

State Water Resources Control Board

March 29, 2019

Kenneth A. Harris Jr., State Oil & Gas Supervisor
Department of Conservation
Division of Oil, Gas & Geothermal Resources
801 K Street, MS 18-05
Sacramento, CA 95814-3530
ken.harris@conservation.ca.gov

FINAL CONCURRENCE ON THE PROPOSED AQUIFER EXEMPTION, MIDWAY SUNSET OIL FIELD, KERN COUNTY

Dear Mr. Harris:

State Water Resources Control Board (State Water Board) staff, in consultation with Central Valley Regional Water Quality Control Board staff (collectively Water Boards staff), have reviewed the aquifer exemption proposal provided by the Division of Oil, Gas and Geothermal Resources (DOGGR) on May 25, 2018 for the Midway Sunset (MWSS) Oil Field. The proposal seeks to expand the aquifer exemption for the Tulare B zone of the Tulare Formation, Potter Sands, Spellacy Sands, Miocene Shales/Warson Sands, and Antelope Sands within the MWSS Oil Field for Class II injection.

As described in the attached memorandum, State Water Board staff assessed whether the proposal meets the criteria set forth in California Public Resources Code (PRC) section (§) 3131 and § 146.4 of Title 40 of the Code of Federal Regulations (CFR) and considered comments received during the public comment process. Based on this review, State Water Board staff concur with the exemption proposal for the Potter Sands, Spellacy Sands, Miocene Shales/Warson Sands, and Antelope Sands (concurrence area). Staff make no decision regarding the proposal for the Tulare B zone of Tulare Formation at this time.

Public Comment Process

On June 19, 2018, State Water Board staff preliminarily concurred with the exemption proposal pending the State's public comment process. On November 6, 2018, DOGGR published notice of the exemption proposal and opened a public comment period. DOGGR and State Water Board staff held a joint public hearing to receive comments on the exemption proposal on December 6, 2018. The comment period closed on December 6, 2018. DOGGR and State Water Board staff have reviewed and responded in writing to the comments received during the comment period and public hearing.

Conditions on Injection Projects

Approval of Class II UIC projects involves a joint review by DOGGR and Water Boards staff. DOGGR and Water Boards staff will consider incorporating conditions into approvals of Class II injection projects. Potential conditions include, but are not limited to, requiring monitoring to confirm that injected fluids remain in the concurrence area. If a monitoring requirement is incorporated in a UIC project approval, the operator must submit a work plan to the Central Valley Regional Water Quality Control Board for consideration.

If you have any questions regarding this matter, please contact Mr. John Borkovich at (916) 341-5779 or john.borkovich@waterboards.ca.gov.

Sincerely,

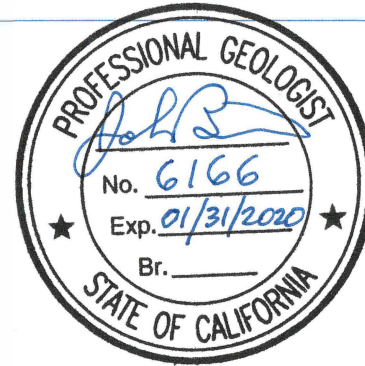


Jonathan Bishop
Chief Deputy Director

cc: Patrick Pulupa
Executive Officer
Central Valley Regional Water Quality Control Board
patrick.pulupa@waterboards.ca.gov

Cameron Campbell
Deputy, Inland District
Department of Conservation
Division of Oil, Gas & Geothermal Resources
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State Water Resources Control Board



TO: Jonathan Bishop
Chief Deputy Director

FROM: John Borkovich
Supervising Engineering Geologist

DATE: March 28, 2019

**SUBJECT: PROPOSED AQUIFER EXEMPTION, MIDWAY SUNSET OIL FIELD,
KERN COUNTY**

On May 25, 2018 the Division of Oil, Gas and Geothermal Resources (DOGGR) staff provided the State Water Resources Control Board (State Water Board) with an aquifer exemption proposal for the Midway Sunset (MWSS) Oil Field. The proposal seeks to expand the exemption for the Tulare B zone of the Tulare Formation, Potter Sands, Spellacy Sands, Miocene Shales/Warson Sands, and Antelope Sands within the MWSS Oil Field for Class II injection.

