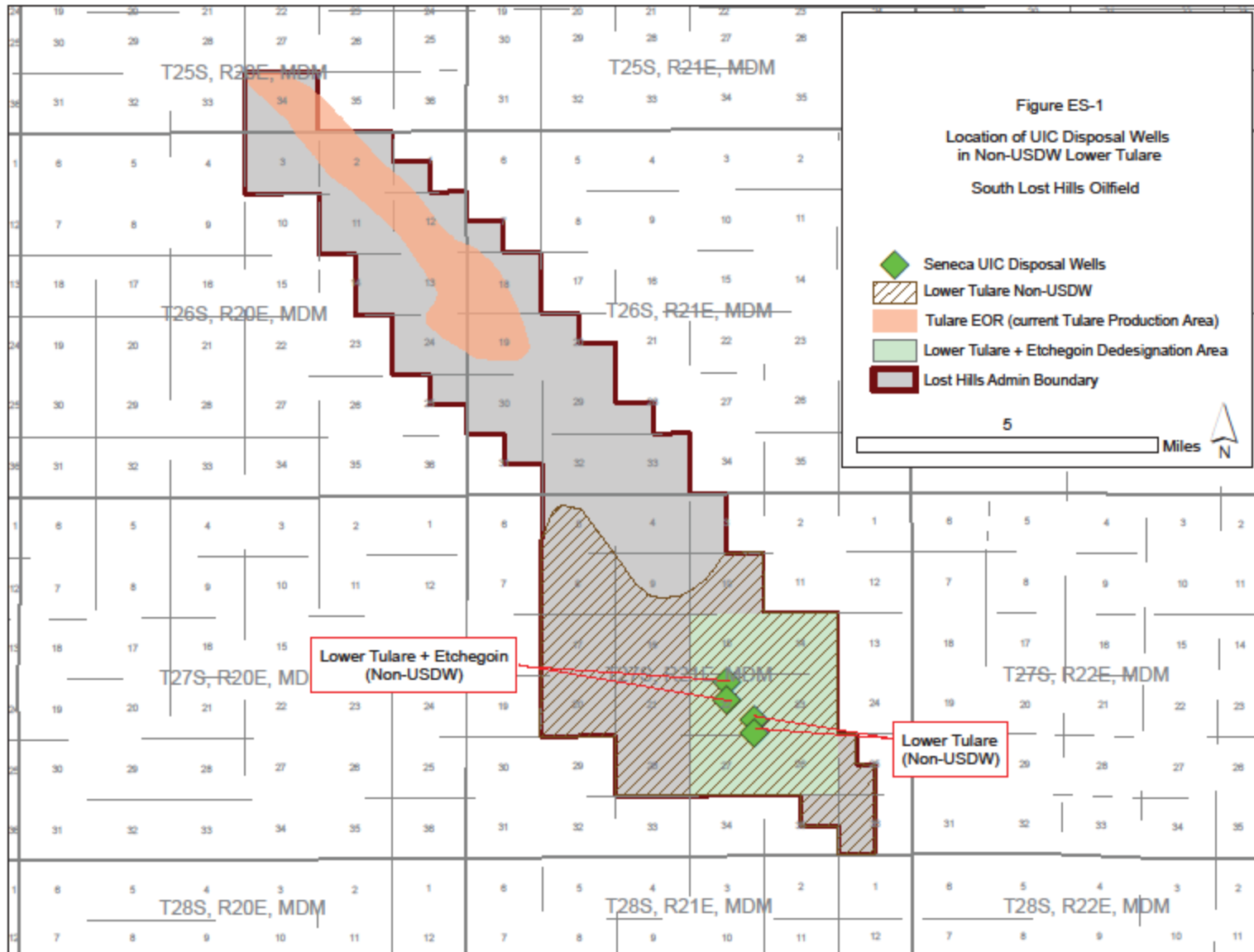
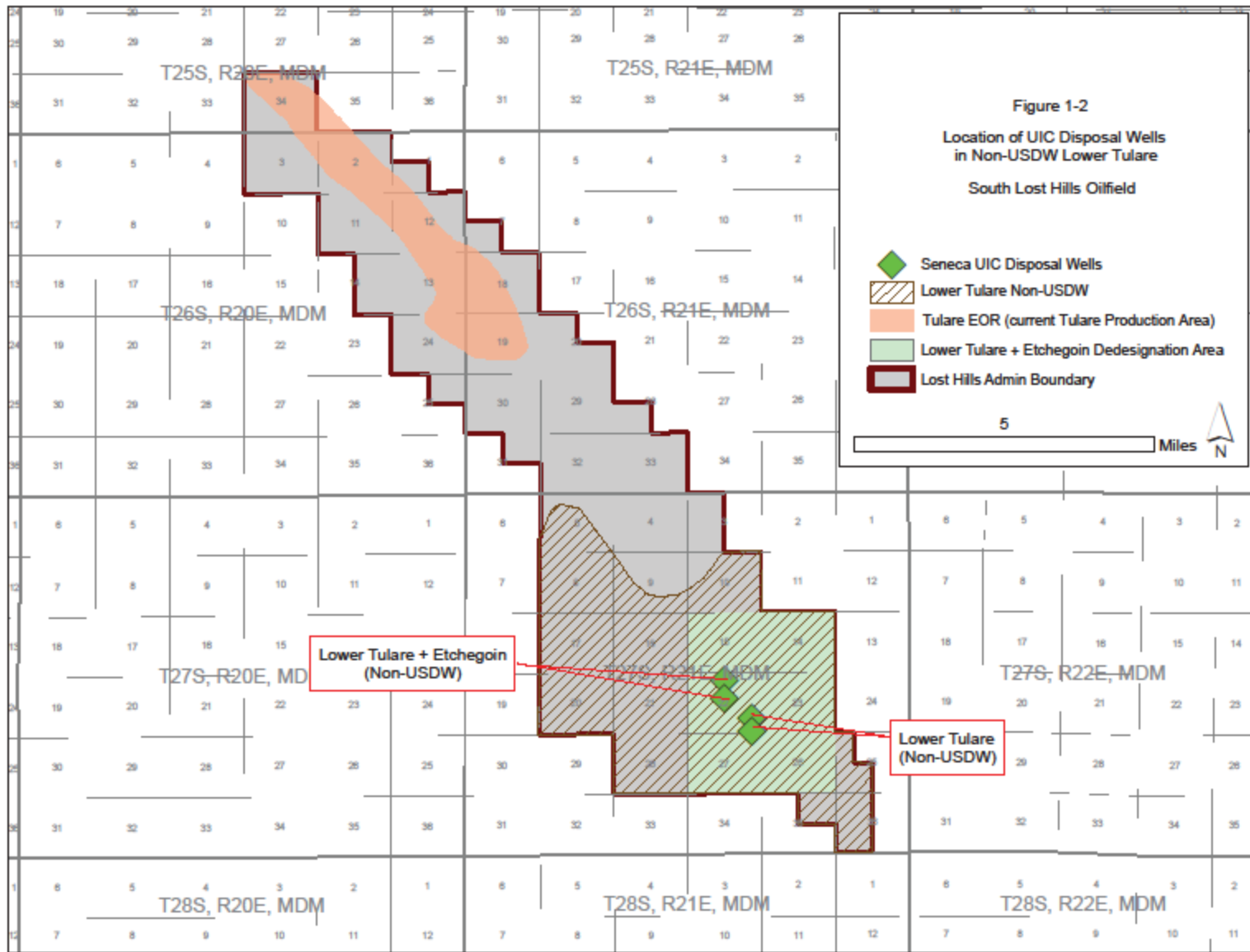


Figures for Southern Lost Hills Oilfield BPA Draft Staff Report





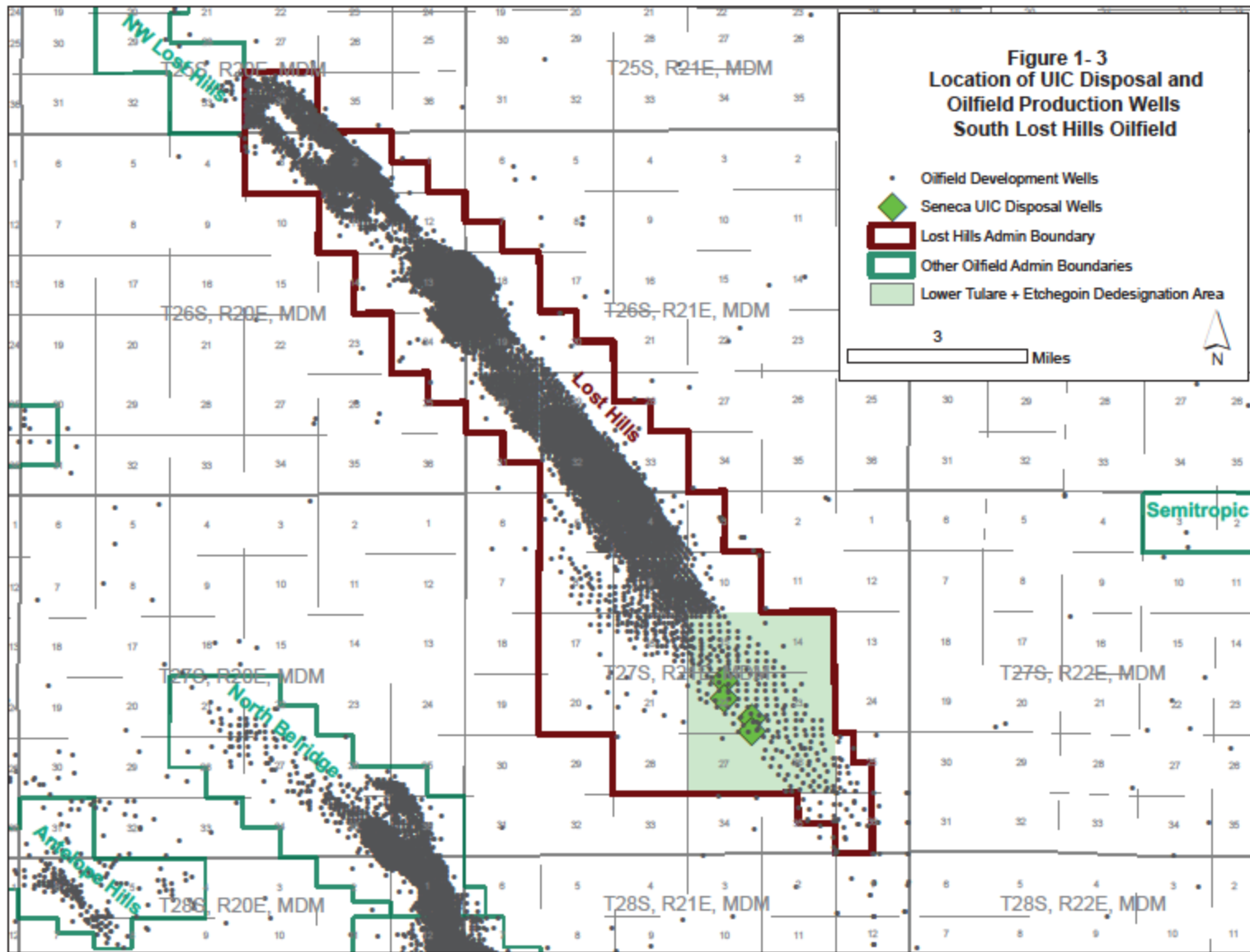
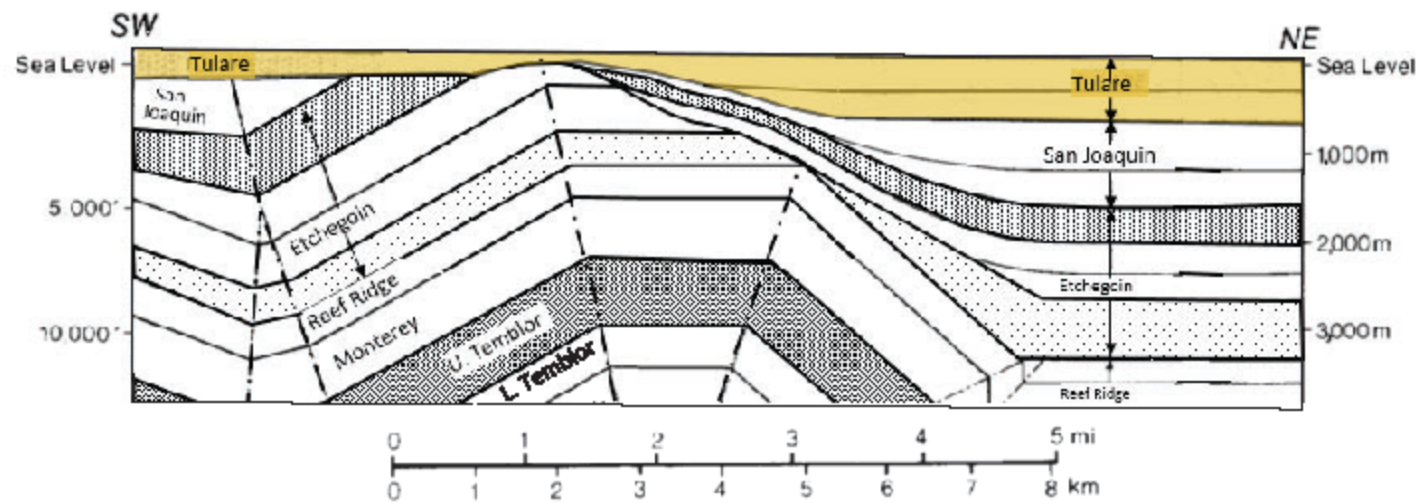


