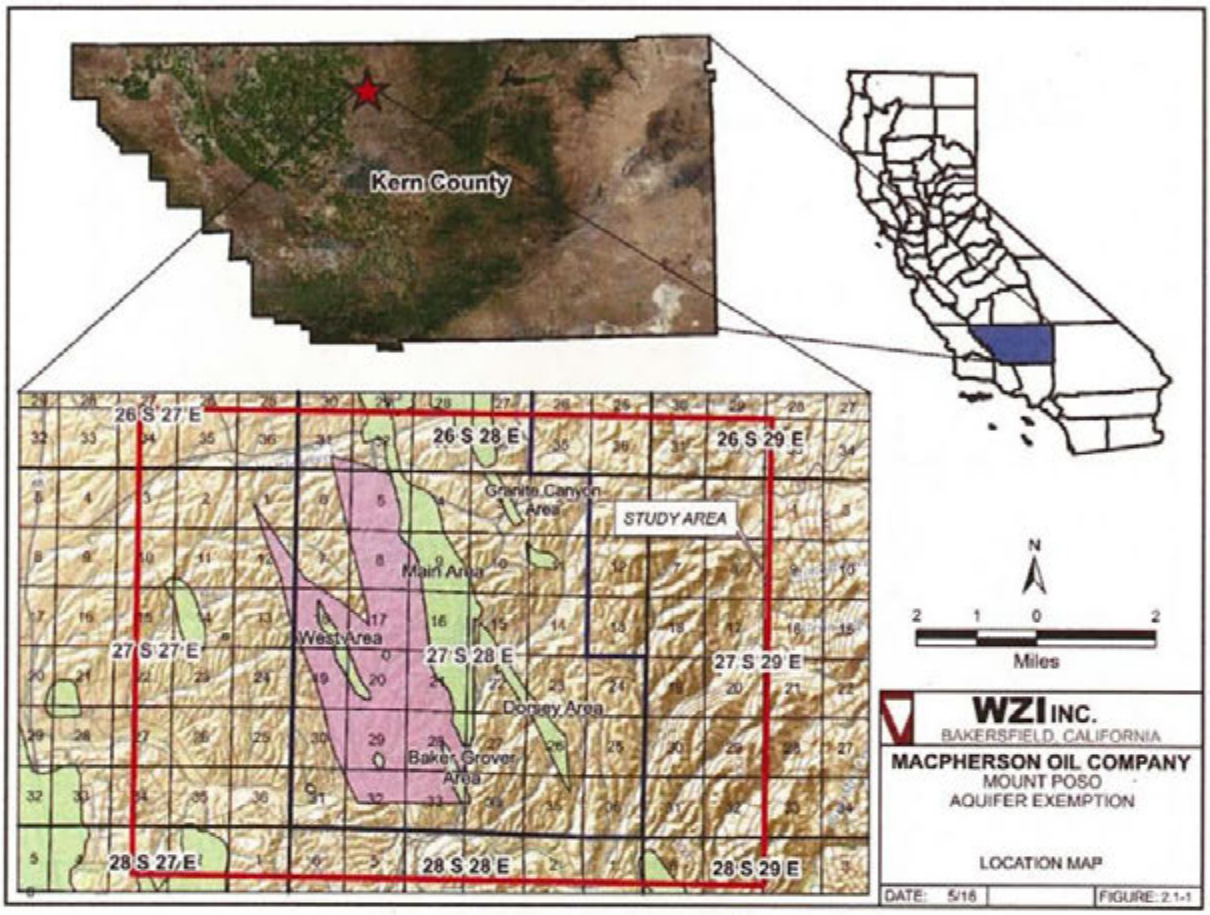
During the supplemental public comment period, one written comment was submitted to DOGGR. This comment was critical of the aquifer exemption review process, however the comment does not address the content of the supplemental information provided by DOGGR to support the revision to the original Mount Poso Oil Field aquifer exemption.

CONCLUSION AND DECISION

Based on a review of the entire record, including the written and oral comments submitted to DOGGR during its initial and supplemental 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.