State Water Board staff, in consultation with Central Valley Regional Water Quality Control Board staff (collectively Water Boards staff) reviewed the proposal for the Potter Sands, Spellacy Sands, Miocene Shales/Warson Sands, and Antelope Sands, considered comments received during the public comment process, and have determined it meets the criteria set forth in California Public Resources Code (PRC) section (§) 3131 and § 146.4 of Title 40 of the Code of Federal Regulations (CFR). DOGGR staff are supplementing the proposal for the Tulare B zone of the Tulare Formation. Accordingly, State Water Board staff will address this zone in a separate memorandum after DOGGR staff finalize the proposal.

State and Federal Exemption Criteria

As required by PRC § 3131(a)(1) and 40 CFR § 146.4(a), the concurrence area does not currently serve as sources of drinking water. No water supply wells were identified as being completed within the concurrence area. Water supply wells identified in proximity to the concurrence area are all completed in the undifferentiated alluvium/Tulare A zone. In the area of these supply wells, the undifferentiated alluvium/Tulare A zone is vertically separated from the shallowest formation at issue (Spellacy Formation) by approximately 2,500 to 6,000 feet and multiple vertical confining layers.

Consistent with 40 CFR § 146.4(c), the concurrence area contains groundwater with concentrations of total dissolved solids (TDS) between 3,000 and 10,000 milligrams per liter (mg/L) and is not reasonably expected to supply a public water system due to the presence of

hydrocarbons and/or elevated concentrations of other constituents, such as TDS and boron. In addition, as per PRC § 3131(a)(2), the injected fluids are not expected to affect the quality of water that is, or may reasonably be, used for any beneficial use because (1) the groundwater contained in the concurrence area is not expected to be put to beneficial use because it contains petroleum hydrocarbons and/or contains constituents such as boron and TDS at concentrations that limit its suitability for agricultural, domestic, and other beneficial uses, and (2) the injected fluids are expected to remain in the concurrence area.

The requirement of PRC § 3131(a)(3) is also satisfied because the injected fluids are expected to remain within the concurrence area due to the following conditions:

Potter Sands

The concurrence area is separated into the North Midway-Sunset (NMWSS) and Midway Valley expansion areas (Figure 1). In the NMWSS area, the Potter Sands are laterally contained to the west by the McKittrick Thrust Fault (Figures 1 and 2). Lateral containment to the north, northeast, east, and southeast is provided by a geologic pinch-out of the Potter Sands into the low permeability Reef Ridge Shale. In the Midway Valley area, the Potter Sands are laterally contained to the southwest and west along its erosional outcrop due to a production-induced inward-directed hydraulic gradient (Figures 1, 2, and 3).

The Potter Sands are vertically contained below by the Reef Ridge Shale. Low permeability shales in the basal San Joaquin/Etchegoin Formation and the basal Tulare Formation overlie (unconformably) the Potter Sands, restricting vertical fluid migration (Figures 2 and 3).

Spellacy Sands

The concurrence area includes a hydrocarbon bearing EOR area in the north and a larger EOR expansion area in the south (Figure 4). In the northern area, vertical containment of the Spellacy Sands is provided above and below by the deep marine Miocene Shales. In the southern area, vertical containment is provided by the low permeability shales in the basal San Joaquin/Etchegoin Formation and the Miocene Shales. The Spellacy Sands are laterally contained to the west along its erosional outcrop due to a production-induced inward-directed hydraulic gradient and by a pinch-out into the Miocene Shales to the east (Figure 5).

