STATE OF NEW MEXICO
ENERGY, MINERALS AND NATURAL RESOURCES DEPARTMENT
OIL CONSERVATION COMMISSION

APPLICATION OF GOODNIGHT MIDSTREAM PERMIAN, LLC FOR APPROVAL OF SALTWATER DISPOSAL WELLS LEA COUNTY, NEW MEXICO **CASE NO. 24123**

APPLICATIONS OF GOODNIGHT MIDSTREAM PERMIAN, LLC FOR APPROVAL OF SALTWATER DISPOSAL WELLS LEA COUNTY, NEW MEXICO **CASE NOS. 23614-23617**

APPLICATION OF GOODNIGHT MIDSTREAM PERMIAN LLC TO AMEND ORDER NO. R-22026/SWD-2403 TO INCREASE THE APPROVED INJECTION RATE IN ITS ANDRE DAWSON SWD #1, LEA COUNTY, NEW MEXICO. **CASE NO. 23775**

APPLICATIONS OF EMPIRE NEW MEXICO LLC TO REVOKE INJECTION AUTHORITY, LEA COUNTY, NEW MEXICO **CASE NOS. 24018-24027**

GOODNIGHT MIDSTREAM'S MOTION TO EXCLUDE IMPROPER REBUTTAL STATEMENTS AND EXHIBITS OF RYAN M. BAILEY & STANLEY SCOTT BIRKHEAD

Empire New Mexico LLC ("Empire") attempts to offer expansive testimony from Ryan M. Bailey and Stanley Scott Birkhead at the eleventh hour which goes beyond responding to Goodnight Midstream Permian, LLC's ("Goodnight") expert testimony and instead offers affirmative opinions that may be properly presented only in its affirmative case. Not only does Mr. Bailey and Mr. Birkhead's testimony expressly conflict with Empire's expert testimony in its affirmative case, but Empire's tactics eliminate Goodnight's ability to fully respond to and cross-examine Mr. Bailey and Mr. Birkhead on their opinions and instead threaten to litigate this

proceeding by ambush rather than on its merits. This has been Empire's approach from the outset. Further, Goodnight is unable to depose Mr. Bailey or Mr. Birkhead regarding their affirmative opinions and has no opportunity, or time, under the Third Amended Prehearing Order to file sur-rebuttal reports. Accordingly, Empire's attempt to offer untested affirmative opinions must be rejected.[1]

Intervenors Rice Operating Company, Permian Line Service, LLC, and Pilot Water Solutions SWD, LLC join in the Motion. Counsel for the Oil Conservation Division takes no position on the Motion but notes, in principle, that Empire's rebuttal as presented in the Motion does appear to be direct, not rebuttal, testimony.

BACKGROUND

The parties' expert disclosures are governed by the Third Amended Pre-Hearing Order dated January 31, 2025. *See* Third Amended PHO, attached as **Exhibit A**. The PHO recognizes the parties had already disclosed their direct witnesses and "filed their direct witness testimony and exhibits." *See id.* ¶ 1. The PHO further provides "[r]ebuttal testimony and exhibits shall be filed on Monday, February 10, 2025." *Id.* ¶ 6.

Empire submitted the direct testimony of Joseph A. McShane and Galen Dillewyn, on August 26, 2024. *See* Empire Revised Exhibits G,[2] F.[3] Mr. McShane is a petroleum geologist

[1] Goodnight raised its objections to Empire's purported rebuttal in response to Empire's Revised Rebuttal Witness Disclosure in its Motion to Strike Empire's Rebuttal Witness Disclosure, filed on January 15, 2025. Goodnight incorporates its arguments and authority in that Motion and Reply as if fully referenced herein.

[2] https://ocdimage.emnrd.nm.gov/Imaging/FileStore/santafe/cf/20241209/23614_12_09_2024_08_30_20.pdf (Empire Revised Exhibit G, McShane Statement).

[3] https://ocdimage.emnrd.nm.gov/Imaging/FileStore/santafe/cf/20241205/23614_12_05_2024_10_46_08.pdf (Empire Revised Exhibit F, Dillewyn Statement).

who offers an analysis and estimate for oil-in-place within the San Andres to attempt to support Empire's contention that the San Andres contains an economic residual oil zone. *See* Empire Revised Exhibits G at 3-4. His conclusions and oil-in-place calculations are based on the petrophysical model and calculated oil saturations prepared by Mr. Dillewyn. *See id.* at 3 ("**D. Log Analysis by Nutech Showingcasing Hydrocarbon Presence in San Andres**"). Mr. Dillewyn is Empire's proffered expert in petrophysics and opines about a petrophysical model and analysis he prepared to calculate oil saturations from well logs in the EMSU. *See, e.g.*, Empire Revised Exhibit F at 1 ("The scope of the analysis was to determine reservoir quality, porosity, permeability, and saturations"); Dillewyn Depo. Tr. 86:6-10, 12/17/24, attached as **Exhibit B**. Mr. McShane relies on Mr. Dillewyn's opinions. *See* Empire Revised Exhibit F at 3. Combined, Mr. McShane and Mr. Dillewyn's testimony is necessary for Empire to establish there are economic hydrocarbons in the San Andres formation within the EMSU. Empire admits that such evidence is part of its burden of proof. *See, e.g.*, Empire Motion to Clarify Scope (August 26, 2024); *see also* Empire Reply in Support of Motion to Clarify (Sept. 19, 2024).

After receiving Goodnight's direct testimony on its petrophysical analysis and estimate of the oil-in-place on August 26, 2024, Empire submitted revised testimony on December 4th and 6th for Mr. Dillewyn and Mr. McShane, respectively.[4] The revised testimony is based on a revised petrophysical model Mr. Dillewyn prepared at Empire's direction that relied on cored log data in the EMSU previously available but not initially analyzed by Mr. Dillewyn. *See id.* The

[4] https://ocdimage.emnrd.nm.gov/Imaging/FileStore/santafe/cf/20250130/23614_01_30_2025_04_50_28.pdf (Empire's Amended Notice of Revised Testimony, stating "In light of direct testimony filed by Goodnight Midstream Permian LLC ("Goodnight") in this matter, Empire requested NUTECH to rerun its analysis with different m and n values and to review the EMSU-679 core report on September 13, 2024.").

revisions incorporated a substantial change in the inputs and parameters and the underlying rationale used to interpret logged intervals across the Grayburg and San Andres formations that Mr. Dillewyn changed following Empire's instruction. The changed analytical approach resulted in a substantial decrease in calculated oil saturations and an average 60% reduction in Empire's estimated oil-in-place in the San Andres. Empire did not seek leave to file its revised testimony and did not provide a basis or justification for filing revised testimony more than three months after the deadline. The parties subsequently reached an agreement to file notice of revised testimony that explained what changed in the revised testimony, why it was changed, and a justification for the timing of the revisions. As a result of the Empire's revisions, Goodnight was forced to expend significant resources in the midst of preparing for the hearing to assess these revised analyses requiring it to discard its review of Empire's original petrophysics and oil-in-place analysis filed in August 2024 and undertake a completely new assessment of the revised direct testimony that adopted a different rationale and substantially modified analysis—more than three months after direct testimony was due.

It is important to keep in mind that Empire had originally engaged Mr. Dillewyn and his firm, NuTech Energy Alliance, on or around August 2023 in preparation for Case Nos. 23614-23617, when the cases were initially pending before the Division. Mr. Dillewyn conducted his analysis and submitted his testimony in those cases, which are now before the Commission, on October 26, 2023.[5] Empire's petroleum geologist at the time—Nicholas Cestari—relied on Mr. Dillewyn's petrophysical analysis to prepare an oil-in-place analysis[6] that was later adopted by

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5 https://ocdimage.emnrd.nm.gov/Imaging/FileStore/santafe/cf/20231027/23614_10_27_2023_07_56_17.pdf (Empire's direct testimony and exhibits in Case Nos. 23614-23617, Tab 6, Exhibit F at 3, "D. Log Analysis by Nutech Demonstrating Hydrocarbon Presence in the San Andres").

6 *See id.*

Mr. McShane in Empire's August 26, 2024 testimony. The hearing was set before the Division on November 2, 2023—all testimony and exhibits had been filed—when the Division vacated the hearing on Goodnight's Motion to Compel Production of Documents[7] and Motion to Continue to a Status Conference or, in the Alternative, to Exclude Empire's Evidence and Testimony[8] to avoid a trial by ambush when it became apparent that Empire had substantially failed to comply with its discovery obligations. As a result of that stay and the referral of the cases to the Commission, Empire had from November 2023 until August 2024 to evaluate its petrophysics and oil-in-place analyses and make any changes it deemed necessary. Empire made essentially no changes and decided to stick with its petrophysical analysis and oil-in-place estimates from November 2023 until revising its testimony in December 2024.

Now, months after the Commission's deadline for filing affirmative testimony in these cases, Empire again seeks to revise its direct testimony under the guise of rebuttal testimony. In particular, it seeks to present two new witnesses, Mr. Bailey and Mr. Birkhead, to offer opinions regarding the exact same topics and issues addressed by Mr. McShane and Mr. Dillewyn in their direct and revised direct testimony. For example, just as Mr. Dillewyn provides an opinion on a complete subsurface characterization of the Grayburg and San Andres formations within the EMSU based on NuTech's petrophysics model and analysis, Mr. Birkhead provides a different opinion on his own "petrophysical interpretation" of the same formations using the same wells and many others. *Compare* Empire Revised Exhibit F and attachments *with* Empire Rebuttal

7 https://ocdimage.emnrd.nm.gov/Imaging/FileStore/santafe/cf/20231031/23614_10_31_2023_07_49_58.pdf (Goodnight's Motion to Compel).

8 https://ocdimage.emnrd.nm.gov/Imaging/FileStore/santafe/cf/20231031/23614_10_31_2023_07_53_12.pdf (Goodnight's Motion to Continue to Exclude).

Exhibit L and attachments. And just as Mr. McShane provides Empire's analysis of the structure and tops of the San Andres interval, as well as estimated oil-in-place based on NuTech's calculated oil saturations, Mr. Bailey re-did the same analysis to "define a stratigraphic model" correlating some new and entirely different geologic tops for the Grayburg and San Andres, among other intervals, as well as a new estimate oil-in-place values based on Mr. Birkhead's petrophysical analysis. *Compare* Empire Revised Exhibit G *with* Empire Rebuttal Exhibit K at 8-10.

This means Empire now has **competing and conflicting** petrophysics and oil-in-place analyses within and between Empire's own expert opinions, each approach using different reasoning, inputs, and parameters. It is apparent Empire's intent is to reconcile the conflict by supplanting its previously filed revised direct testimony with its rebuttal testimony. That is untenable.

Empire's gamesmanship and attempt to supplant its direct testimony at the eleventh hour in a flagrant disregard for the PHO must be rejected, especially as Goodnight has no ability to depose either witness or prepare a sur-rebuttal report with less than two weeks before the hearing.

ARGUMENT

I. Mr. Bailey and Mr. Birkhead's testimony improperly exceeds rebuttal of Goodnight's expert testimony.

Much of the testimony that Mr. Bailey and Mr. Birkhead offer is not rebuttal. It is a blatant re-do of Empire's initial stratigraphic analysis—identifying many different San Andres formation tops than what Empire previously adopted—and a complete do-over of Empire's petrophysical model and analysis of well logs in the Grayburg and San Andres formations with an apparently new rationale using different inputs and parameters and calibrated to new and

different cored logs. Based on this new petrophysical model and analysis and updated stratigraphic interpretation, Empire is now attempting to present entirely new and conflicting oil-in-place assessments. **Exhibit C** identifies in highlighting the testimony and exhibits offered that should be excluded. None of this new analysis and testimony aligns with what Empire previously submitted in its revised direct testimony.

Rebuttal evidence is limited to matters that could not have been reasonably anticipated in advance of the hearing or to refute, contradict, criticize, or explain evidence presented by the opposing party. *See State v. Manus*, 1979-NMSC-035, ¶ 38, 597 P.2d 280 ("Genuine rebuttal evidence is not simply a reiteration of evidence in chief but consists of evidence *offered in reply to new matters*. The plaintiff, therefore, is not allowed to withhold substantial evidence supporting any of the issues which it has the burden of proving in its case in chief merely in order to present this evidence cumulatively at the end of defendant's case." (quoting *State v. White*, 444 P.2d 661 (Wash. 1968)) (emphasis in original)); *Martinez v. Rio Rancho Estates, Inc.*, 1979-NMCA-086, ¶ 6, 93 N.M. 187, 598 P.2d 649 (where "[t]he tender of the excluded evidence discloses that the witness's testimony would have parallelled testimony which was presented in plaintiff's case-in-chief by his other expert," it was not "rebuttal evidence" and thus, was properly excluded). Accordingly, where rebuttal evidence exceeds "the scope of the subject matter [Goodnight's] experts addressed," it is excludable. *See Unitedhealth Grp. v. Columbia Cas. Co.*, 2011 U.S. Dist. LEXIS 169735, at *5 (D. Minn. Sep. 6, 2011); *Martinez-Hernandez v. Butterball, LLC*, 2010 U.S. Dist. LEXIS 50246, at *43 (E.D.N.C. May 21, 2010) (discouraging

"back-door attempt[s]" to get in rebuttal expert testimony outside the scope of "true rebuttal testimony").[9]

Here, Mr. Bailey and Mr. Birkhead's expert opinions include completely new analyses on the same subjects as those already addressed by Mr. McShane and Mr. Dillewyn and required to be presented as part of Empire's case in chief. For example, Mr. Birkhead offers a new and different petrophysical model and analyses—with different assumptions, input parameters, and core calibrations—than Mr. Dillewyn, resulting in totally different log-based oil saturation calculations. *See generally*, Empire Rebuttal Exhibit L.