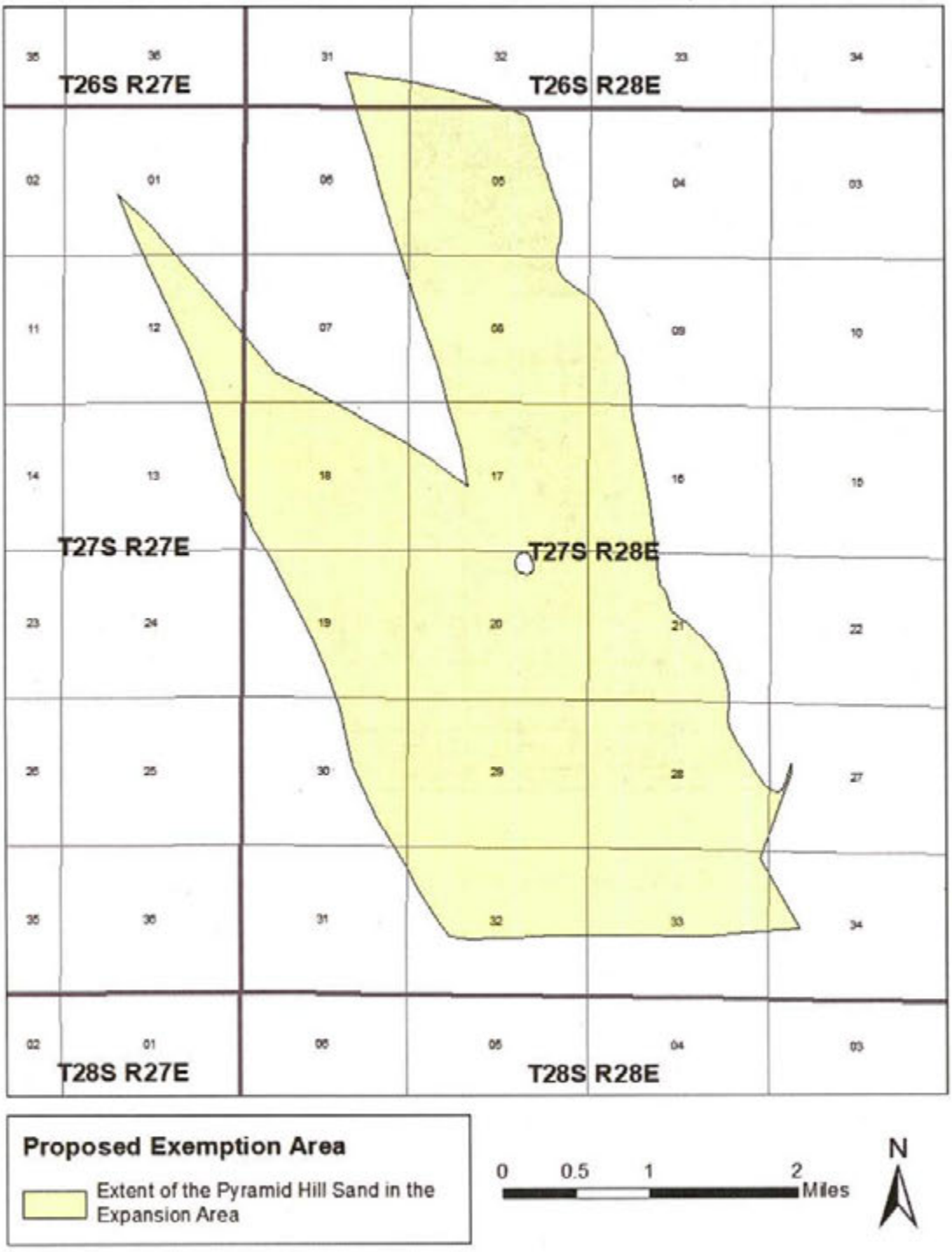
Effective Date of Revised ROD: October 10, 2018