Miocene Shales/Warson Sands

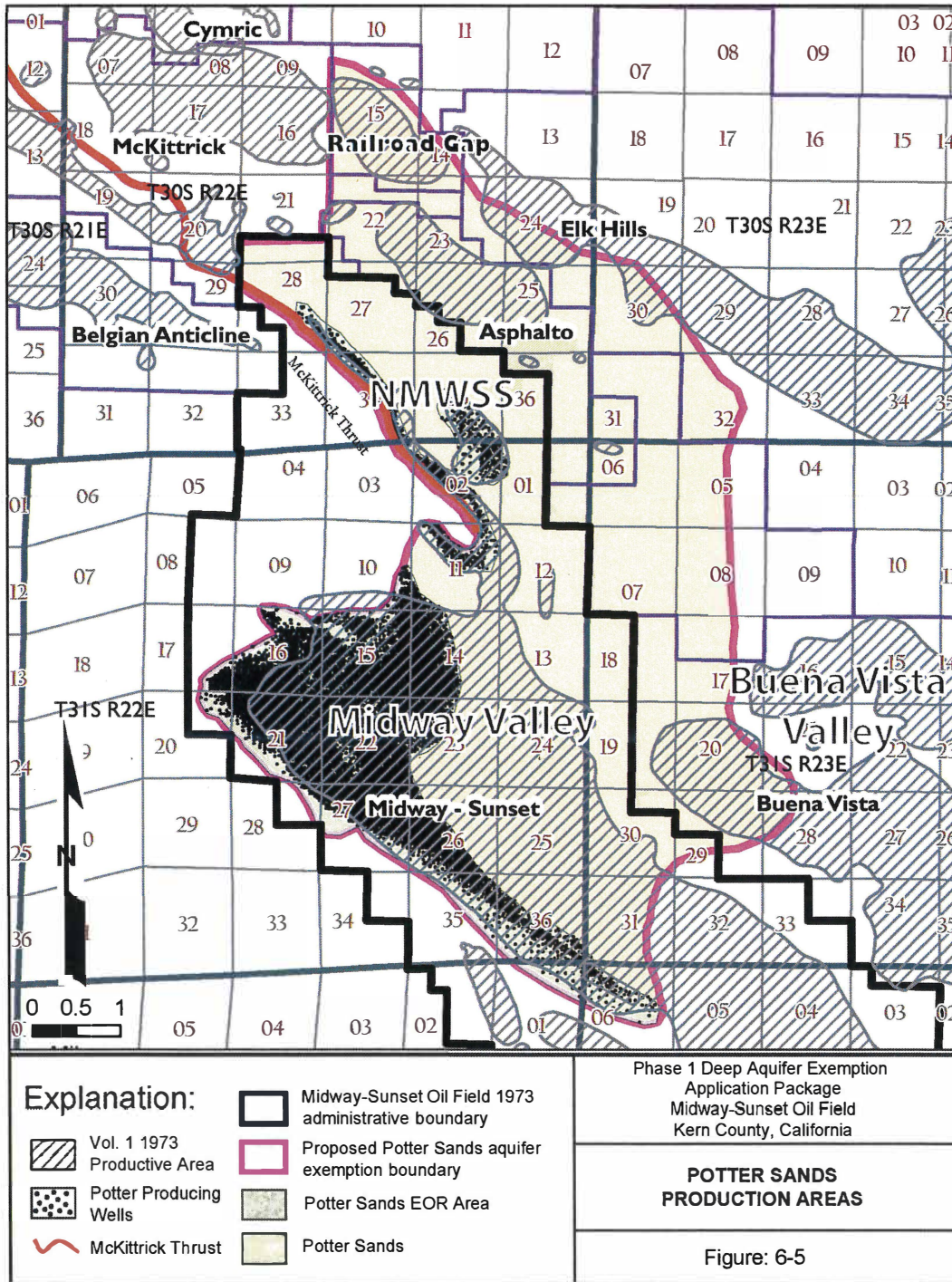
The concurrence area includes the North Midway-Sunset and Central Midway-Sunset expansion areas (Figure 6). The Miocene Shales/Warson Sands are contained by a regional Pliocene-Miocene unconformity. The interbedded silts and shales of the Tulare and San Joaquin/Etchegoin Formations overlie the Pliocene-Miocene unconformity, providing additional vertical and lateral containment. The low permeability matrix of the Miocene Shales in combination with viscous, tarry nature of the oil further restricts fluid migration. The Warson Sands are contained vertically and laterally by the low permeability Miocene Shales.