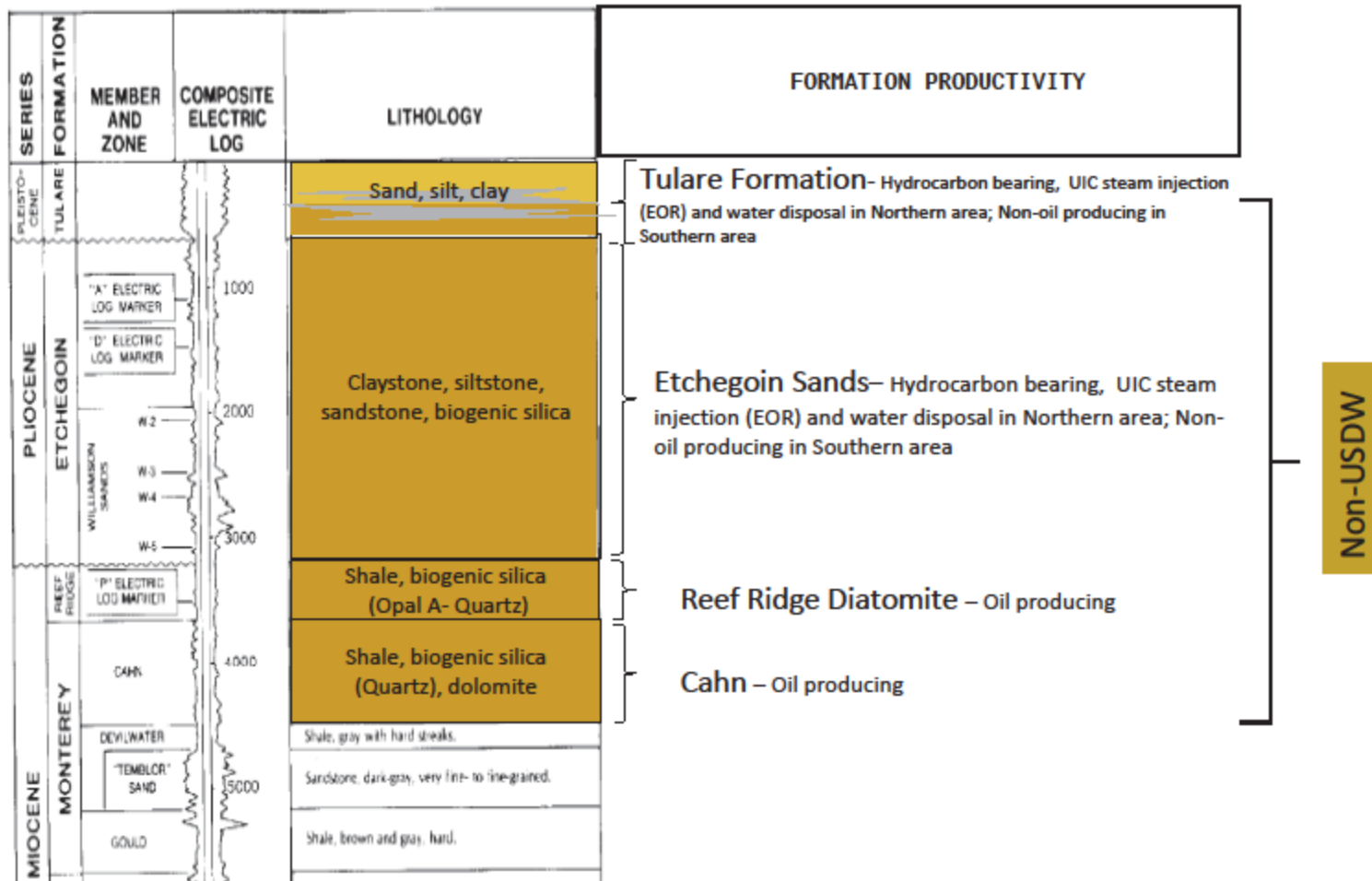
Figure 1-4 : Structural Cross-Section Over Lost Hills Anticline



- Asymmetric fold with erosion of Etchegoin and San Joaquin Formations with eastward deposition of Tulare Formation thinning onto the structure and thickening to the east.

