



California

**Department of
Conservation**

California Geologic Energy Management Division

Aquifer Exemption

Kern River Reservoir, Kern River Oil Field

A presentation by the CalGEM with preliminary concurrence by the State Water Resource and Central Valley Regional Water Quality Control Boards

The Kern River Oil Field, Aquifer Exemption Materials can be accessed at:
<https://www.conservation.ca.gov/calgem/Pages/Aquifer-Exemptions-Status.aspx>

Additional written comments may be submitted by

email to: comments@conservation.ca.gov

FAX to: (916) 324-0948,

or mail to: Department of Conservation

715 P Street, MS 1803

Sacramento, CA 95814

ATTN: Aquifer Exemption

1. Executive Summary

2. Introduction

- a) Location
- b) Operations
- c) Geology

3. Exemption Proposal

4. Meets Federal Exemption Criteria

- a) Not a current source of drinking water
- b) Hydrocarbon producing / formation characteristics

5. Meets State Exemption Criteria

- a) Water quality and beneficial use
- b) Injectate confinement

6. Conclusions



Kern River Oil Field, 2025

Executive Summary



Objective

- To update limits of the exempted portion of the Kern River Reservoir to include the hydrocarbon bearing portions of the reservoir.

Key Messages

- The KR Reservoir consists of both the Kern River Formation below the 'C' silt and the upper Chanac Formation all within and immediately surrounding the Kern River Oil Field.
- The proposed expanded project area is defined by the limits of the oil producing zones, in which, there are no private or municipal drinking water supply wells.
- The produced water is treated and reinjected back to the reservoir. Analysis of 25 years of historical water quality data has demonstrated that the reservoir's water quality has not been degraded by injection activities.
- Oil field operations through fluid extraction activities related to hydrocarbon production have formed a low-pressure zone in the center of the field, creating an inward hydraulic gradient. This inward hydraulic gradient establishes the primary hydraulic control within the oil field boundaries providing isolation of injected fluids.

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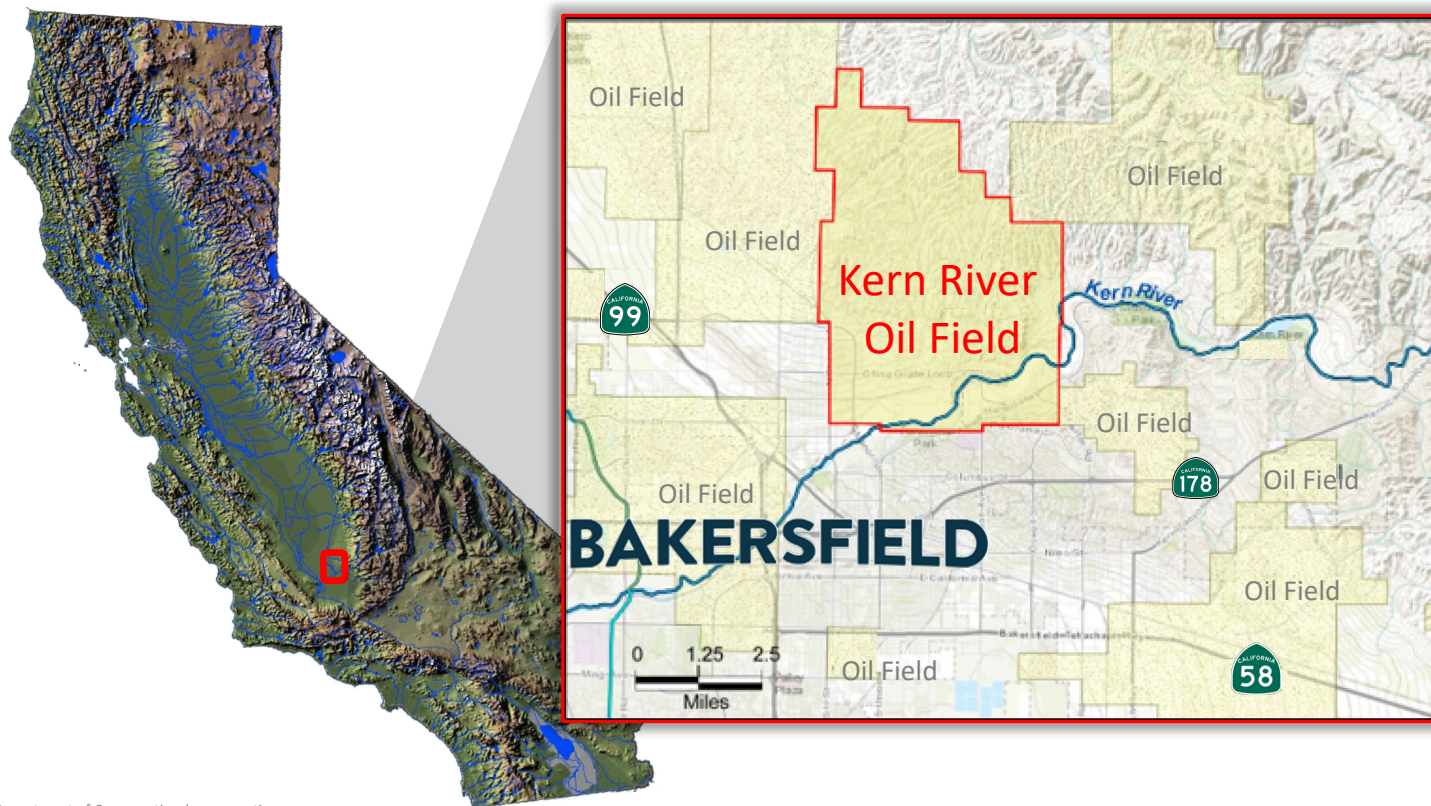
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Introduction: Location

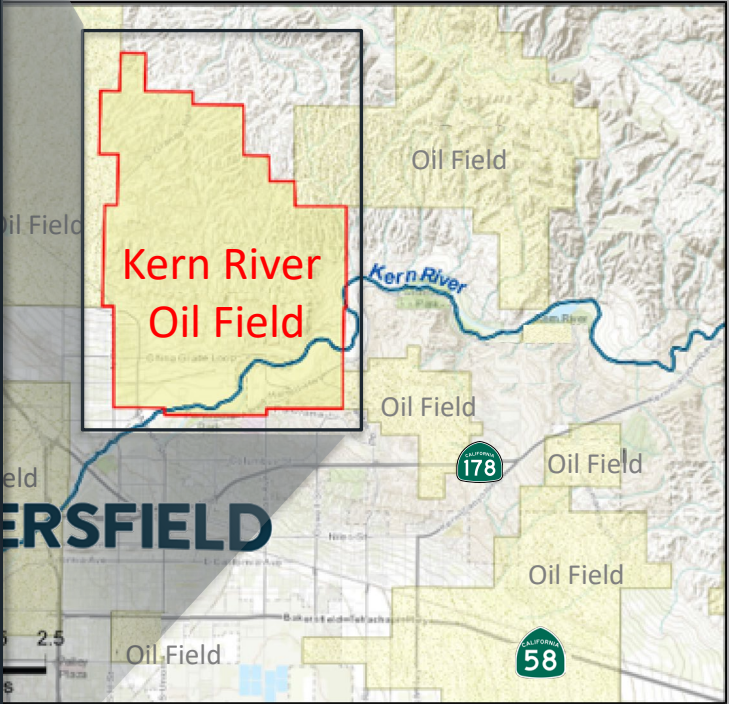
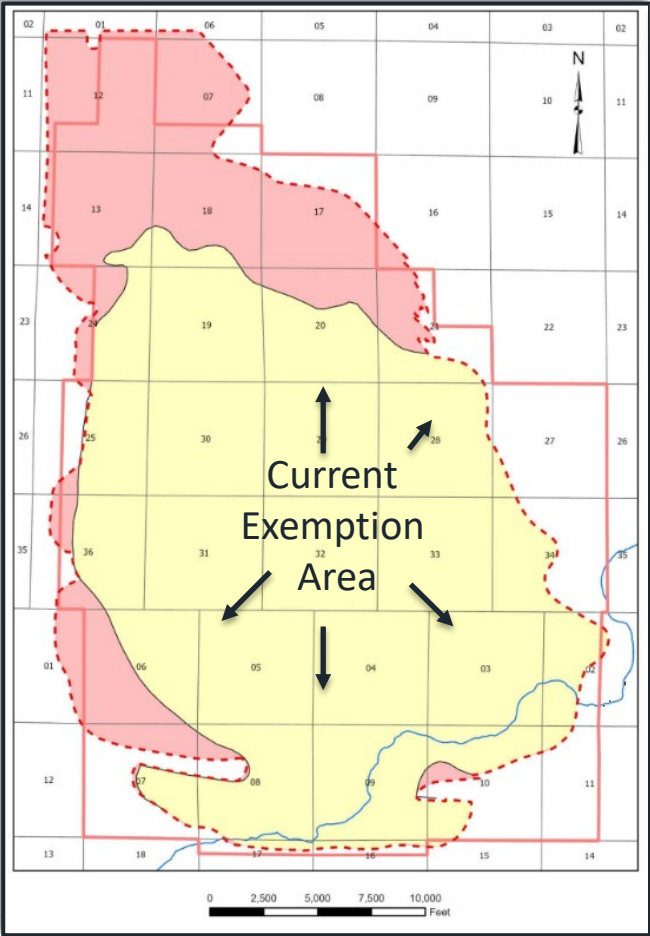


In the eastern San
Joaquin Valley

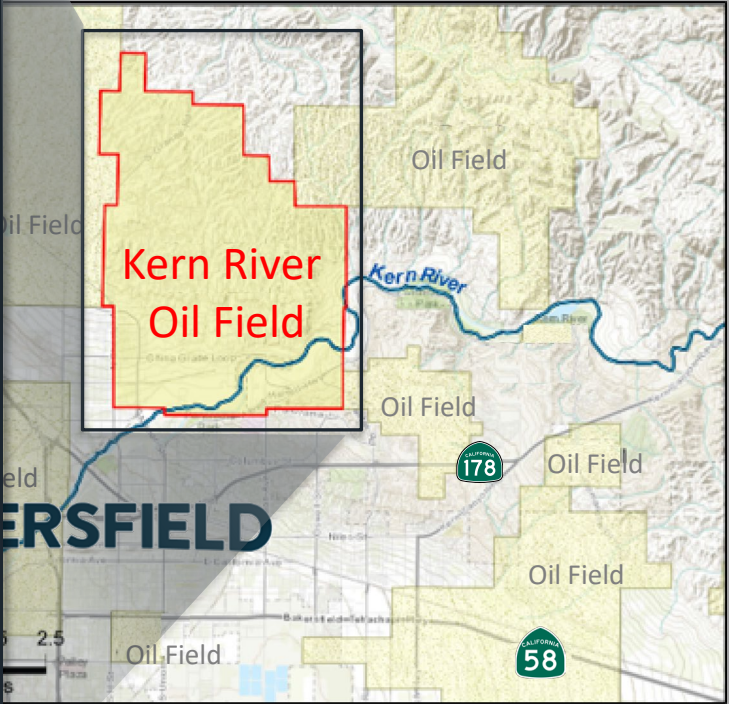
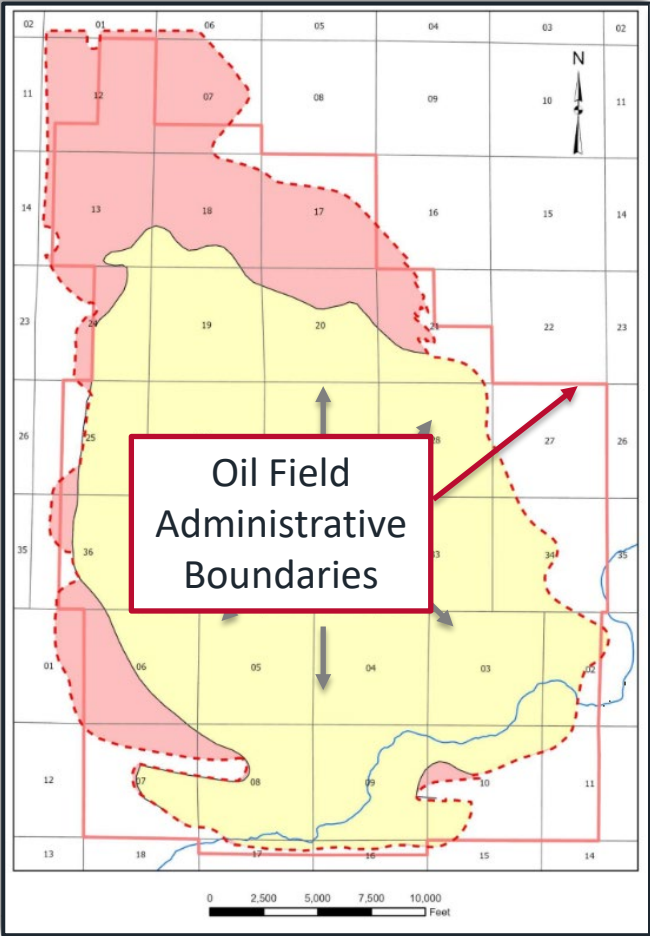
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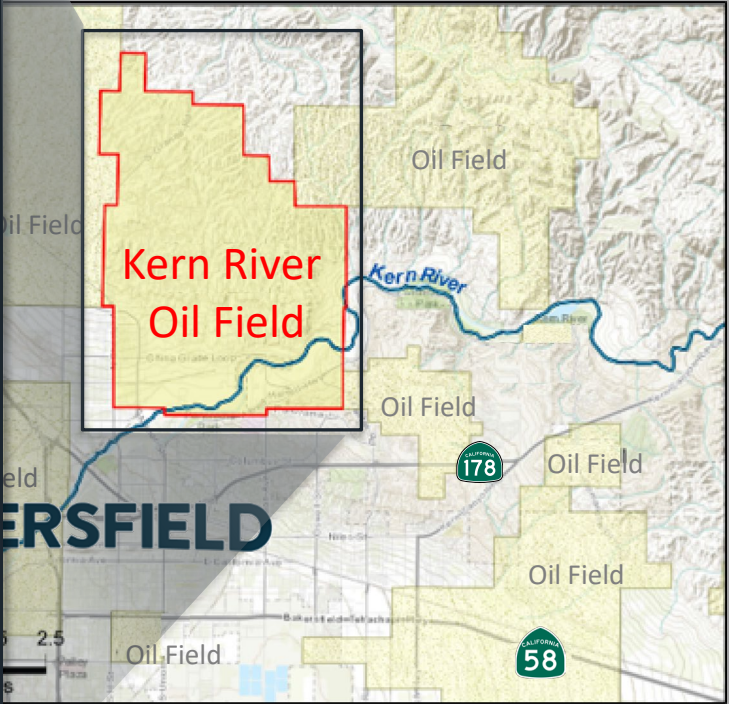
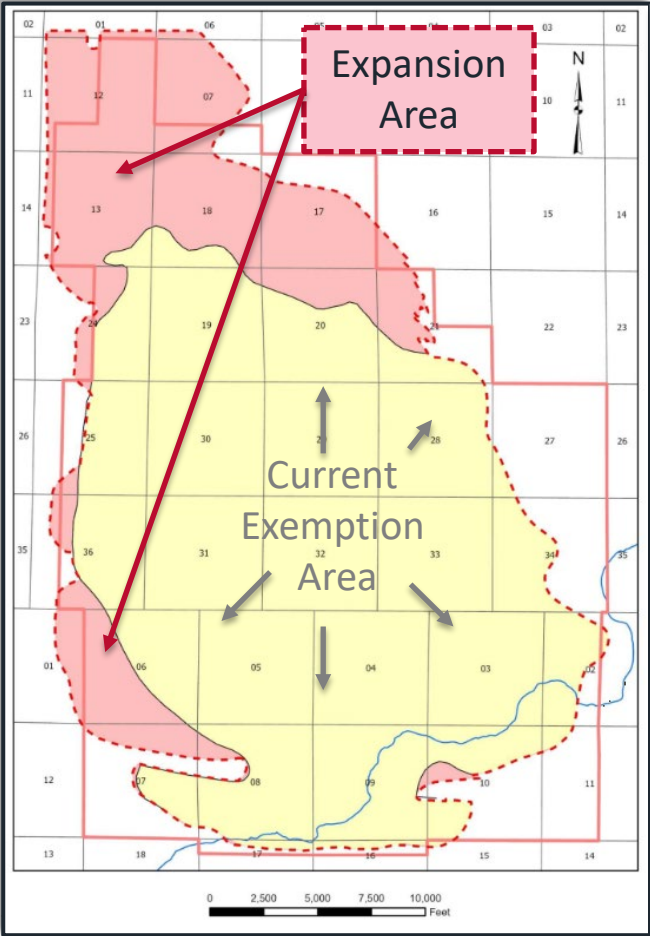
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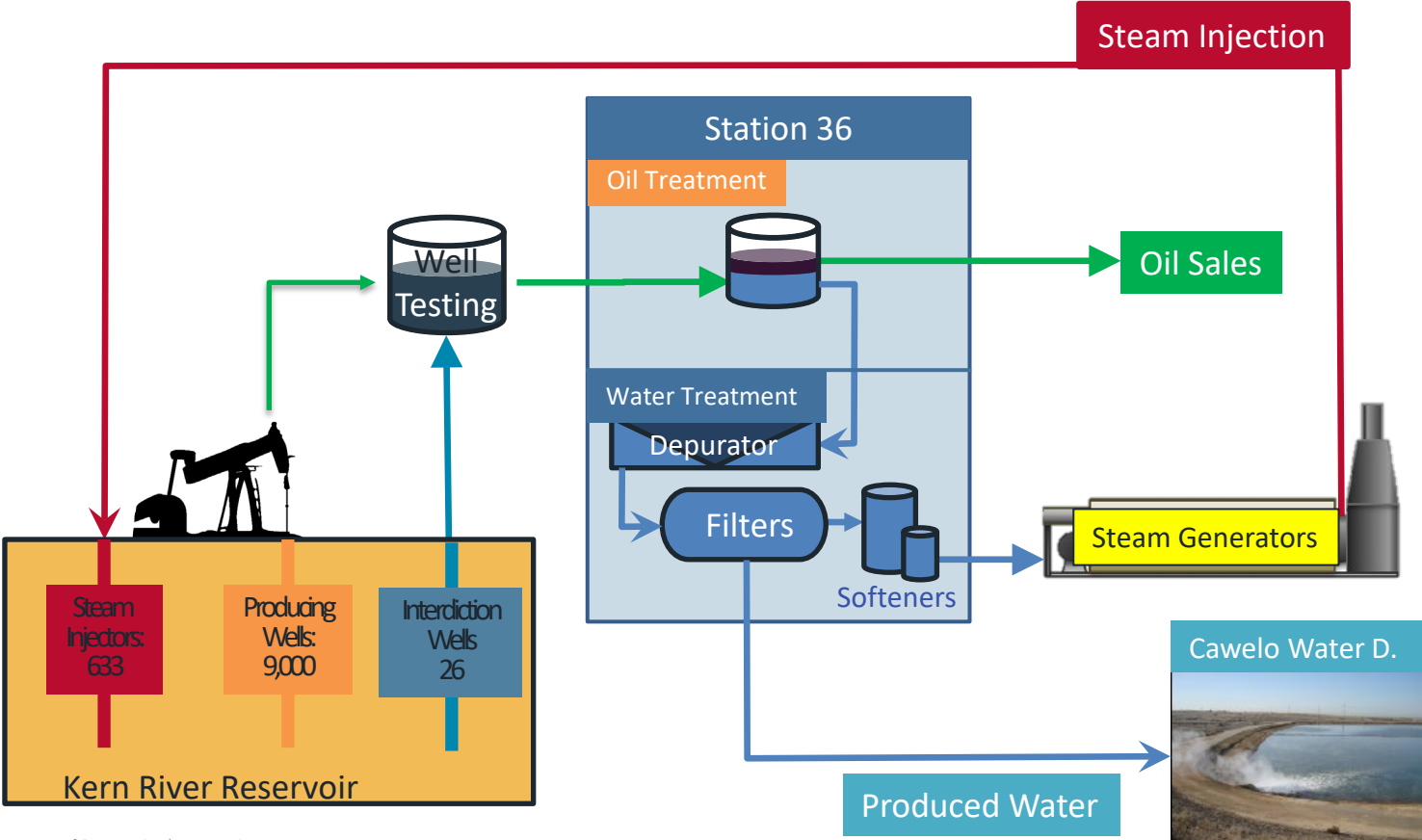
The Kern River Oil Field

- 25 square miles.
- 3rd Largest oil field in California.
- 9,000 producing wells.
- Produces:
 - 67,000 barrels of oil per day.
 - 783,000 barrels of water per day.
- Injects 137,000 barrels of steam per day for EOR*
 - 633 steam injectors*.