Lower Antelope Sands

The Lower Antelope Sands are contained vertically and laterally by the low permeability Miocene Shales (Figure 5).

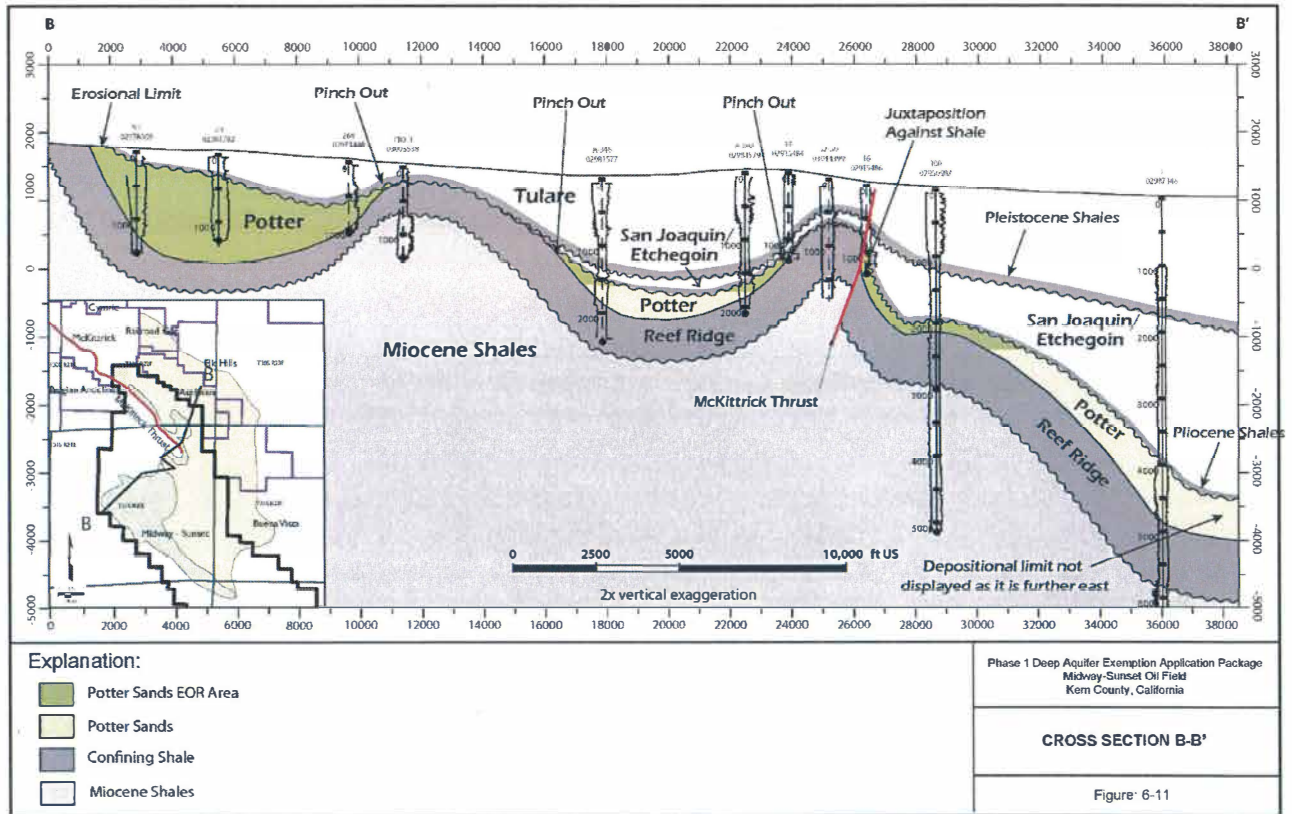
Enclosure

Figure 1