Similarly, Mr. Bailey developed new and conflicting (1) interpretations of the stratigraphy of the San Andres formation and (2) San Andres oil-in-place calculations based on the petrophysical analysis prepared by Mr. Birkhead in lieu of the ones offered by Mr. McShane. *See generally*, Empire Rebuttal Exhibit K. The analyses of Mr. Bailey and Mr. Birkhead are apparently intended to supplant Empire's previous direct testimony and indeed, will be in conflict with, Empire's recently filed revised testimony. The portions of their testimony and exhibits that offer entirely new affirmative opinions, which should have been included in Empire's direct testimony, are not proper rebuttal under any reasonable definition.

Nor is it material that Empire simply labels Mr. Bailey and Mr. Birkhead's testimony as rebuttal testimony. *See Wirth v. Commer. Res., Inc.*, 1981-NMCA-057, ¶ 20, 96 N.M. 340, 630 P.2d 292 ("Although defense counsel tried to characterize Mr. Patterson's testimony as 'rebuttal', it was not such."). Rather, a cursory review of Mr. Bailey and Mr. Birkhead's

[9] The New Mexico Rules of Civil Procedure are modeled after the Federal Rules of Civil Procedure, and "where the state rule closely tracks its federal counterpart, the federal construction of the federal rule is persuasive authority for construction of the corresponding state rule." Rule 1-034 NMRA, *Committee commentary for 2021 amendments* (citing *Marquez v. Frank Larrabee and Larrabee, Inc.*, 2016-NMCA-087, ¶ 12, 382 P.3d 968).

testimony clearly shows their testimony is intended to supplant (and indeed, is contradictory to) the testimony offered by Mr. McShane and Mr. Dillewyn in Empire's affirmative case. *Compare* Empire Revised Exs. G–H, *with id.* Rebuttal Exs. J–K. The table below provides a simple comparison of Mr. McShane's revised oil-in-place estimate, which is based on NuTech's revised petrophysical analysis ("Empire's Revised"), to the output from Mr. Bailey and Mr. Birkhead's analyses ("OPS Lo" and "OPS Hi"), illustrating the point. Differences in the oil-in-place comparison on a well-by-well basis reflect a substantial difference in the underlying oil saturation calculations that result from Mr. Birkhead's entirely new petrophysical analysis (*see* "DIFF Lo" and "DIFF Hi").

All San Andres	OPS Lo	OPS Hi	EMPIRE REVISED	DIFF Lo	DIFF Hi
Snyder Ryno SWD #1	19.9	33.0	15.6	4.3	17.4
EMSU 746	41.7	69.5	62.2	(20.5)	7.3
EMSU 713	4.1	6.5	8.0	(4.0)	(1.6)
EMSU #673	12.8	13.8	31.7	(18.9)	(17.9)
EMSU 660	14.0	28.4	48.6	(34.6)	(20.2)
EMSU 628	28.7	47.3	40.8	(12.2)	6.5
EMSU 658	26.3	38.9	30.3	(4.0)	8.6
TOTALS	147.2	237.3	237.2	(90.0)	0.1

The table demonstrates that the challenged "rebuttal" testimony is in no way aligned with Empire's underlying revised direct testimony; instead, the analyses conflict with and are substantially contradictory to Empire's revised direct testimony.

Such testimony is not proper rebuttal testimony and must have been disclosed as affirmative testimony as recognized by the Commission's operative PHO—that Empire proposed and agreed to. As discussed below, this did not occur, and this testimony must be excluded.

II. Mr. Bailey and Mr. Birkhead's affirmative testimony is untimely.

New Mexico rules dictate a pretrial "order shall control the subsequent course of the action unless modified by a subsequent order." N.M. R. Civ. P. Dist. Ct. 1-016(E) NMRA. *See*

also Fahrbach v. Diamond Shamrock, Inc., 1996-NMSC-063, ¶ 1, 928 P.2d 269 ("The principle is well established that a pretrial order, made and entered without objection, and to which no motion to modify has been made, controls the subsequent course of action." (internal quotations omitted)). And where a party attempts to make untimely affirmative disclosures, it is proper for the Commission to "refuse[] to allow the testimony of a witness not included in the pretrial order, when that witness is not presenting rebuttal evidence." *Wirth v. Commer. Res., Inc.*, 1981-NMCA-057, ¶ 20, 630 P.2d 292. *See also Martinez*, 1979-NMCA-086, ¶ 6. This is because "[a] pretrial order narrows the issues for trial, reveals the parties' real contentions, and eliminates unfair surprise." *Fahrbach*, 1996-NMSC-063, ¶ 1 (emphasis added). Indeed, New Mexico courts consistently criticize "the gamesmanship inherent in this type of litigation tactic," and emphasize "[t]he process is far too important and the goal too dear to allow this kind of trial maneuvering." *State v. Clark*, 1986-NMCA-095, ¶ 39, 727 P.2d 949 (internal quotations omitted).

While it is true that rules of civil procedure and evidence serve as guidance in Commission proceedings, in these cases the Commission has entered a prehearing order that governs. Moreover, Empire is the party that proposed the prehearing procedure and witness disclosures that Goodnight and the Division agreed to and were ultimately adopted by the Commission. *See* Empire counsel email proposing PHO, dated April 10, 2024, attached as **Exhibit D**.

The Third Amended PHO, dated January 31, 2025, clearly recognizes affirmative expert opinions and direct testimony must have already been disclosed. *See* Exhibit D ¶ 1. And the February 10, 2025, deadline for expert disclosures is expressly limited to rebuttal testimony. Empire must be held accountable to the very timelines and procedures they proposed and agreed to. Accordingly, the affirmative opinions offered by Mr. Bailey and Mr. Birkhead—which were

not offered until February 10, 2025—are patently untimely. Now, Empire seeks to circumvent its own agreed-to prehearing procedure to secure an unfair advantage to the detriment of Goodnight through the tactic of surprise.

III. Goodnight is substantially, unfairly prejudiced because it has no opportunity to respond to Mr. Bailey and Mr. Birkhead's affirmative opinions.

Improperly disclosed testimony must be excluded where the adverse party has been prejudiced and does not have an opportunity to cure the prejudice. *See, e.g.*, *Manus*, 1979-NMSC-035, ¶ 40.

Here, discovery is closed, and the parties are less than two weeks out from the hearing. Notably, Empire already has had a second bite at the apple; it already substantially revised its oil in place and petrophysical analyses via Mr. McShane's and Mr. Dillewyn's "revised" direct testimony—disclosed more than three months after the deadline to file direct testimony. Although substantially untimely, Goodnight expended substantial resources to quickly analyze that "revised" testimony and prepare for Mr. Dillewyn's deposition. And crucially, during that deposition, Mr. Dillewyn disclaimed the revised analysis. That important evidence for Goodnight obviously was not lost on Empire, as Empire now seeks to inject new direct testimony in its place—taking the proverbial, and, under the Third Amended PHO, prohibited third bite at the apple.

Not only does this violate the Third Amended PHO, but it also substantially and unfairly prejudices Goodnight. Unlike Goodnight's ability to test Mr. Dillewyn's (and Mr. McShane's vis-à-vis Mr. Dillewyn) "revised" direct testimony via deposition, Goodnight has no opportunity to depose Mr. Bailey or Mr. Birkhead ahead of the administrative hearing. *Cf. Manus*, 1979-NMSC-035, ¶ 40 ("Th[e] opportunity to depose this surprise rebuttal witness before his testimony at trial served to remove the prejudice caused by the initial surprise."). Nor does

Goodnight have the opportunity to supplement its expert reports or otherwise file a sur-rebuttal to address these eleventh-hour opinions. *See Campanile v. Daimler N. Am. Corp.*, 2023 U.S. Dist. LEXIS 243940, at *10 (D. Or. Aug. 16, 2023) ("Thus, even if [Plaintiff's expert's] report includes affirmative opinions, providing defendants with additional time to depose Kohles and supplement their expert reports sufficiently addresses any potential prejudice.").

Allowing Empire to provide additional affirmative expert opinions under the pretext it is rebuttal testimony two weeks before the hearing, when Goodnight has no opportunity to depose either expert or prepare sur-rebuttal reports, severely prejudices Goodnight and gives it no chance to cure the prejudice. Put another way, if the Commission allows Mr. Bailey and Mr. Birkhead to testify, it will unfairly and irreparably permit Empire "to benefit from their conduct to the prejudice of" Goodnight. *See In re Fla. Cement & Concrete Antitrust Litig.*, 278 F.R.D. 674, 684 (S.D. Fla. 2012). Empire has had over a year and a half to elicit the petrophysical and an oil-in-place analyses that it concedes it must present to meet the burden of proof in this proceeding. To now attempt to present entirely new direct evidence less than two weeks before the Hearing (which already has been continued from the original date) is unfairly prejudicial to Goodnight and prejudices the Commission's ability to provide a fair tribunal to decide these issues. The Commission should decline this invitation to permit untimely direct evidence in violation of the Commission's Hearing Orders and exclude "these supplemental analyses" from otherwise proper rebuttal testimony offered by Mr. Bailey and Mr. Birkhead. *See id.*

CONCLUSION

For the reasons stated above, the Commission should grant this motion and exclude the improper rebuttal testimony offered by Mr. Bailey and Mr. Birkhead and grant Goodnight other such relief it deems just and proper.

DATED:February13, 2025

Respectfully submitted,

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CERTIFICATE OF SERVICE

I hereby certify that on February 13, 2025, I served a copy of the foregoing document to the following counsel of record via Electronic Mail to:

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EXHIBIT A

Case Nos. 24277-24278, 23614-23617, 24018-24027, 23775
Order No. R-23208-C

STATE OF NEW MEXICO
ENERGY, MINERALS AND NATURAL RESOURCES DEPARTMENT
OIL CONSERVATION COMMISSION

APPLICATION OF GOODNIGHT MIDSTREAM PERMIAN, LLC TO AMEND ORDER NO. R-7767 TO EXCLUDE THE SAN ANDRES FORMATION FROM THE EUNICE MONUMENT OIL POOL WITHIN THE EUNICE MONUMENT SOUTH UNIT AREA, LEA COUNTY, NEW MEXICO. **CASE NO. 24277**

APPLICATION OF GOODNIGHT MIDSTREAM PERMIAN, LLC TO AMEND ORDER NO. R-7765, AS AMENDED TO EXCLUDE THE SAN ANDRES FORMATION FROM THE UNITIZED INTERVAL OF THE EUNICE MONUMENT SOUTH UNIT, LEA COUNTY, NEW MEXICO. **CASE NO. 24278**

APPLICATIONS OF GOODNIGHT MIDSTREAM PERMIAN, LLC FOR APPROVAL OF SALTWATER DISPOSAL WELLS LEA COUNTY, NEW MEXICO

CASE NOS. 23614-23617

APPLICATIONS OF EMPIRE NEW MEXICO LLC TO REVOKE INJECTION AUTHORITY, LEA COUNTY, NEW MEXICO

CASE NOS. 24018-24027

APPLICATION OF GOODNIGHT MIDSTREAM PERMIAN LLC TO AMEND ORDER NO. R-22026/SWD-2403 TO INCREASE THE APPROVED INJECTION RATE IN ITS ANDRE DAWSON SWD #1, LEA COUNTY, NEW MEXICO.

CASE NO. 23775

THIRD AMENDED PRE-HEARING ORDER

This Pre-Hearing Order follows the status conference held on September 23, 2024, before the Oil Conservation Commission. The above-referenced matters shall proceed as follows:

1. These matters will be heard, and evidence presented, starting on February 24,

2025, beginning at 9:00 A.M., and continuing thereafter on consecutive business days until complete, unless and until otherwise ordered. Opening arguments shall be heard on February 20, 2024.The parties, having disclosed their direct witnesses and having filed their direct witness testimony and exhibits, shall disclose their additional witnesses for rebuttal, each rebuttal witness's particular area of expertise, and identify the subject matter of each rebuttal witness's anticipated testimony, by Monday, January 6, 2025.

2. The last day to submit requests for subpoenas, including subpoenas for witness depositions in advance of hearing, shall be December 16, 2024.

3. Discovery motions may be filed, and if filed, motions to compel shall be filed on or before Friday, January 24, 2025. Responses will be due by Friday, January 31, 2025.No replies shall be filed. Rulings shall be made pursuant to 19.15.4.16.C NMAC.

4. Dispositive motions shall be filed no later than Thursday, January 23, 2025. Responses will be due ten business days after service of the dispositive motion and, in any event, no later than Thursday, February 6, 2025. Replies will be due seven business days after service of the response and, in any event, no later than Thursday, February 13, 2025. The Commission shall hear all outstanding motions at its February 20, 2025, regularly scheduled meeting.

5. Pre-hearing statements shall be filed on Monday, February 10, 2025, and shall include a list of issues common to all applications and a list of issues unique to any specific application or sub-group of applications.

6. Rebuttal testimony and exhibits shall be filed on Monday, February 10, 2025. The parties agree to provide copies of documents that are (1) within the respective party's possession, custody, or control, (2) upon which each party (including their witnesses) relied in preparation for the merits hearing, and (3) referenced in the rebuttal testimony and exhibits

within one week of a request for such documents, without a subpoena.

7. Objections to testimony and exhibits shall be filed no later than Thursday, February 13, 2025.

8. Hearing, if any, on any unresolved motions shall be held at the start of the evidentiary hearing.

9. Except as to dates certain provided herein, all periods shall be calculated according to Rule 1-006 NMRA. Extensions to the foregoing deadlines and dates, including hearing continuances, may be granted by the Division Director, by agreement of the parties or on a motion for good cause shown.