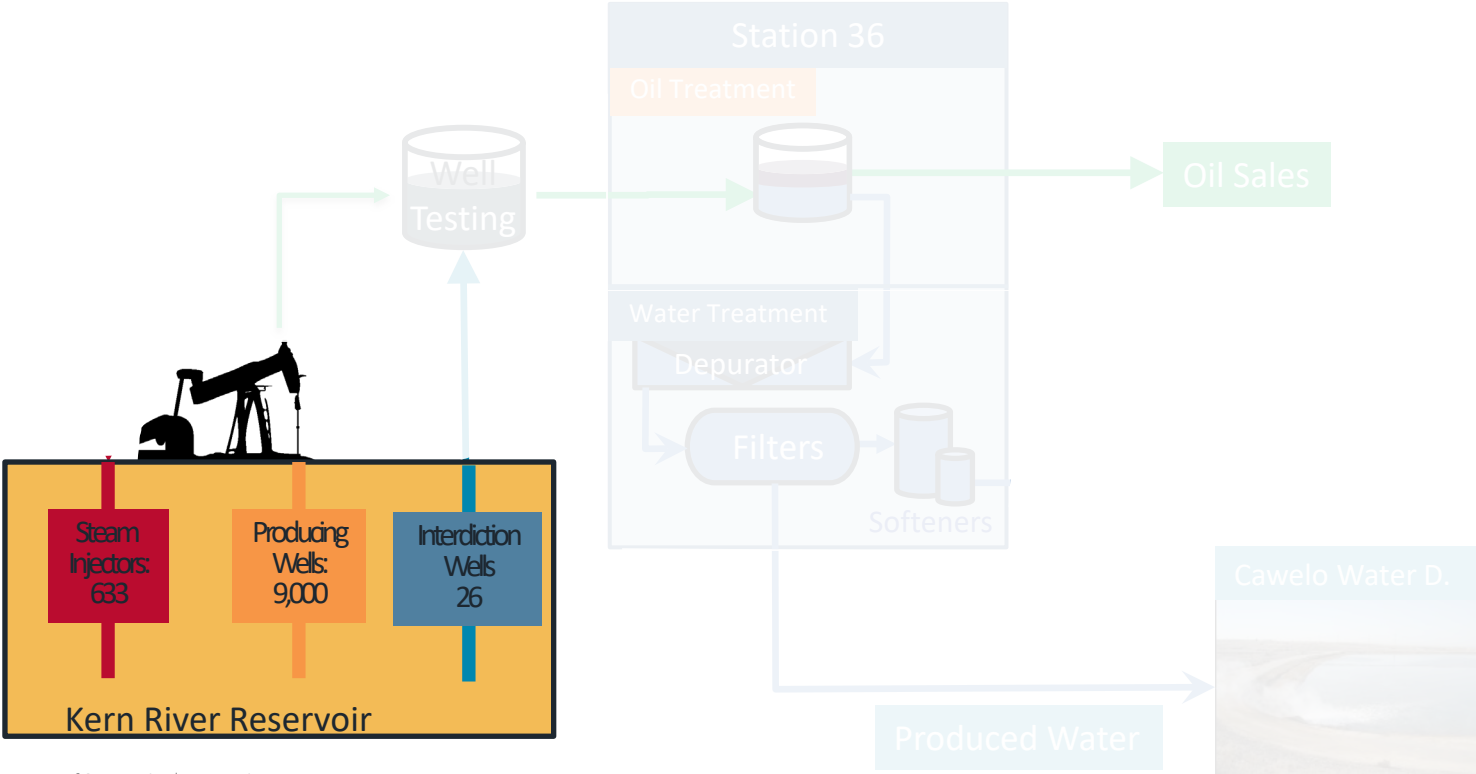
**2020 values*

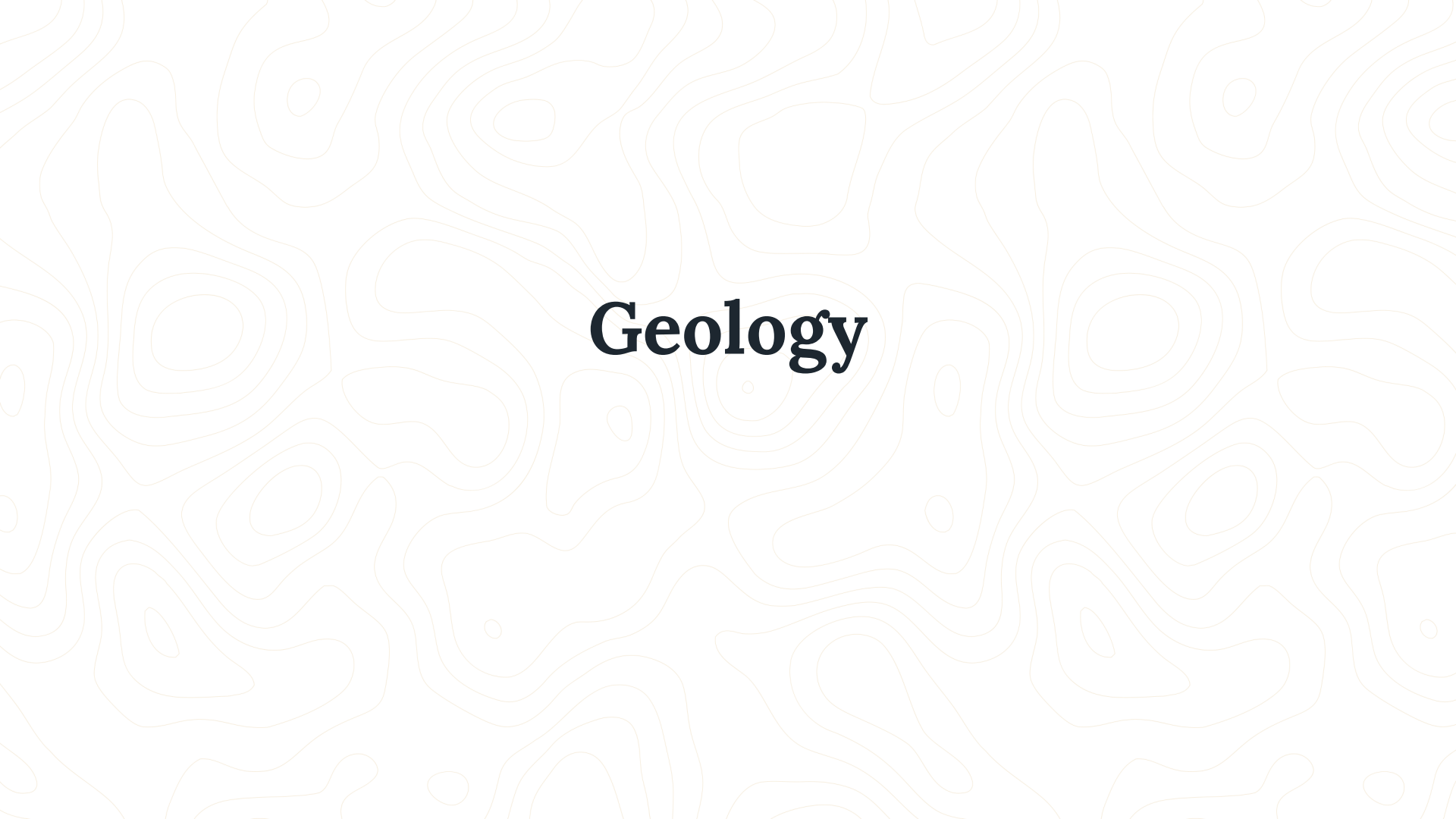


Introduction: Operations



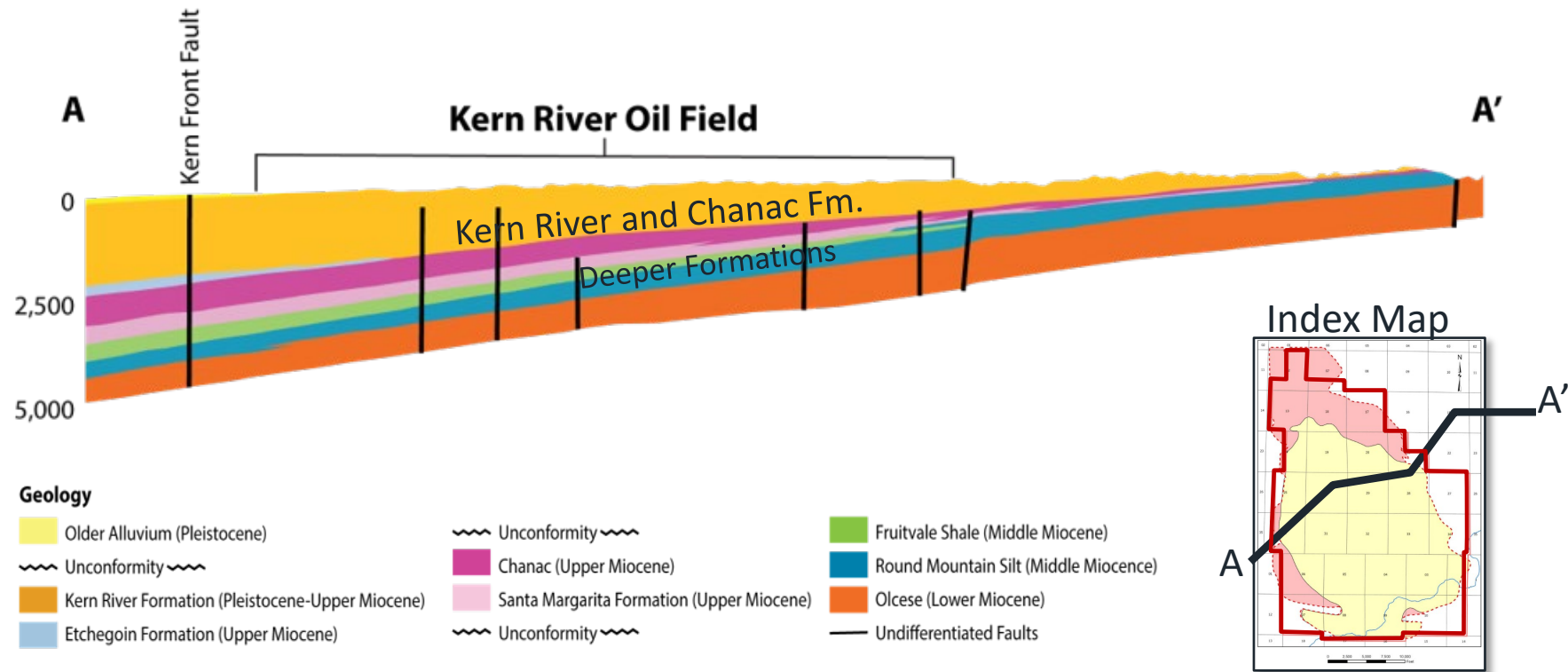
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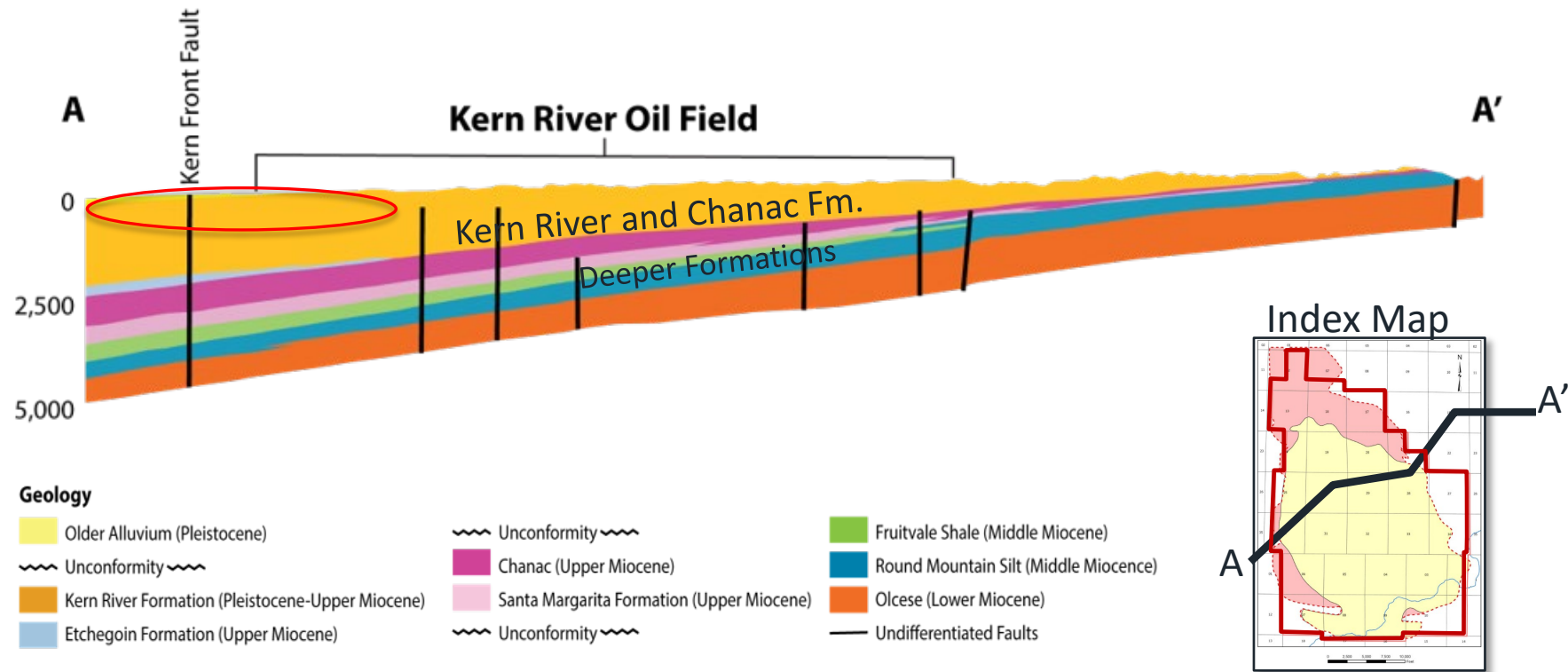
The background of the image is a light gray topographic map. It features numerous thin, brown contour lines that form various closed loops and elongated shapes, representing different elevations and geographical features. The lines are more densely packed in some areas, indicating steeper slopes, and more spread out in others, indicating flatter terrain. The overall pattern is complex and organic, typical of a real-world topographic map.