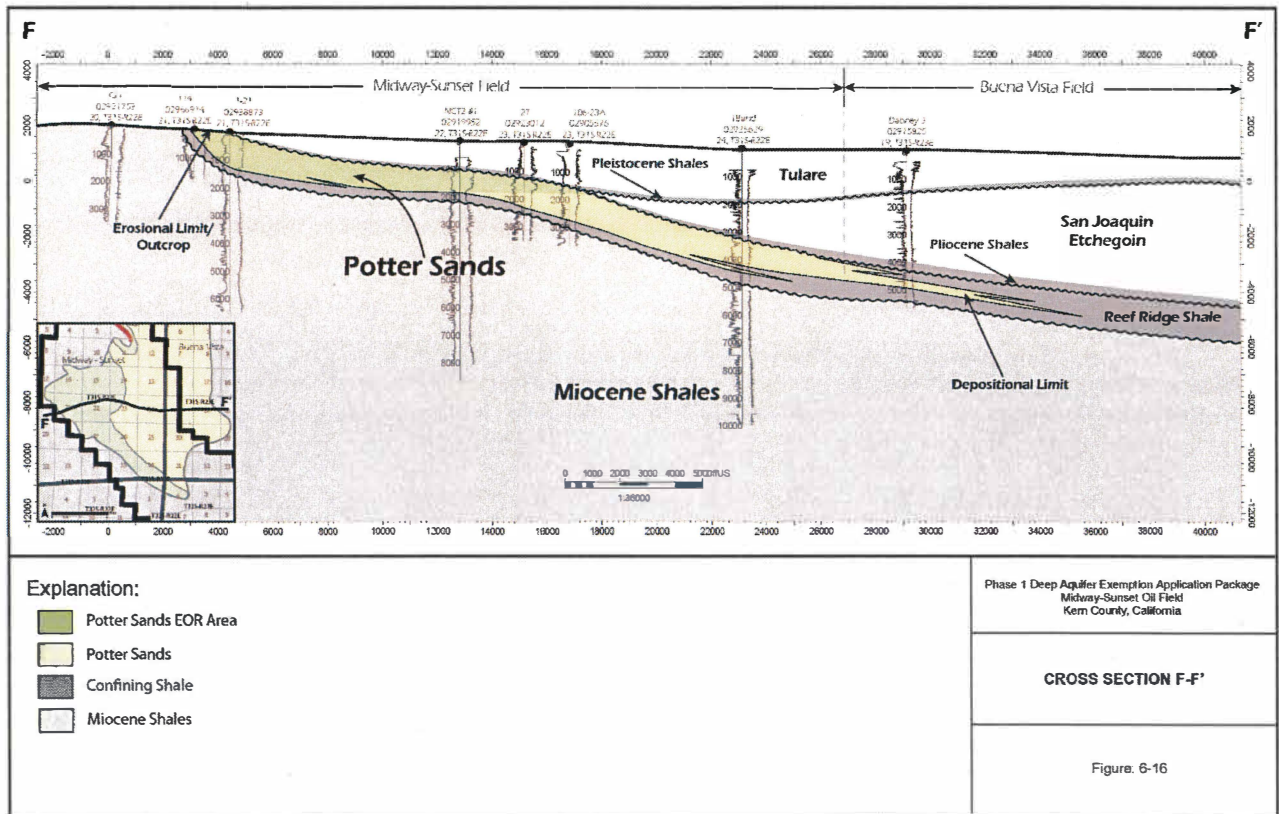
Proposed Potter Sands Aquifer Exemption Boundary (Figure 6-5 of the revised figures), Aquifer Exemption Application, Midway-Sunset Oil Field, Kern County, California, May 25, 2018.