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



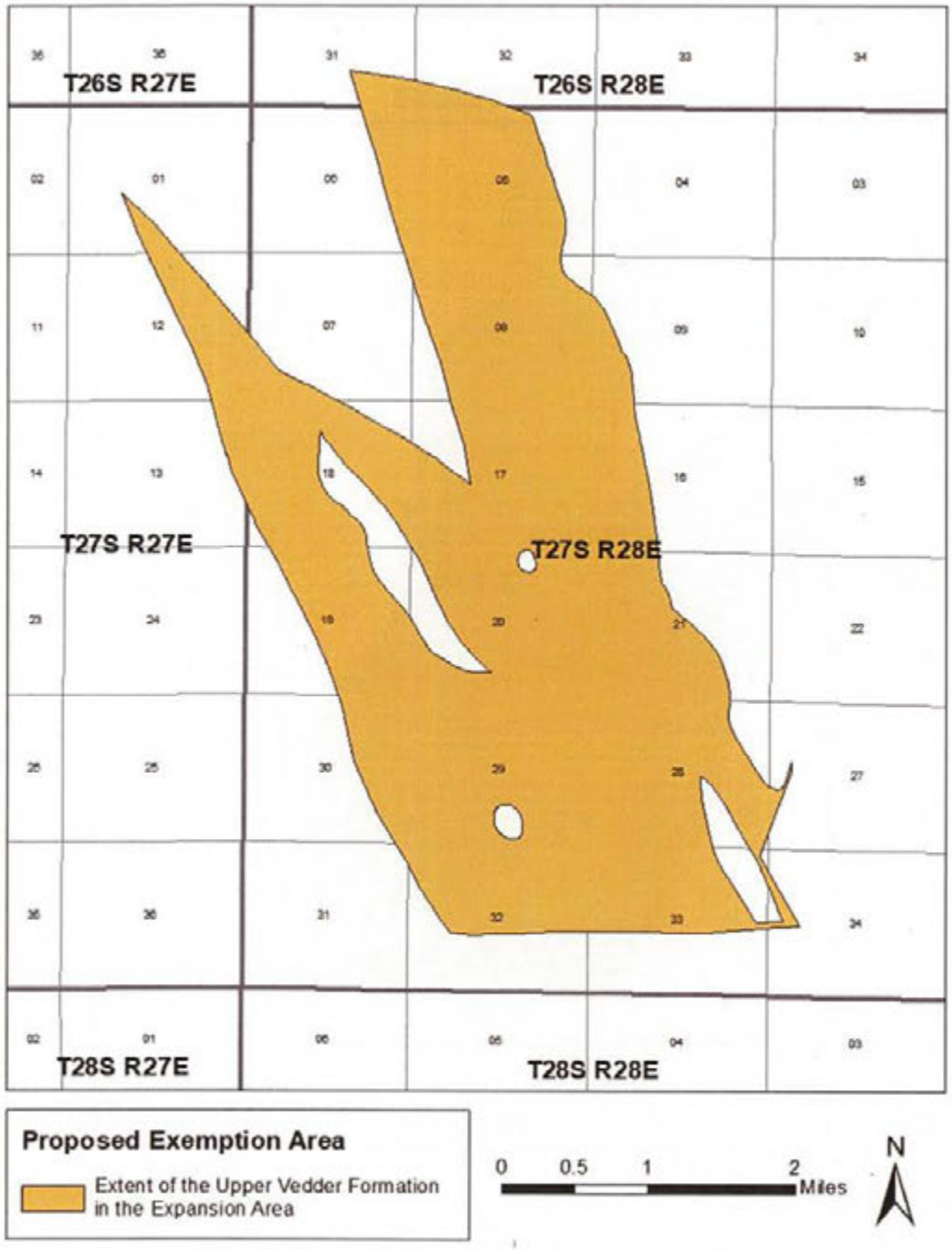
Source: Figure 2.1-1, DOGGR's Aquifer Exemption Application for the Mount Poso Oil Field

Figure 2.1: Pyramid Hill Sand Aquifer Exemption Location Map, Mt. Poso Oil Field, Kern County, California



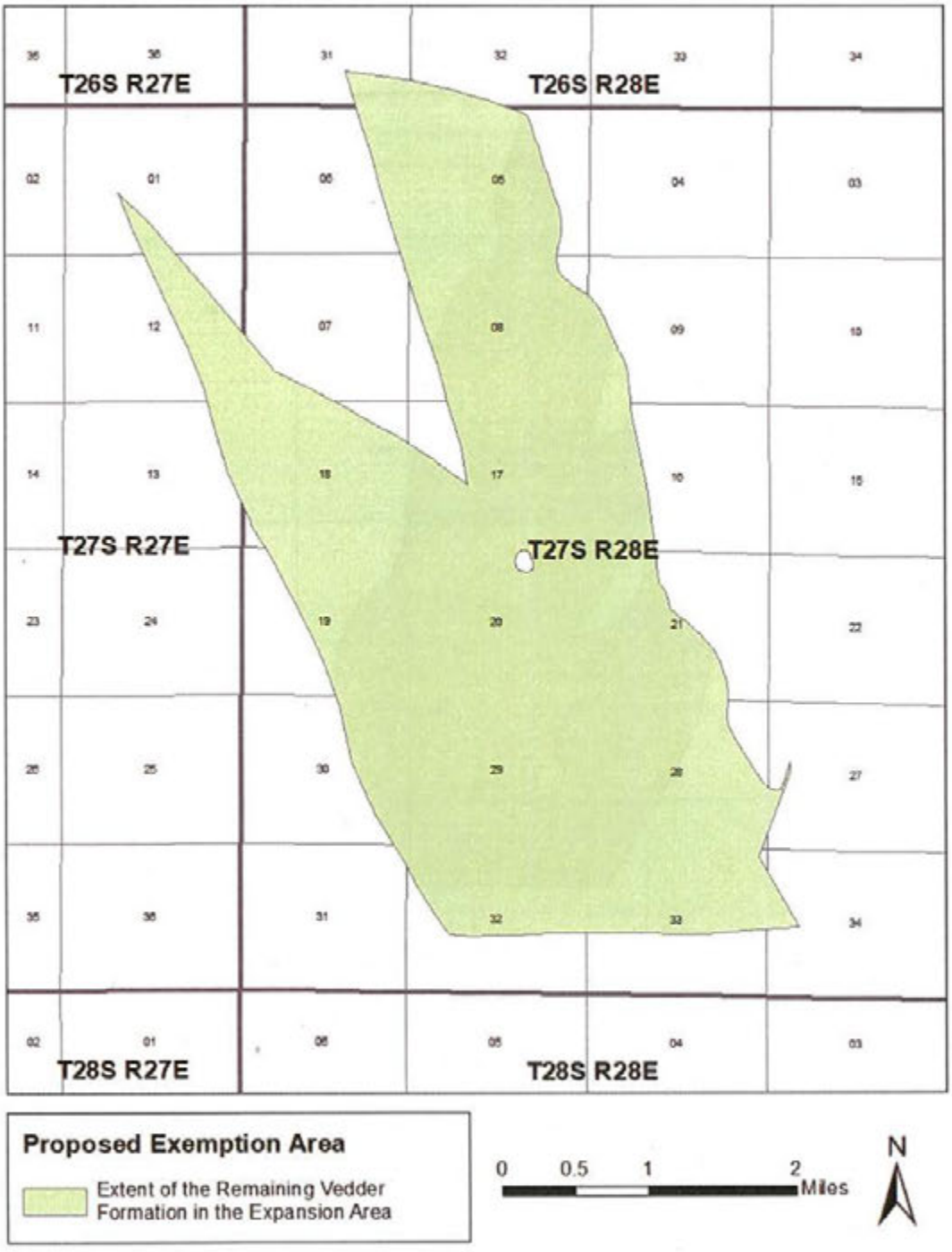
Source: DOGGR's Addendum to the Aquifer Exemption Application for the Mt. Poso Oil Field