Geology

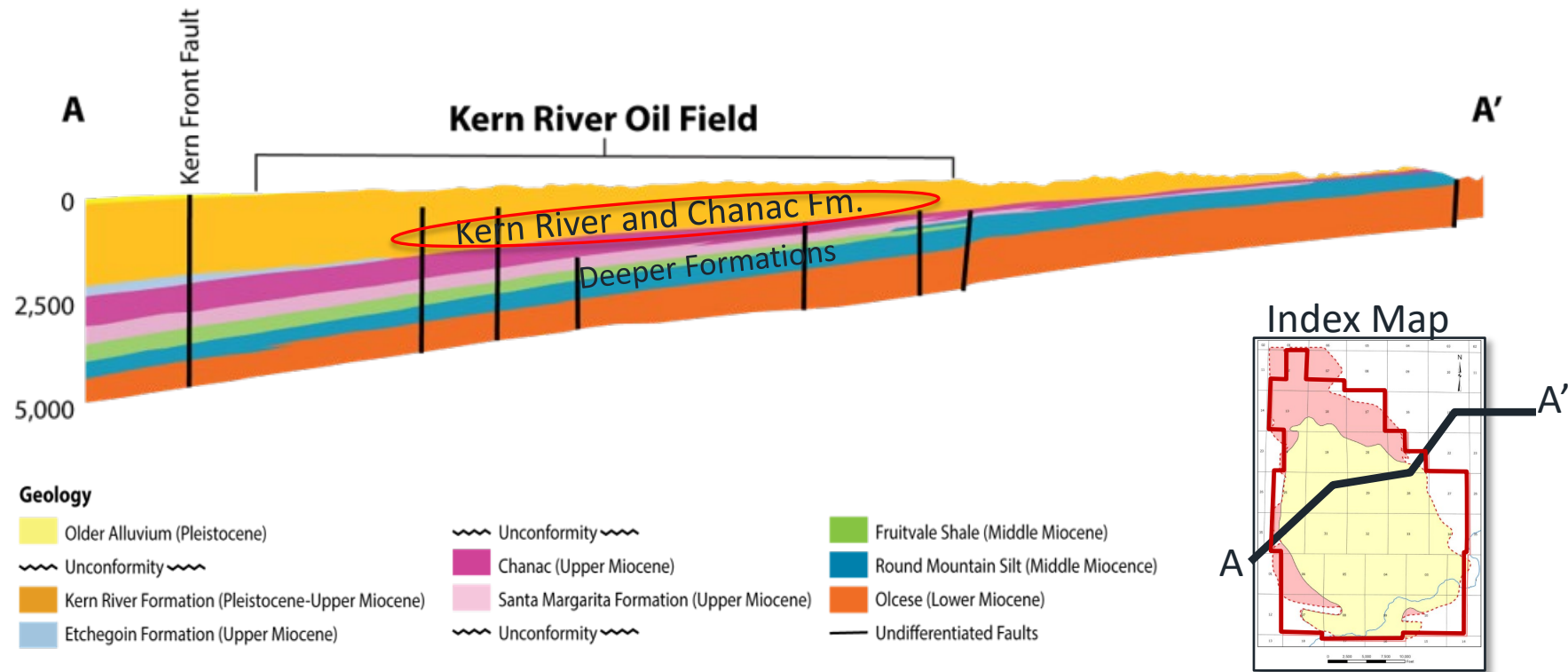
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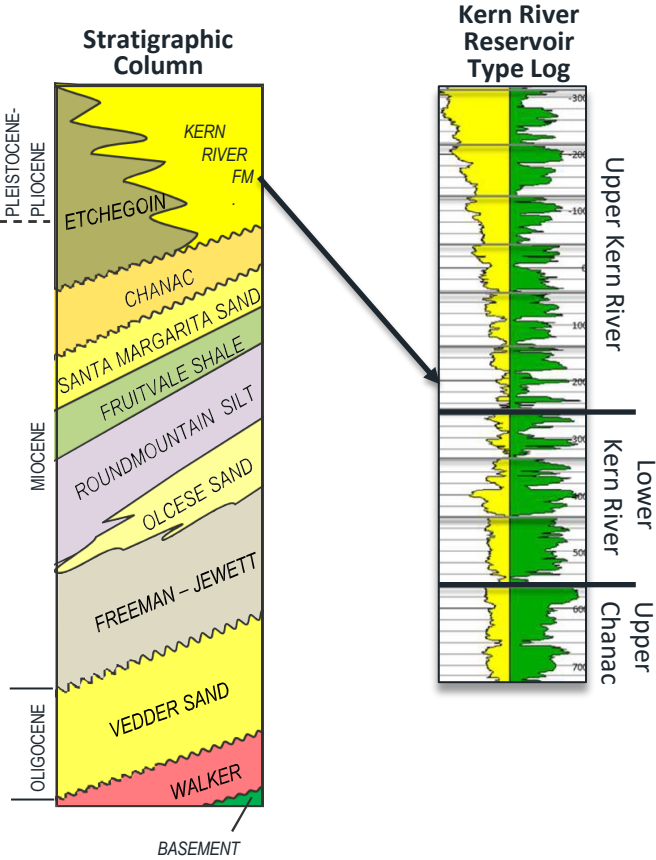
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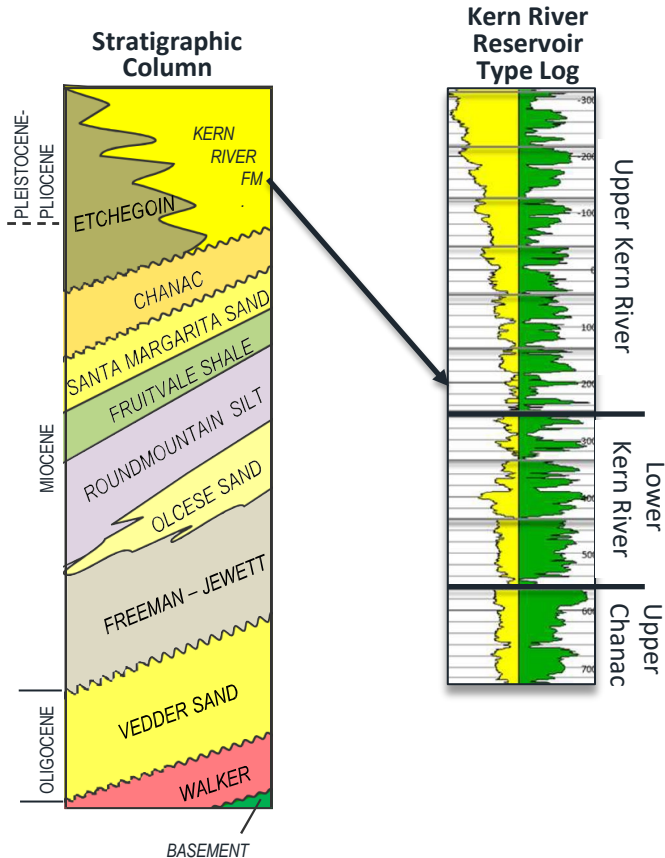
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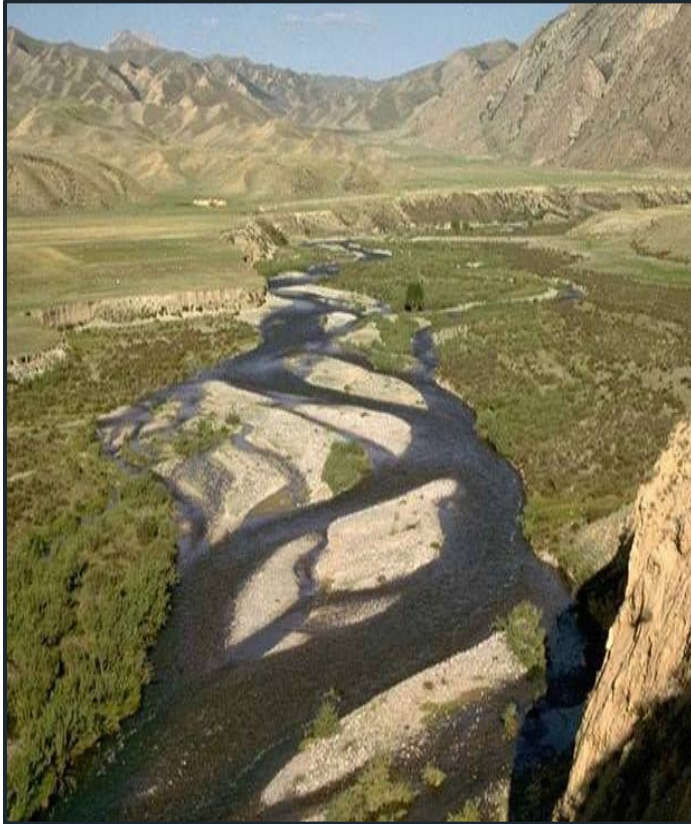


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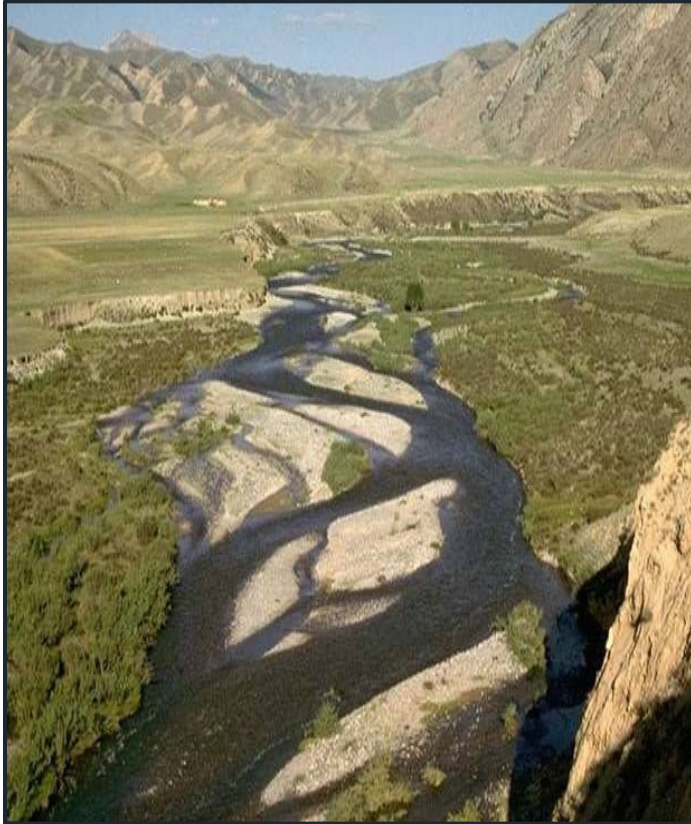
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- These formations were deposited as a non-marine fluvial, braided stream system.
- 2 primary lithofacies
 1. Channelized, amalgamated sand lobes (76%).
 2. Overbank/floodplain interbeds dominantly composed of fine-grained silt and clay (24%).

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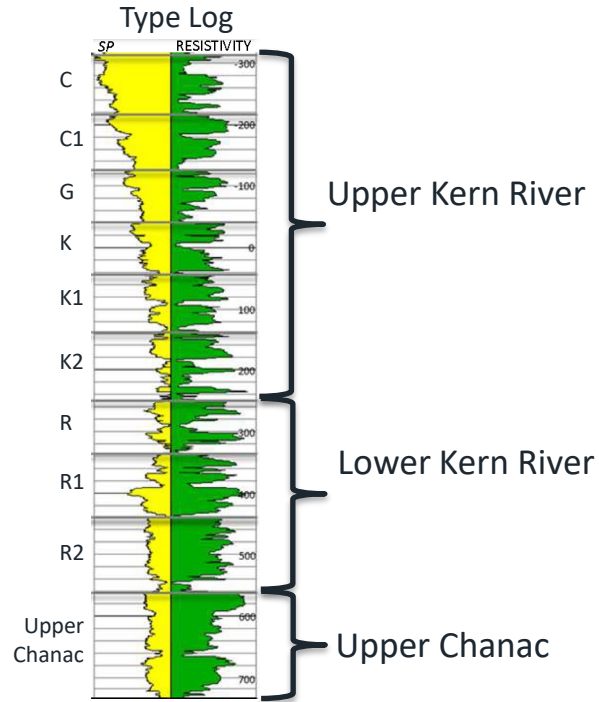
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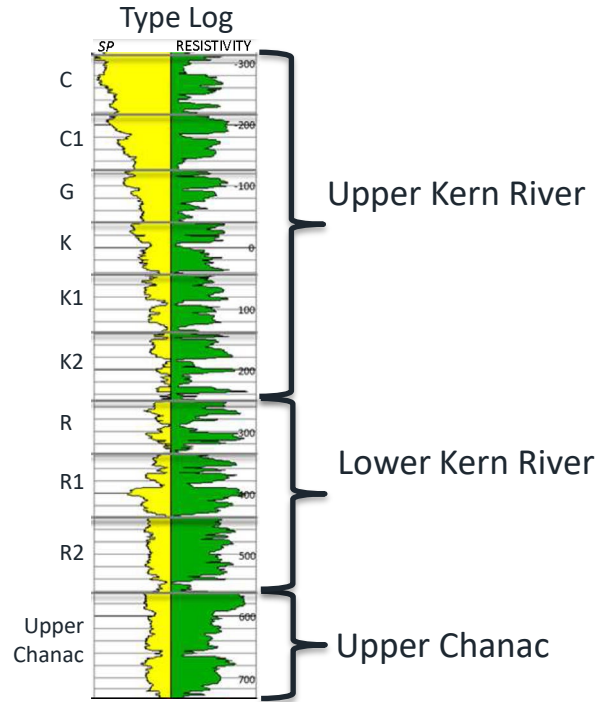
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- Subdivided into 10 zones
 - C, C1, G, K, K1, K2, R, R1, R2, Upper Chanac
 - Each zone is bracketed by impermeable silt and clay layers created by the overbank/floodplain deposits.

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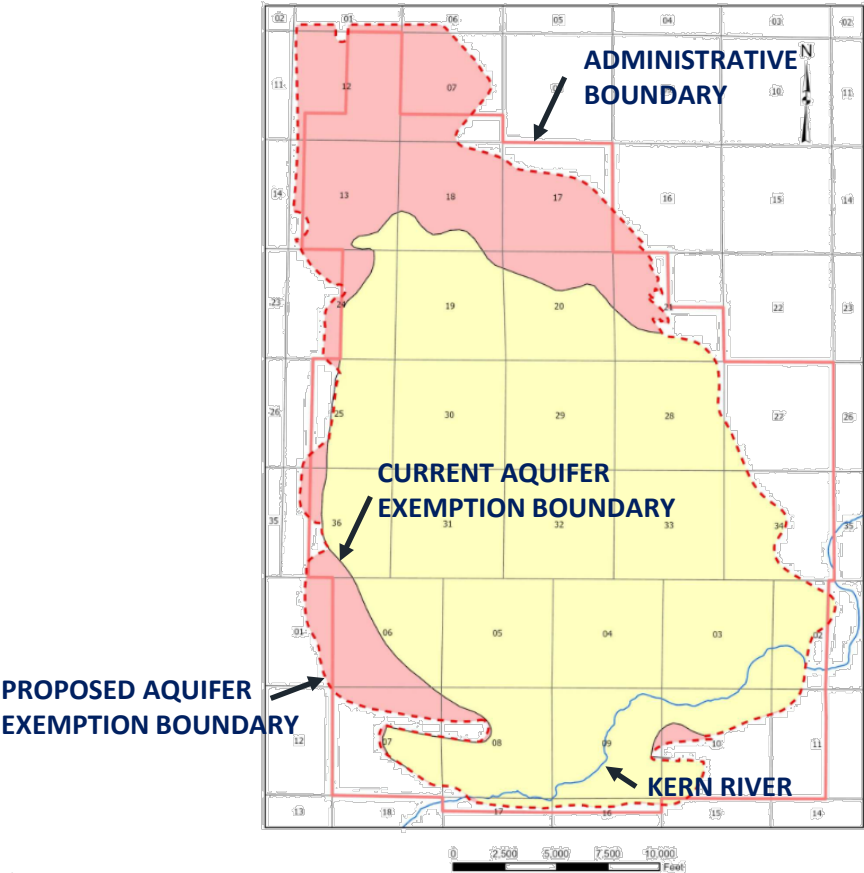
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Exemption Proposal Overview

Exemption Proposal

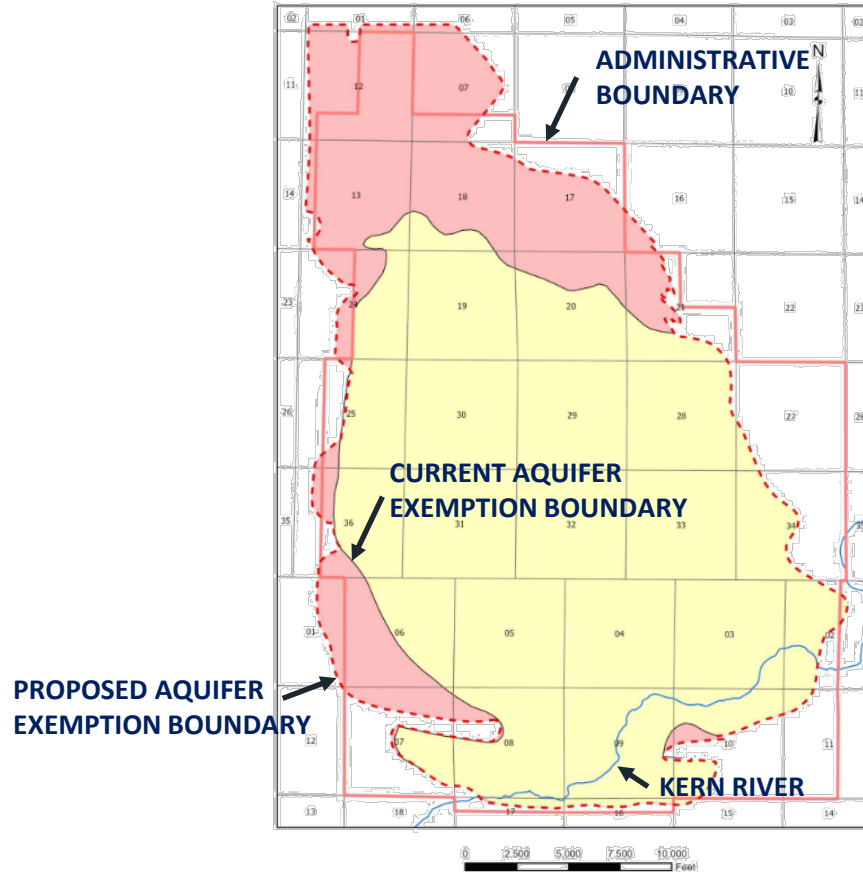


Figure 16, page 78



Exemption Proposal

Figure 16, page 78



Current Exempt Area	10,789 acres
Expansion Area	<u>+3,916 acres</u>
Total Area	14,705 acres

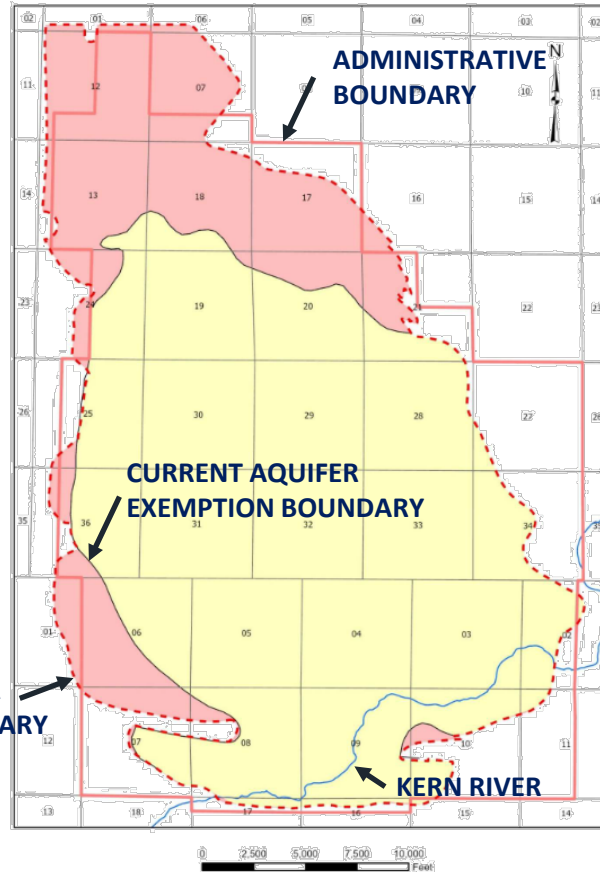
27% Increase

Exemption Proposal

Figure 16, page 78

The aquifer exemption expansion is defined by the limits of the oil producing zone, in which, there are no private or municipal drinking water supply wells.