DONE at Albuquerque, New Mexico on the 31st day of January, 2025.

STATE OF NEW MEXICO
OIL CONSERVATION COMMISSION

Gerasimos Razatos, Acting Chair

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EXHIBIT B

petrophysical analysis or the log interpretations, agree?

MS. SHAHEEN: Objection. Form, foundation.

Q. BY MR. RANKIN: You can answer.

A. Yes.

Q. All right. All right. Let's see. I'm going to move into your testimony now. Mr. Dillewyn, what subject matter are you requesting that the Commission recognize you as an expert in for purposes of testifying in this hearing?

A. Petrophysics.

Q. Okay. In your statement here, you say that since July of 2009 you've worked as an engineer for NuTech Energy Alliance, agree?

A. Yes.

MS. SHAHEEN: Adam, did you want to be sharing this?

MR. RANKIN: Thank you. Sorry.

MS. SHAHEEN: It's okay.

MR. RANKIN: Stop sharing.

Q. BY MR. RANKIN: All right. So back to your revised self-affirmed statement. You -- you state here that since July of 2009 I've worked as an engineer for NuTech Energy Alliance; is that correct?

A. Yes.

Q. Okay. And in that role you state that you are

EXHIBIT C

STATE OF NEW MEXICO
DEPARTMENT OF ENERGY, MINERALS AND NATURAL RESOURCES
OIL CONSERVATION COMMISSION

APPLICATION OF GOODNIGHT MIDSTREAM PERMIAN, LLC FOR APPROVAL OF A SALTWATER DISPOSAL WELL, LEA COUNTY, NEW MEXICO	**CASE NO. 24123** **ORDER NO. R-22869-A**
APPLICATIONS OF GOODNIGHT MIDSTREAM PERMIAN, LLC FOR APPROVAL OF SALTWATER DISPOSAL WELLS LEA COUNTY, NEW MEXICO	**CASE NOS. 23614-23617**
APPLICATION OF GOODNIGHT MIDSTREAM PERMIAN LLC TO AMEND ORDER NO. R-22026/SWD-2403 TO INCREASE THE APPROVED INJECTION RATE IN ITS ANDRE DAWSON SWD #1, LEA COUNTY, NEW MEXICO.	**CASE NO. 23775**
APPLICATIONS OF EMPIRE NEW MEXICO LLC TO REVOKE INJECTION AUTHORITY, LEA COUNTY, NEW MEXICO	**CASE NOS. 24018-24020, 24025**

SELF-AFFIRMED STATEMENT OF RYAN M. BAILEY – REBUTTAL

I, Ryan M. Bailey, make the following self-affirmed statement:

1. I am over the age of 18, and have the capacity to execute this affirmation, which is based on my personal knowledge.

2. I am Co-founder and Vice President of Ops Geologic, LLC in The Woodlands, Texas and I am a geologist with over 17 years of experience in the petroleum industry.

3. I submit this statement on behalf of Empire New Mexico, LLC in connection with the above-referenced matters, in accordance with paragraph 7 of the Pre-Hearing Order issued in these matters on December 5, 2024.

4. I have not previously testified before the New Mexico Oil Conservation Commission. A copy of my curriculum vitae is attached as Exhibit K-56. In short, I graduated

EXHIBIT K

from the University of Alabama with a BS and MS in geology. My academic course work and thesis focused on understanding structural styles within the Appalachian-Ouachita fold and thrust belt, interpreting seismic and well log data to structurally restore a seismic profile in the Southern Appalachian thrust belt in Alabama. I co-authored a paper in the Gulf Coast Association of Geological Societies 2012 (Vol. 1) titled Structure of the Alleghanian Thrust Belt under the Gulf Coastal Plain of Alabama. I am a member of the American Association of Petroleum Geologists and the Houston Geological Society.

5. I reviewed the available literature and utilized Dr. Lindsay's lifelong work in the field and core to define a stratigraphic model based on Dr. Lindsay's original stratigraphic model. I correlated the Grayburg and all zones within the Grayburg, Upper San Andres, Lovington Sand, Lower San Andres, and Glorieta formations across the EMSU unit. In addition, I worked with Ops Geologic petrophysicist, Scott Birkhead, who generated a petrophysical model over the EMSU and mapped the resultant reservoir properties across the EMSU, including structure, isopach, porosity, water saturation, pore volume, hydrocarbon pore volume, and oil in place.

6. I have reviewed the testimony of Mr. Preston McGuire previously filed on August 26, 2024, on behalf of Goodnight Midstream Permian, LLC ("Goodnight"). I make this statement in rebuttal to some of the opinions stated therein by Mr. McGuire's testimony, particularly the items described below.

Summary

- I reviewed the testimony of Preston McGuire and provide a stratigraphic model in rebuttal to Mr. McGuire's opinions. Scott Birkhead responds in rebuttal to the opinions expressed by Dr. Davidson.

- Base maps for the study area are shown in exhibits K-1 and K-2. Exhibit K-1 is a base map that shows all wells within the Eunice Monument South Unit ("EMSU") and exhibit K-2 is a base map that shows all wells that were used to map the San Andres structure, all active disposal wells colored by operator, and the core and petrophysical wells that were utilized to develop reservoir property maps. Several publications document that the Lovington sand lies within the Upper San Andres formation. (Foster, 1976; Fitchen, 1993; Dutton et al., 2011; Trentham, 2011). Goodnight has incorrectly chosen to place the top of the San Andres below the Lovington sand based on pressure differences above and below the sand. Goodnight has chosen to use this model to argue there are not any ROZ zones within the San Andres and thereby support the case for water disposal in the San Andres. Our analysis demonstrates that Goodnight's model is incorrect, as explained below.
- Exhibits K-3 and K-4 are type sections for the cored wells from the R.R. Bell 4 and EMSU 679 and are the basis for our stratigraphic model. This model is of critical importance as it shows a ROZ in the Upper San Andres as opposed to Goodnight's model of the ROZ being in the Lower Grayburg.

In addition, I worked with Scott Birkhead to generate a petrophysical model for the Grayburg and San Andres across the EMSU unit. Ops Geologic petrophysical model analyzed 29 wells - 18 wells were used to map the reservoir properties for the Upper San Andres and 12 wells were used for the Lower San Andres. The resultant reservoir properties were mapped for the Upper and Lower San Andres, inclusive of Net Reservoir, Pore Volume (PHIH), Oil Saturation (So), Hydrocarbon Pore Volume (HCPV), and Original Oil in Place (OOIP). As explained by Mr. Birkhead, the petrophysical model clearly identifies oil saturations over 20% throughout the Upper San Andres as well as several potential zones within the Lower San Andres. Determining the oil

saturations (SOIL LO and SOIL HI) as shown in the type logs in Track 6 of Exhibits K-3 and K-4 were critical to identifying potential ROZ zones within the San Andres. The resultant petrophysical model allowed for understanding the potential ranges of oil saturations throughout the San Andres which, along with the reservoir property maps, allowed for developing and mapping out potential ranges for original oil in place (OOIP). These reservoir property maps, along with cross sections across the EMSU unit, will be utilized throughout to rebut Mr. McGuire's testimony.

Preston McGuire Statement

- On page 3 bullet 2 of Preston McGuire's summary, he states: "Substantial data on the sustained and geographically extensive pressure differentials between the Grayburg and San Andres aquifer confirm (1) the presence of an effective geologic barrier between the two formations, and (2) that the Grayburg reservoir and San Andres aquifer are distinct geologic zones that are functionally severed and do not act, and cannot be considered, as a single reservoir."

Rebuttal

- I agree that the Grayburg and San Andres are separate geologic intervals. However, based on fluid communication between the San Andres and Grayburg in wells within the EMSU, it is undisputed that these reservoirs are in communication with one another. In Dr. Lindsay's fracture study to G.W. Burg on the EMSU 679 well core (Exhibit K-5), he measured 313 fractures. Four intervals of collapse breccia were present along with small fractures. The study shows a well-developed northwesterly and a poorly developed northeasterly set of fractures as part of a conjugate joint system in EMSU 679 well. Fractures and oil staining from a cored

interval below the top of the San Andres from 4,229-4,239' is shown in the core photo in Exhibit K-5. Similar fracturing, most likely higher frequency, would be expected to be seen on the flanks and crest of the Eunice Monument anticline given the flexuring of stratigraphy up onto the structure. In addition, based on Chevron's analysis in the EMSU (Strickland et al., 1996), which is referenced by Mr. McGuire on page 6 bullet 19 of his testimony, there does not seem to be a consistent, continuous regional geologic barrier between the Grayburg and San Andres. It is noted:

- "During the time of primary production prior to unitization and initiating the waterflood in the Eunice Monument field, barium sulfate scale deposition was experienced in a number of producing wells. Although the drilling was confined to the Penrose and Grayburg formations, apparently some San Andres water was finding its way into the wellbore of these wells and resulted in a barium sulfate scale, barite, deposition problem. Production experience strongly suggests that mixing of water occurs in the producing wellbores rather than in the formation. This problem was and continues to manifest itself in downhole pump problems. Inflow of fluids into the wells is not affected, thus leading to the conclusion that sulfate rich water found its way into some producing wells before the waterflood was initiated.

  Barium sulfate scale has also been detected in the surface vessels that are used to process the produced fluids."

- More importantly, Goodnight's stratigraphic model is inaccurate. Based on Dr. Lindsay's field work on outcrop and core descriptions and literature across the Northwest shelf and Central Basin Platform (Foster, 1976; Fitchen, 1993; Dutton et al., 2011; Trentham, 2011) it is understood that the Lovington sand sits within the Upper San Andres. Foster work regarding San Andres stratigraphy states, "the upper part is dolomite with an interval of sandstone and black shale, known as the Lovington sand, about 150' below the top" (Exhibit K-6). Fitchen's work states, "On the platform, this unit contains several sandstone beds, the lowermost of which lies 25-47m below the top of the San Andres formation". I have also provided Upper San Andres type logs from the BEG study and Bob Trentham's work, illustrating the Lovington Sand sitting within the upper San Andres (Exhibit's K-7 and K-8). These statements are consistent with the outcrop analysis and stratigraphic model provided by Dr. Lindsay and are the basis for how our stratigraphic model was built.
- We define the top of the San Andres as the tight dolomite sequence approximately 130-150' above the Lovington Sand and thinning to the east onto the Eunice Monument anticline, where it is approximately 100' below the top of the San Andres in the R.R. Bell 4. The top of the San Andres is correlated by a tight dolostone/anhydrite sequence identified using gamma ray (GR), density (RHOB), density/neutron porosity (DPHI/NPHI), sonic (DT), and photoelectric (PE) log curves. This is illustrated in the type-log sections for the R.R. Bell 4 and EMSU 679 (Exhibits K-3 and K-4). Both wells were cored down into the San Andres and allowed Dr. Lindsay to define the top of the San Andres based on his core

descriptions, which provided the basis for our stratigraphic model. Goodnight has generally defined the top of the San Andres below the Lovington Sand marker except for in the EMSU 679 well, where the define the top as 40' above the Lovington sand marker and 125' below the OCD and Ops Geologic top of the San Andres. However, in the Ryno SWD 1, Goodnight defines the top exactly where we define the top of the San Andres.

- Exhibit K-9 is a base map showing the location of cross sections across EMSU. Exhibits K-10 through K-12 are strike and dip sections across the field illustrating our correlations and, exhibit K-13 is a structural dip section through the Ryno SWD, EMSU 679, EMSU 001, EMSU 628, and EMSU 660 illustrating the difference between Goodnight's correlations and ours.
- In addition, the reported perforated intervals for EMSU 628 and EMSU 658 and the bridge plug for EMSU 713 further support our model. In the EMSU 628, the reported perforated intervals by XTO from 3,918'-3,924', 3,935-3,950', 4,030'-4,040', and 4,057-4,067 are designated as San Andres. The upper perforation sits directly below our top of San Andres. These perforations are well above Goodnight's top of 4,089' MD for the San Andres. In EMSU 658, the reported perforated intervals by XTO from 3,995-4,004', 4,018-4,030', and 4,074-4,084' are designated San Andres and again sit well above Goodnight's top of 4,145' MD for the San Andres. The OCD has the top of the San Andres at 3,949' MD, which matches the depth of our San Andres top. In EMSU 713, the bridge plug that was set for this well from 4,042-4052' is designated Grayburg Zone 6. Our top of the San Andres sits directly below this bridge plug and is consistently correlated with

the EMSU 628 and 658 as shown in Exhibit K-14. Goodnight did not provide a pick for the San Andres formation top in the EMSU 713, but the OCD top sits well above our top at 3,942.