Figure 2.2: Upper Vedder Formation Aquifer Exemption Location Map, Mt. Poso Oil Field, Kern County, California



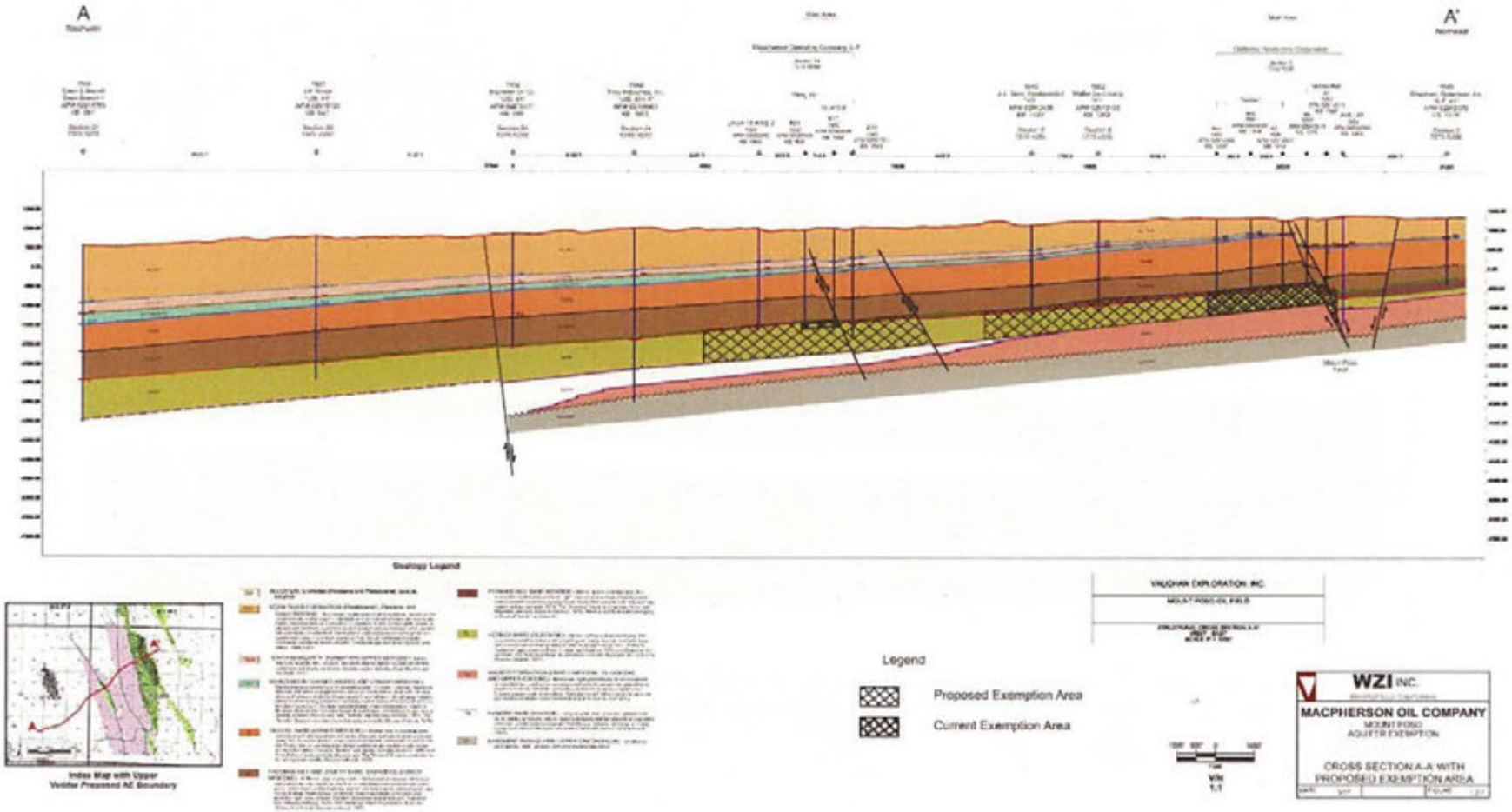
Source: DOGGR's Addendum to the Aquifer Exemption Application for the Mt. Poso Oil Field