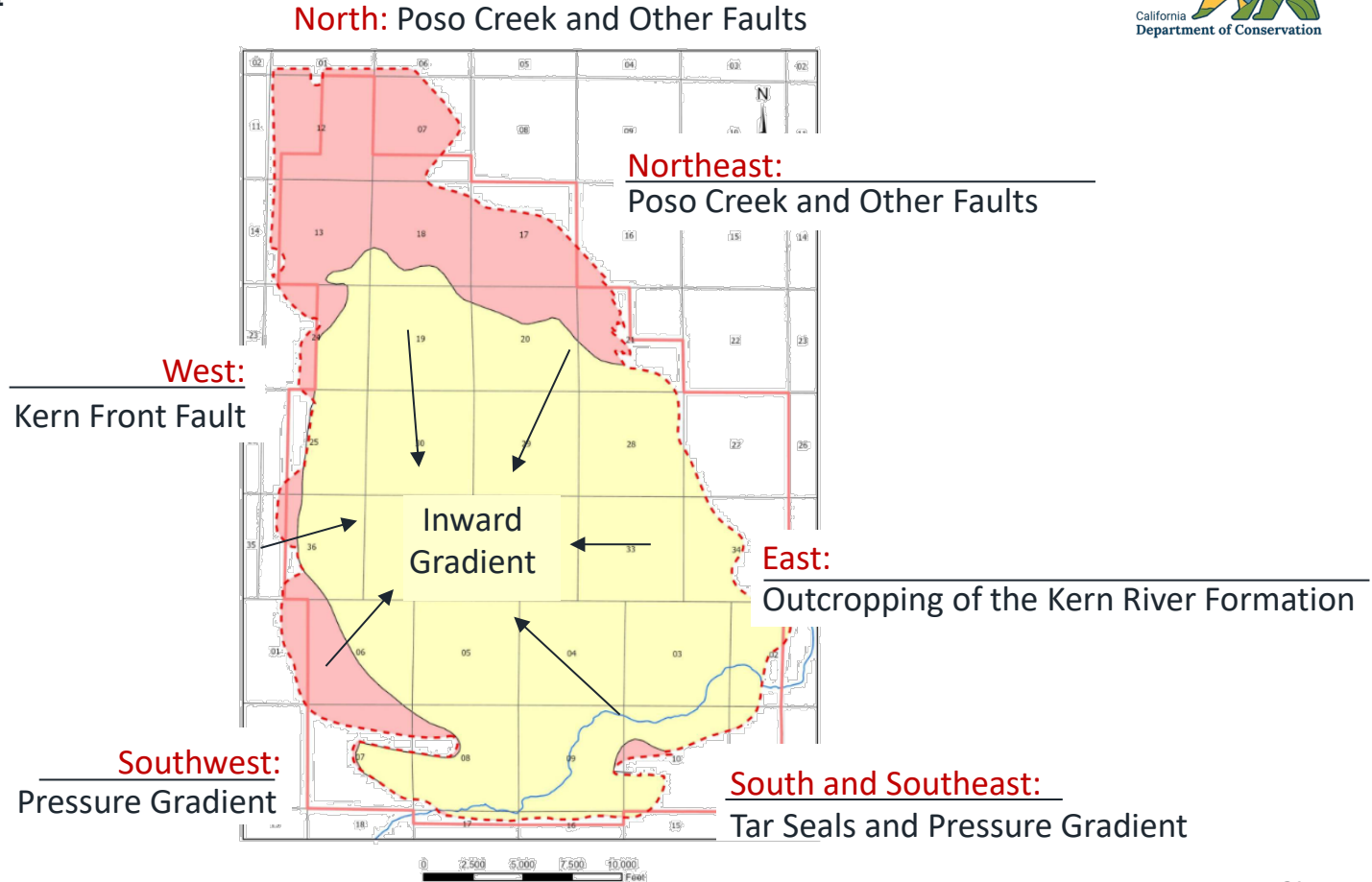
**PROPOSED AQUIFER
EXEMPTION BOUNDARY**



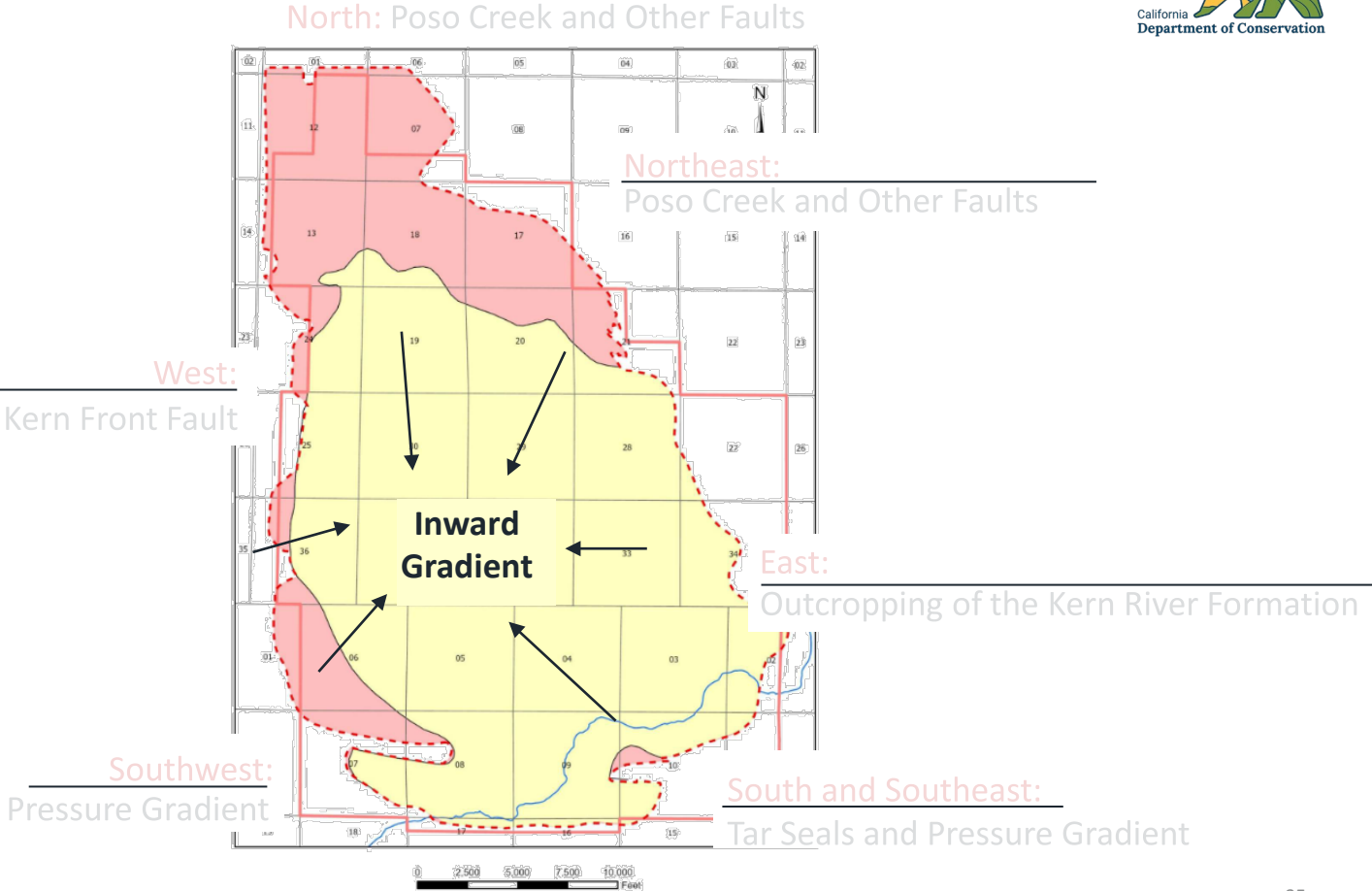
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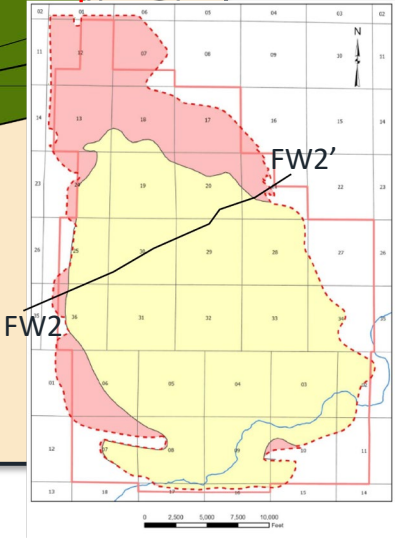
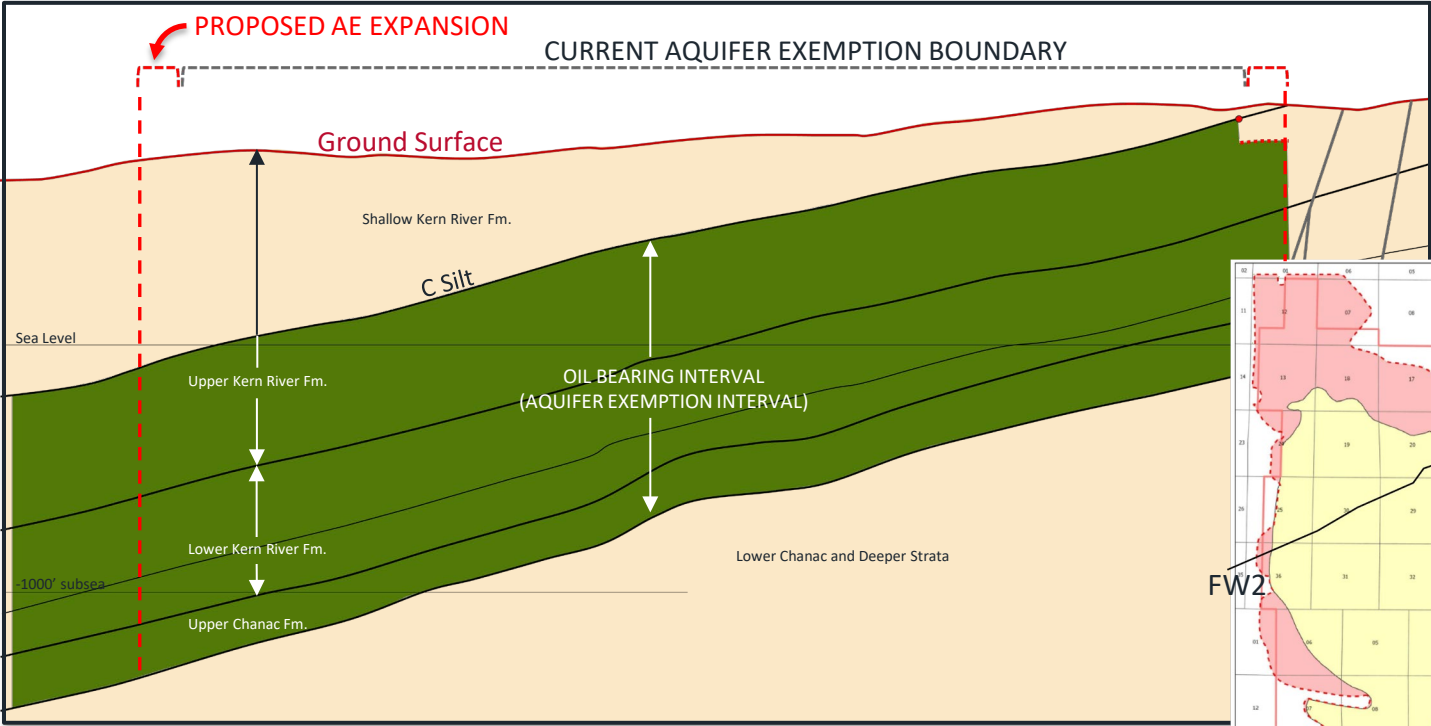


Exemption Proposal



FW2

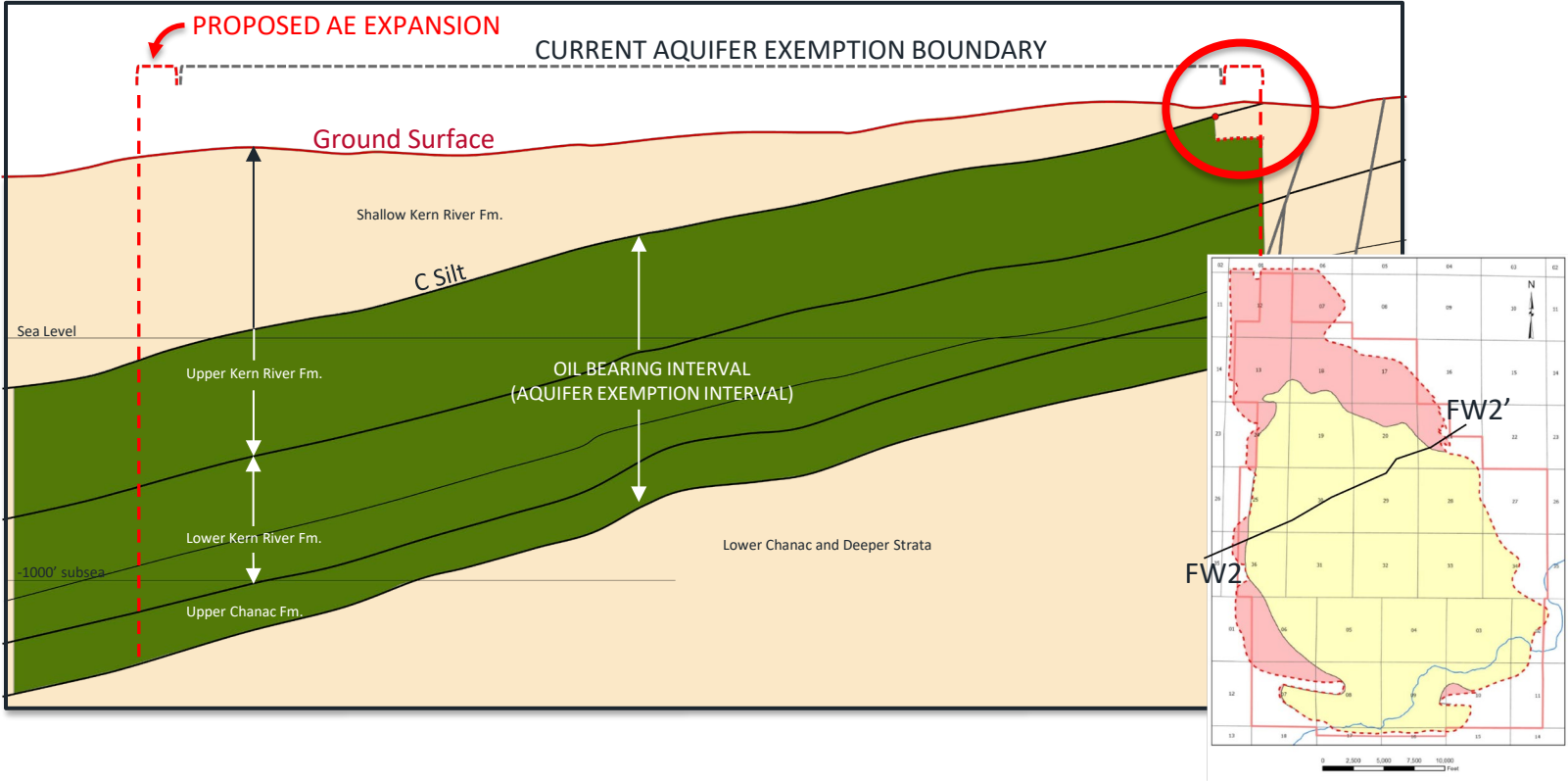
FW2'



Exemption Proposal

FW2

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Meets Exemption Criteria



Federal Exemption Criteria (40 CFR 146.4)

- A. The aquifer does not currently serve as a source of drinking water.
- B. The aquifer 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 operation to contain hydrocarbons that considering their quantity and location are expected to be commercially producible.

State Exemption Criteria (PRC 3131(a))

- 1. Criteria set forth in Section 146.4 of Title 40 of the Code of Federal Regulations.
- 2. The injection of fluids will not affect the quality of water that is, or may reasonably be, used for any beneficial use.
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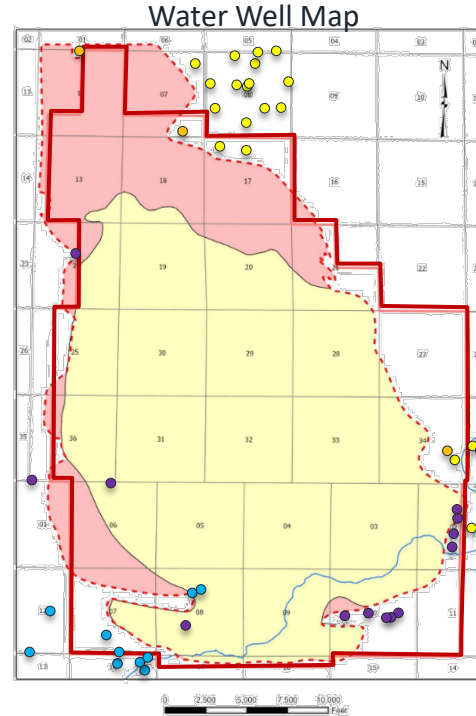
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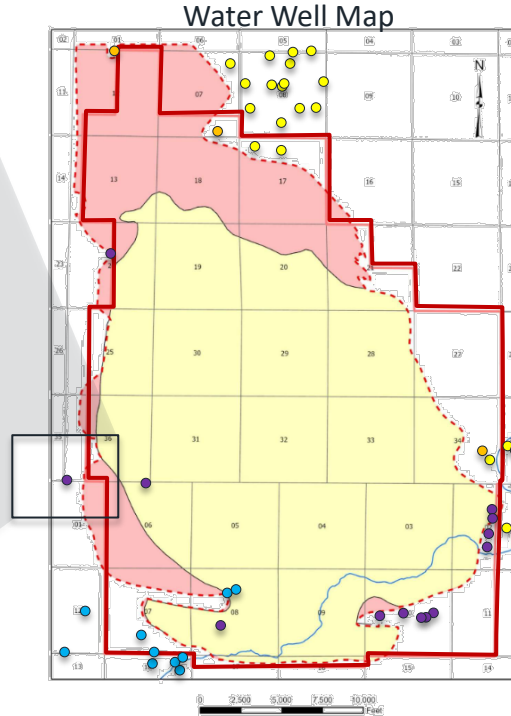
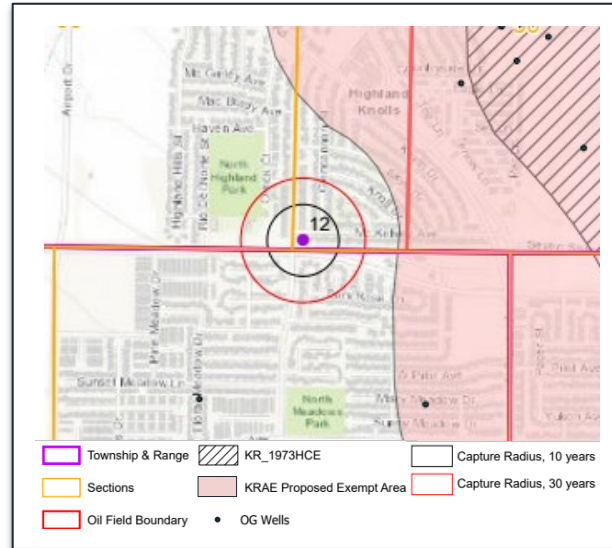
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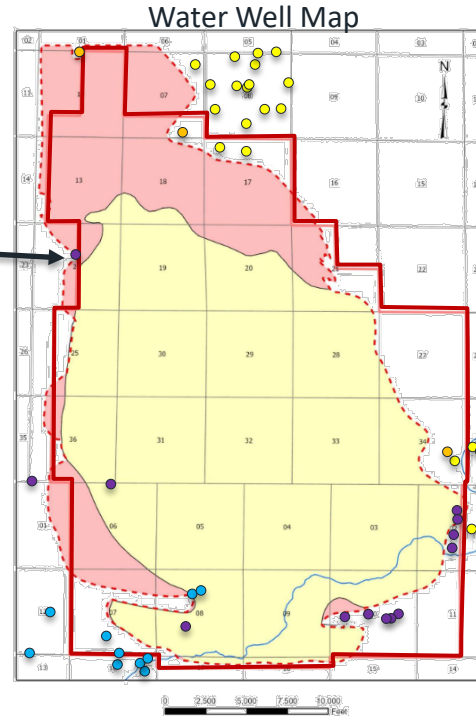
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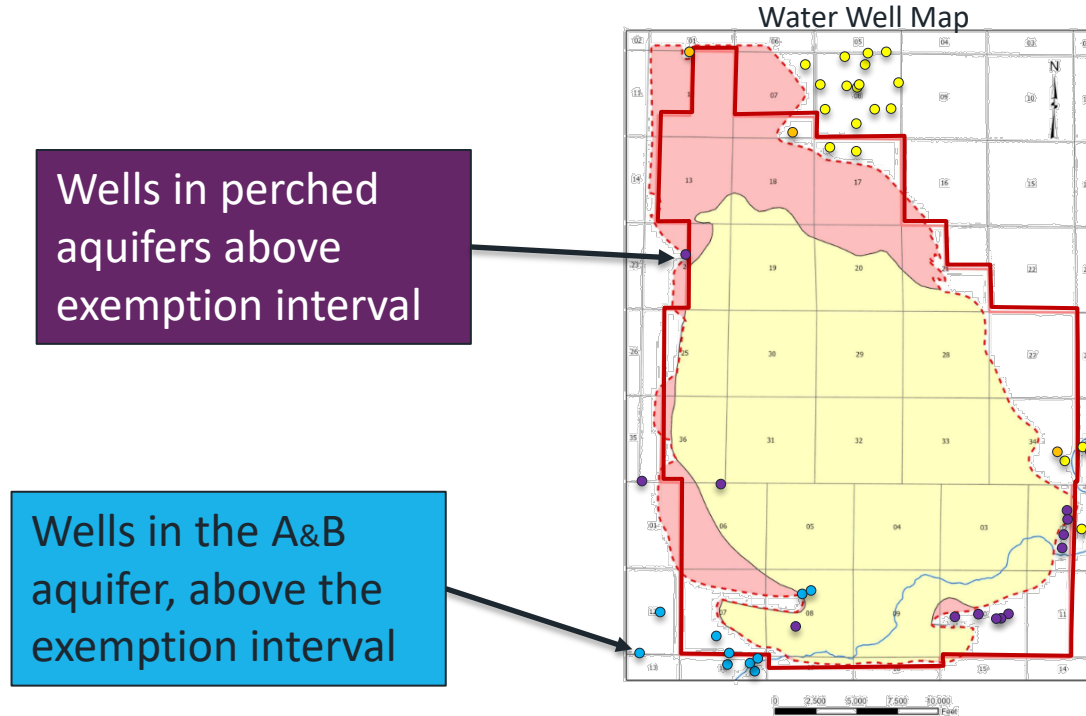
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Wells in perched
aquifers above
exemption interval