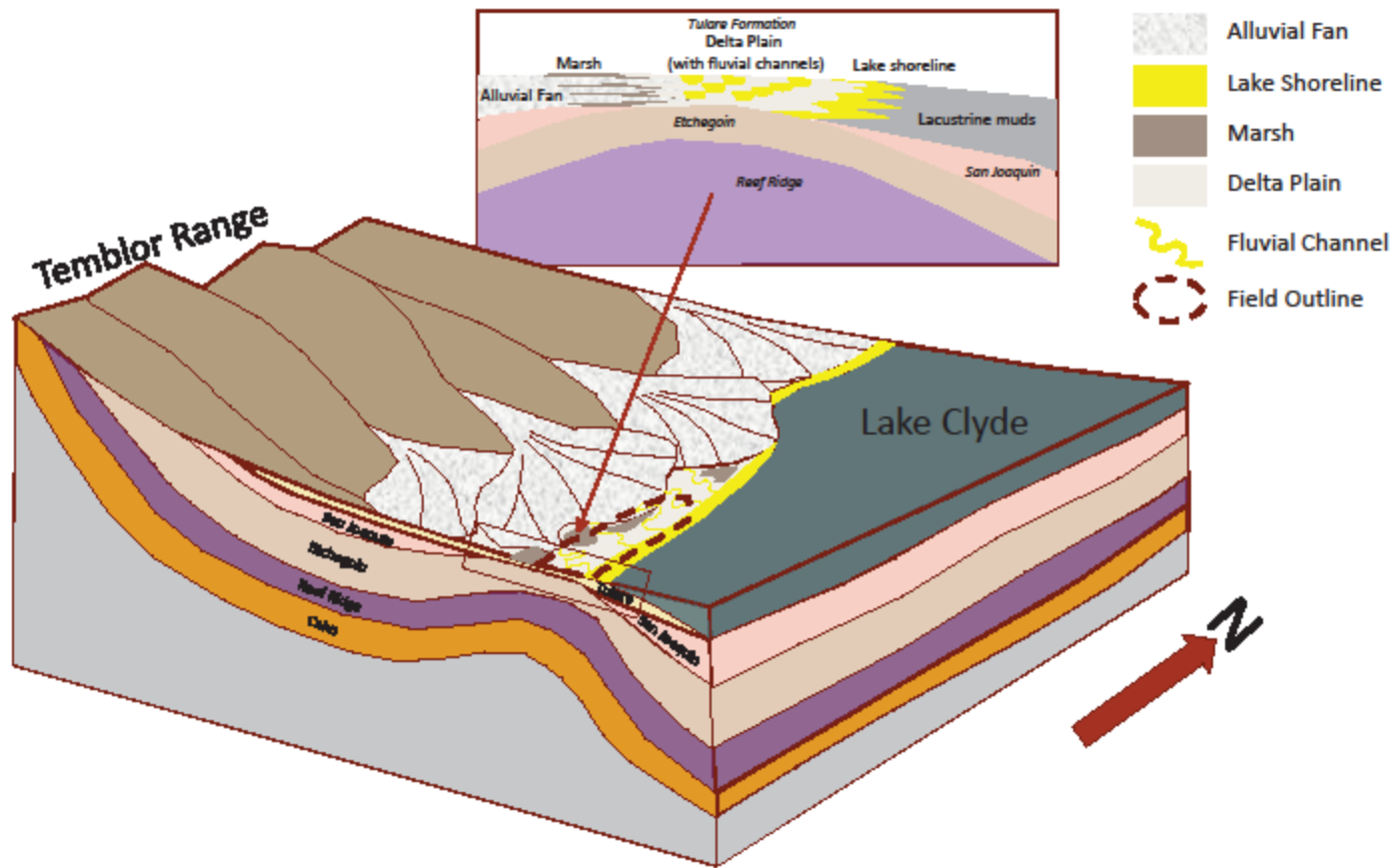
Adapted From Medwedeff, 1989

Figure 1-5: Type log, Stratigraphic Column and Formation Production



Adapted From California Oil & Gas Fields, Volume 1, DOGGR 1973

Figure 1-6: Tulare Depositional Block Diagram



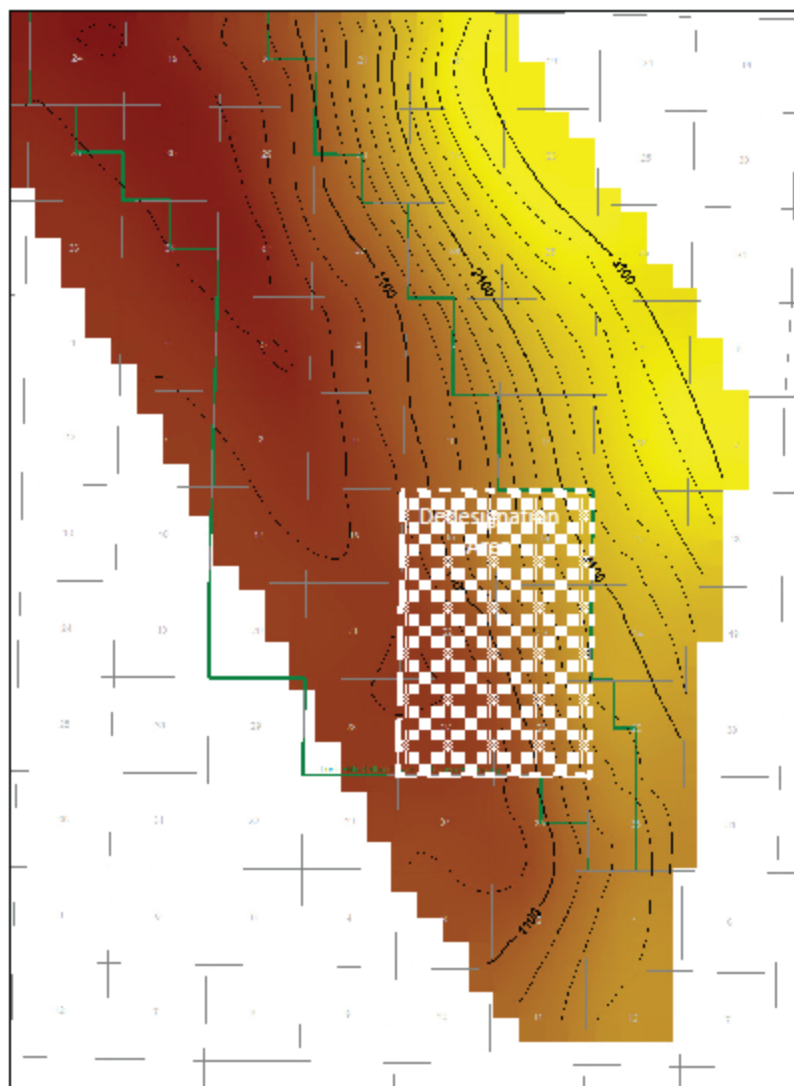




Figure 1-7
Tulare Formation Isochore Thickness
Contour Map

-  Lost Hills Field Admin Boundary
-  PLS Sections

Isochore Thickness Contour Color Fill



N
↑

2 miles

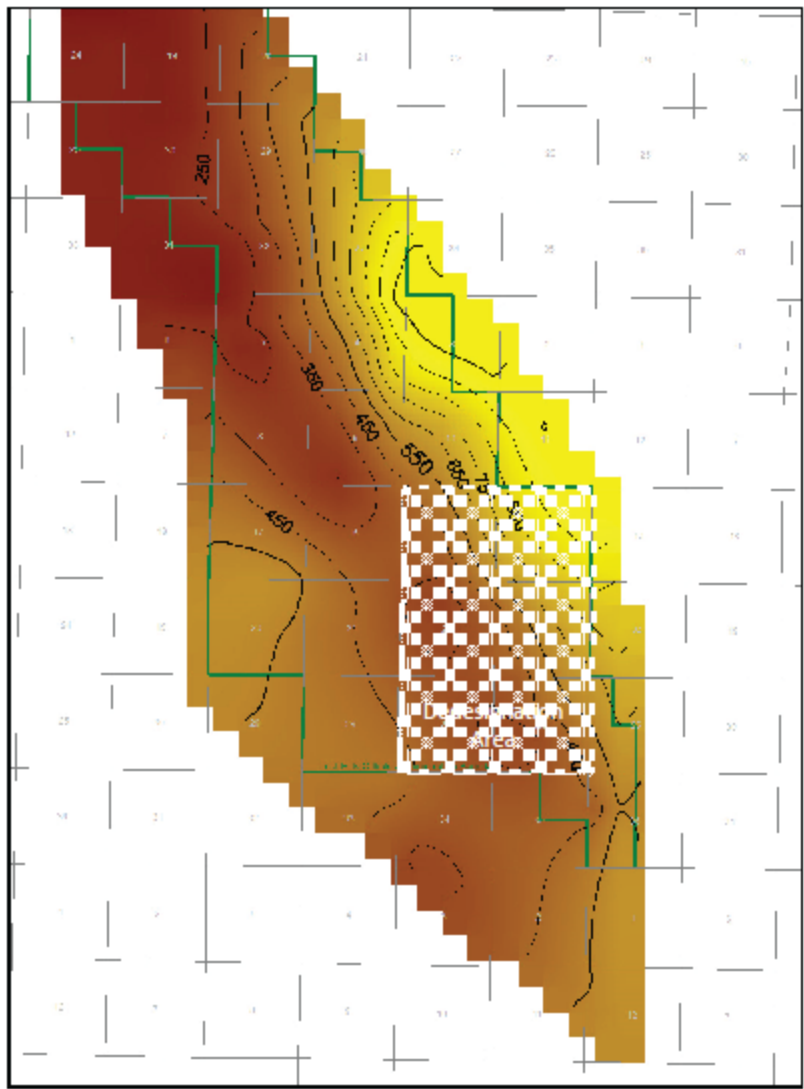


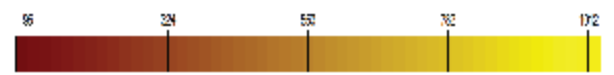


Figure 1-8
Lower Tulare Isochore Thickness
Contour Map

-  Lost Hills Field Admin Boundary
-  PLSS Sections

Isochore Thickness Contour Color Fill



N
↑

2 miles

Figure 1-9
Tulare Type Log
Lost Hills
Oilfield

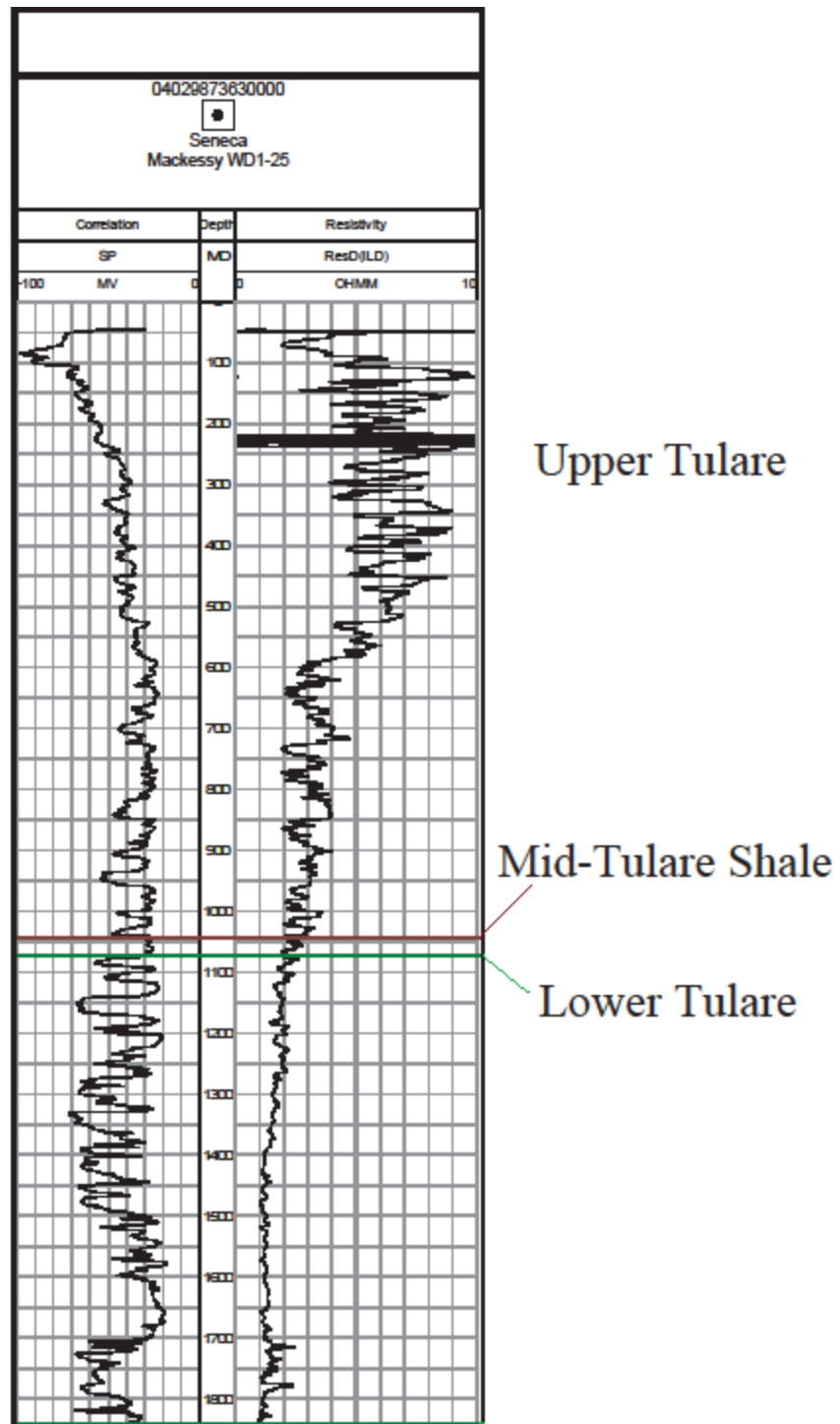
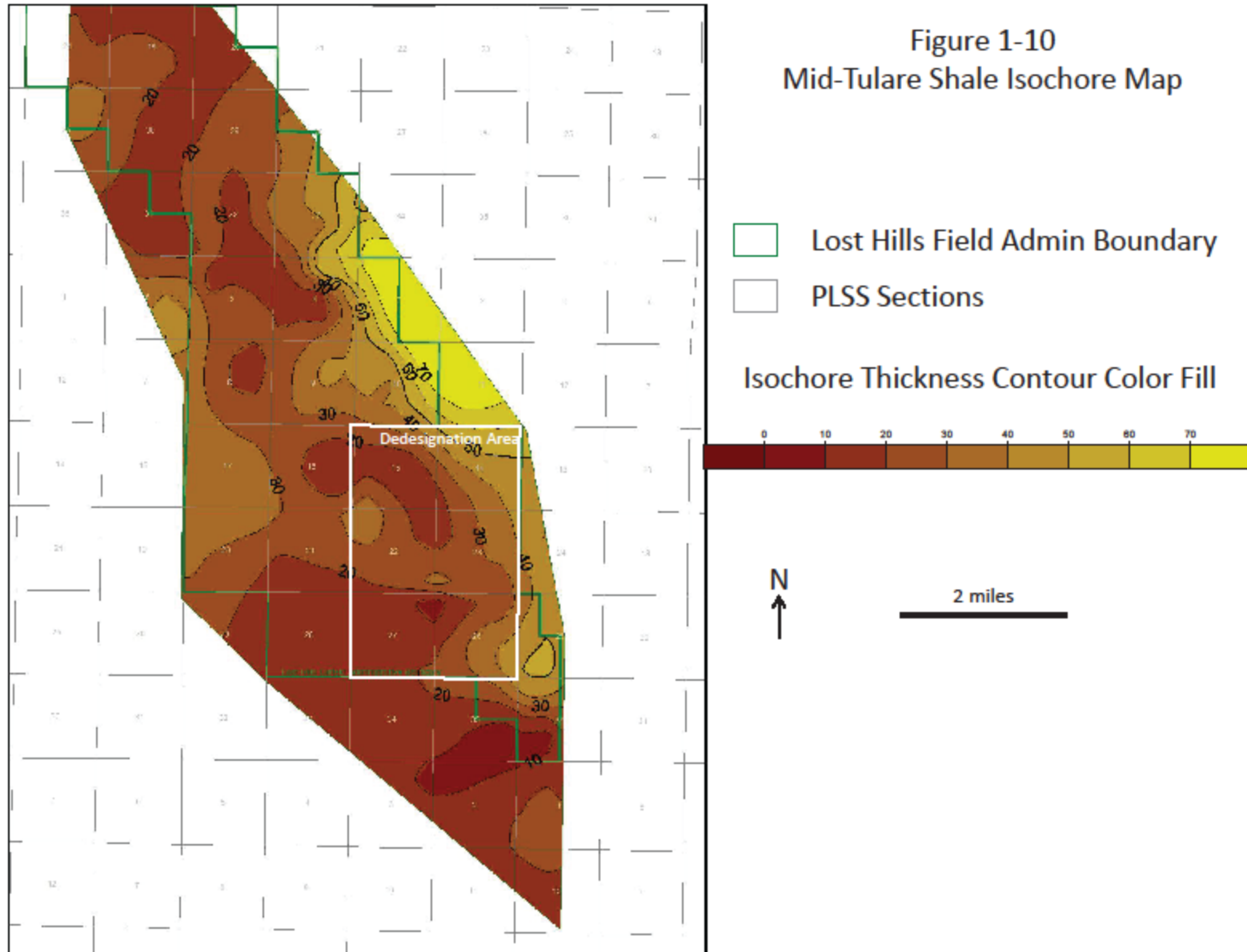
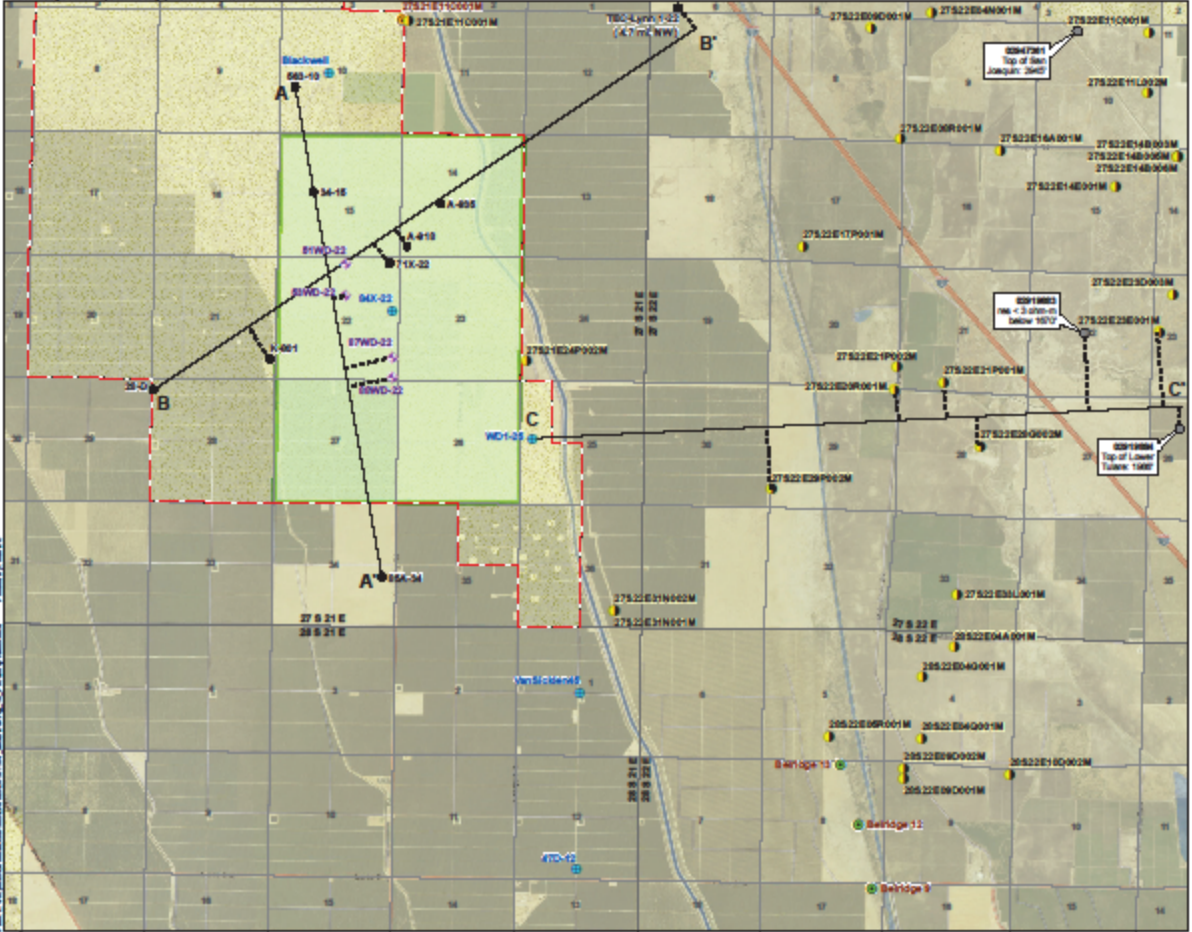