Figure 2.3: Remaining Vedder Formation Aquifer Exemption Location Map, Mt. Poso Oil Field, Kern County, California



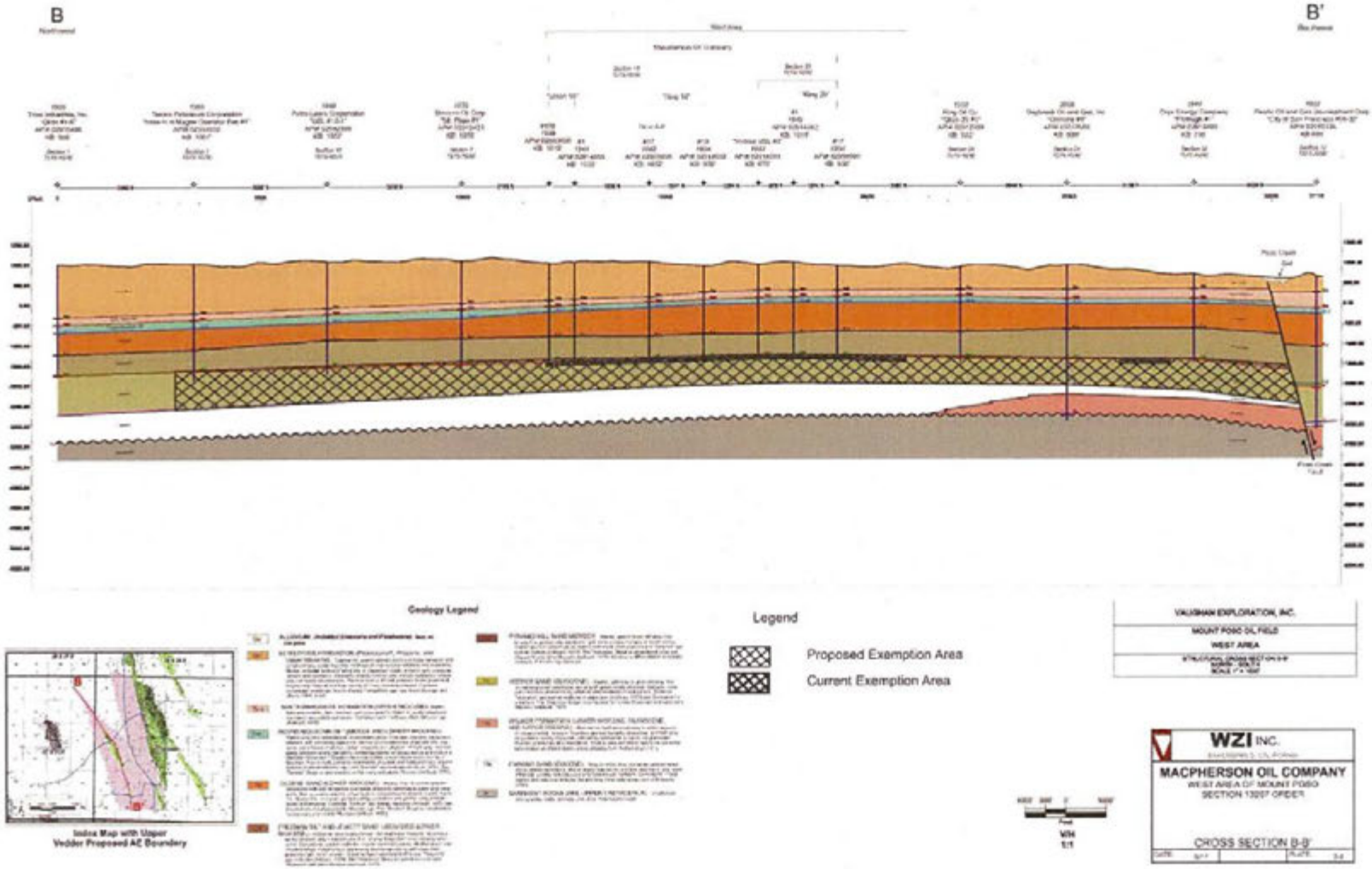
Source: DOGGR's Addendum to the Aquifer Exemption Application for the Mt. Poso Oil Field