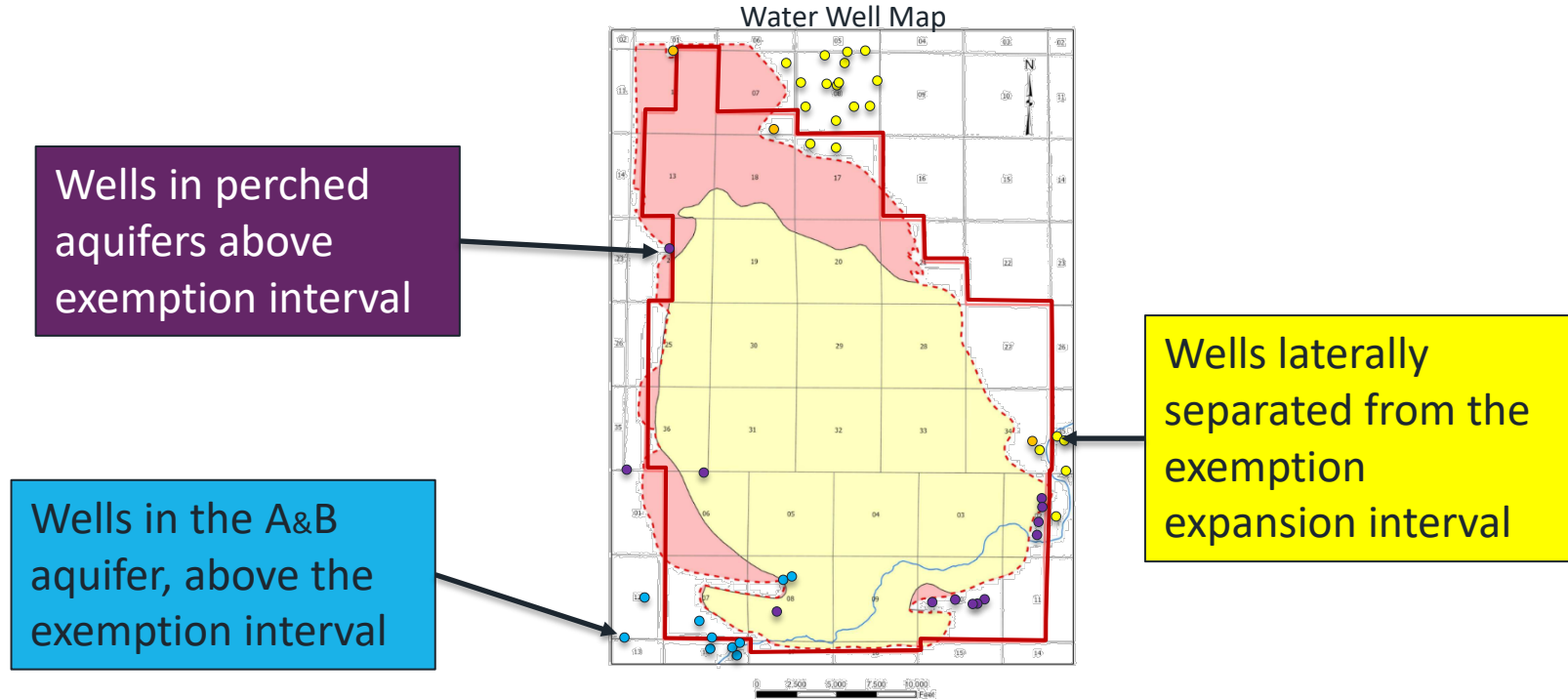
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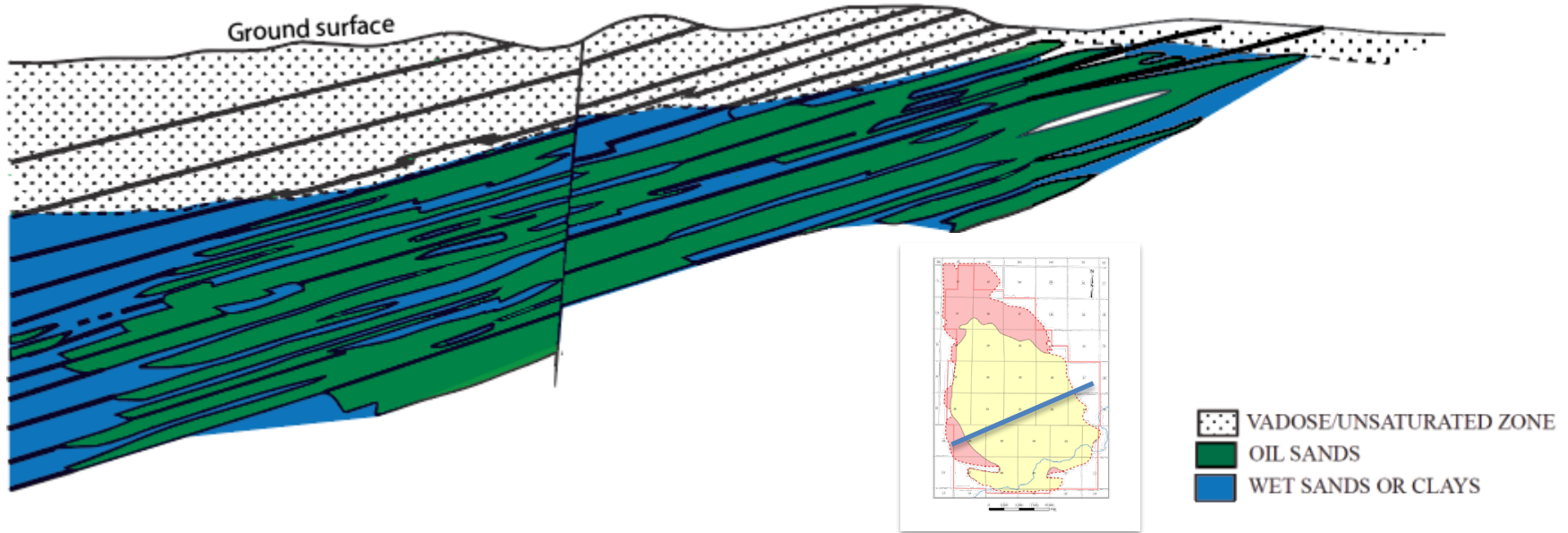
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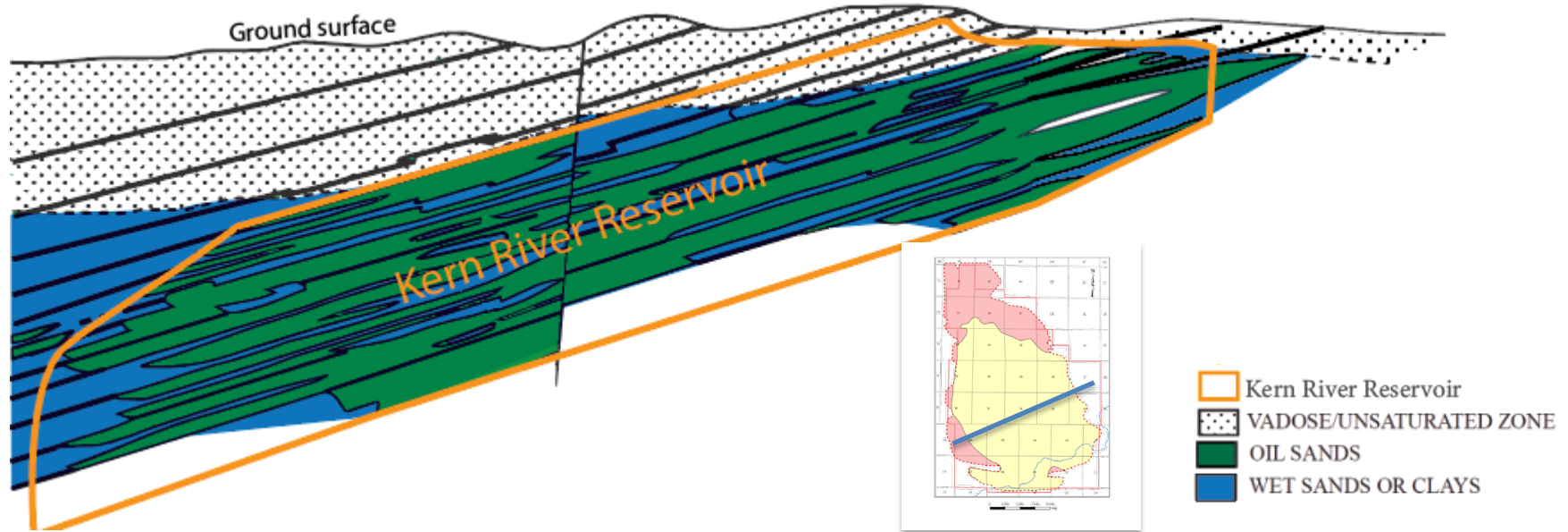
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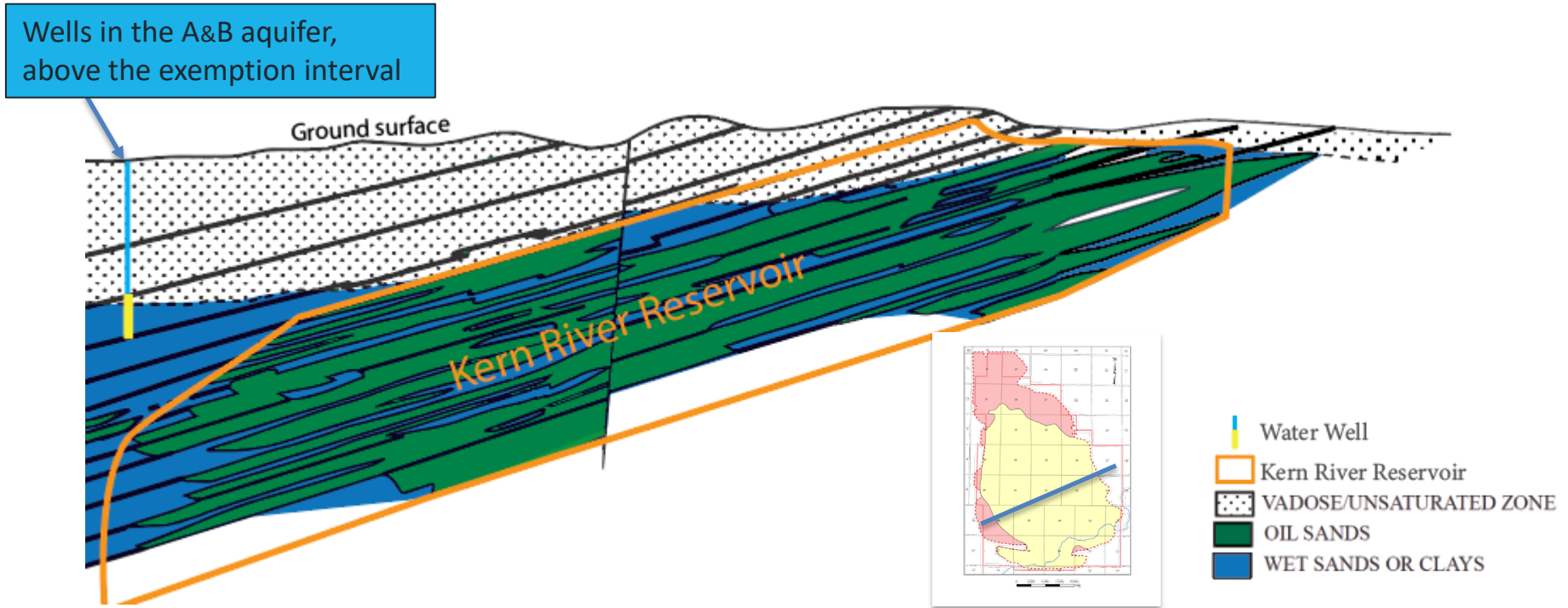
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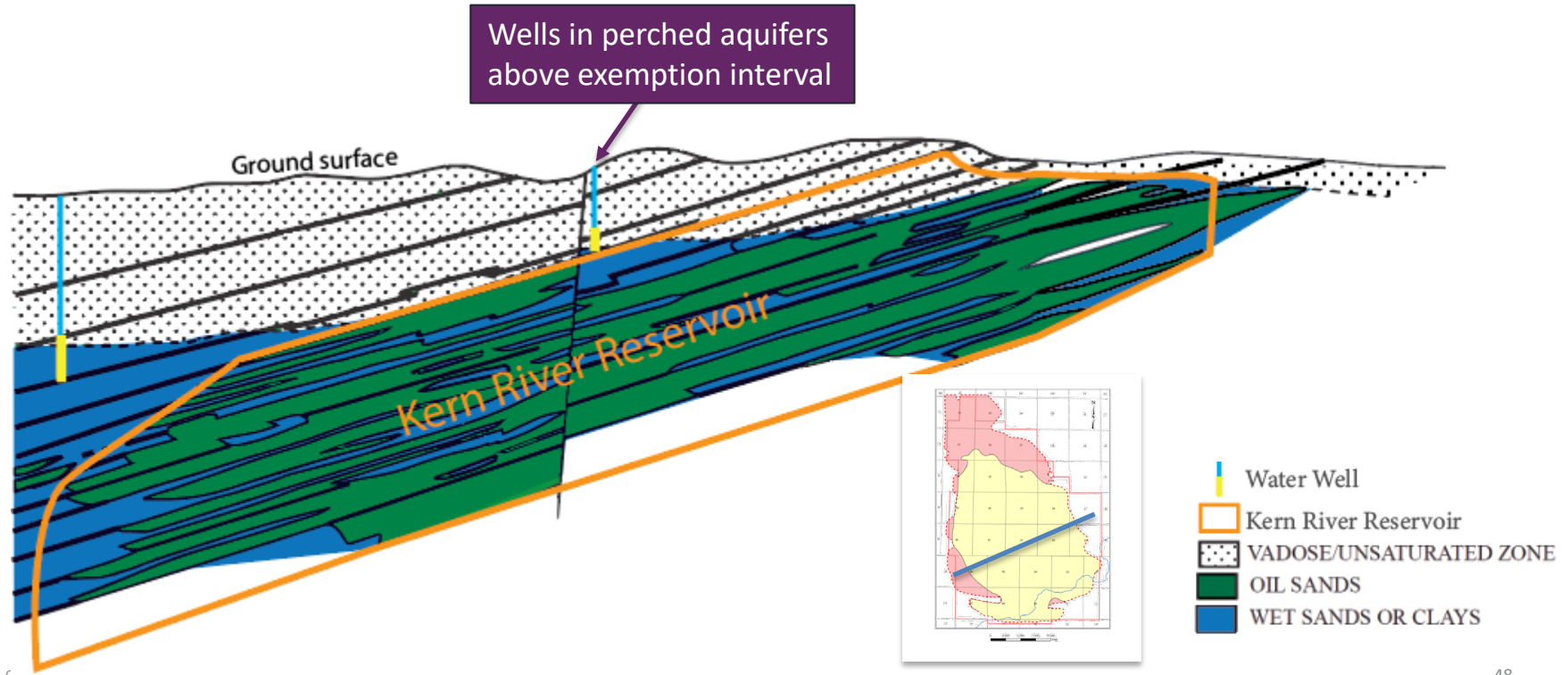
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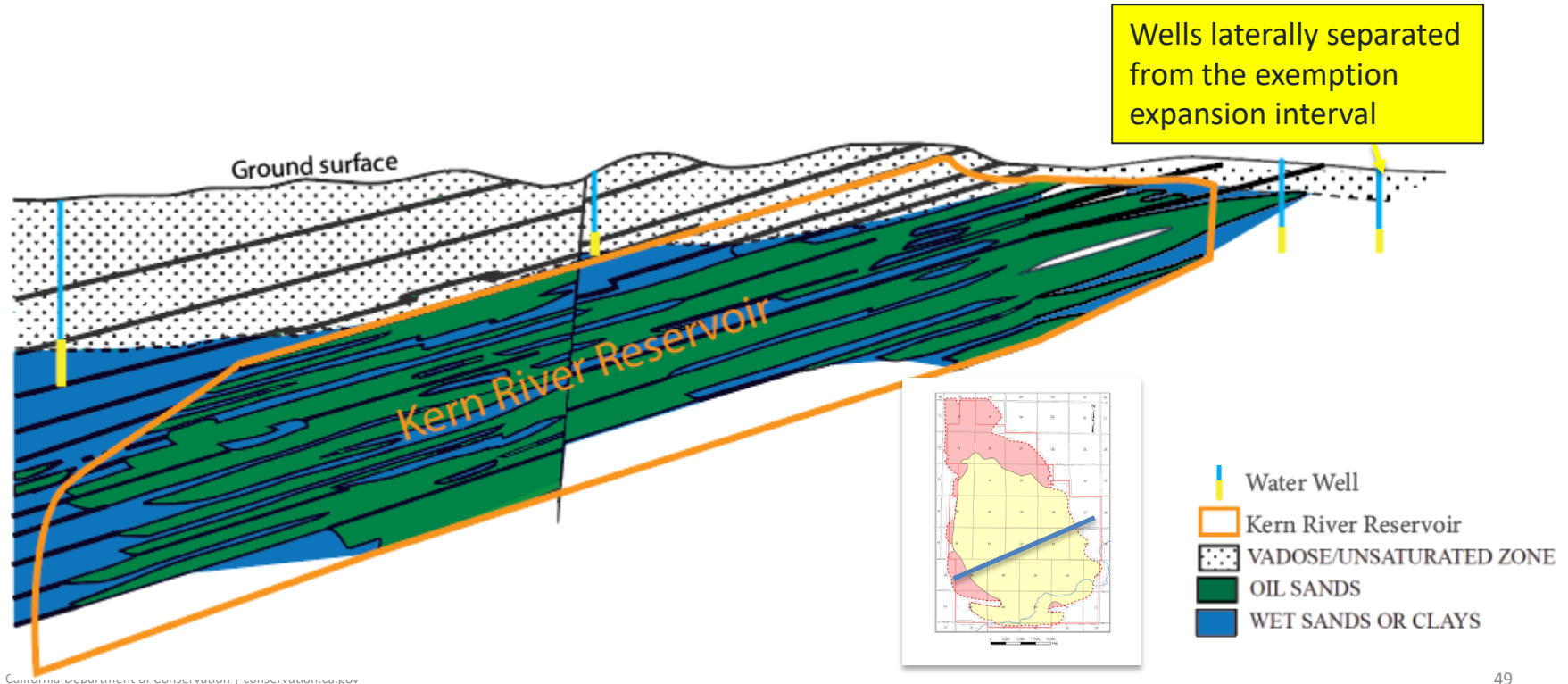
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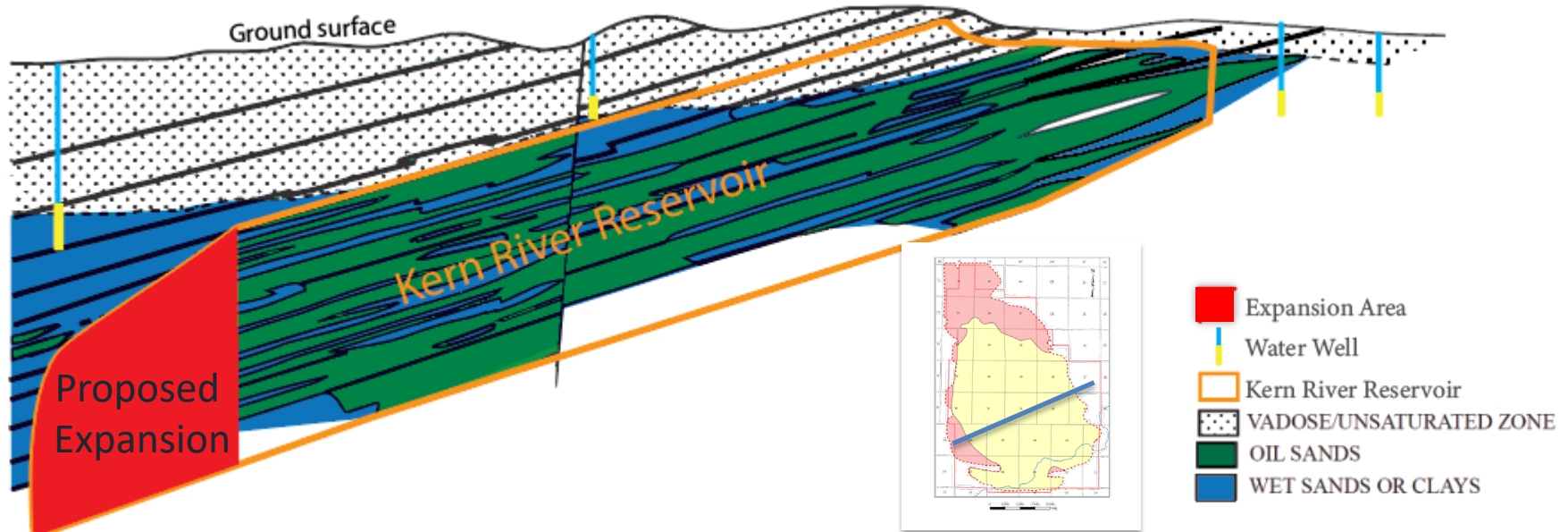
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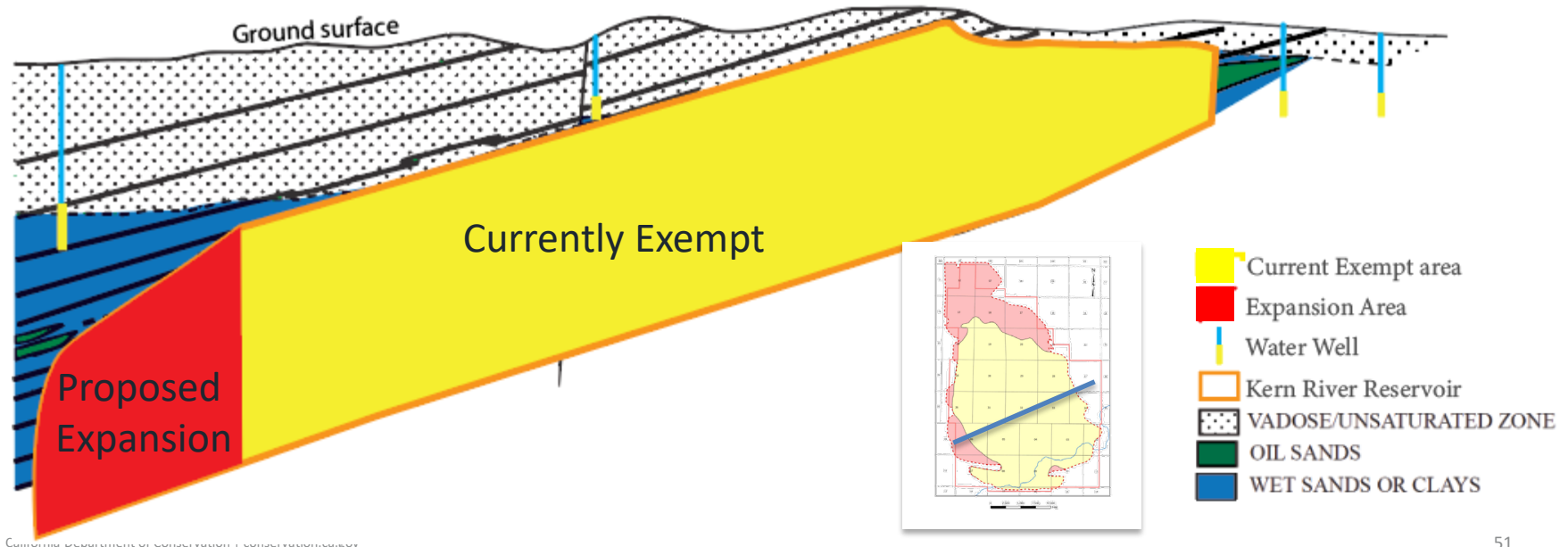
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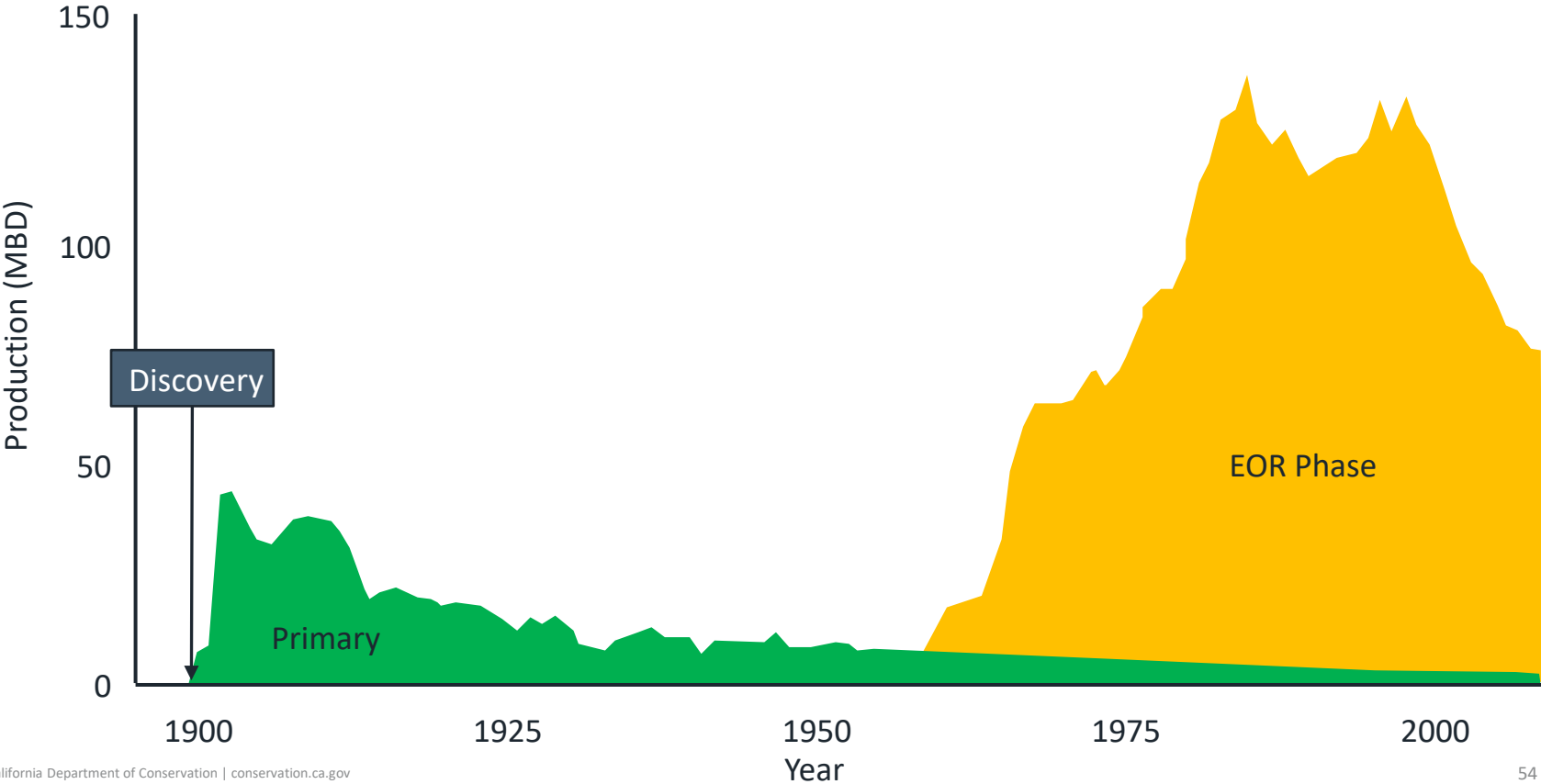
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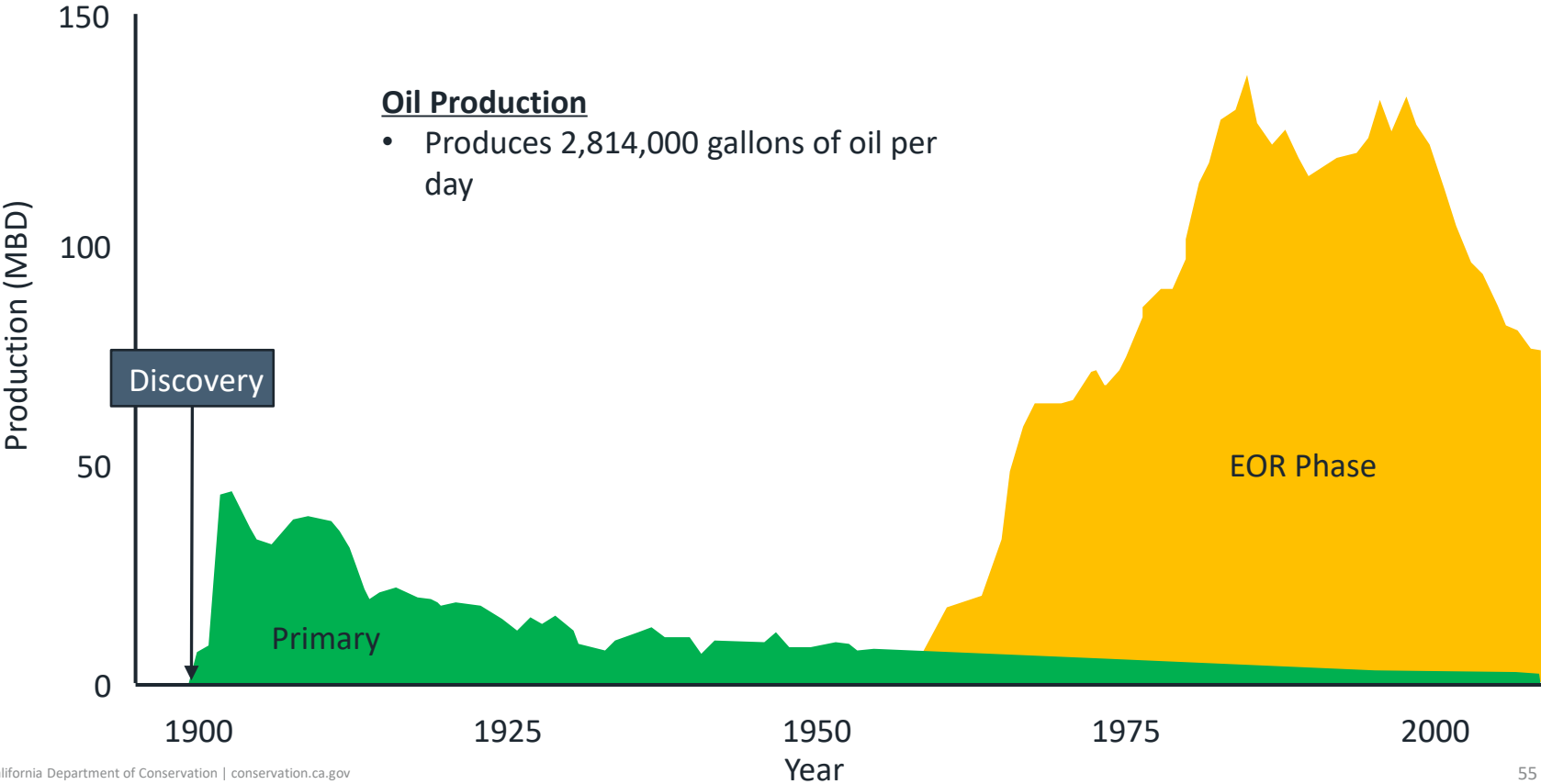