- Based on Dr. Lindsay's analysis, the cited literature, and the perforated intervals discussed above, wells with logs across the field were correlated, and structure and isopach maps were generated for the Lower and Upper San Andres and Grayburg (Exhibits K-15 through K-20). Based on log coverage over the intervals, the following number of wells were used to generate the structure and isopach maps across the EMSU unit for the Lower and Upper San Andres and Grayburg: 79 wells were used to generate the Lower San Andres structure and 65 wells were used to generate the isopach maps; 90 wells were used to generate the Upper San Andres structure and 78 wells were used to generate the isopach maps; and 131 wells were used to generate the Grayburg structure and 90 wells were used to generate the isopach maps. The Eunice monument anticline is clearly shown in the structure maps, oriented NW-SE across the east-central part of the EMSU (Exhibits K-15-K17). The Lower San Andres maintains fairly consistent thickness across the EMSU with slight thickness variations upwards of 30-60' in spots. Both the San Andres and Grayburg thicken into the basin, though the Grayburg thickens more rapidly (Exhibits K-18-K20). The Grayburg was deposited on a distally steepening ramp (Lindsay, 2017) so expansion of the section into the basin is expected.
- Reservoir property maps for low and high cases for the Lower and Upper San Andres net pay, average porosity above 4% cutoff (PHIT), average water saturation below 80% cutoff (SWT), oil saturation (So), pore volume (PHIH), hydrocarbon

pore volume (HCPV), and original oil in place (OOIP) are shown in exhibits K-21-K46. In addition, combined maps for the Upper and Lower San Andres Net Pay, PHIH, HCPV, and OOIP are shown in exhibits K-47 through K54. As mentioned in the summary above, the low and high cases were based on low and high cases Mr. Birkhead developed for the water saturation to determine the potential ranges for oil saturations within the San Andres. Net pay calculations for both the Upper and Lower San Andres were determined using a 4% PHIT cutoff, 80% water saturation cutoff, and 60% volume of clay cutoff (VCL). Oil saturation maps were generated using 1-Sw for each case. PHIH maps were generated by multiplying the average porosity above the 4% cutoff with the net pay maps. HCPV maps were generated by multiplying the PHIH maps by the So maps to give the total hydrocarbon filled pore volume. OOIP maps were generated in millions of barrels/section using the standard OOIP calculation of:

$$OOIP=7,758*A*HCPV/Bo$$

Where 7,758 is the constant that converts the results from acre-feet to barrels, A is the area which is 640 acres/section, HCPV comes from the maps generated for each formation, and 1.3 was used for the Bo known as the oil formation volume factor which was provided by Empire's engineers. For the Lower San Andres, OOIP ranges from 5-40+ MMBLS/Section for the low case and 10-60+ MMBLS/Section for the high case. For the Upper San Andres, OOIP ranges from 3-20+ MMBLS/Section for the low case and 5-30+ MMBLS/Section for the high case. Total San Andres OOIP volumes range from 8-60+ MMBLS for the low case and 15-90+ MMBLS for the high case. OOIP was also calculated for the entire EMSU

unit utilizing the HCPV maps, an area of 14,179.85 acres (hand drawn polygon, the actual unit size from Gulf Oil's Case No. 8399 is 14,189.84 more or less), and a Bo of 1.3. Total OOIP volumes for the Upper San Andres in the EMSU unit range from 191 MMBL for the low case to 331 MMBLS for the high case. For the Lower San Andres, OOIP volumes for the EMSU unit range from 439 MMBLS for the low case to 718 MMBLS for the high case. That brings the OOIP volumes for the total San Andres to 630 MMBLS for the low case and 1,049 MMBLS for the high case (Exhibit K-55)

Preston McGuire Statement

- On page 3 bullet 3 of Preston McGuire's summary, he states: "Analysis of core data and historical production tests confirms that the San Andres does not meet the criteria for a ROZ because San Andres oil saturations are well below the defined 20% cutoff as defined by Empires' own ROZ experts, confirming that Goodnight's disposal operations will not cause waste or impair correlative rights in the San Andres disposal zone."

Rebuttal

- The cross sections I've provided (Exhibits K10 throughK-14) clearly show that oil saturations are above 20% and potentially above 40% throughout the Upper San Andres. And while we have fewer wells available for evaluation in the Lower San Andres, there are clear zones of interest with oil saturations over 20% and potentially in the range of 40-60%. In addition, the oil saturation maps generated for the low and high cases for both the Lower San Andres (Exhibits K-26 and K-

27) and Upper San Andres (Exhibits K-39 and K-40) clearly illustrate oil saturation averages above 20% across the EMSU.

Preston McGuire Statement

- On page 3 bullet 4 of Preston McGuire's summary, he states: "Because Goodnight's San Andres disposal zone is confined to intervals below any potential ROZ that may exist in the Grayburg and is isolated by a sustained and geographically extensive geologic seal, disposal operations will not interfere with Eunice Monument South Unit ("EMSU") operations in the Grayburg main pay zone or ROZ intervals based on the effective seal of the disposal zone."

Rebuttal

- First, disposal is impacting the potential ROZ zones within the San Andres as I have shown in the cross section exhibits. Second, I have also shown in my summary from the literature (Strickland et al., 1996), that barium sulfate scale was causing downhole pump problems and was detected in surface vessels. Chevron concluded that sulfate rich water made its way into the producing wellbores before the water flood. San Andres water is sulfate rich, and Grayburg water contains barium. If the two are mixing prior to the waterflood, it can only be concluded that San Andres water is migrating into the Grayburg. On face value this shouldn't seem surprising given that the Grayburg was the main producing zone, and the likely pressure drop associated with Grayburg production allowed for fluids to migrate from the San Andres into the Grayburg. In addition, the documented fracturing within the EMSU 679 core and the likelihood of higher frequency fracturing on the Eunice Monument anticline would only enhance the potential for fluid communication. The

information provided here certainly doesn't lead one to conclude that there is a geographically extensive geologic seal across the EMSU.

Preston McGuire Statement

- On page 11 bullet 25 of Preston McGuire's testimony, he states: "The San Andres at the EMSU has never been prospective for hydrocarbons and has been the defined water management zone for the area, both for disposal and water supply, since as early as the 1960s."

Rebuttal

- Mr. McGuire ignores that to date, there have been no tertiary enhanced oil recovery (EOR) efforts made in the San Andres within the EMSU unit. There are currently several active CO2 floods in the San Andres along the same trend across the Northwest Shelf and Central Basin Platform (Hobbs, Wasson, Seminole, Vacuum, Means, Hanford, and Goldsmith-Landreth Units). I have illustrated the potential oil saturations within the San Andres through our petrophysical modeling and I have shown oil staining within the Upper San Andres from the EMSU core. It is unreasonable to deny the possibility that the San Andres has potential for tertiary recovery.

Preston McGuire Statement

- On page 15 bullet 36 of Preston McGuire's testimony, he states: "While a ROZ does not occur in the San Andres aquifer at the EMSU, one potentially exists below the oil-water contact within the Grayburg but is entirely limited to the Grayburg. There has never been any evidence that San Andres disposal operations have

interfered with the Grayburg producing zone in the 60 plus years since San Andres disposal began at the EMSU."

Rebuttal

- I have clearly shown from literature and through our correlations that what Goodnight has determined to be the lower Grayburg is the Upper San Andres. What Goodnight defines as a regional geographically extensive seal is difficult to determine given Goodnight's inconsistency in correlations, which I have illustrated in Exhibit K-13. If we assume that the base of the Lovington sand is Goodnight's top seal, then I would question Goodnight's description of a tight dolomite/anhydrite interval as there is greater than 4% porosity and generally increased porosity at the top of the interval, especially in wells on the Eunice Monument anticline. If we assume Goodnight's regional seal is the Lovington sand, then Goodnight's lithologic description of this interval as a tight dolomite/anhydrite is inaccurate because the Lovington sand is a mix of dolomitic sand and mudstone. Goodnight's model is inconsistent with the outcrop and core analysis by Dr. Lindsay and others, as well as the studies of the geoscientists whose literature I have discussed in my testimony. On that basis, Goodnight's testimony about the formation in which ROZ zones exist and regarding regional seals between the Grayburg and San Andres is incorrect because Goodnight's model is wrong lithologically and stratigraphically. In addition, I have exhibited potential ROZ intervals well down into the San Andres that are currently being impacted by Goodnight's disposal. Goodnight has included cross sections in testimony but has

not provided any structure, isopach, or reservoir property maps to support their geologic analysis.

Preston McGuire Statement

- On page 35 bullet 94 of Preston McGuire's testimony, he states: Goodnight Midstream defines the boundary between the Grayburg and the San Andres as the location of the mappable permeability barrier that prevents flow from occurring between those two formations. This is a functional "Top of San Andres." Everything above performs and behaves together as a single unit and reservoir and is isolated and distinct from everything below this barrier."

Rebuttal

- In Mr. McGuire's geologic overview of Goodnight's existing injection in the EMSU, he describes the Upper San Andres being capped by tight dolomite and anhydrite which serves as the upper geologic seal to prevent migration to the formations above. However, on Exhibit K-13 as well as the cross-section exhibits provided by Mr. McGuire, one can see where Goodnight places the top of the San Andres. Goodnight's top is inconsistent across the field but in general it is below the Lovington sand marker. The Lovington sand interval above Goodnight's top is a mixture of mudstone and dolomitized sands. The hotter gamma ray signature is indicative of not only the mudstones but of the arkosic nature of the Lovington sand. In addition, the Lovington sand interval has average porosities well over 4%. Below Goodnight's top is a dolomite/anhydrite unit, but this interval contains porosities well over 4% as well. Goodnight's statement on the lithology at the top of the San Andres is more in-line with where I have placed the top of the San

Andres, which has porous intervals but is a tighter interval than Goodnight's top of San Andres and is consistent with the work on outcrop, core, and literature I have provided.

Preston McGuire Statement

- On page 35 bullet 96 of Preston McGuire's testimony, he states: "It appears Empire is seeking to create a conflict with Goodnight's disposal operations by calling a potential Grayburg ROZ (the zone below the Grayburg oil-water contact at -325 feet subsea) the San Andres. It is not San Andres. It is Grayburg because it is in an interval that is geologically and functionally isolated and distinct from the underlying San Andres. That means any residual oil in this zone is Grayburg oil and it is Grayburg oil below the Grayburg oil-water contact. Because it is isolated by the well-defined permeability barrier that separates the San Andres from the Grayburg, the oil in this zone, and any current or proposed operations, will not be affected by San Andres water management operations below."

Rebuttal

- Mr. McGuire has chosen to ignore the work of many technical experts in the field and their subsurface analyses. Goodnight is using an engineering approach to define the top of the San Andres based on a purported pressure boundary as opposed to utilizing lithostratigraphic or chronostratigraphic correlations. This theory is akin to what would be utilized offshore to correlate compartmentalized sands over long distances where paleo data is not readily available to chronostratigraphically tie the sands. This methodology is inappropriate for this area given the amount of existing outcrop and subsurface studies, the available well data, and the pre-existing

stratigraphic models that were built based on these analyses. Mr. McGuire's opinion demonstrates that Goodnight lacks a basic understanding of the stratigraphy and has built an incorrect model based on reservoir engineering. I would presume it is also why they have picked inconsistent tops across the EMSU.

Preston McGuire Statement

- On page 37 bullet 102 of Preston McGuire's testimony, he states: "Unlike the majority of the EMSU producers and waterflood injection wells, the tops that were reported in the WSW's were consistent with the unitization exhibits and the Chevron SPE publication discussed above, except for the EMSU #461. The top that is reported for #461 is 4,002 feet, making the Grayburg only 255 feet thick. This is inconsistent with the reported thickness for the Grayburg in the unitization case file and with its thickness at the other WSW's. Goodnight picked the San Andres top in this well at 4,195', which is consistent with the Grayburg thickness reported in the unitization case file and with the other water supply wells that picked the top of the San Andres at a mappable confining layer."

Rebuttal

- The Grayburg is on a distally steepening ramp thickening into the basin (Lindsay, 2017; Lindsay 1991). The Grayburg does not have a consistent thickness across the EMSU, especially from the basin onto the Eunice Monument anticline. This is part of the fallacy in Goodnight's top picks and Goodnight's failure to understand the stratigraphic model for the Grayburg/San Andres. OCD's pick for the EMSU #461 well is actually 20' shallower than our top pick of 4,022' but certainly more

in line with our stratigraphic model for the San Andres than Goodnight's pick of 4,195' below the Lovington sand.

Preston McGuire Statement

- On page 37 bullet 103 of Preston McGuire's testimony, he states: "Goodnight has consistently used this method of picking the San Andres top at the mappable barrier that separates the Grayburg from the San Andres. This top is confirmed to be the barrier that separates two different pressure systems, one associated with the Grayburg and the other associated with the San Andres aquifer. Because of the difficulty identifying stratigraphic intervals within the San Andres carbonate ramp system that exists within the EMSU, the best method for accurately picking the top of the San Andres and the strongest evidence it is correct is not necessarily geologic but engineering based data.

Rebuttal

- Mr. McGuire's correlations illustrate the pitfalls with using an engineering-based methodology to identify tops that cross chronostratigraphic surface boundaries. The pick can be made very clearly across EMSU both lithologically and chronostratigraphically as illustrated in Exhibits K-10 through K-14. Our model relies on the previous work of many geologists who have spent decades defining the stratigraphic framework. Throughout this rebuttal and in my exhibits, I have illustrated the stratigraphic model and how the top is defined. It is incorrect to construct a model to fit an agenda, and doing so shows a lack of basic research and ignores fundamental geology. If Goodnight had argued that field rules designated the top of the San Andres based on a type log and that top fit their model, then that

would be fine. But that is not the case here. Similarly, if Goodnight had utilized a different stratigraphic model from a nearby field that they could argue supports their model, then that would be fine as well. But they have not done that either. So, we must rely on the previous work that has been done and documented in the literature and apply it to the EMSU. That is what I have done and illustrated throughout this rebuttal.

I affirm under penalty of perjury under the laws of the State of New Mexico that this statement is true and correct.