Figure 3.1: Cross Section A-A' across the Area Proposed for Exemption. Mt. Poso Oil Field, Kern County, California



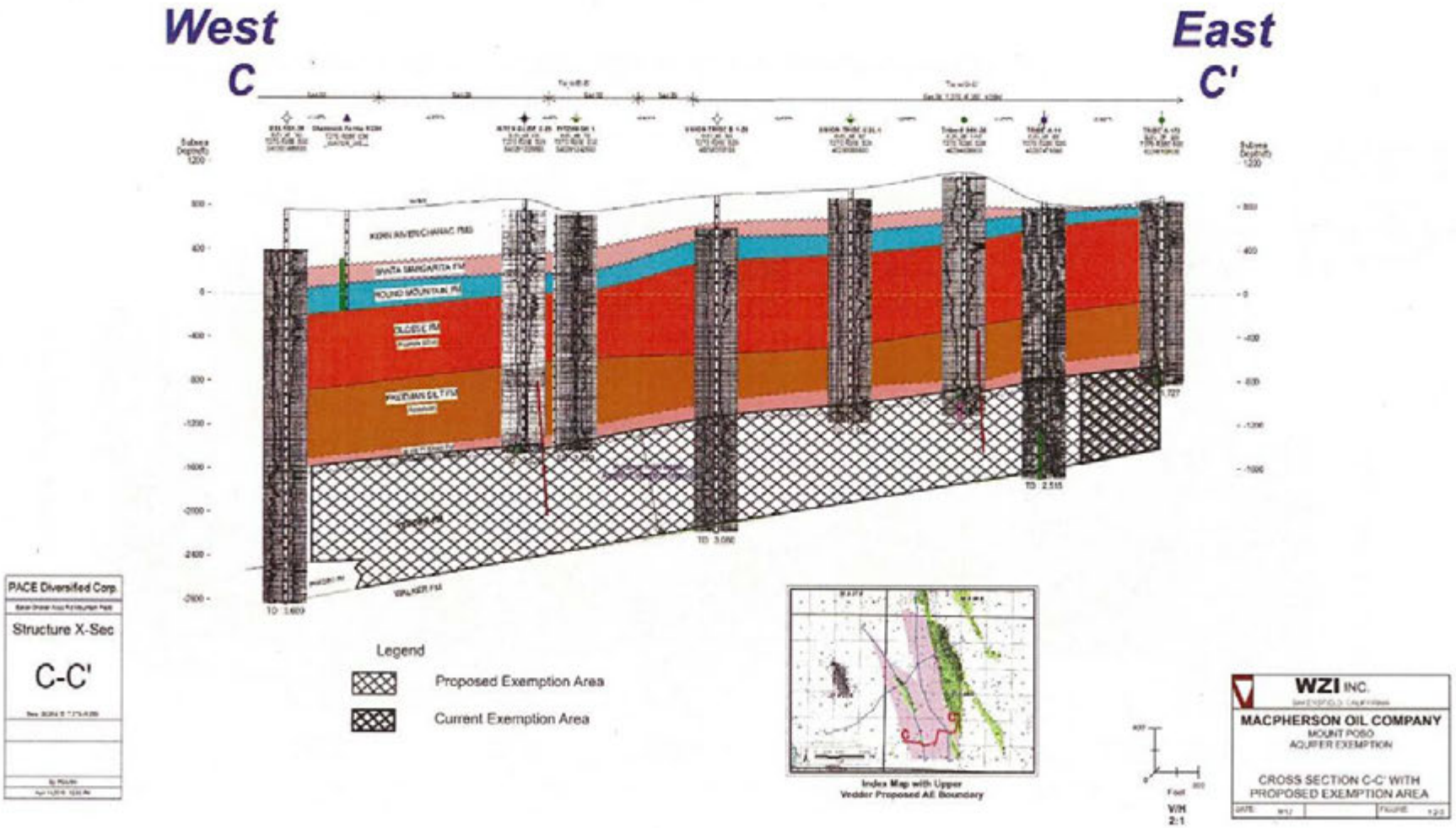
Source: DOGGR's Addendum to the Aquifer Exemption Application for the Mt. Poso Oil Field