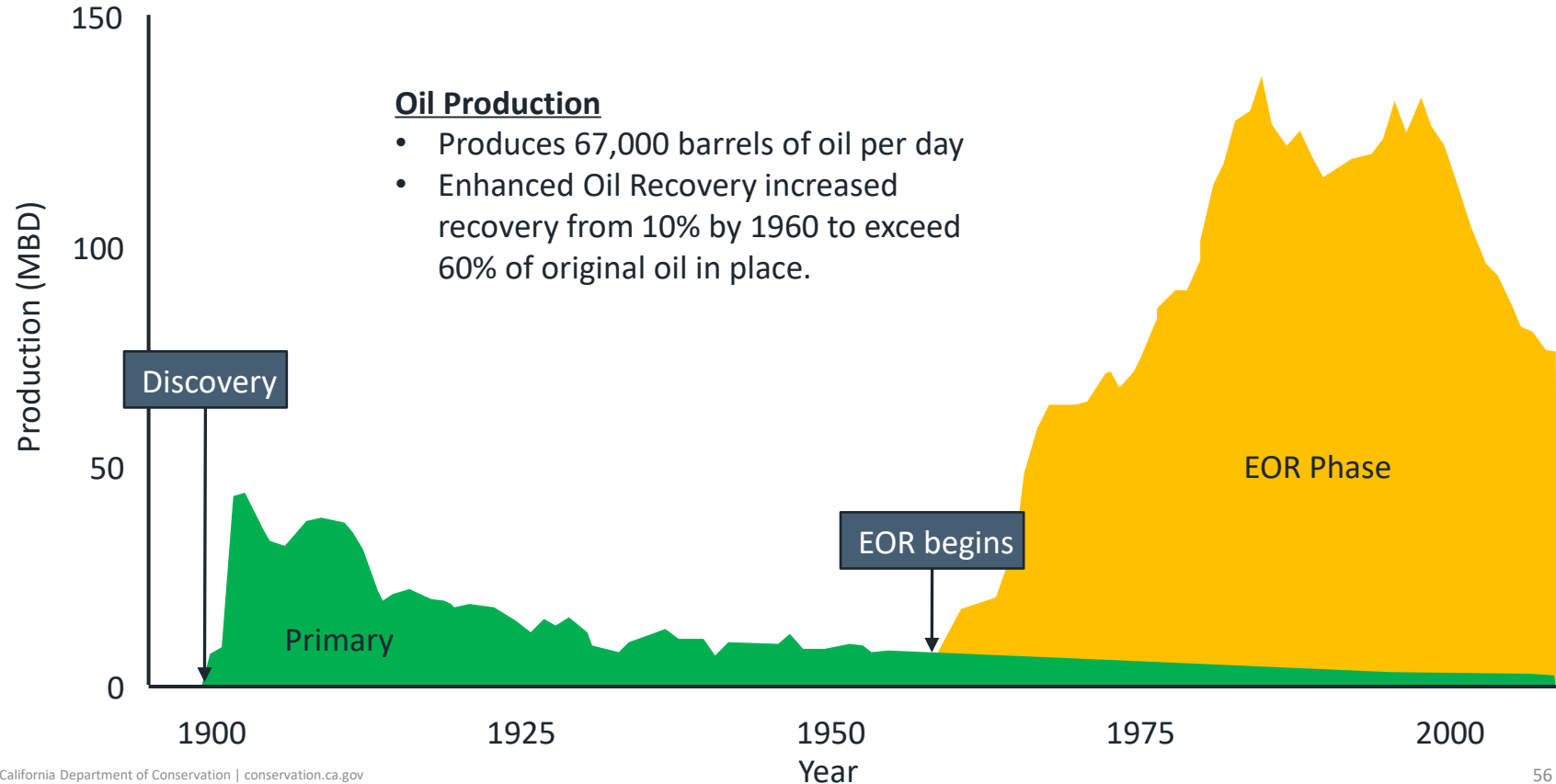
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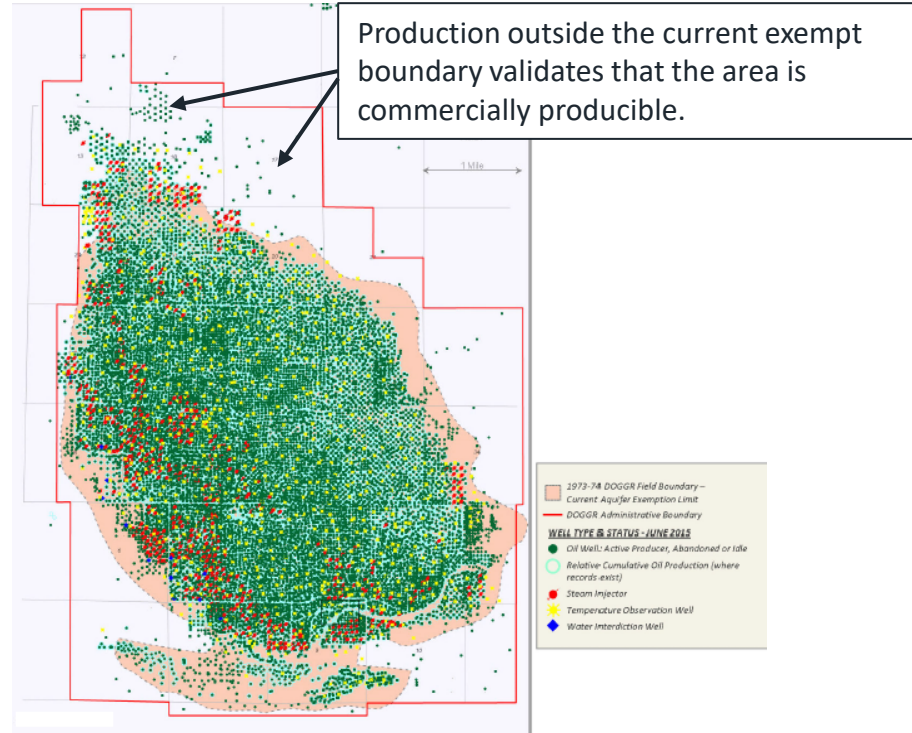