Figure 2



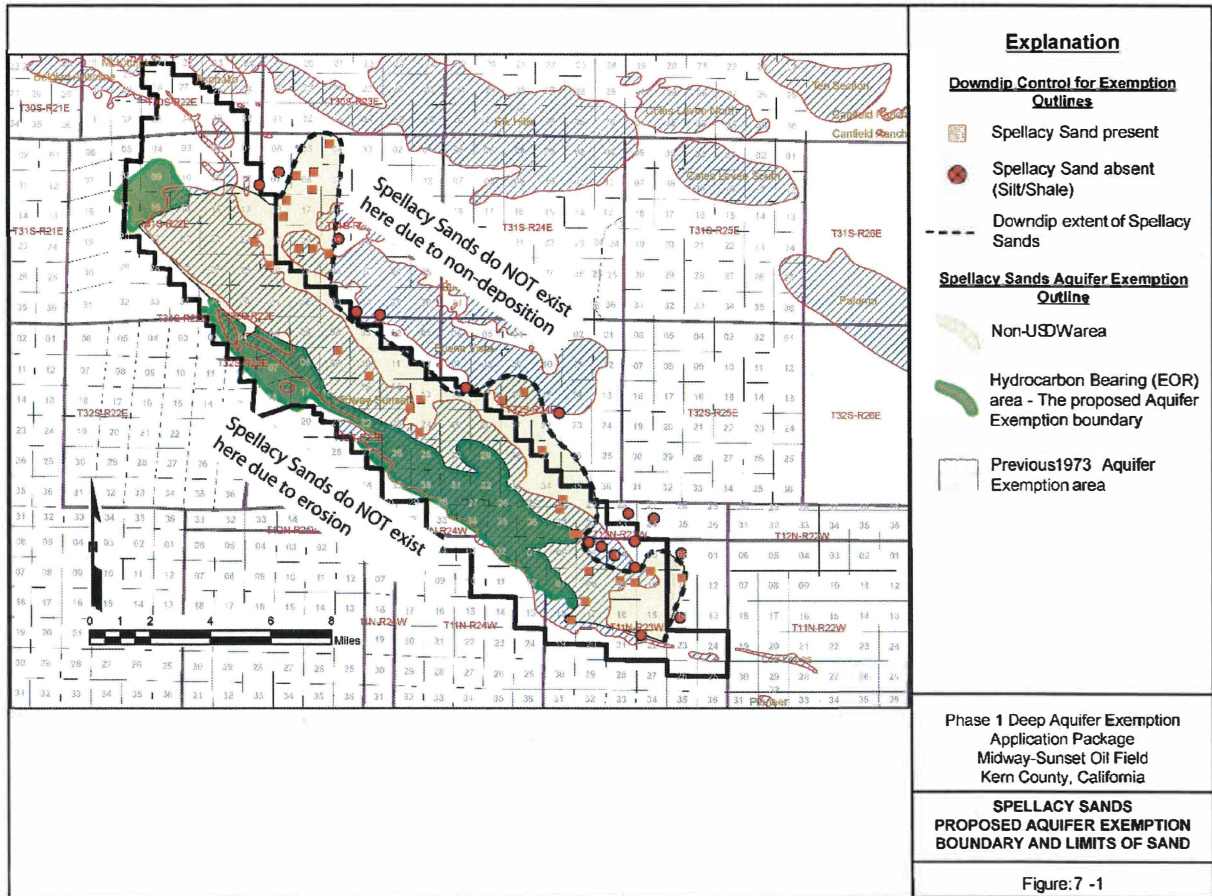
Cross-section B-B' (Figure 6-11 of the revised figures), Aquifer Exemption Application, Midway-Sunset Oil Field, Kern County, California, May 25, 2018.