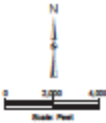
Figure 1-10
Mid-Tulare Shale Isochore Map



Source: USGS National Water Model (NWM) Scenario 1000 Coverage (2016/06/17) in Yellow, Red Lines, 2017; San Jose (King) Services, San Joaquin, Mapworks 10000 10' Spacing; and the USGS Community-Based Data Operations, Analysis, and Reporting (CBAO) in Yellow, Green, and Red Lines (Community)



- Legend**
- Lost Hills Oil Field Administrative Boundary
 - Oil and Gas Field
 - Township/Range/Section
 - Geotrack GAMA Wells
 - Well (Source: AE Appl)
 - Well (Source: AMCC)
 - Wildcat Well (Source: DOGGR)
 - Injection Well
 - Water Well (Water Quality Data)
 - Development Well (Stratigraphic Data)
 - Proposed Aquifer De-designation Area



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 Aquifer De-Designation
 Kern County, California

Cross-Section Location Map

KJ 1805024.00
 March 2017

Figure 1-11

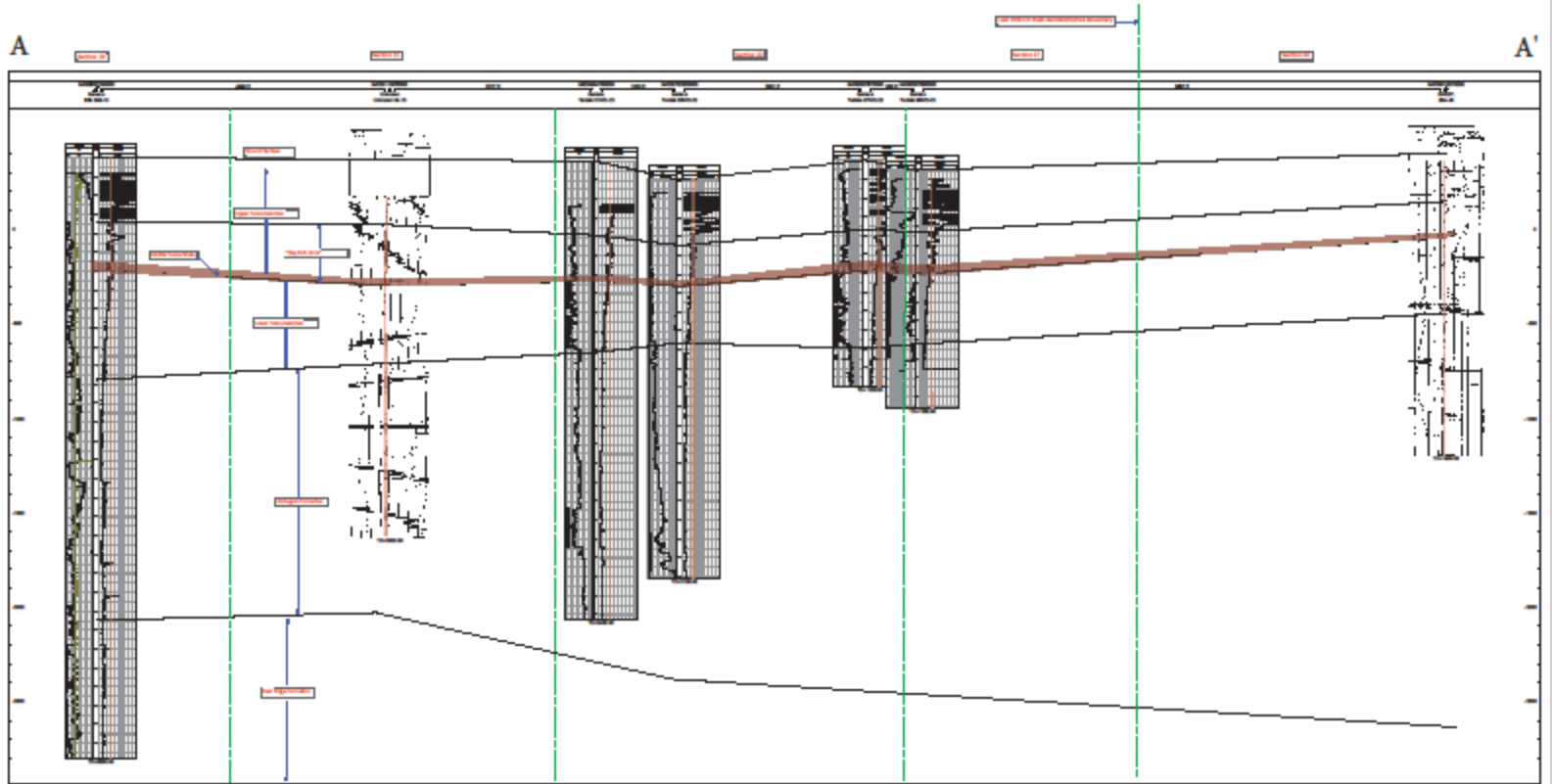


Figure 1-12. Geologic Cross-Section A-A' - North-Northwest to South-Southeast - South Lost Hills Oilfield

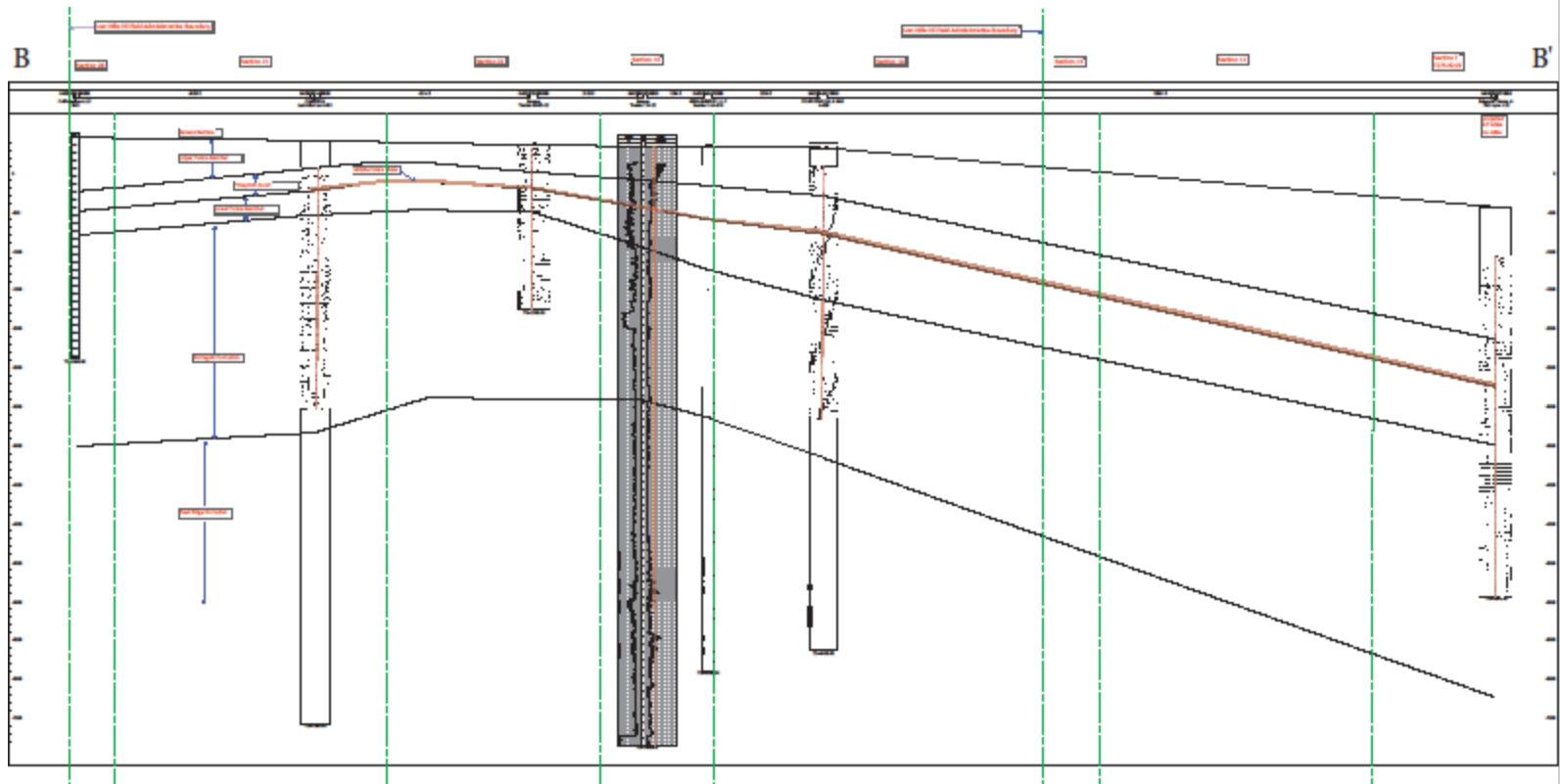


Figure 1-13. Geologic Cross-Section B-B' - West-Southwest to East-Northeast - South Lost Hills Oilfield