Ryan Bailey
Ryan M. Bailey
Vice President Geoscience
OPS GEOLOGIC

2-8-2025
DATE

References

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Exhibit K-1

EMSU Base Map

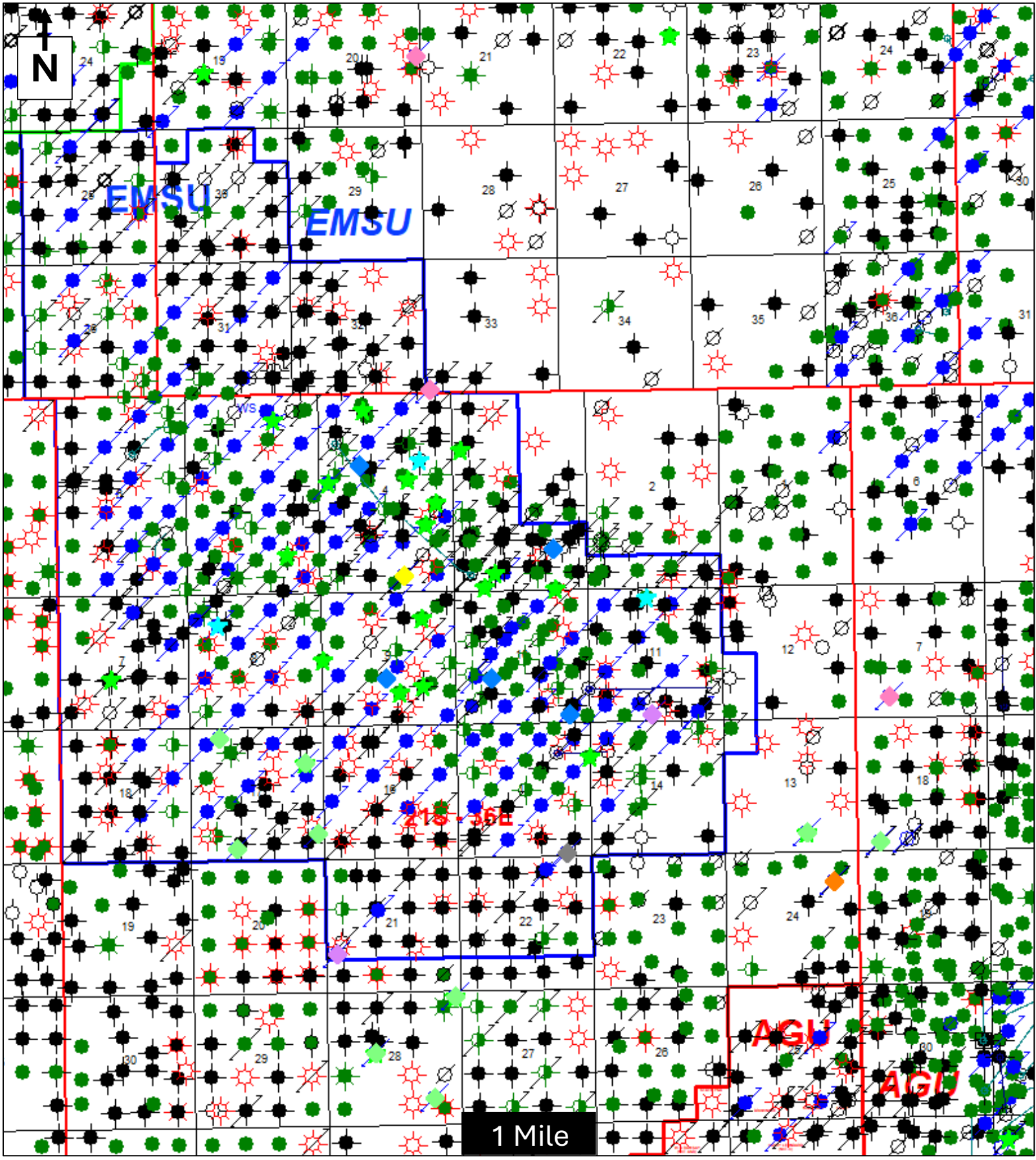


Exhibit K-2

EMSU Base Map w/ San Andres Structure and Disposal Wells

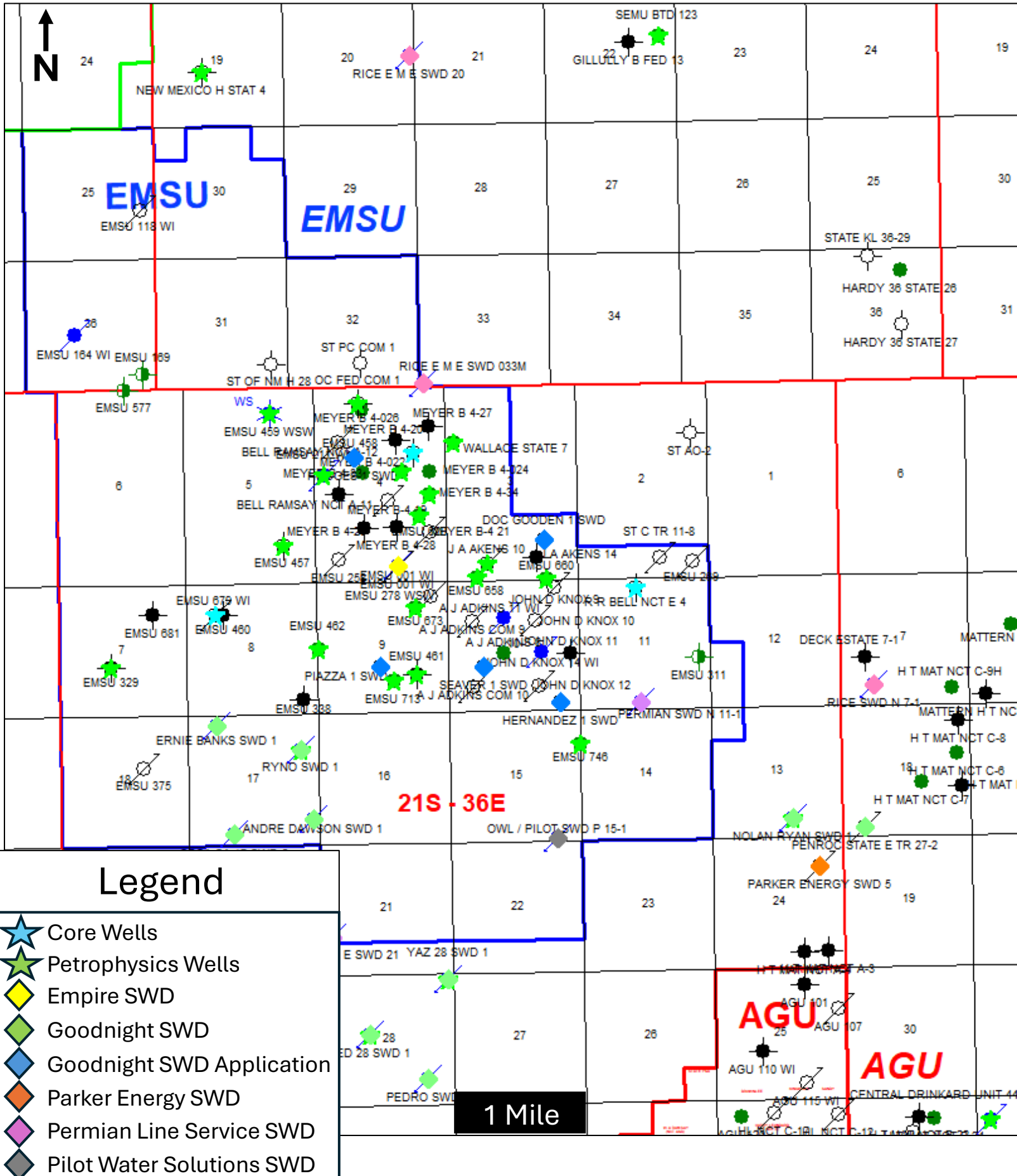
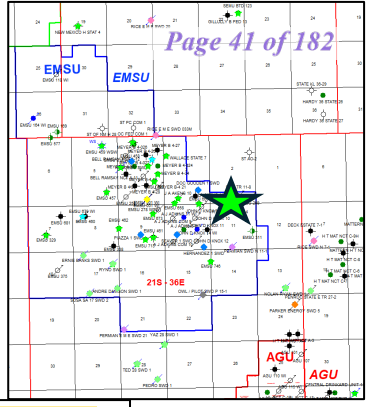


Exhibit K-3

R.R. Bell NCT E 4 Type Log
30025275040000
Spud Date: 10/2/1981



Cored Interval Box in Track 1
RES Shaded Above 200 Ohms
DPHI_DOL Shaded Above 4%

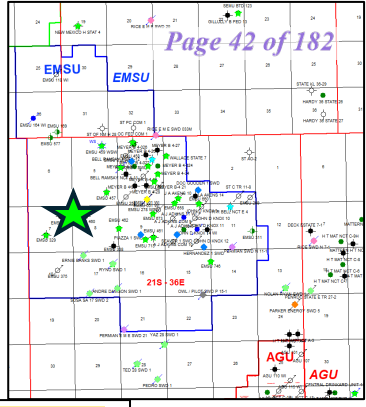
Net Pay Low
Net Pay High

0 CAL 20		0 PE 10	0.3 NPHI 0	130 DT 30	1 SOIL LO 0
0 GR 100	Depth	0.2 RES 2000	0.3 DPHI 0	2 RHOB 3	1 SOIL HI 0

Grayburg
Zone 2
Zone 3
Zone 4
Zone 5
Zone 6
San Andres
Lovington Sand
Lower San Andres
Glorieta