Figure 3



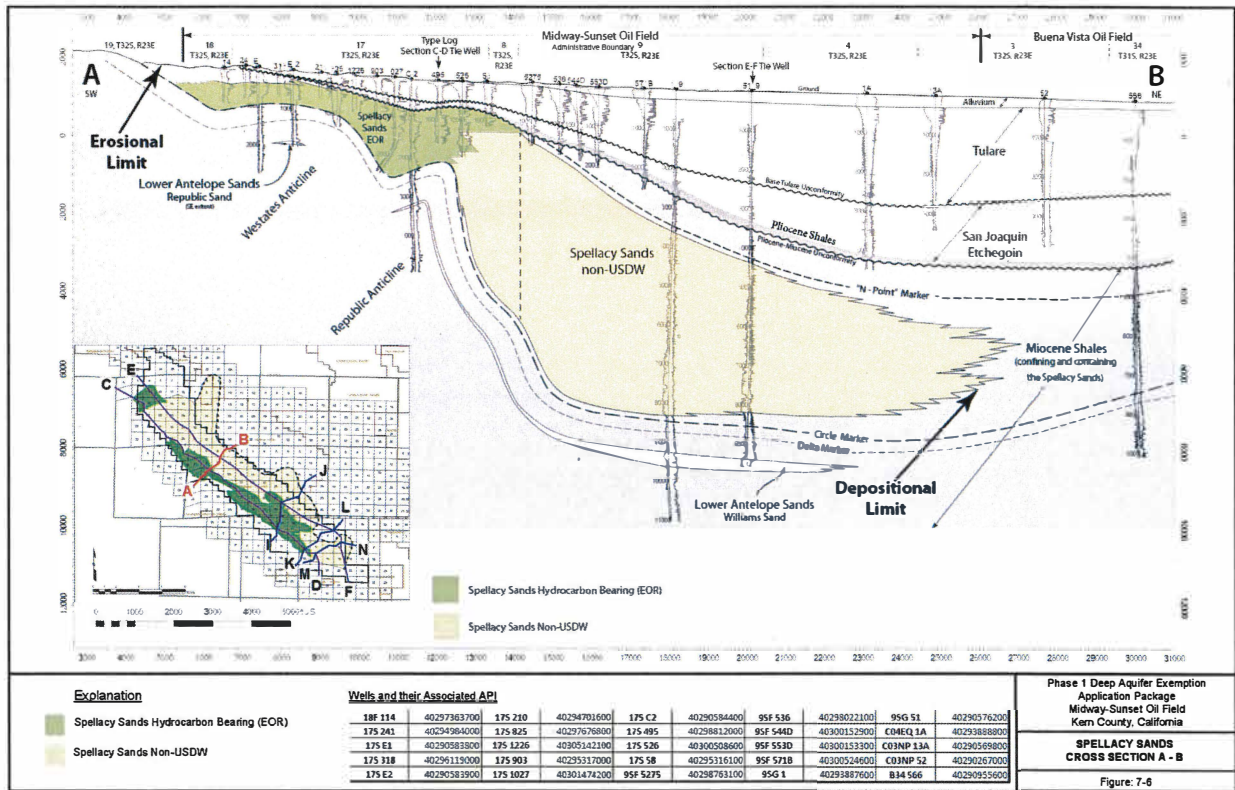
Cross-section F-F' (Figure 6-16 of the revised figures), Aquifer Exemption Application, Midway-Sunset Oil Field, Kern County, California, May 25, 2018.