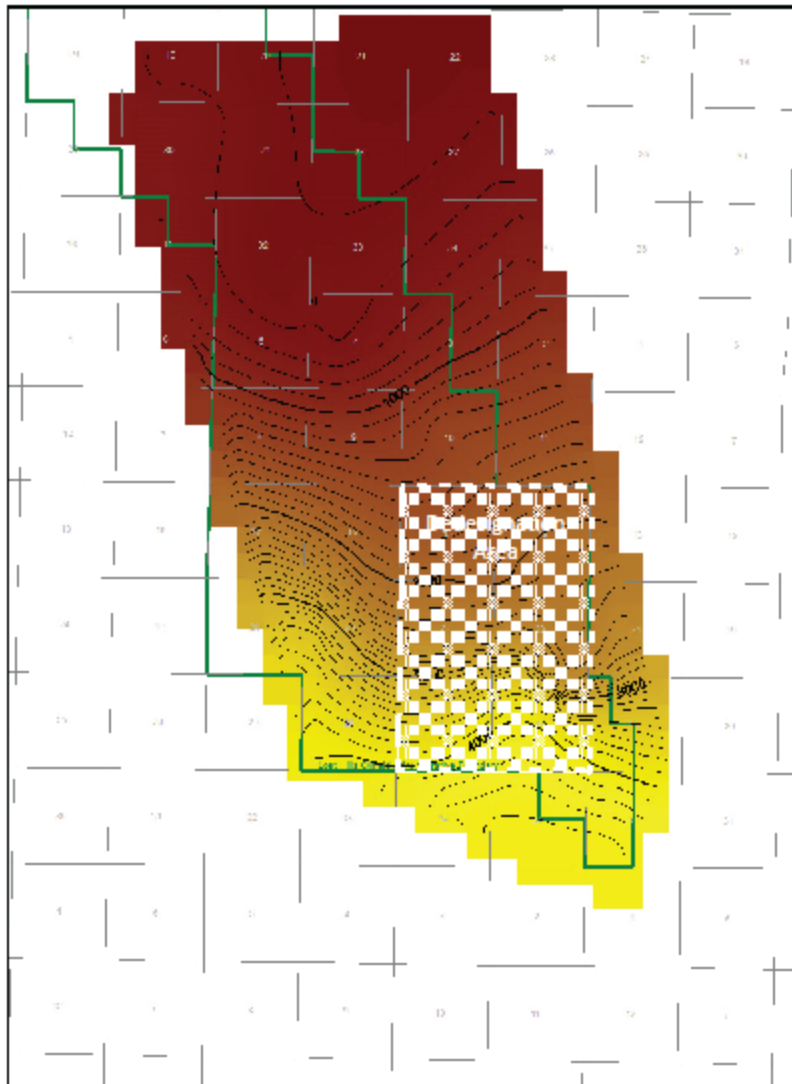




Figure 1-14
Etchegoin Formation
Isochore Thickness Contour Map

-  Lost Hills Field Admin Boundary
-  PLSS Sections

Isochore Thickness Contour Color Fill



N
↑

2 miles

04029657690000

●
Seneca
Tisdale 63-22

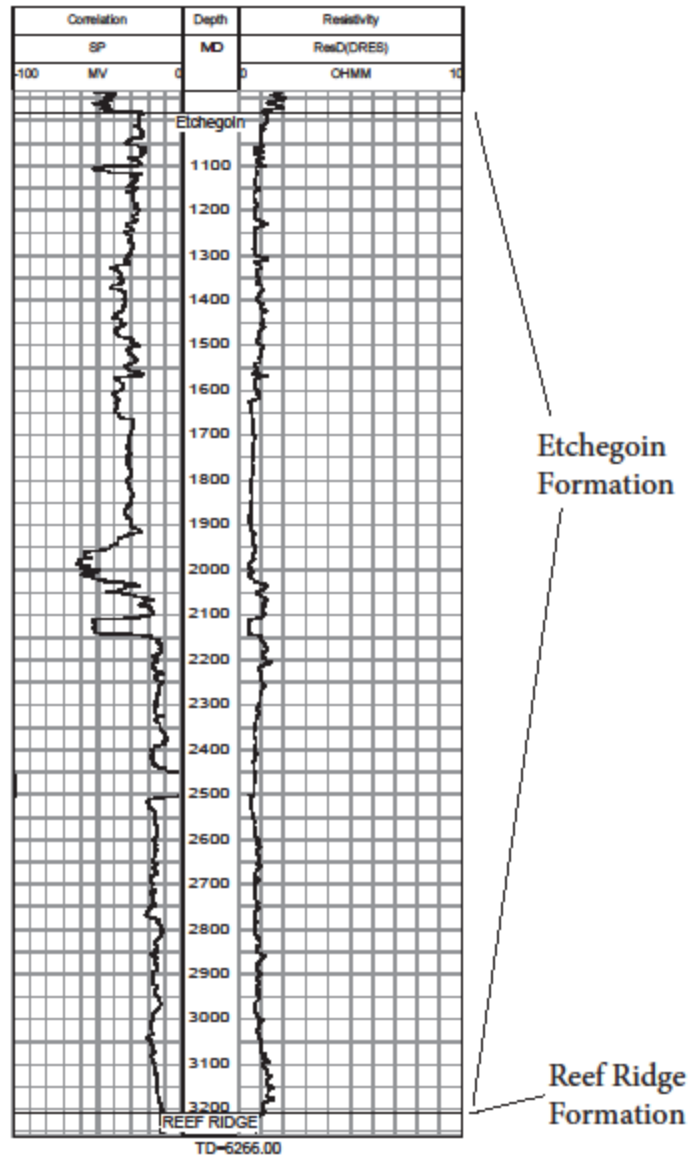
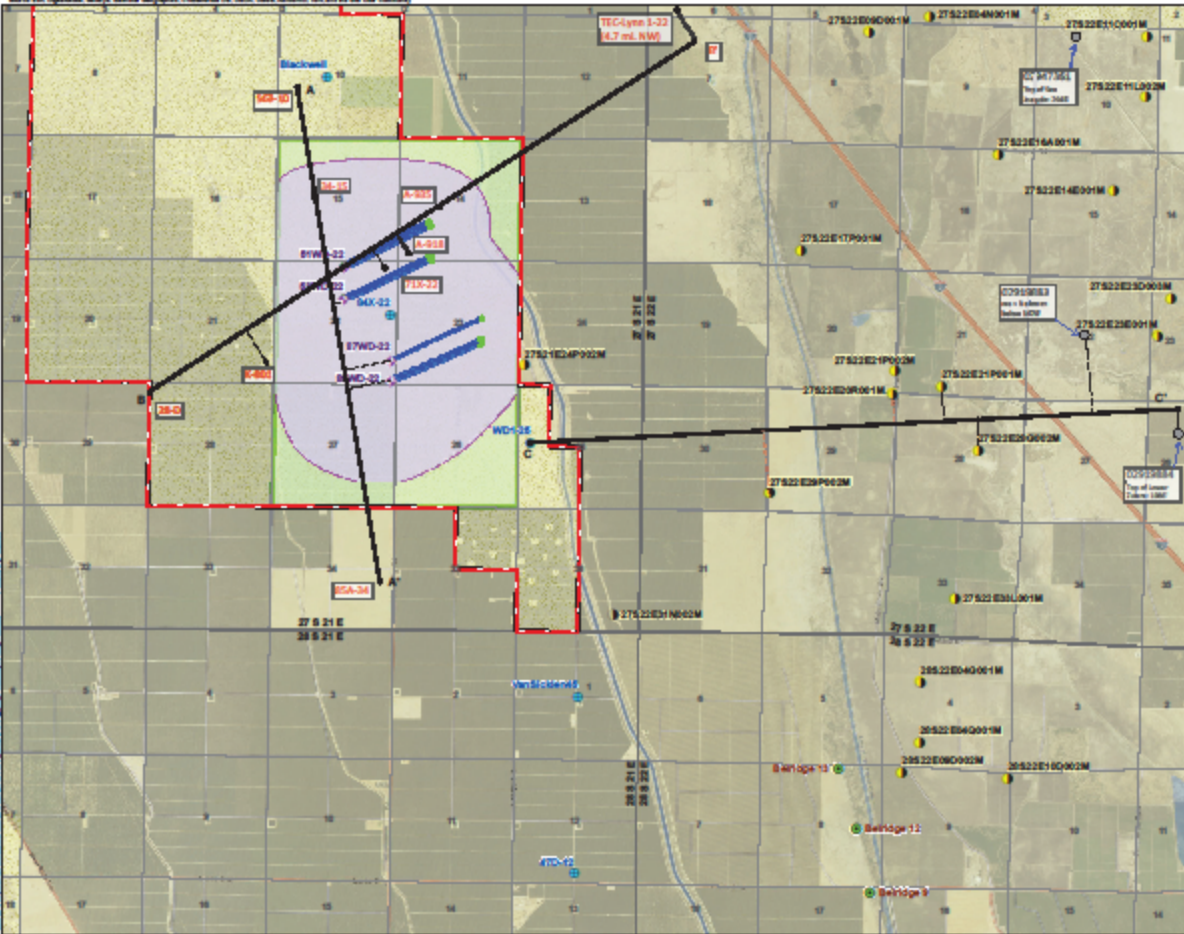


Figure 1-15. Etchegoin Type Log, Lost Hills Oilfield

www.epa.gov/groundwater/gis/arcgis/arcgis.html; for more information, see the following links: www.epa.gov/groundwater/gis/arcgis/arcgis.html; for more information, see the following links: www.epa.gov/groundwater/gis/arcgis/arcgis.html; for more information, see the following links: www.epa.gov/groundwater/gis/arcgis/arcgis.html



Legend

- Lost Hills Oil Field Administrative Boundary
- Oil and Gas Field
- Township/Range/Section
- Geotrack GAMA Wells
- Well (Source: AE App)
- Well (Source: AMEC)
- Wildcat Well (Source: DOGGR)
- Injection Well
- Development Well (Stratigraphic Data)
- Water Well (Water Quality Data)
- Modeled 100-year Injection Plane
- Injection Plane Buffer
- Proposed Aquifer De-designation Area