Figure 3.2: Cross Section B-B' across the Area Proposed for Exemption. Mt. Poso Oil Field, Kern County, California



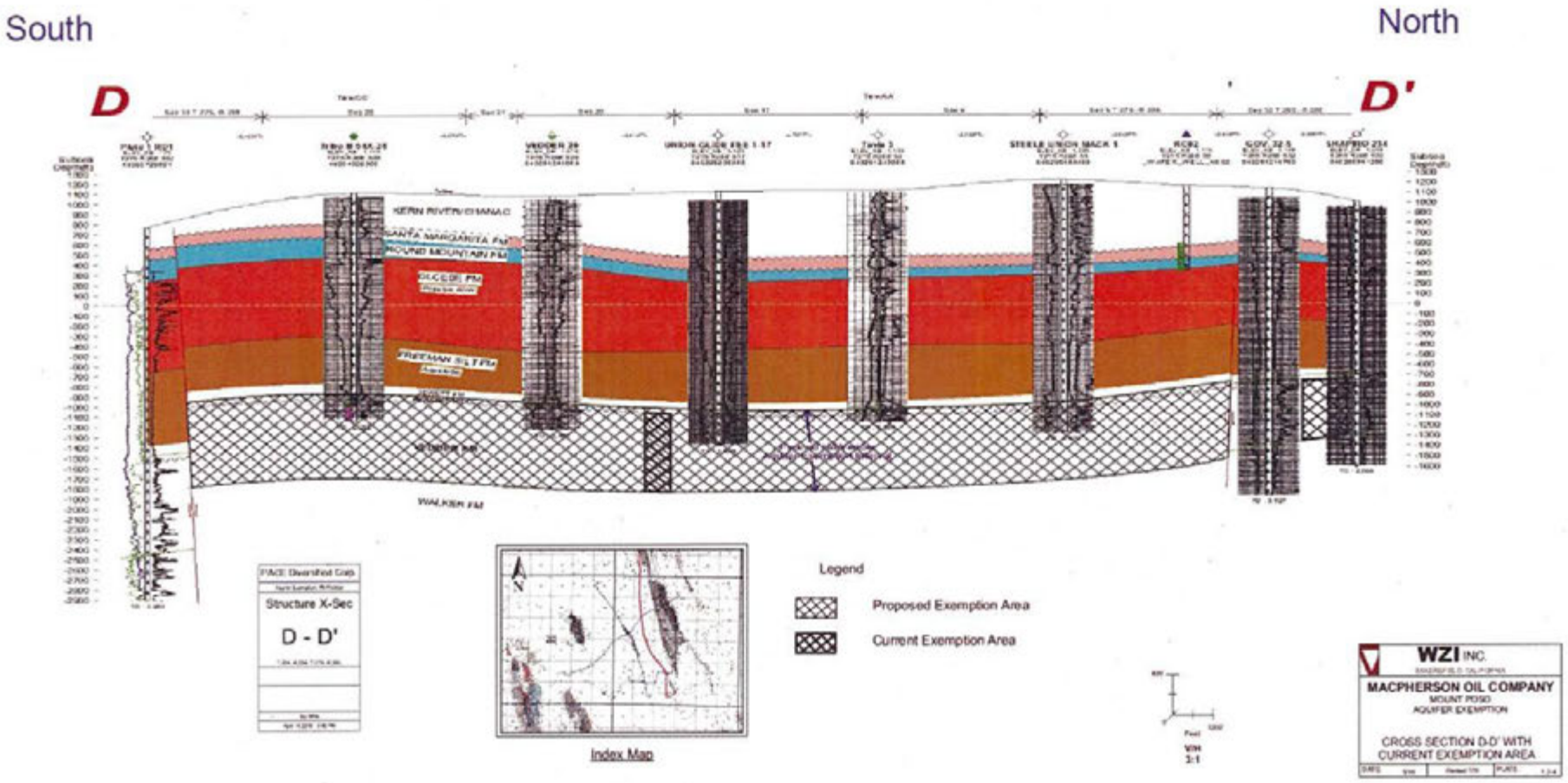
Source: DOGGR's Addendum to the Aquifer Exemption Application for the Mt. Poso Oil Field

Figure 3.3: Cross Section C-C' across the Area Proposed for Exemption. Mt. Poso Oil Field, Kern County, California