Exhibit K-4

EMSU 679 Type Log
30025310090000
Spud Date: 10/9/1990



Cored Interval Box in Track 1
RES Shaded Above 200 Ohms
DPHI_DOL Shaded Above 4%

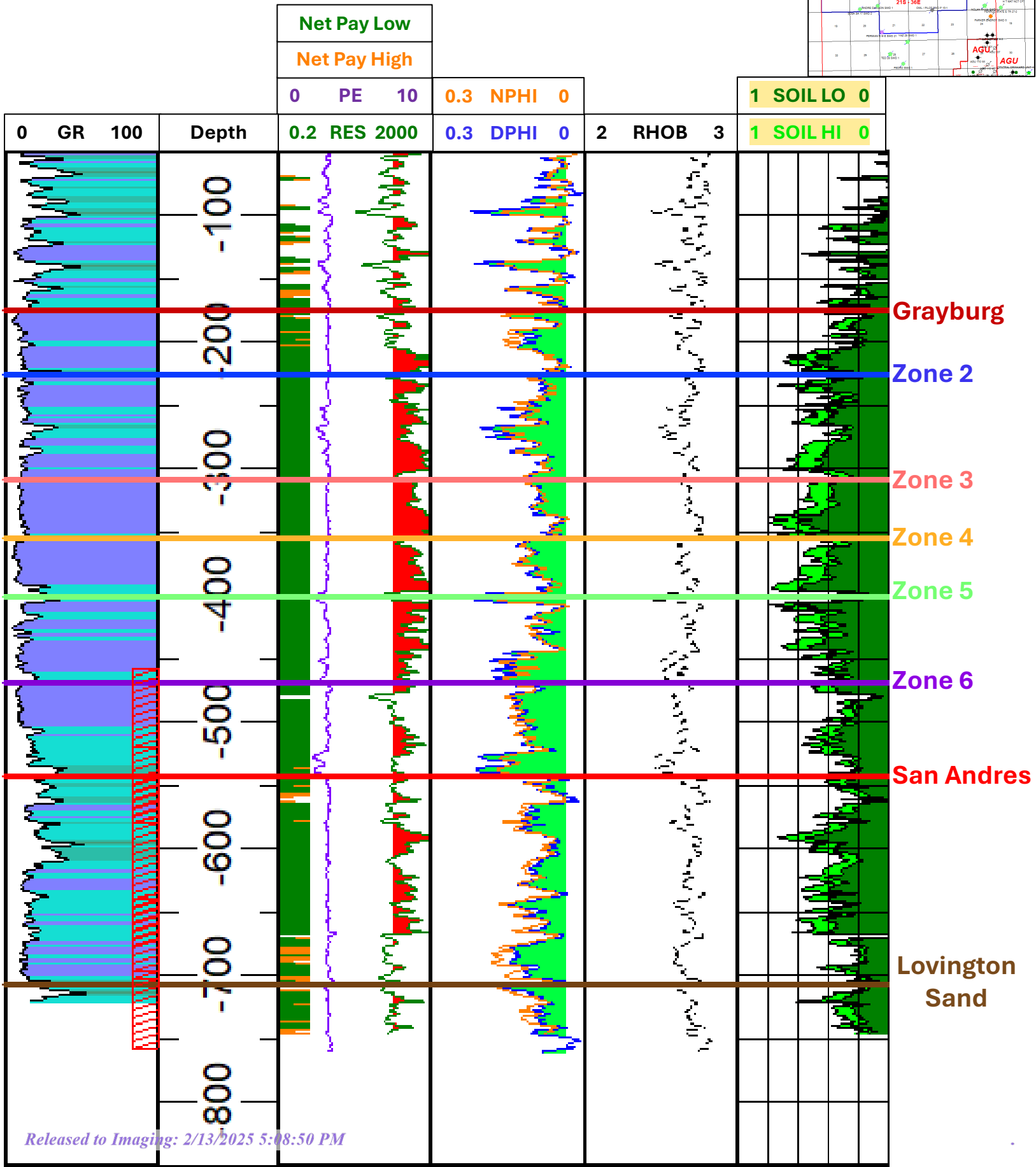


Exhibit K-5

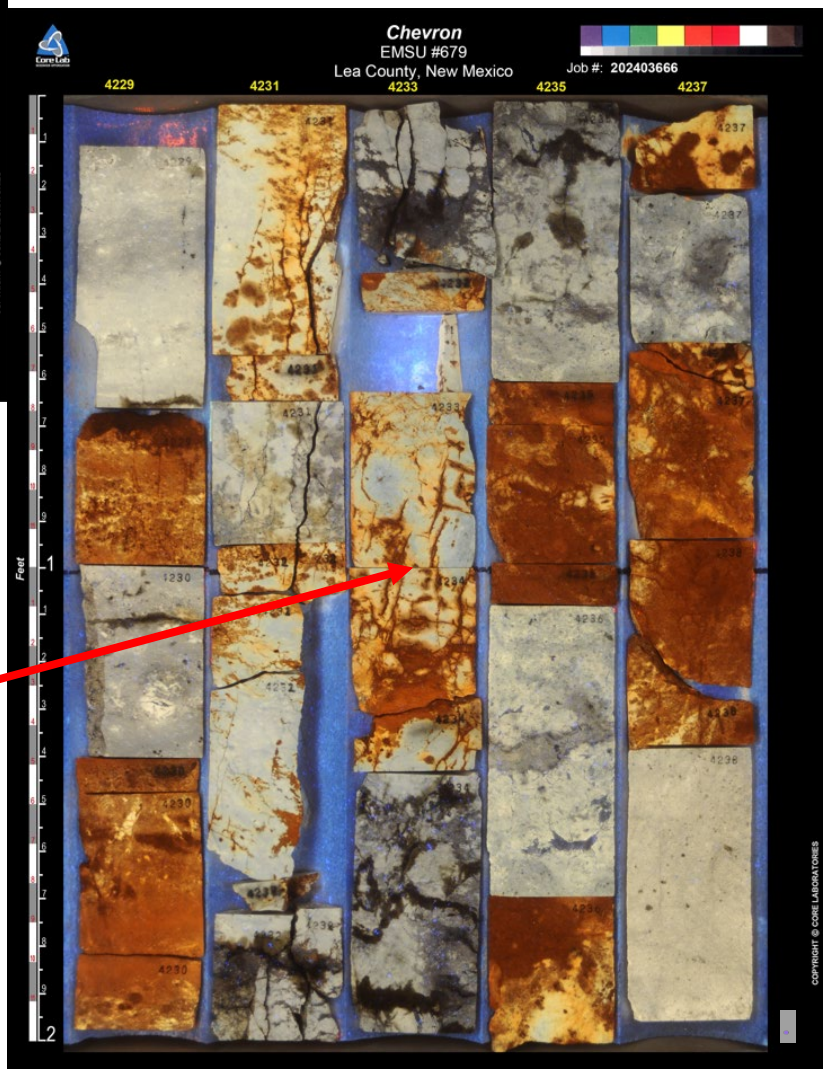
EMSU 679 Core Photo Below the Top of San Andres

Visible Light: Core Depths 4,229-4,237

EMSU 679 Top of San Andres is at 4,142' MD

Note the fractures and oil staining within the cored interval

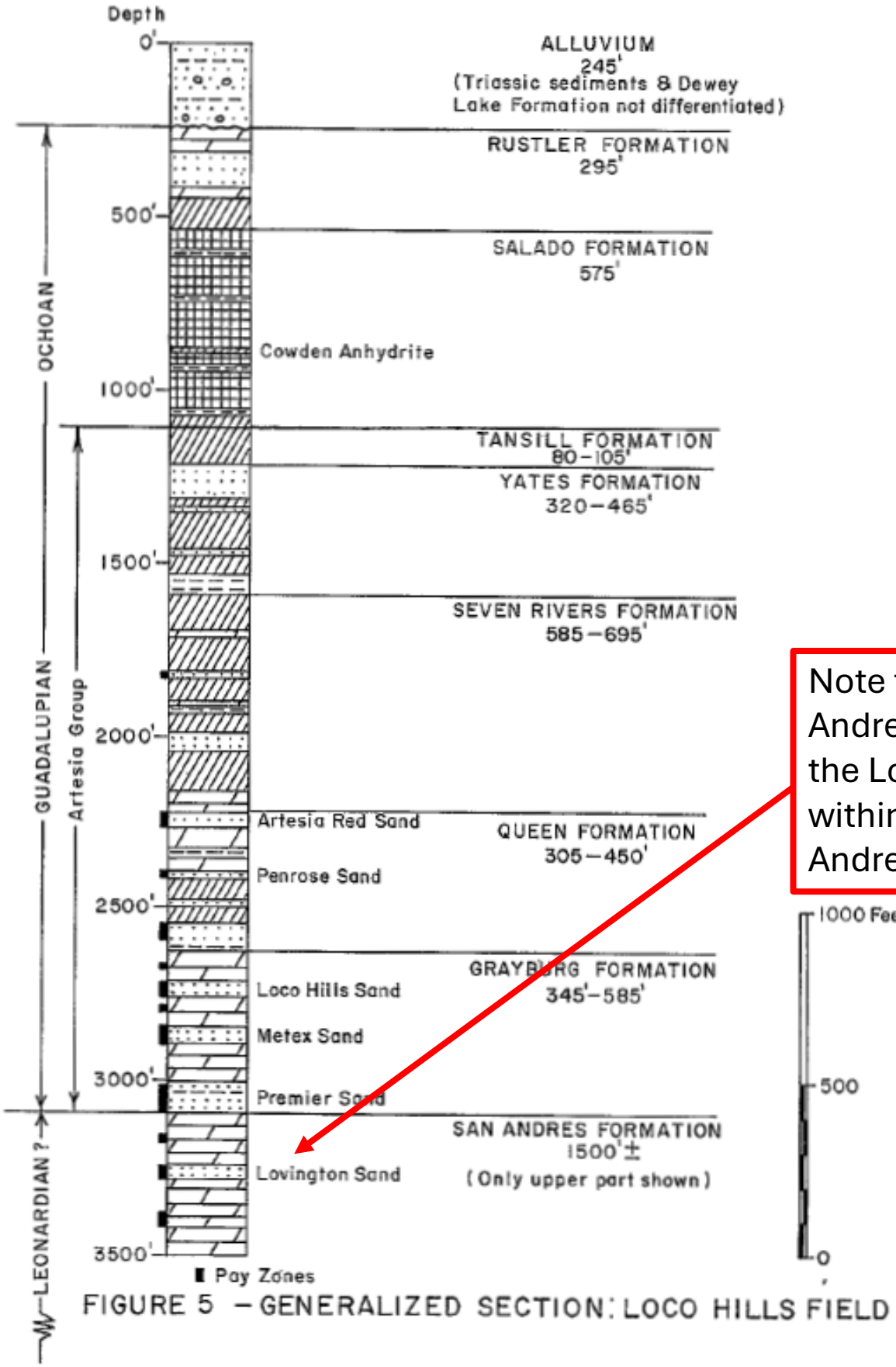
Ultraviolet: Core Depths 4,229-4,237



Note the fractures and oil staining within the cored interval

Exhibit K-6

Foster Type Log Loco Hills Field Oterro County, NM



Note the top of the San Andres is dolomite and the Lovington Sand sits within the Upper San Andres

FIGURE 5 – GENERALIZED SECTION: LOCO HILLS FIELD

Exhibit K-7

BEG Study Type Log for Jackson-Grayburg field on the Northwest Shelf Eddy County, NM

Note the tight dolomitic section of the Upper San Andres on the density/neutron labeled Vacuum and the Lovington Sand sitting within the Upper San Andres

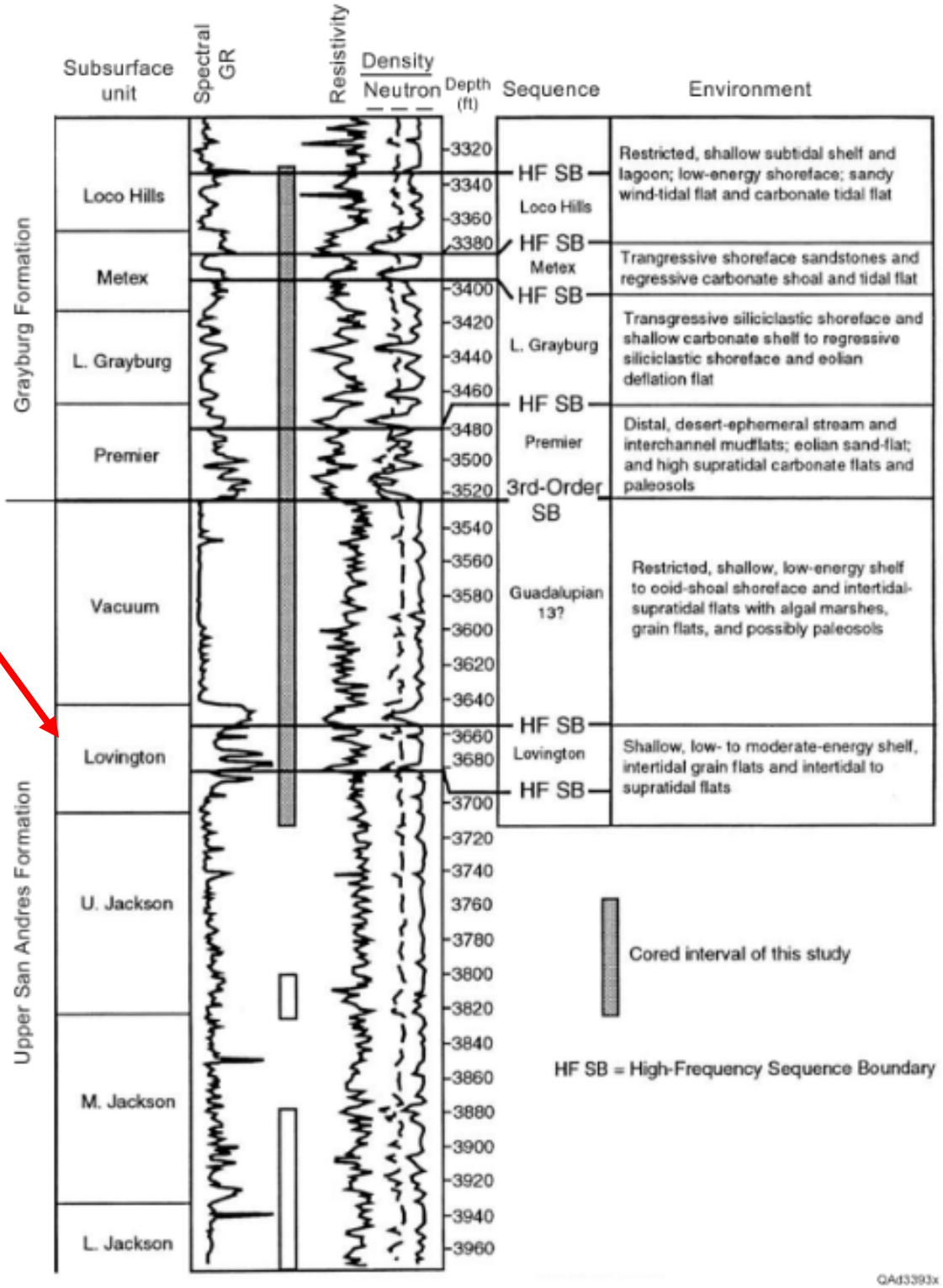


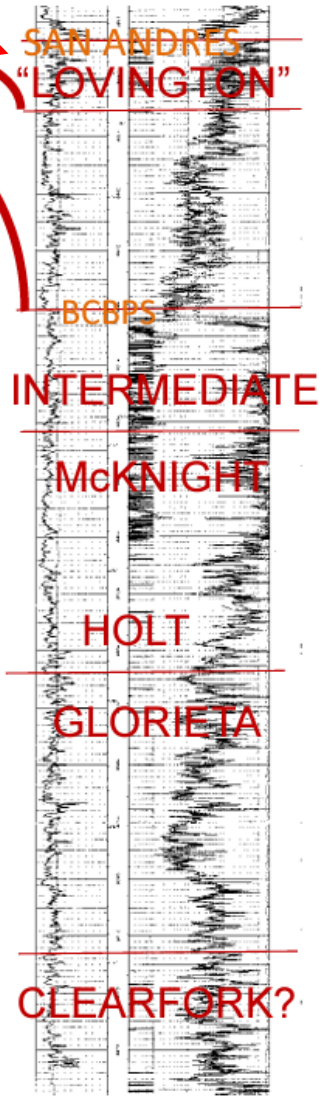
Figure 90. Stratigraphic column for the H. E. West "A" No. 22 well in Jackson-Grayburg field on the Northwest Shelf, Eddy County. From Handford and others (1996).

Exhibit K-8

Type Log for the Central Basin Platform from Bob Trentham's Enhanced Oil Recovery in the Permian Basin Study

Note the Lovington Sand within the Upper San Andres

The major San Andres Sequence Stratigraphic boundaries may act as the boundaries for the original O/W (base of ROZ) and between the present day Main Pay and TZ/ROZ.