Figure 4



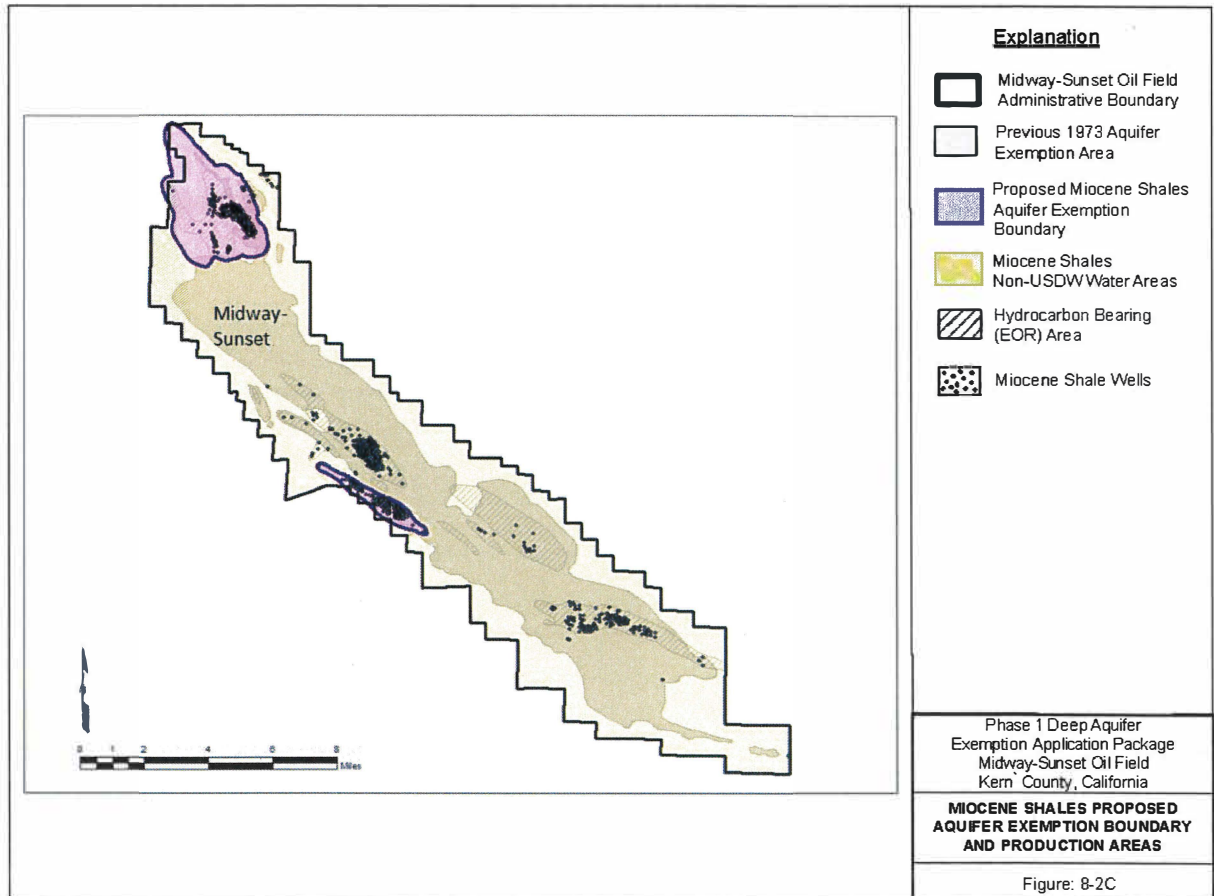
Proposed Spellacy Sands Aquifer Exemption Boundary (Figure 7-1 of the revised figures),
Aquifer Exemption Application, Midway-Sunset Oil Field, Kern County, California, May 25, 2018.

Figure 5



Cross-section A-B (Figure 7-6 of the revised figures), Aquifer Exemption Application, Midway-Sunset Oil Field, Kern County, California, May 25, 2018.

Figure 6



Proposed Miocene Shale Aquifer Exemption Boundary (Figure 8-2C of the revised figures), Aquifer Exemption Application, Midway-Sunset Oil Field, Kern County, California, May 25, 2018.