N

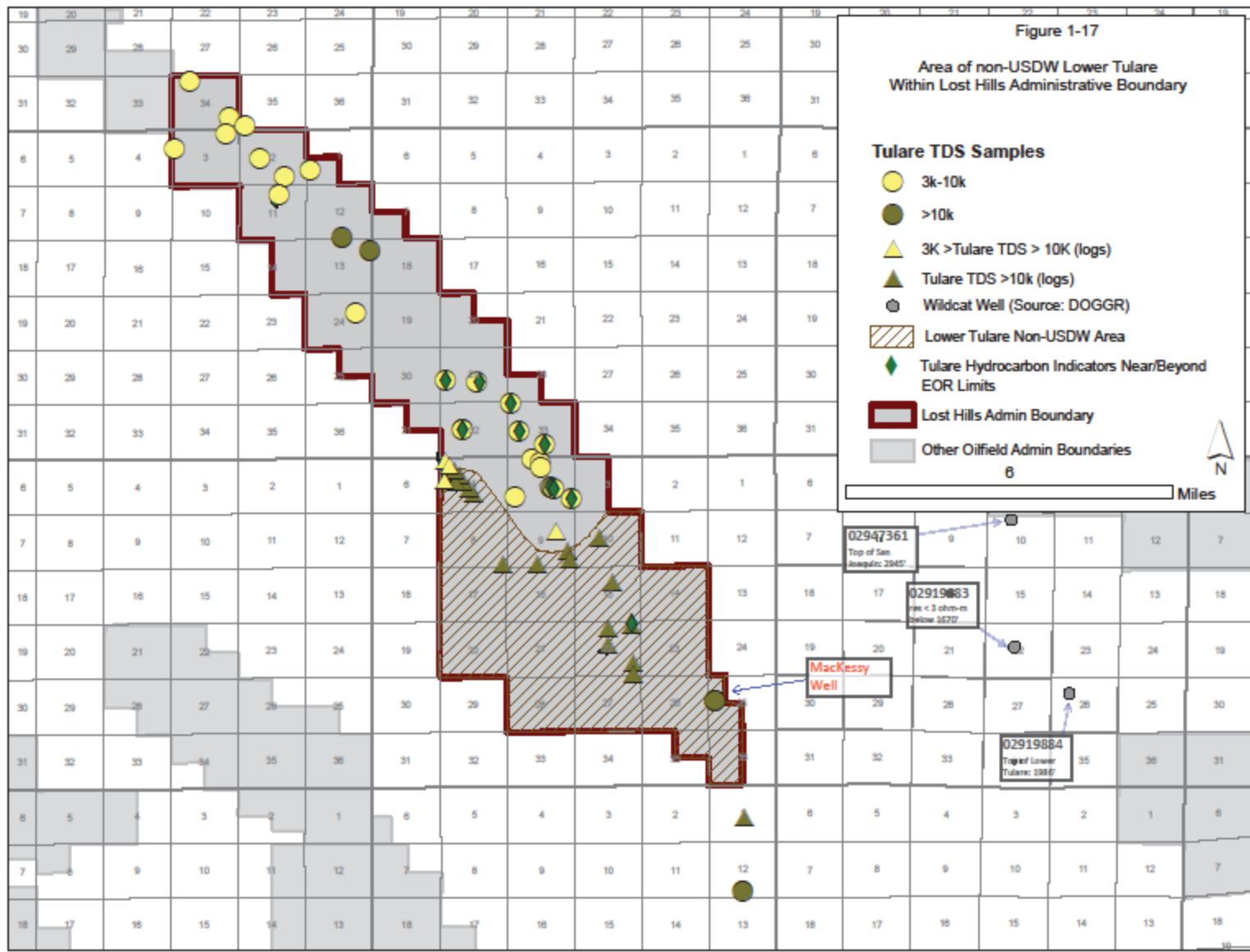
0 2000 4000
Feet Feet

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 Aquifer De-Designation
 Kern County, California

MODFLOW Model Results
 Horizontal Gradient = 0.02 feet/foot,
 and effective porosity = 35

KJ 1905024.00
 March 2017

Figure 1-16



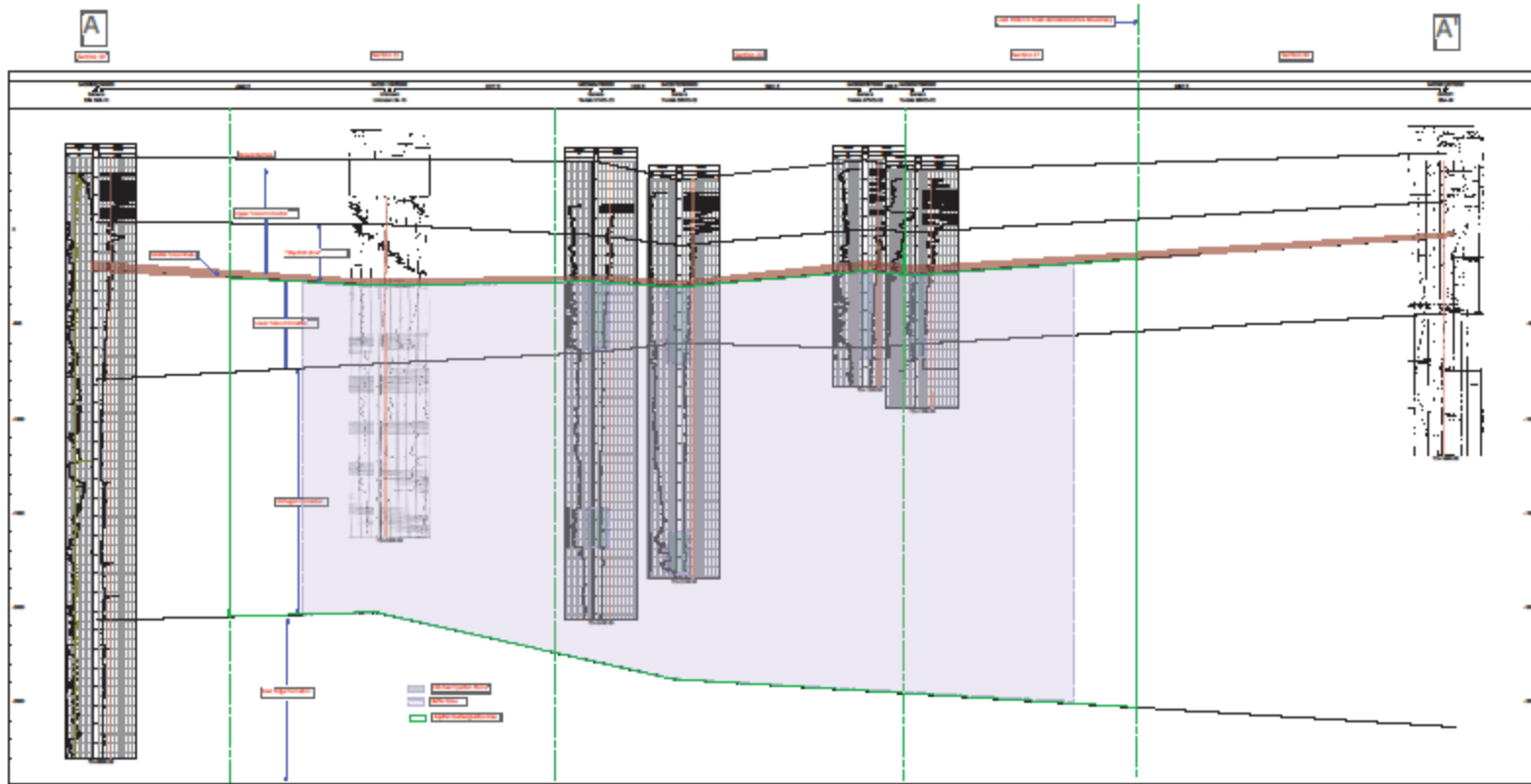


Figure 1-18. Geologic Cross-Section A-A' showing 100-Year Injection Plume, Buffer Zone and Aquifer De-Designation Area, Lost Hills Oilfield

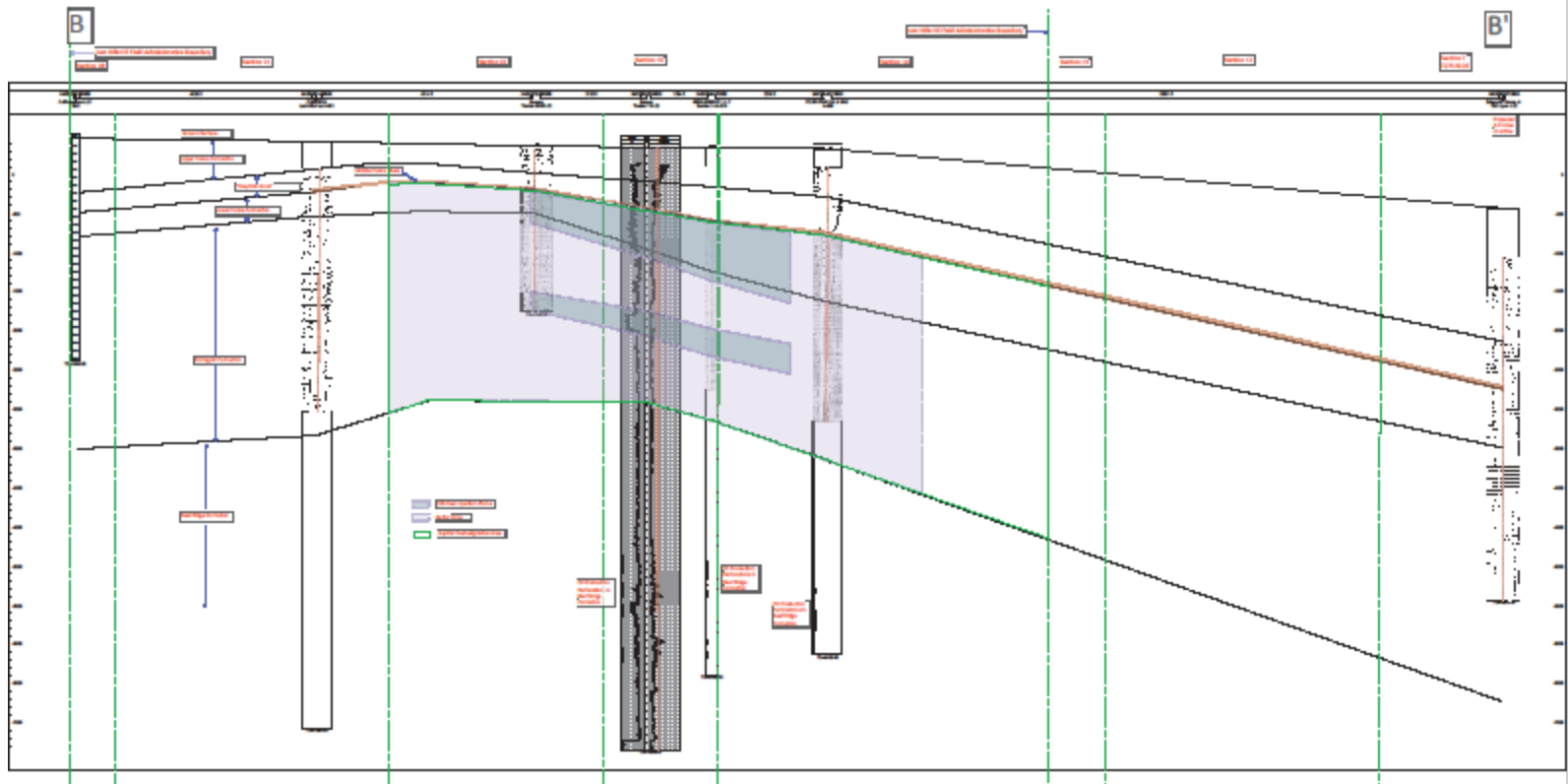


Figure 1-19. Geologic Cross-Section B-B' showing 100-Year Injection Plume, Buffer Zone and Aquifer De-Designation Area, Lost Hills Oilfield