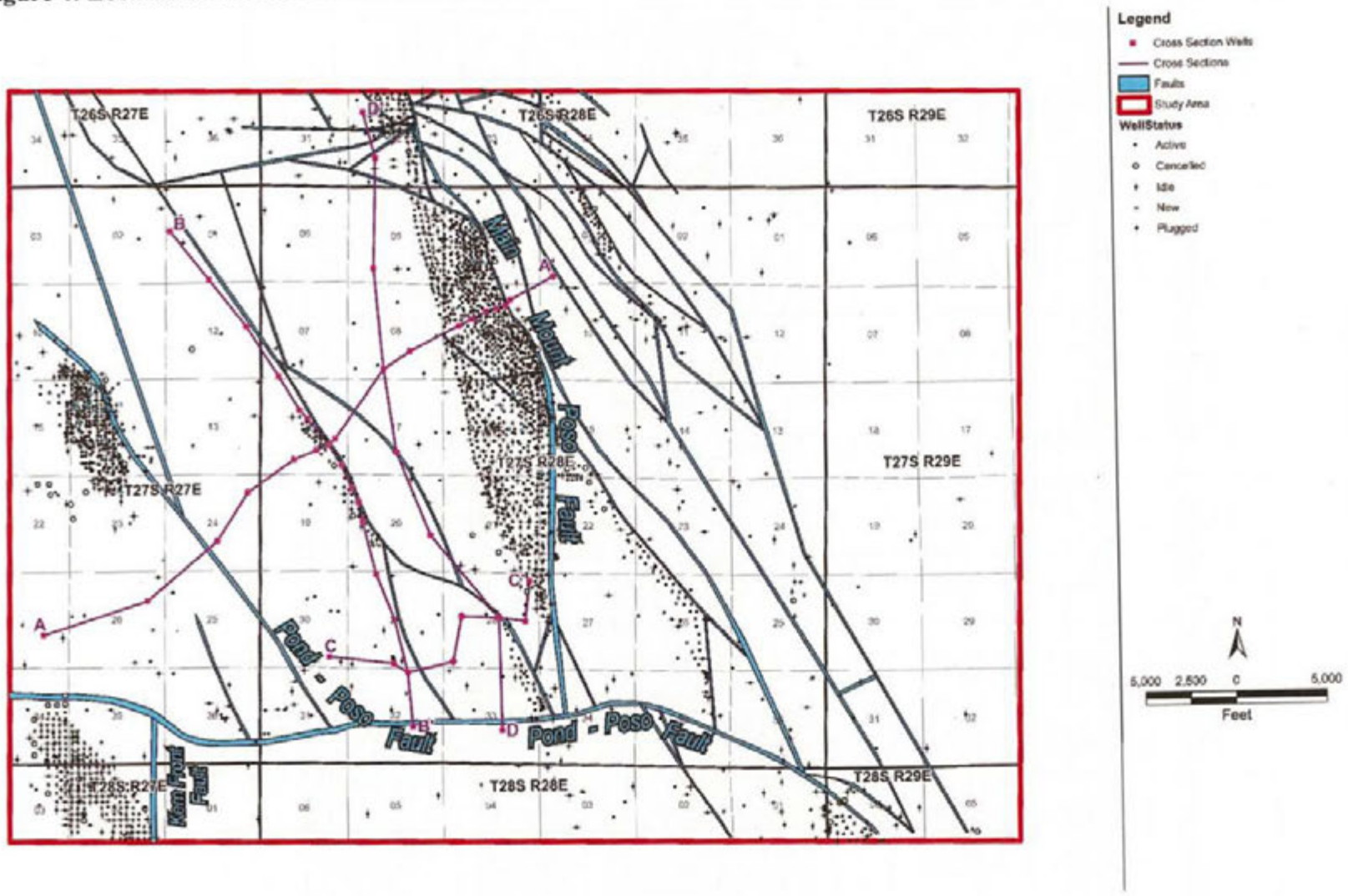
Source: DOGGR's Addendum to the Aquifer Exemption Application for the Mt. Poso Oil Field

Figure 3.4: Cross Section D-D' across the Area Proposed for Exemption. Mt. Poso Oil Field, Kern County, California



Source: DOGGR's Addendum to the Aquifer Exemption Application for the Mt. Poso Oil Field

Figure 4: 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	430		Domestic	Kern River	DWR
Section 3, 27S, 27E	03A01	KC06	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/P	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 #02989773
Section 18, 27S, 28E	WS2	WS2	1997	2716	2707	na	2654-2704	Industrial	Vedder	DOGGR API #03002050

hs 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: Modified after Table 3.4-1, DOGGR's Aquifer Exemption Application for the Mount Poso Oil Field

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

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