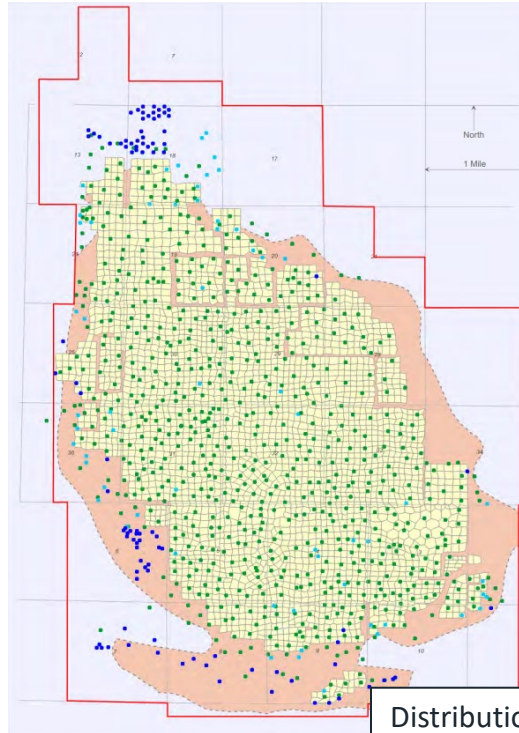
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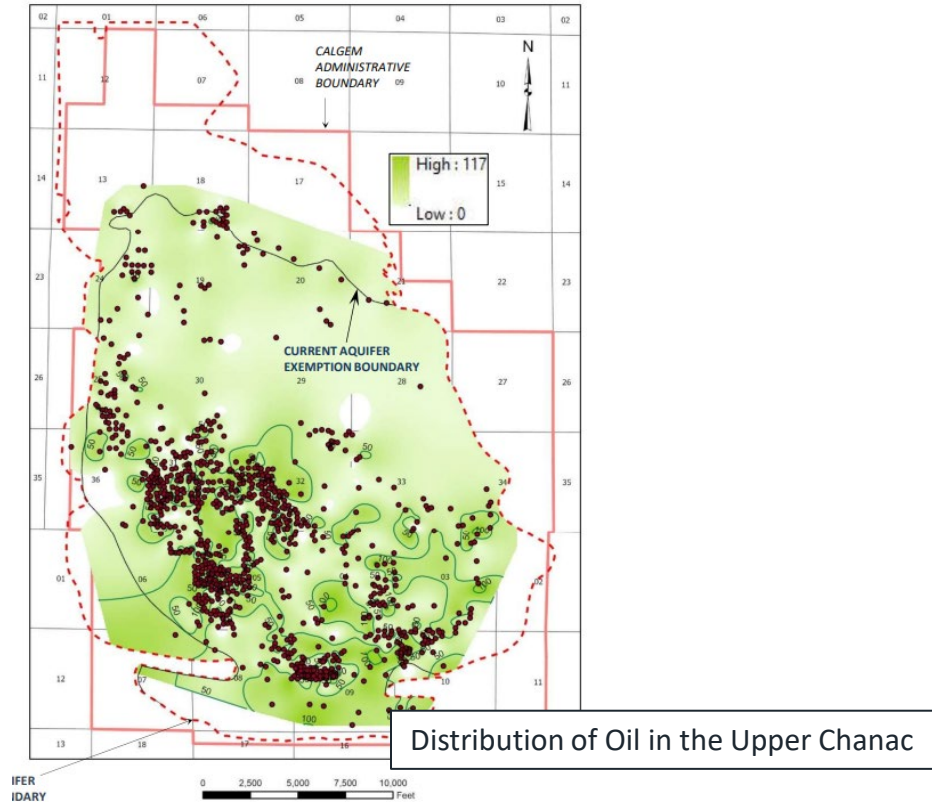


Distribution of Oil Saturation Data

Meets Federal Exemption Criteria

40 CFR 146.4 (b1): Hydrocarbons can be commercially producible from the formation.

Thickness of SODIF > 0.0 ft. in Upper Chanac



Meets Exemption Criteria



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State Exemption Criteria (PRC 3131(a))

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PRC 3131 (a)(2): The injection fluid will not affect the quality of beneficial use water

- Currently produced water is contaminated by naturally occurring hydrocarbons.



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 - Water meets quality criteria established by RWQCB Order R5-2012-0058.



Meets State Exemption Criteria

PRC 3131 (a)(2): The injection fluid will not affect the quality of beneficial use water

- Recent water quality samples, when compared to historical water quality data, show that the overall water quality has not been degraded over the past 20-25 years of injection operations.



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- Water wells up to $\frac{1}{4}$ mile beyond the extended aquifer exemption boundary have not been degraded by oilfield operations.
- Due to the necessitated freshness of injected water for EOR, continued EOR is not expected to impact nearby water quality.



Meets Exemption Criteria



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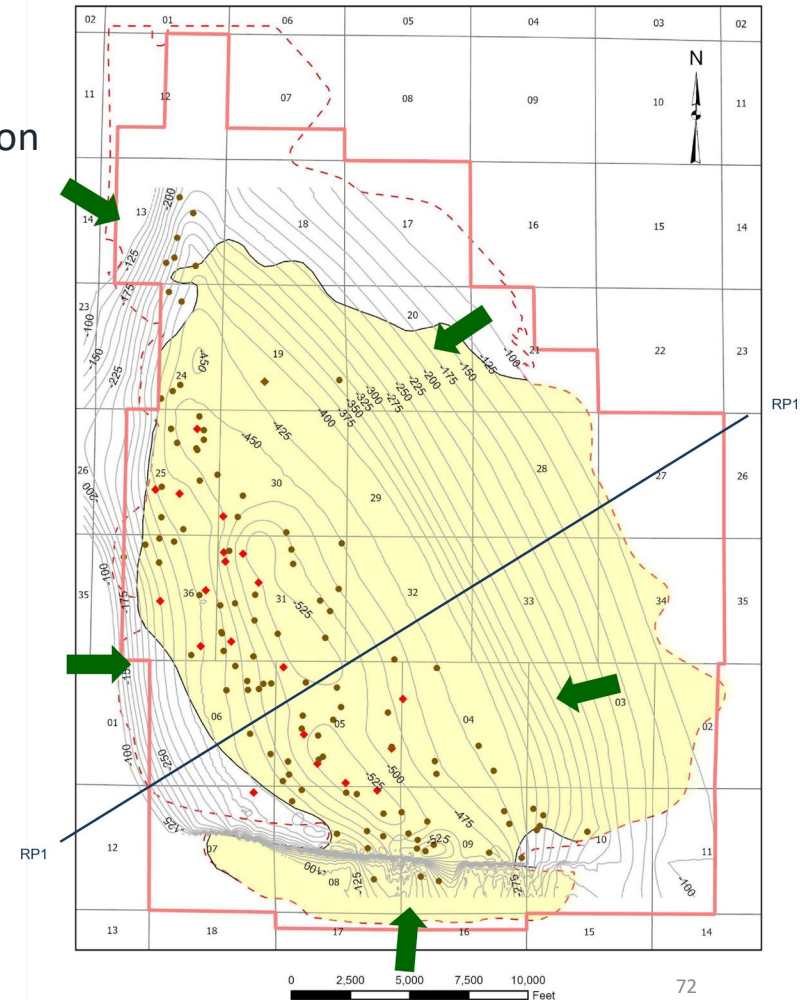
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PRC 3131 (a)(3): The injection fluid will remain in the portion of the aquifer that would be exempted.

The Kern River Reservoir is hydraulically separated from those areas outside the exemption proposal.

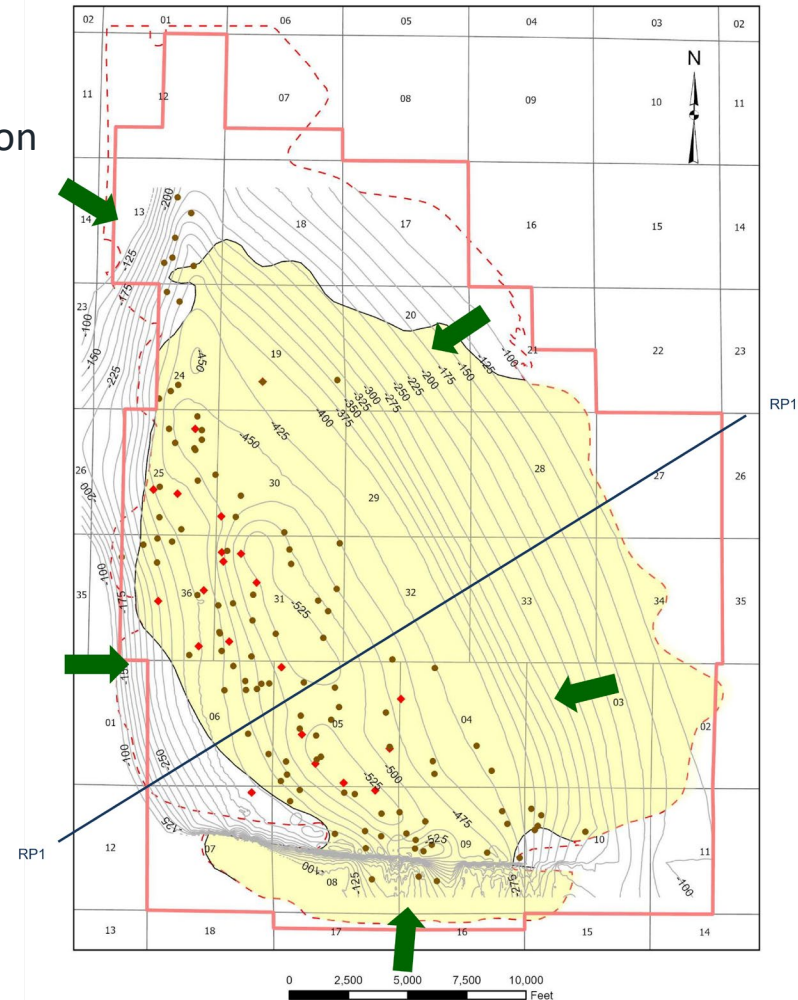


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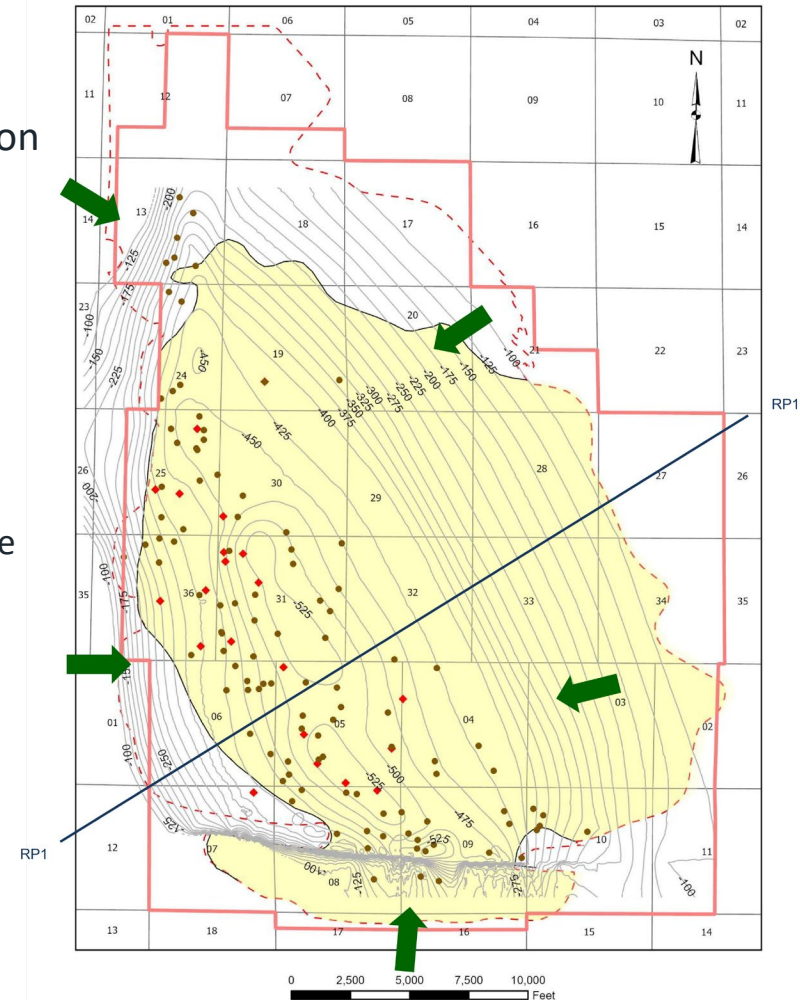


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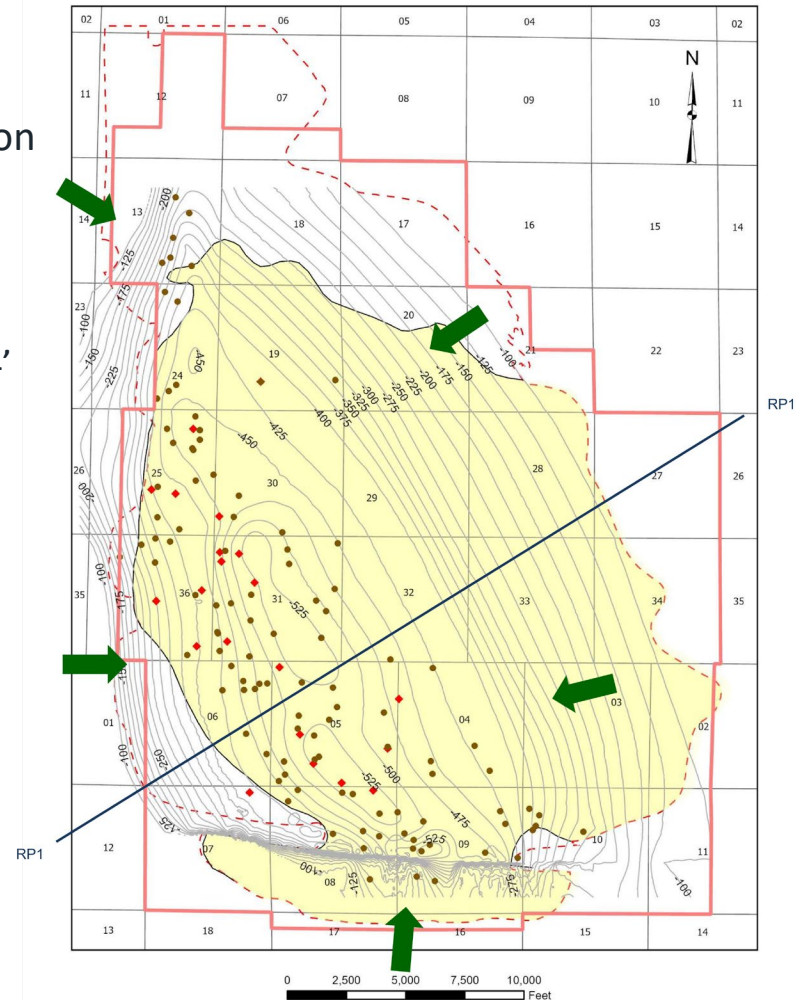
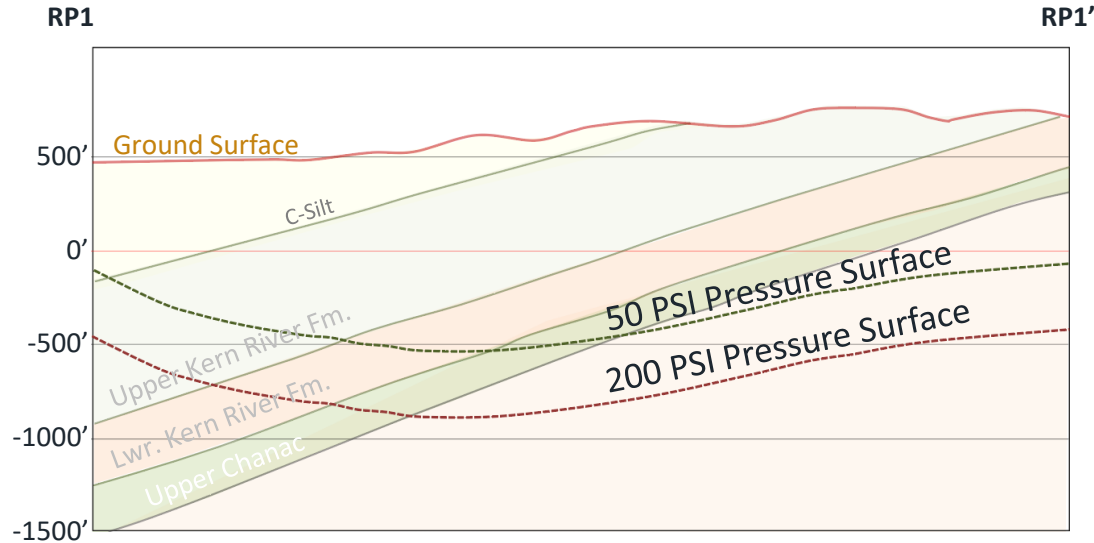
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- Additional measures of hydraulic containment include the Kern Front Fault, the China Grade Fault and the Gun Club Fault, Poso Creek Fault; and by the outcropping of the Kern River Formation;



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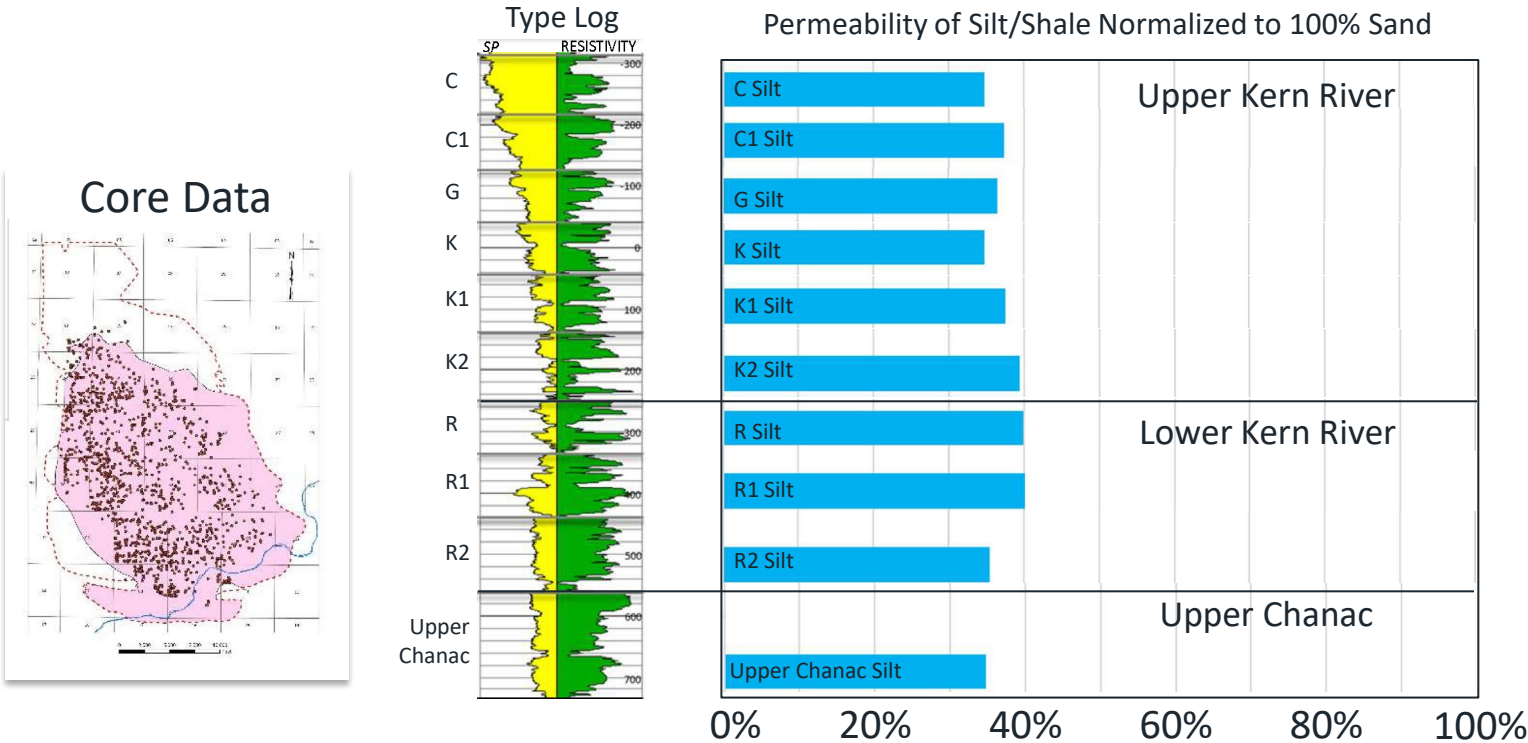
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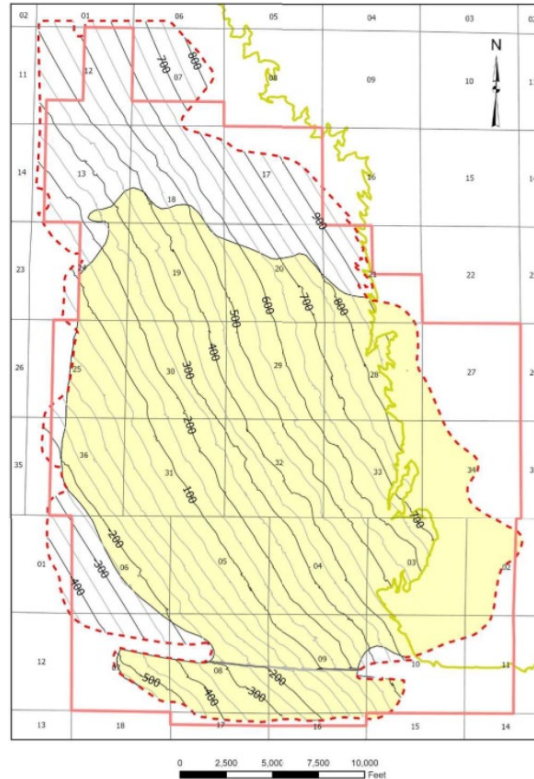
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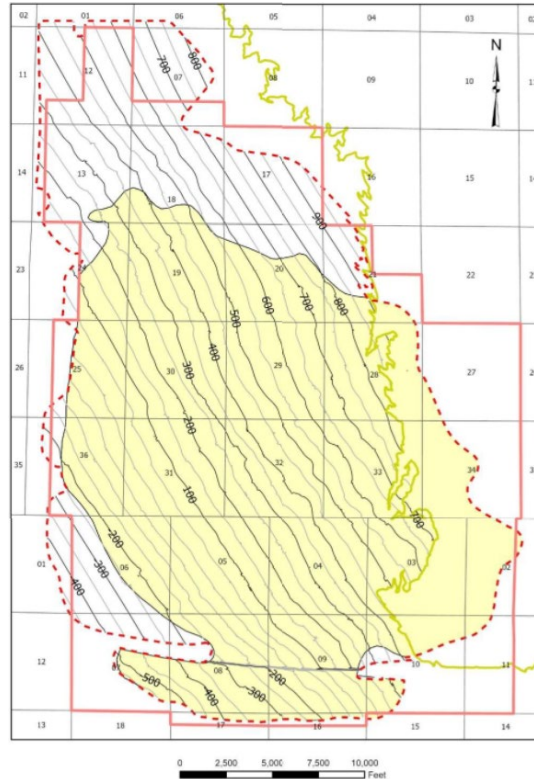
Structure Map of the C-Silt