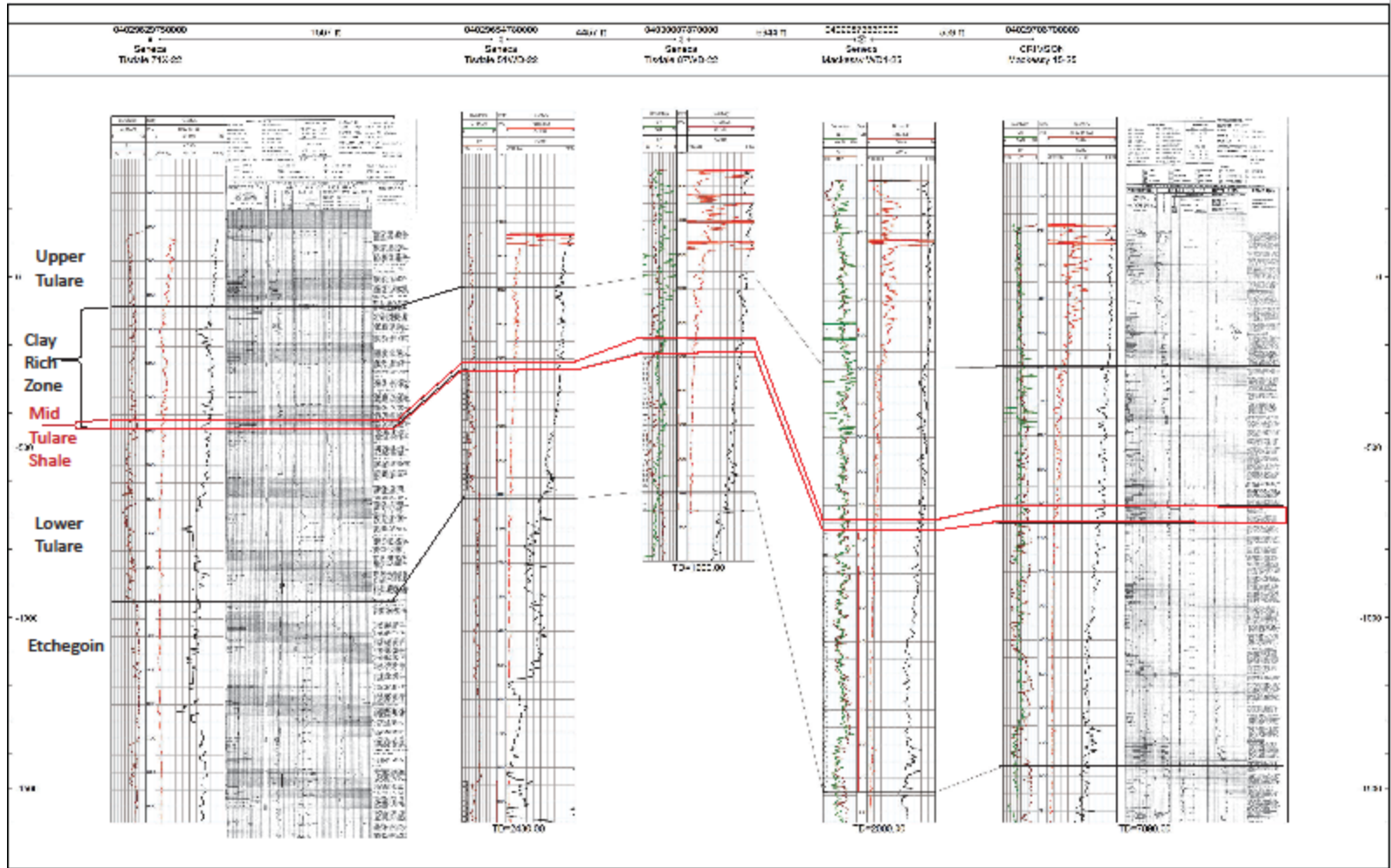
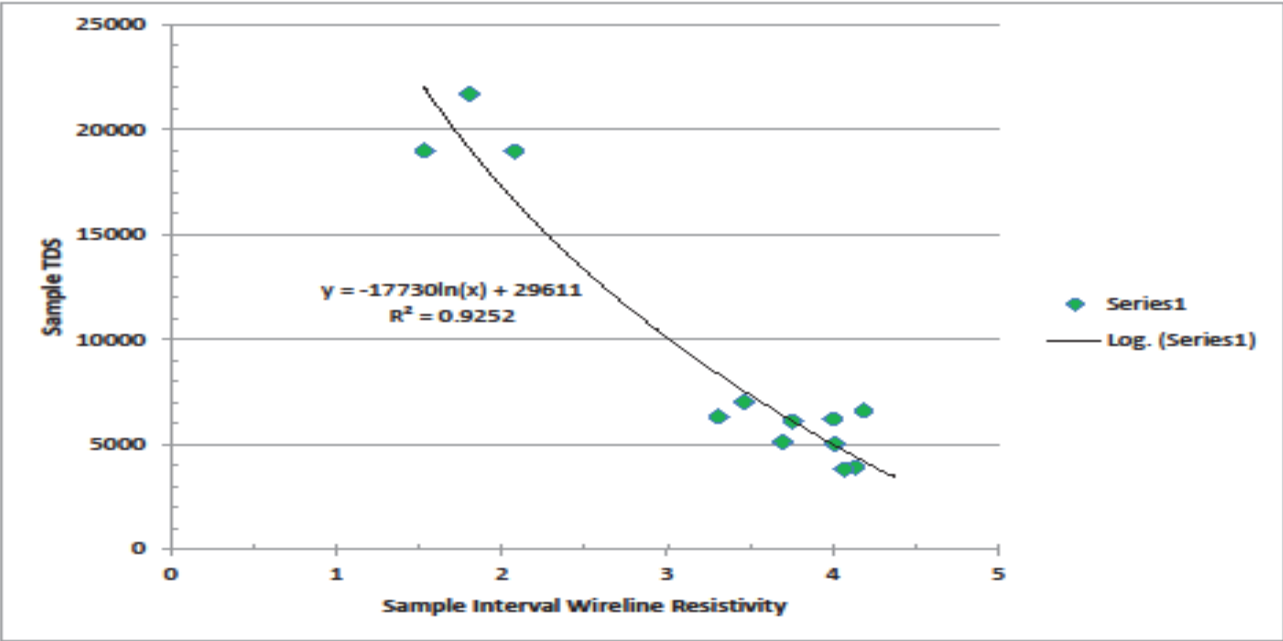
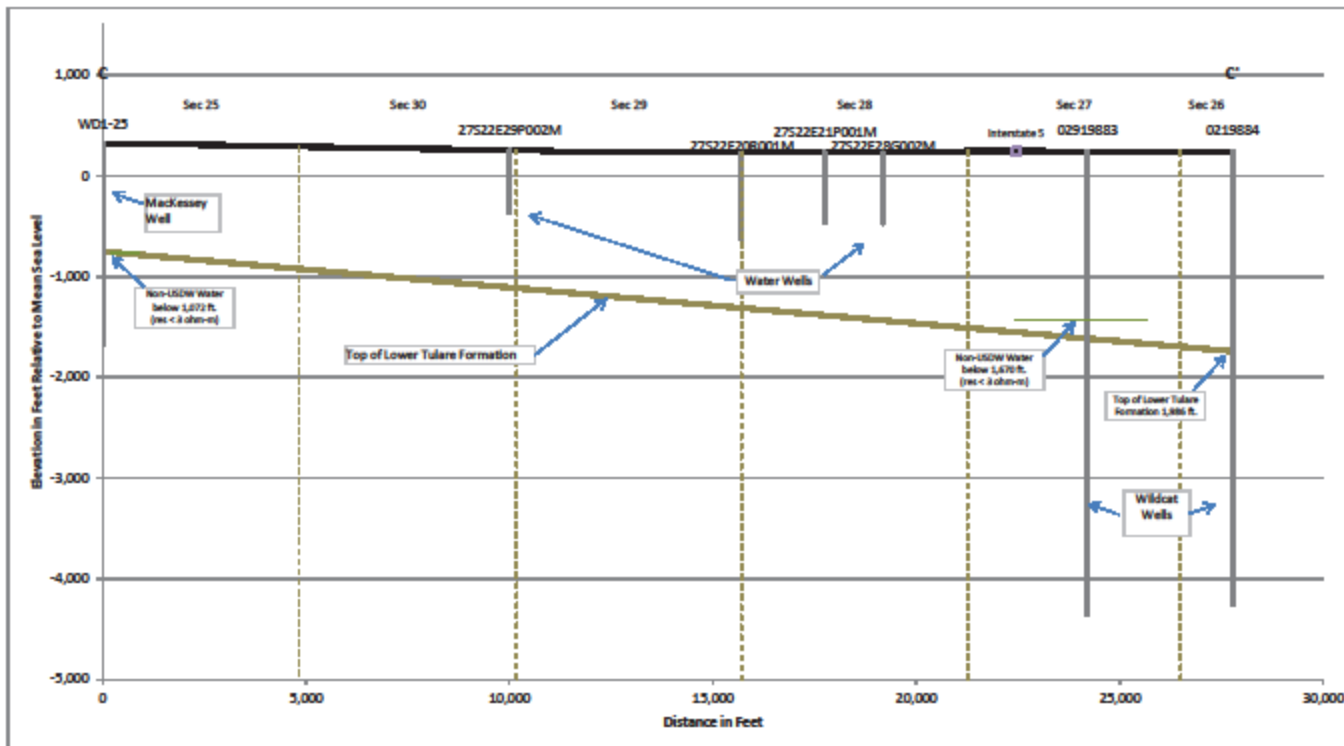


Figure 1-20. Mudlogs Showing Lithologic Descriptions of the Tulare Formation and Upper Etchegoin Formation



Source: Tulare Aquifer Exemption Application

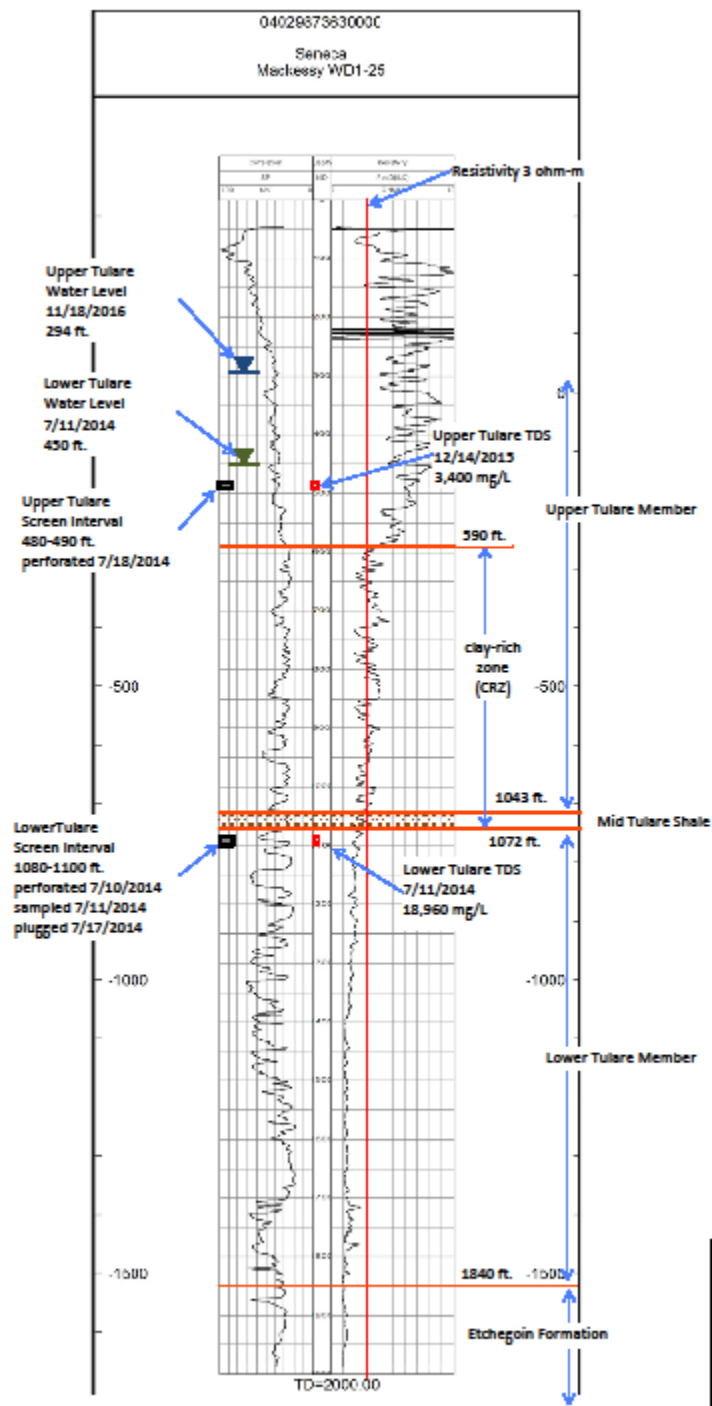
Figure 1-21. Cross Plot of Sample Interval Resistivity and TDS