G 9	Lovington Sand / Lime
G 8	Pre- Lovington / Judkins
G 5 – 7	Brushy Canyon BPS
G 3 – 4	Intermediate
G 1 – 2	McKnight
L 7 – 8	Holt
L 5 – 6	Glorieta

Nomenclature, based on Gulf Oil's Central Basin Platform "Formations"

Exhibit K-9

Cross Section Base Map on San Andres Structure (SSTVD)

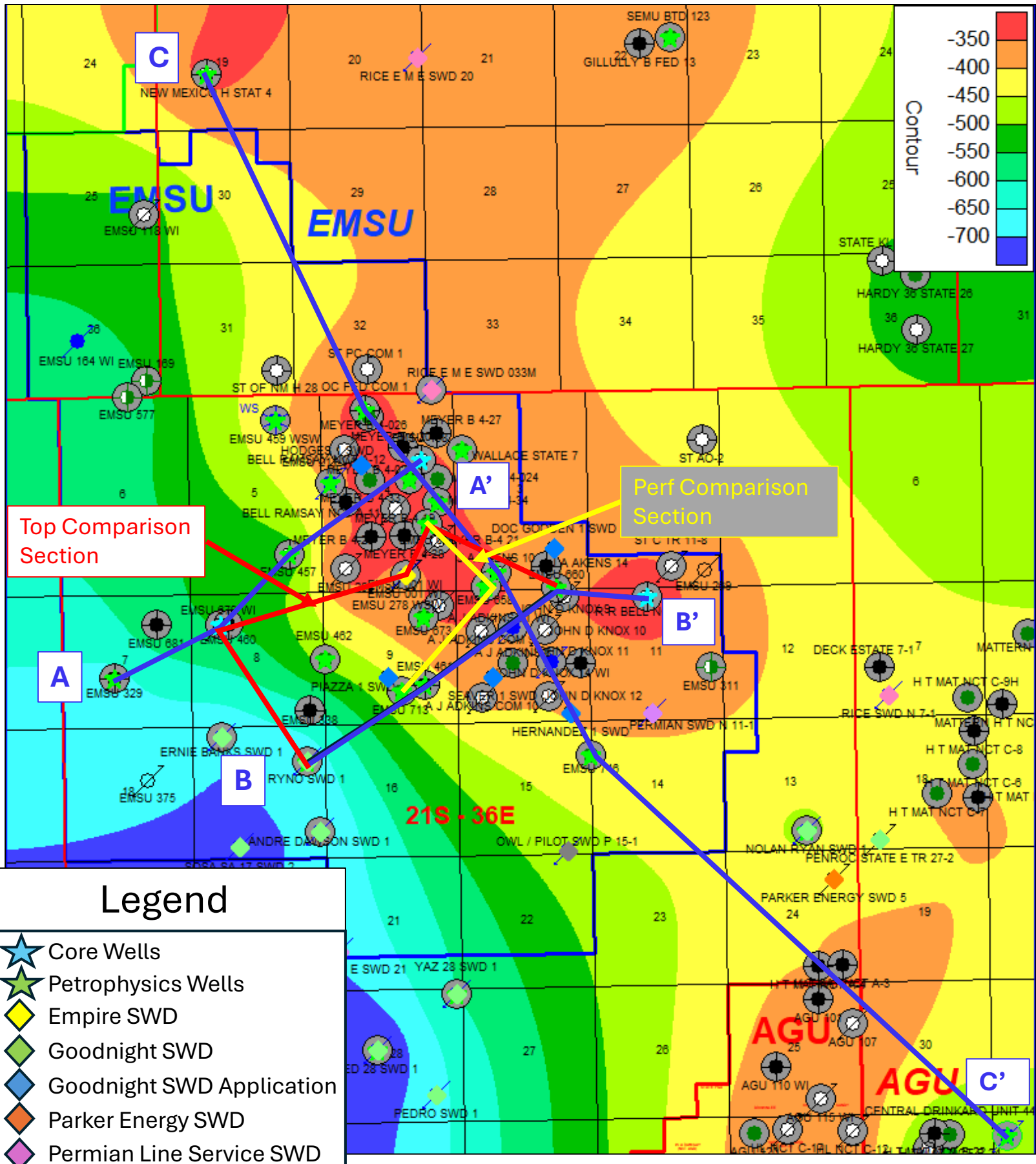
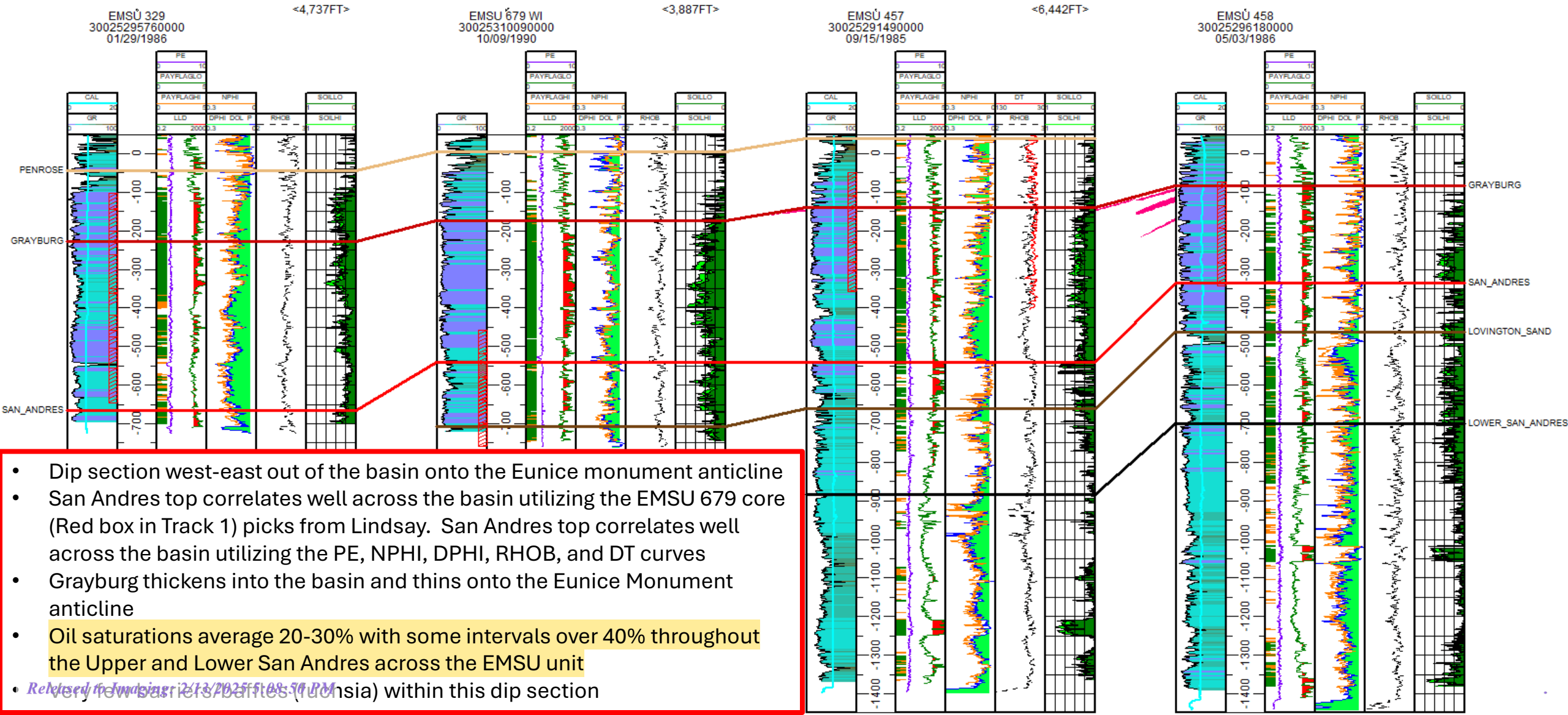


Exhibit K-10

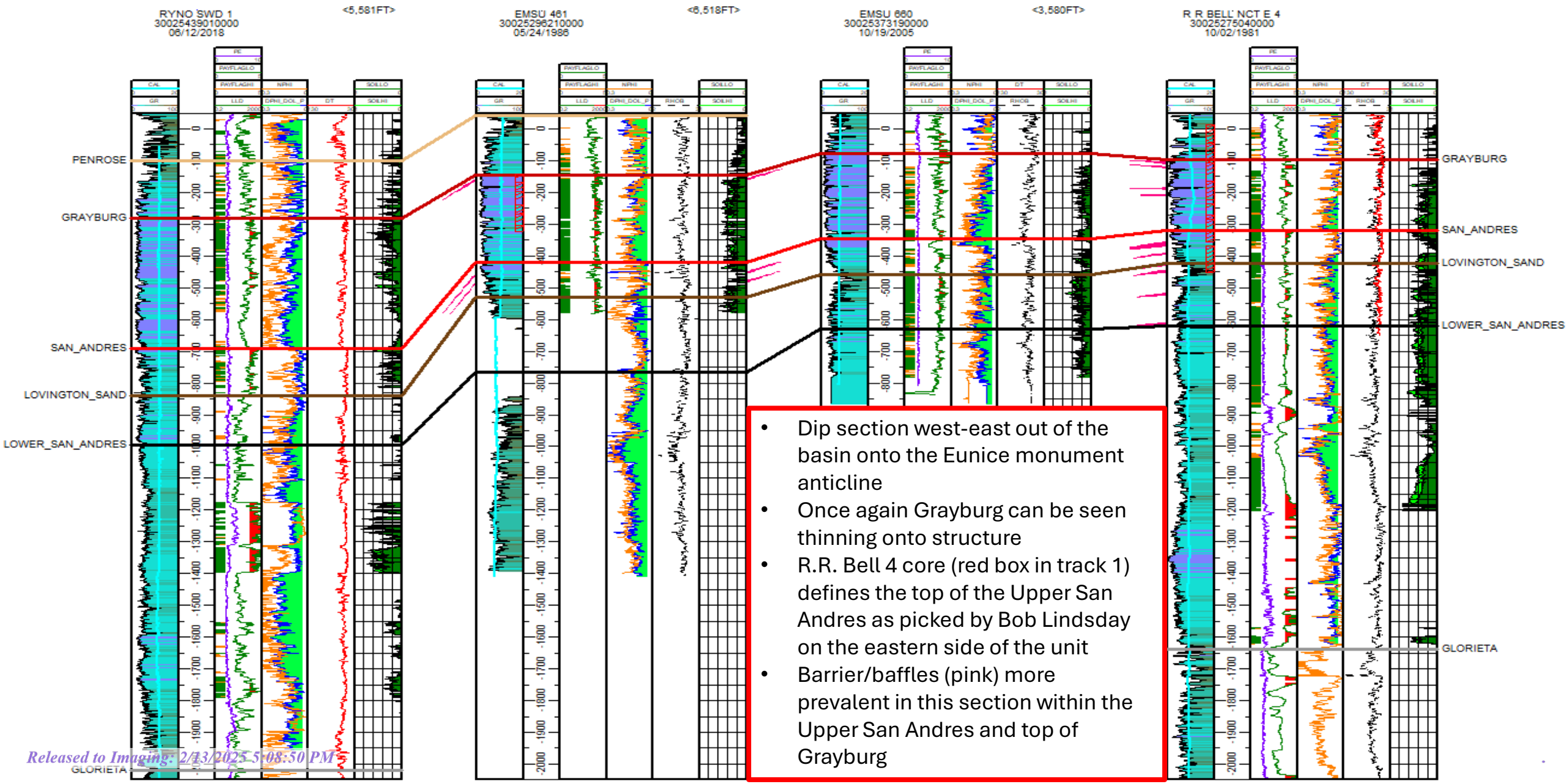
Dip Section A-A’



- Dip section west-east out of the basin onto the Eunice monument anticline
- San Andres top correlates well across the basin utilizing the EMSU 679 core (Red box in Track 1) picks from Lindsay. San Andres top correlates well across the basin utilizing the PE, NPHI, DPHI, RHOB, and DT curves
- Grayburg thickens into the basin and thins onto the Eunice Monument anticline
- Oil saturations average 20-30% with some intervals over 40% throughout the Upper and Lower San Andres across the EMSU unit
- Very few barriers/baffles (fluvial/eolian) within this dip section

Exhibit K-11

Dip Section B-B’



- Dip section west-east out of the basin onto the Eunice monument anticline
- Once again Grayburg can be seen thinning onto structure
- R.R. Bell 4 core (red box in track 1) defines the top of the Upper San Andres as picked by Bob Lindsday on the eastern side of the unit
- Barrier/baffles (pink) more prevalent in this section within the Upper San Andres and top of Grayburg