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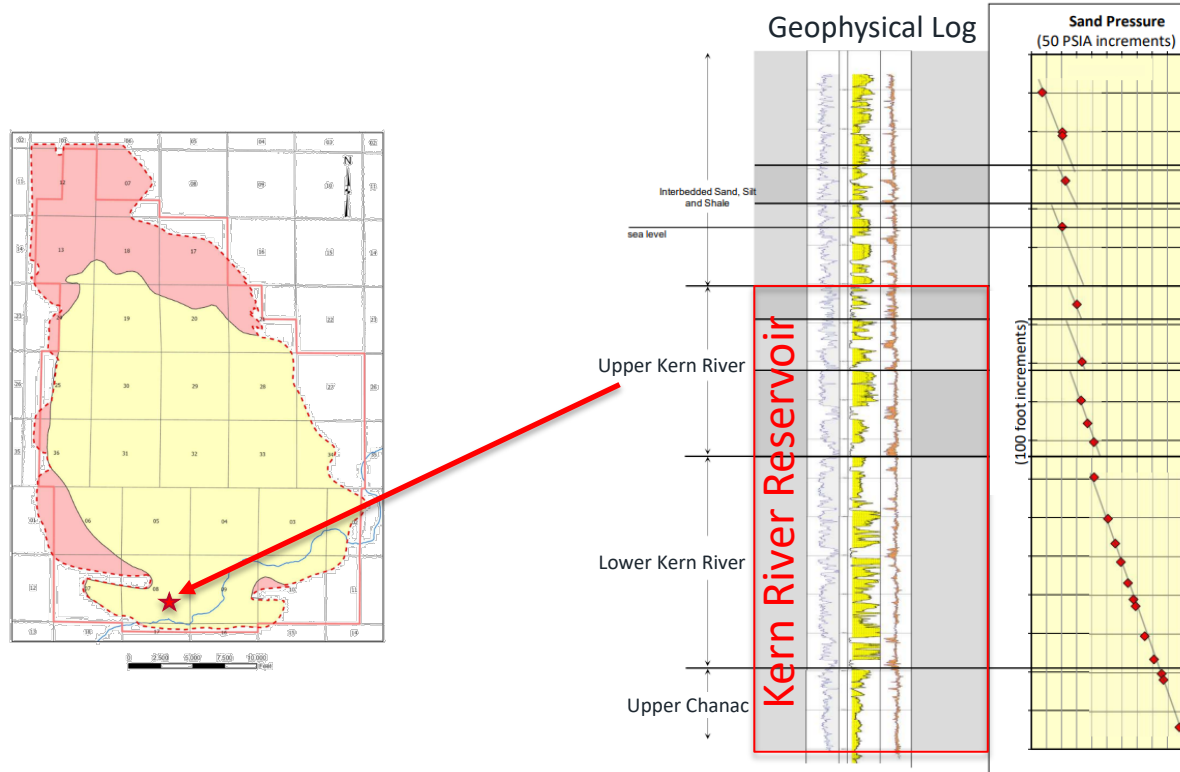
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The C-Silt is the upper most siltstone that caps the reservoir and separates the Kern River Reservoir from the water wells in the overlying aquifers.

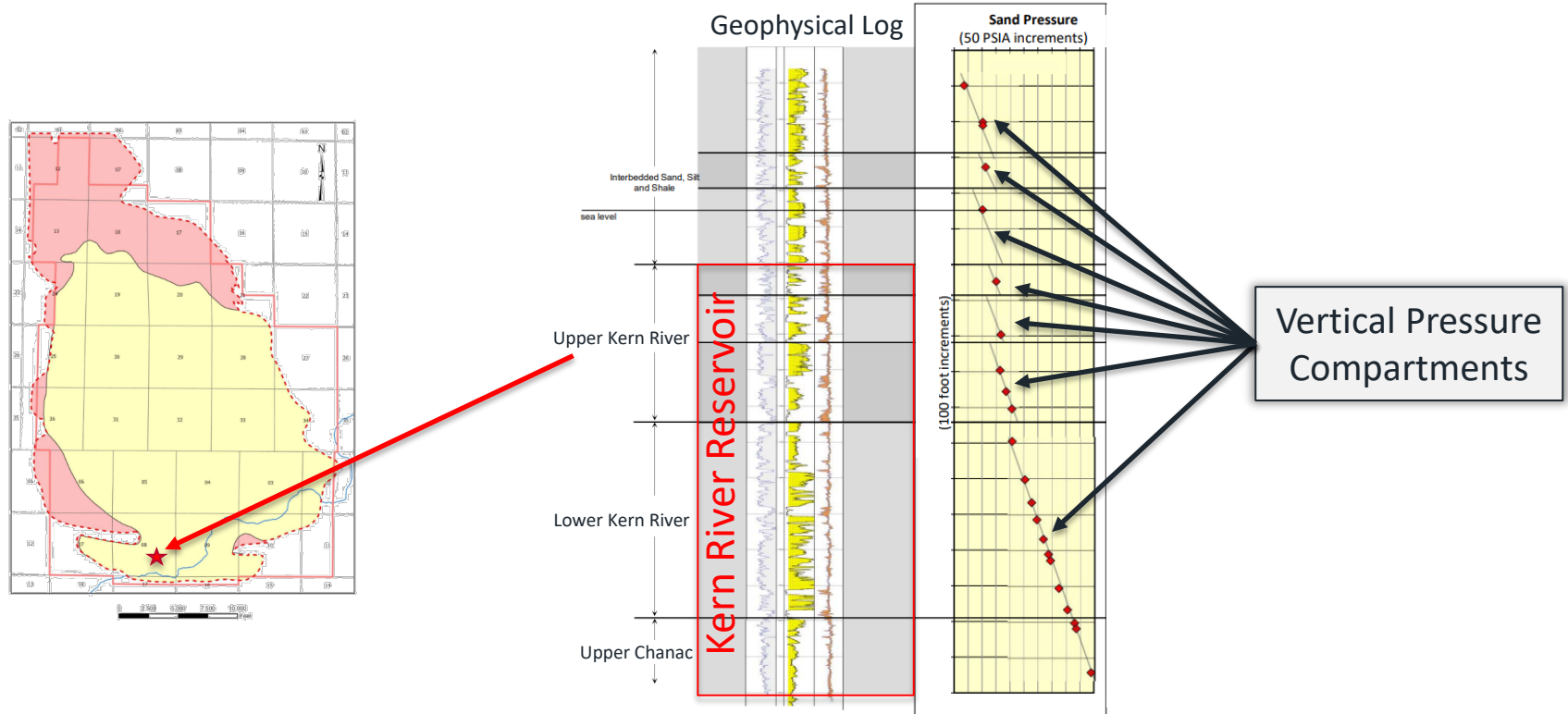
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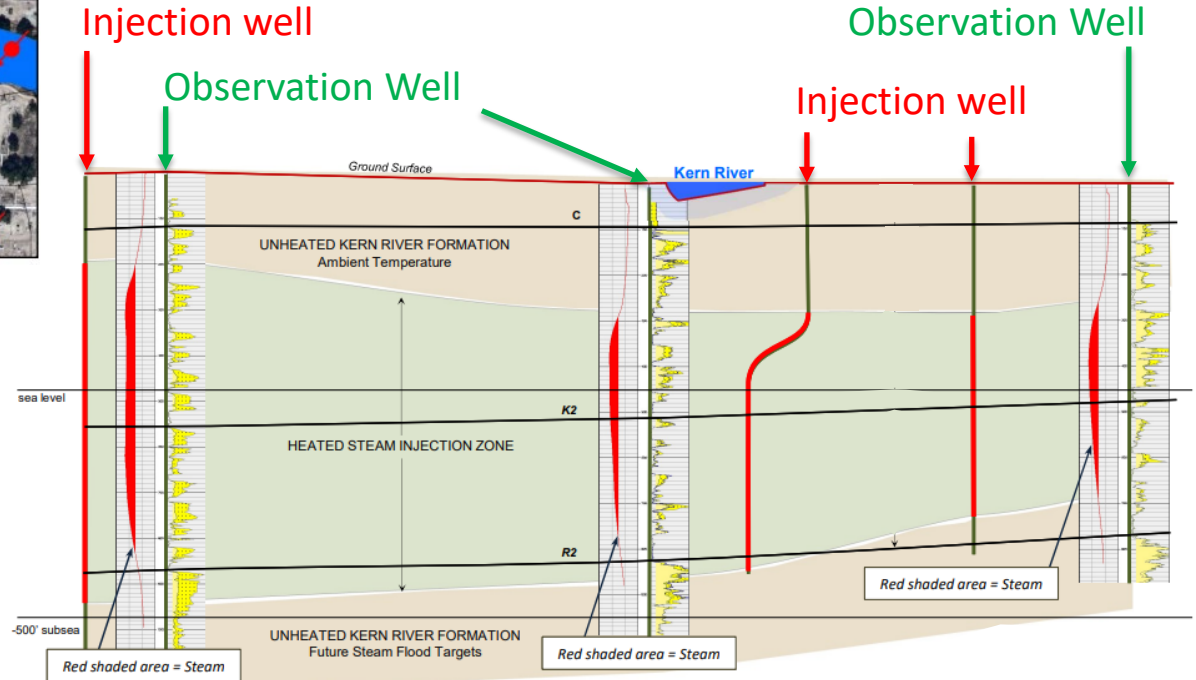
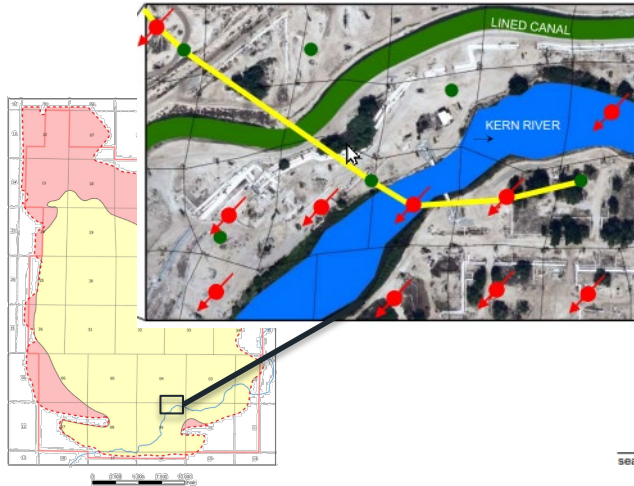
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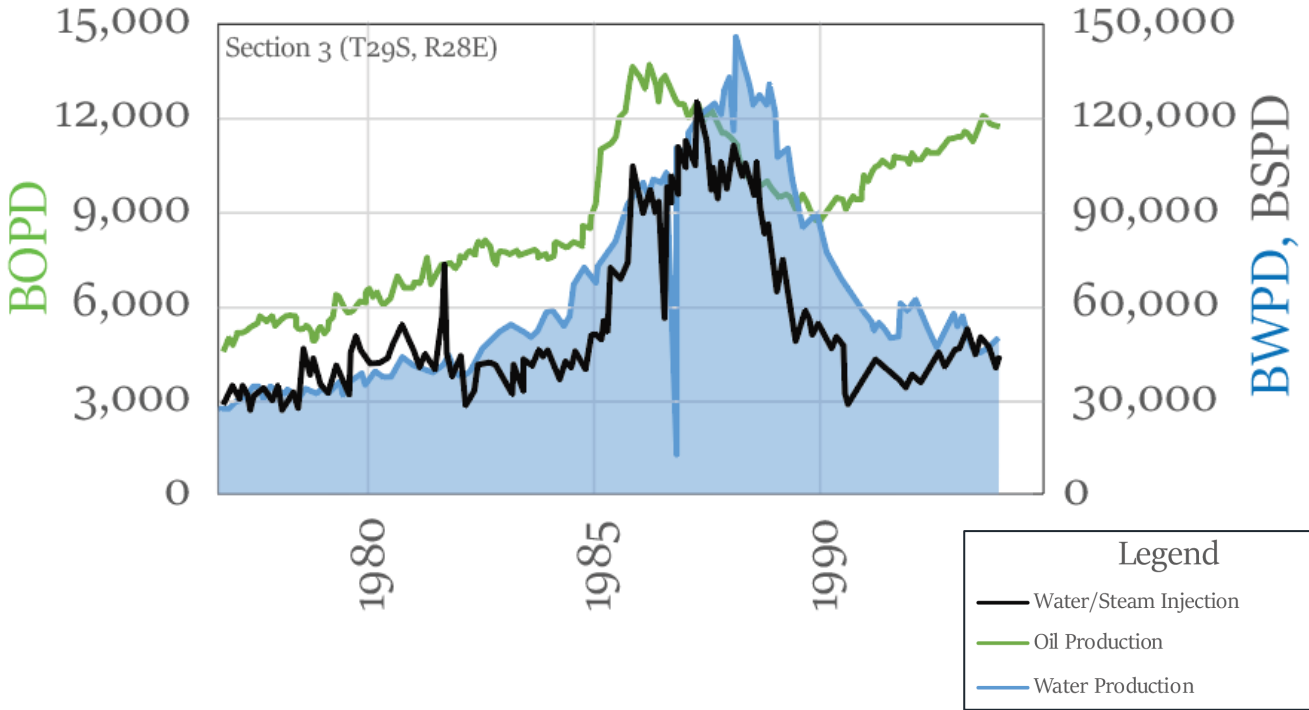
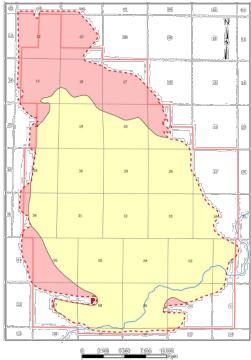
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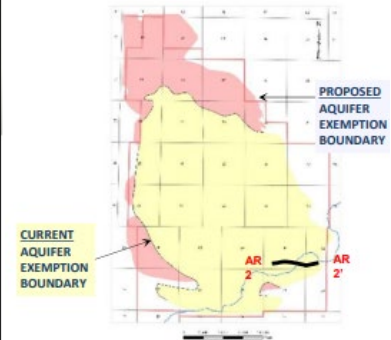
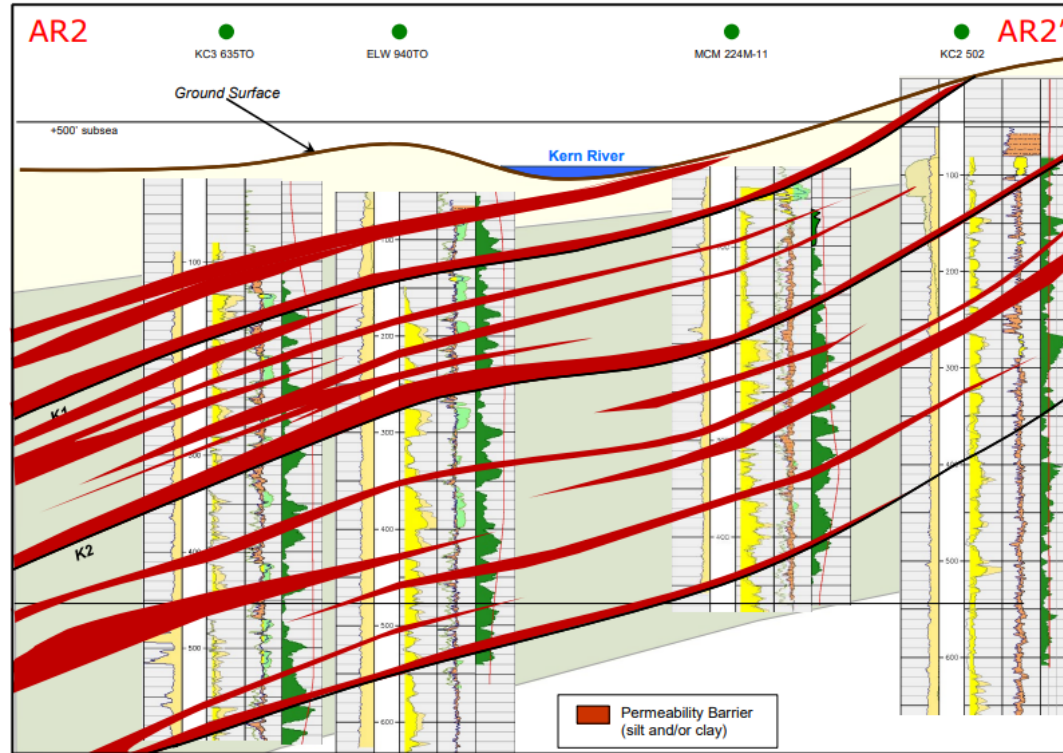


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Questions?