Data Sources:
 Seneca Resources: Mackessey Well
 Geotracker GAMA Database: Water Wells
 DOGGR Database: Wildcat (Anyfield) Wells

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 Kern County, California
 Cross Section C-C'

K/J 1665024.00
 March 2017
 Figure 1-22



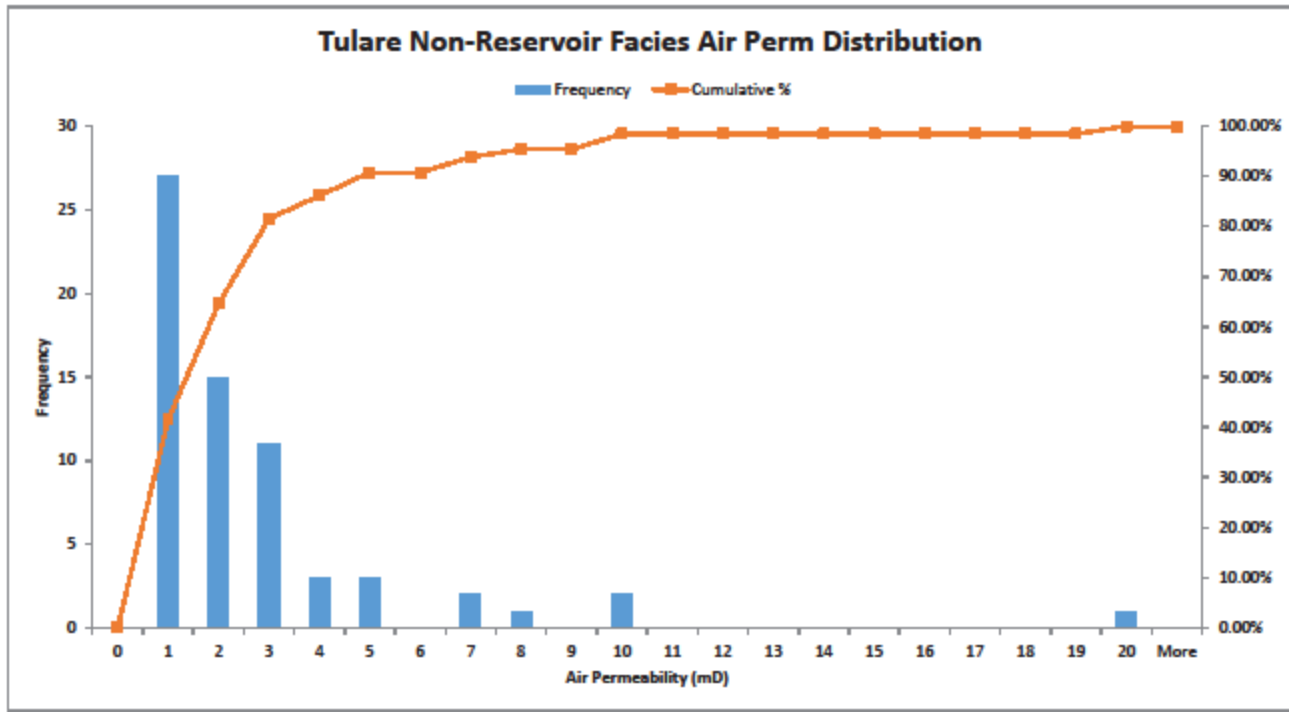
Kennedy/Jenks Consultants

Aquifer De-Designation
Kern County, California

Mackessy Well WD1-25
Stratigraphy, Water Levels, and
Water Quality Data

K/J 1665024.00
April 2019

Figure 1-23



Legend
 mD millidarcy

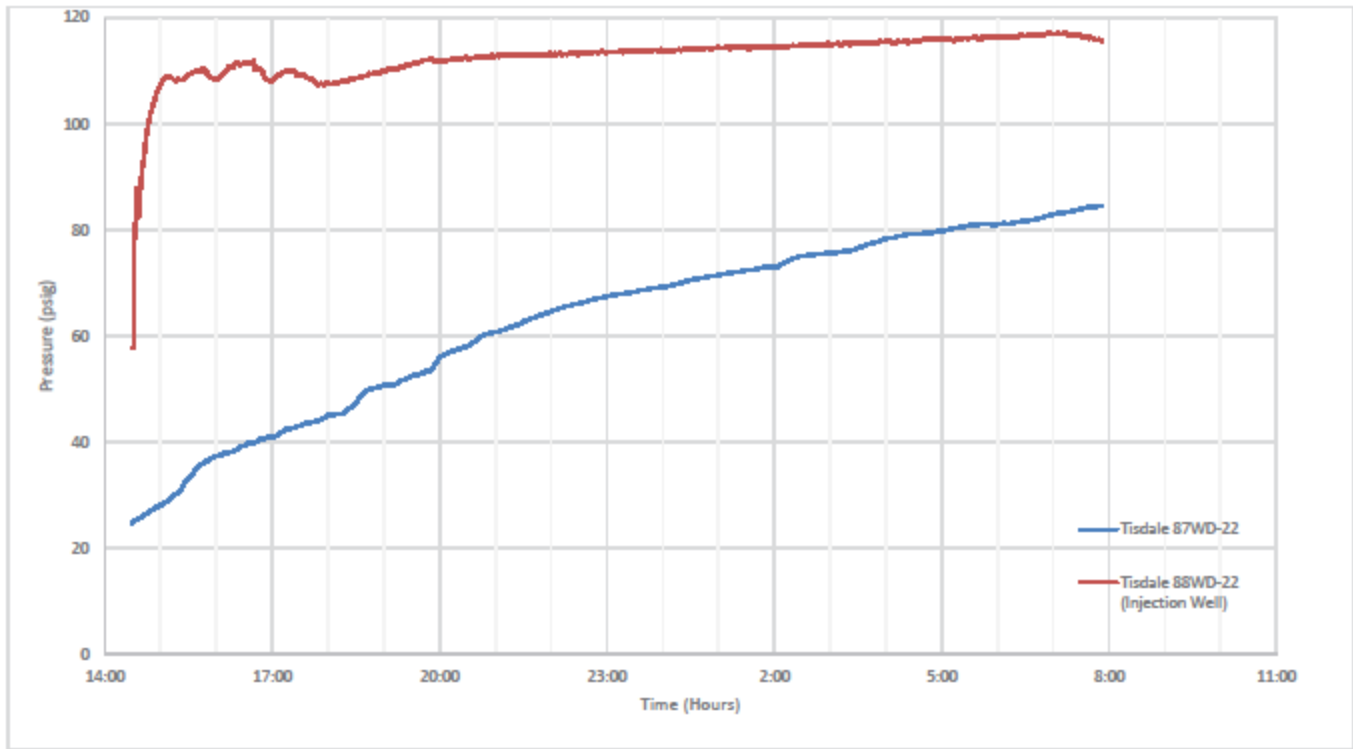
Source: Seneca Resources Corporation

Kennedy/Jenks Consultants

Aquifer De-Designation
 Kern County, California

**Air Permeability Measurements
 In the Mid Tulare Shale**

K/J 1665024.00
 September 2017
 Figure 1-24



Legend

Test performed on 14 and 15 September 2017

During the test, water was injected into 88WD-22 and 87WD-22 was monitored.
 psig - pounds per square inch of mercury

Source: Seneca Resources Corporation

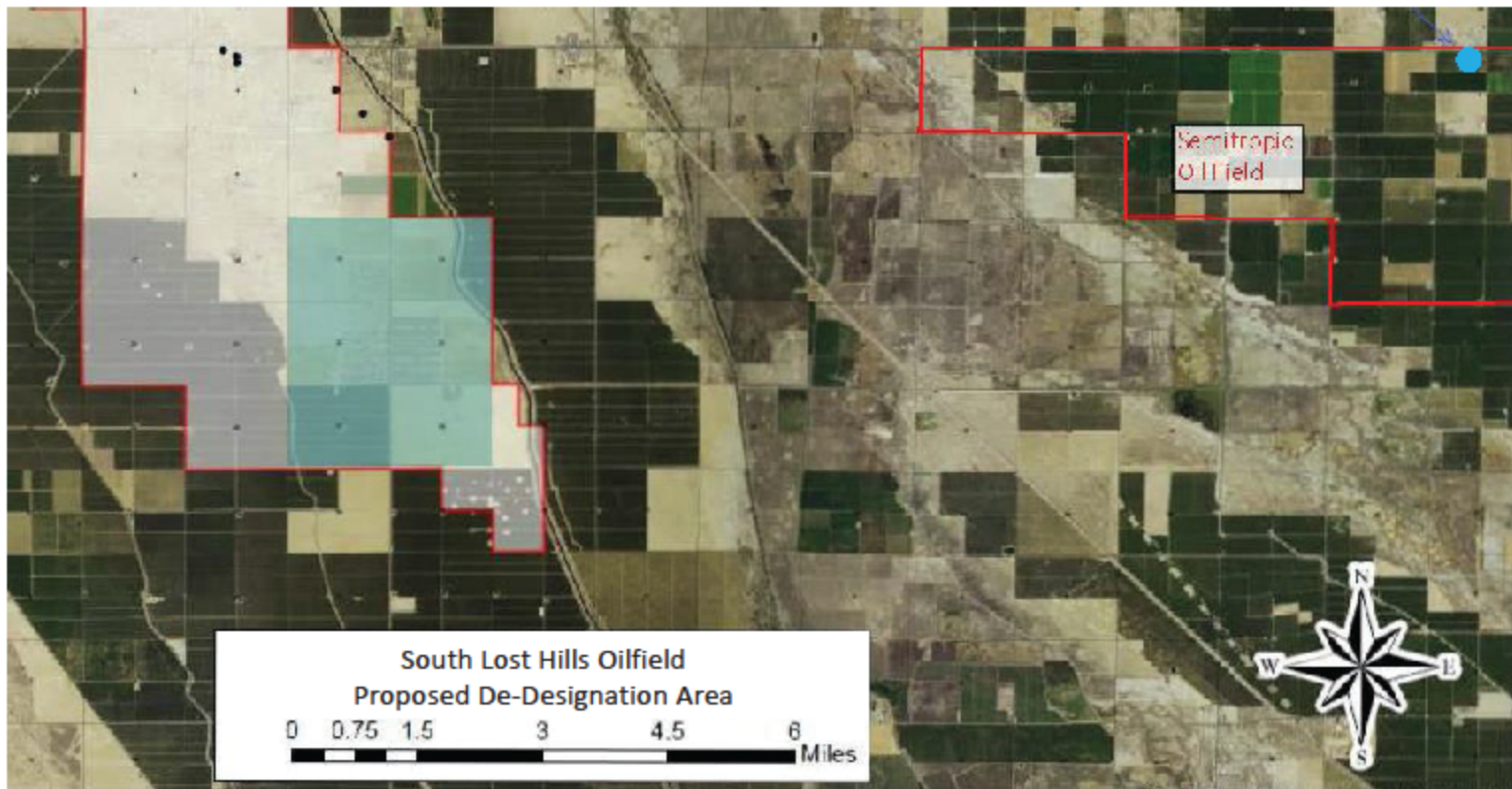
Kennedy/Jenks Consultants

Aquifer De-Designation
 Kern County, California

Pump Test Results
 Tisdale 87WD-22 and 88WD-22

K/J 1665024.00
 September 2017

Figure 1-25



Legend




-  Proposed De-Designation Area
-  Nearest Municipal Well to De-Designation Area
-  Oilfield Administrative Boundary

Figure 1-26. Location of Nearest MUN Well to Lost Hills Oilfield