Exhibit K-12

NW-SE Strike Section C-C' Across EMSU into AGU

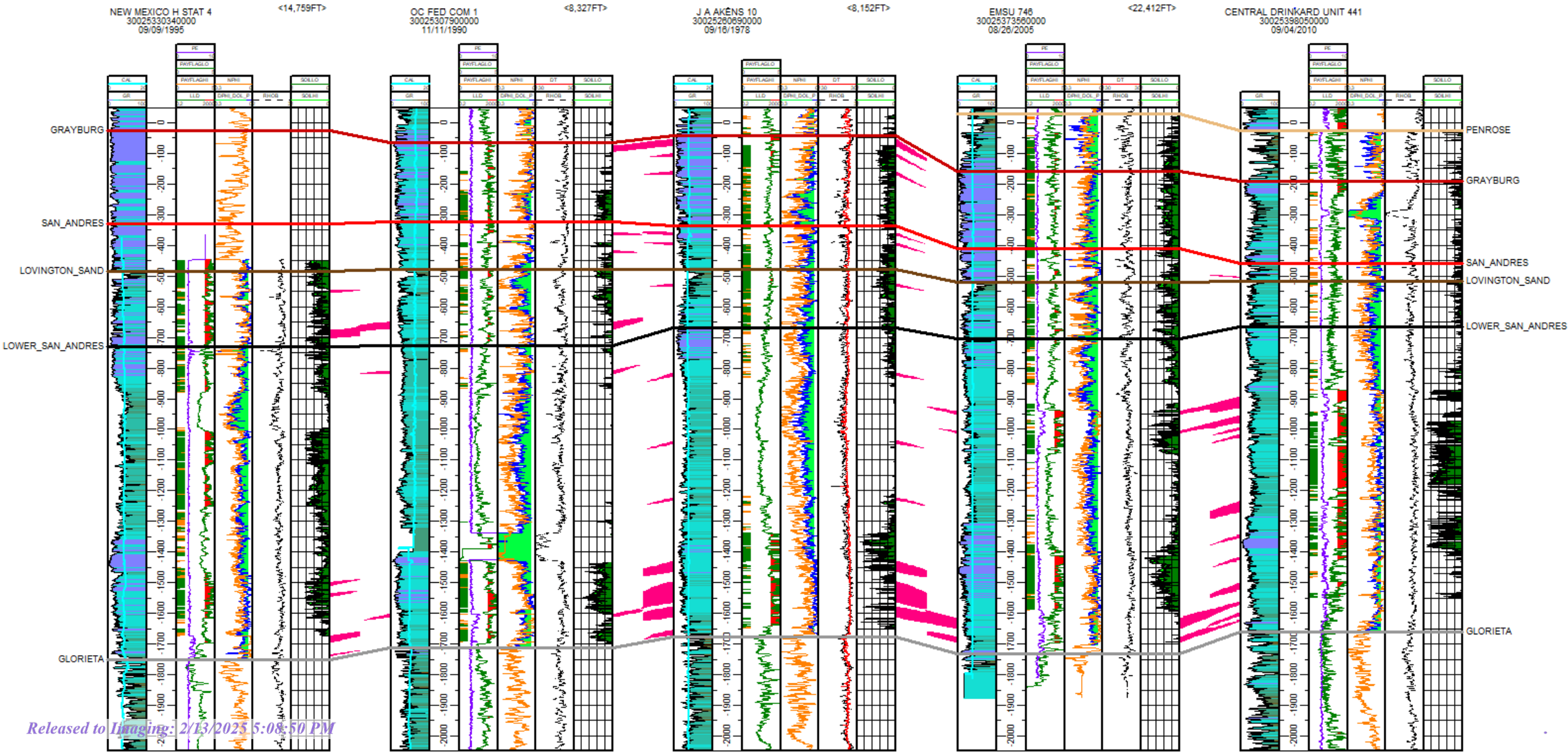
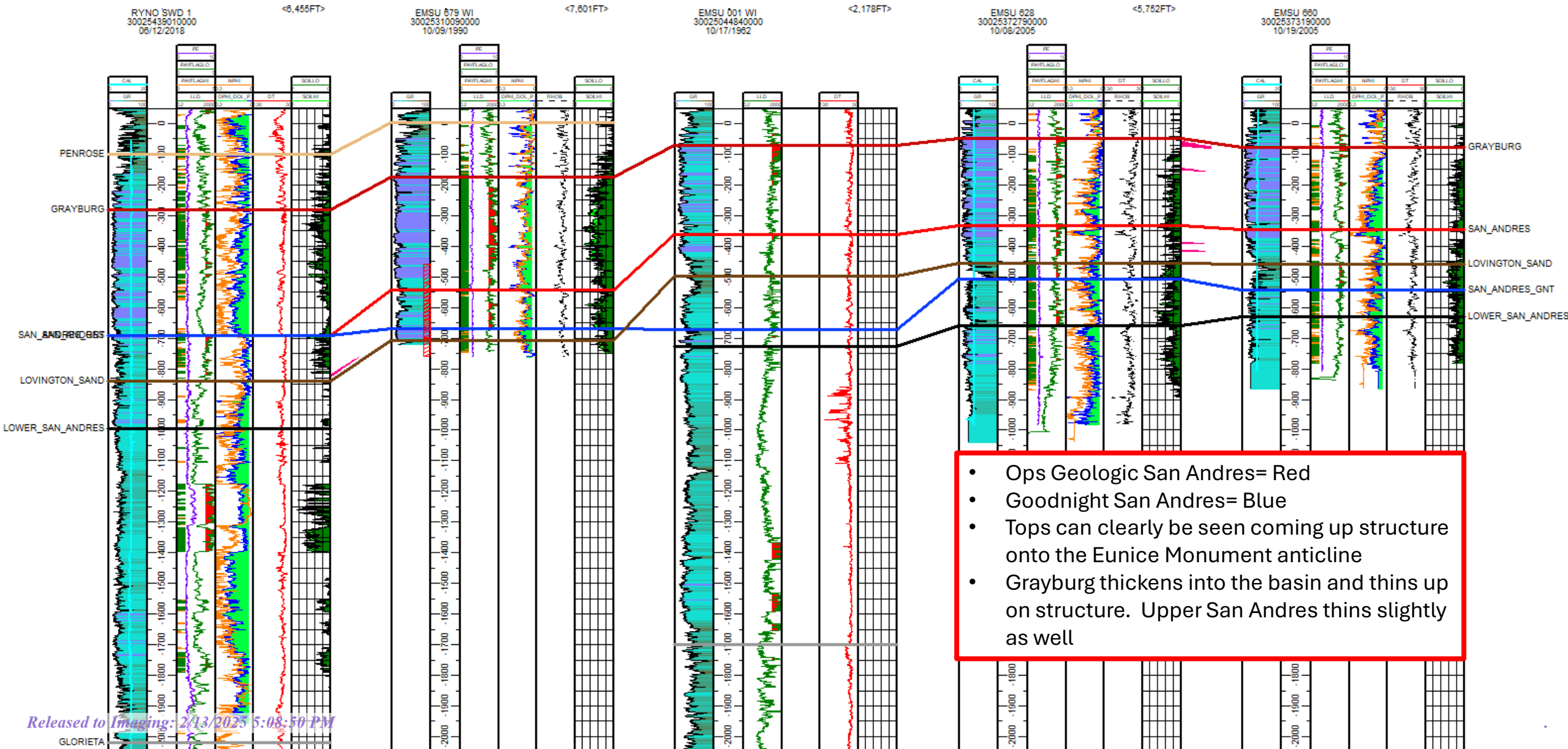


Exhibit K-13

Comparison of Ops Geologic (Red) vs. Goodnight San Andres Top (Blue)



- Ops Geologic San Andres= Red
- Goodnight San Andres= Blue
- Tops can clearly be seen coming up structure onto the Eunice Monument anticline
- Grayburg thickens into the basin and thins up on structure. Upper San Andres thins slightly as well

Exhibit K-14

Comparison of Perf Designations with Goodnight Top

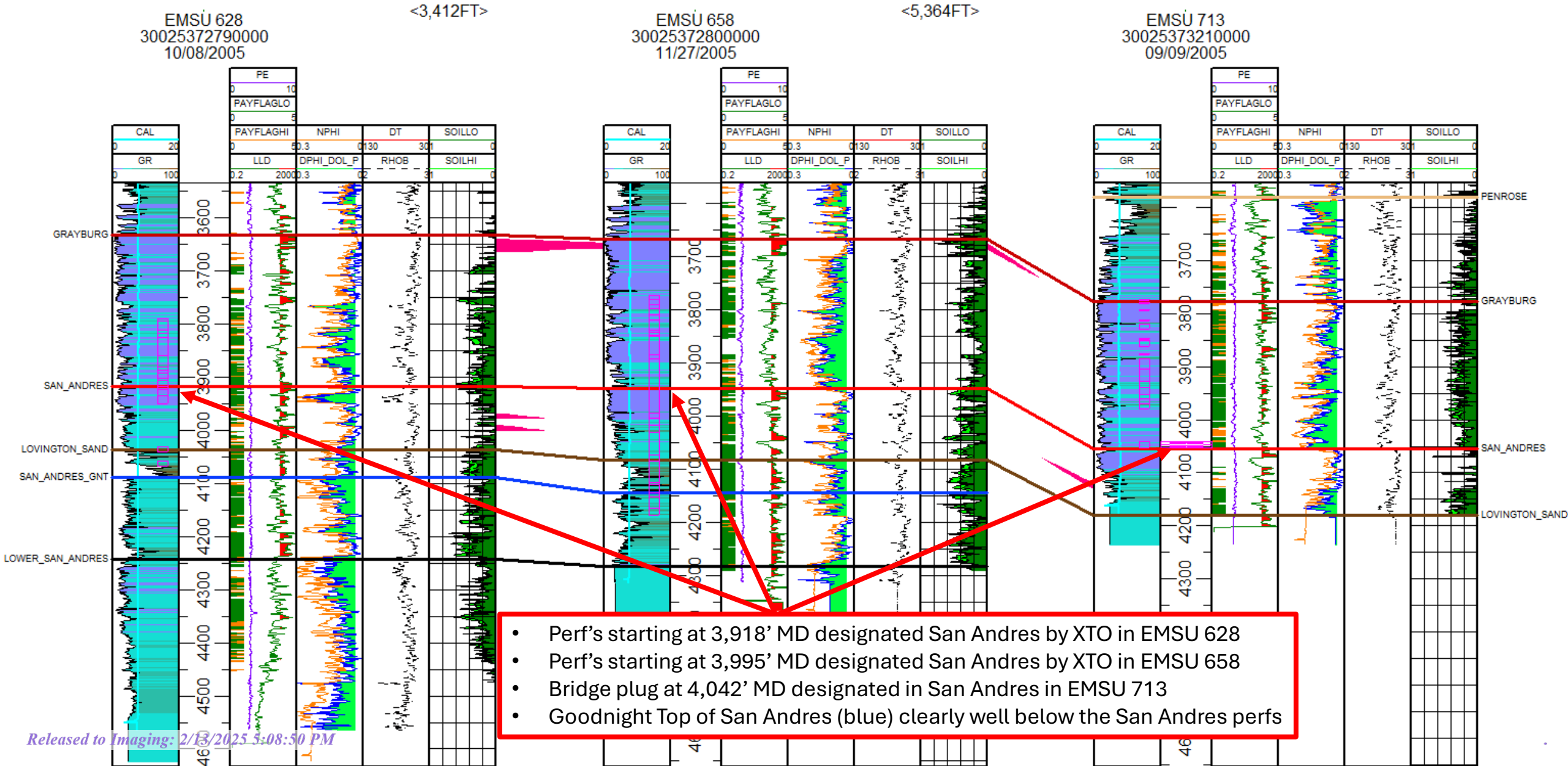
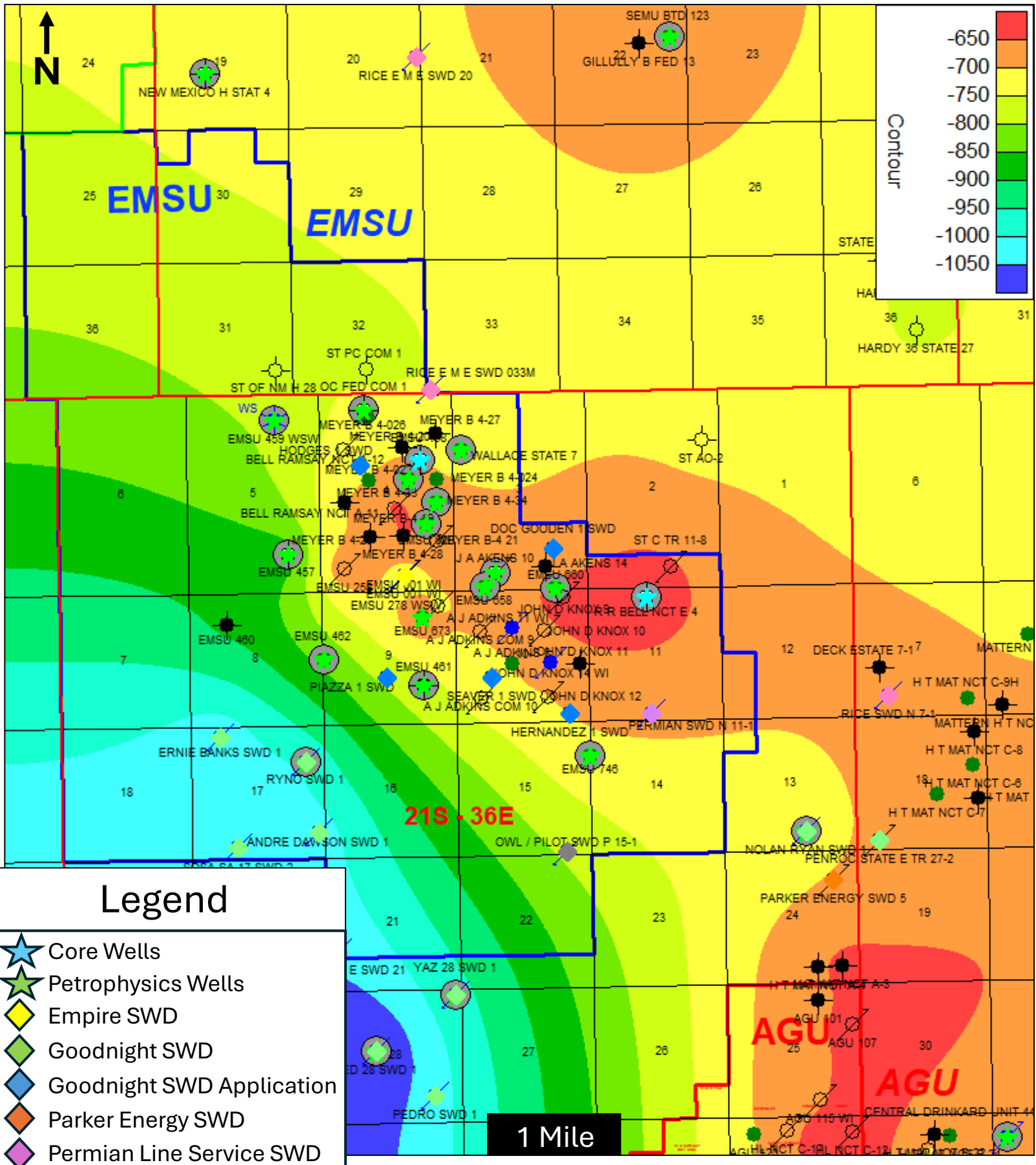


Exhibit K-15

Lower San Andres Structure Map (SSTVD)

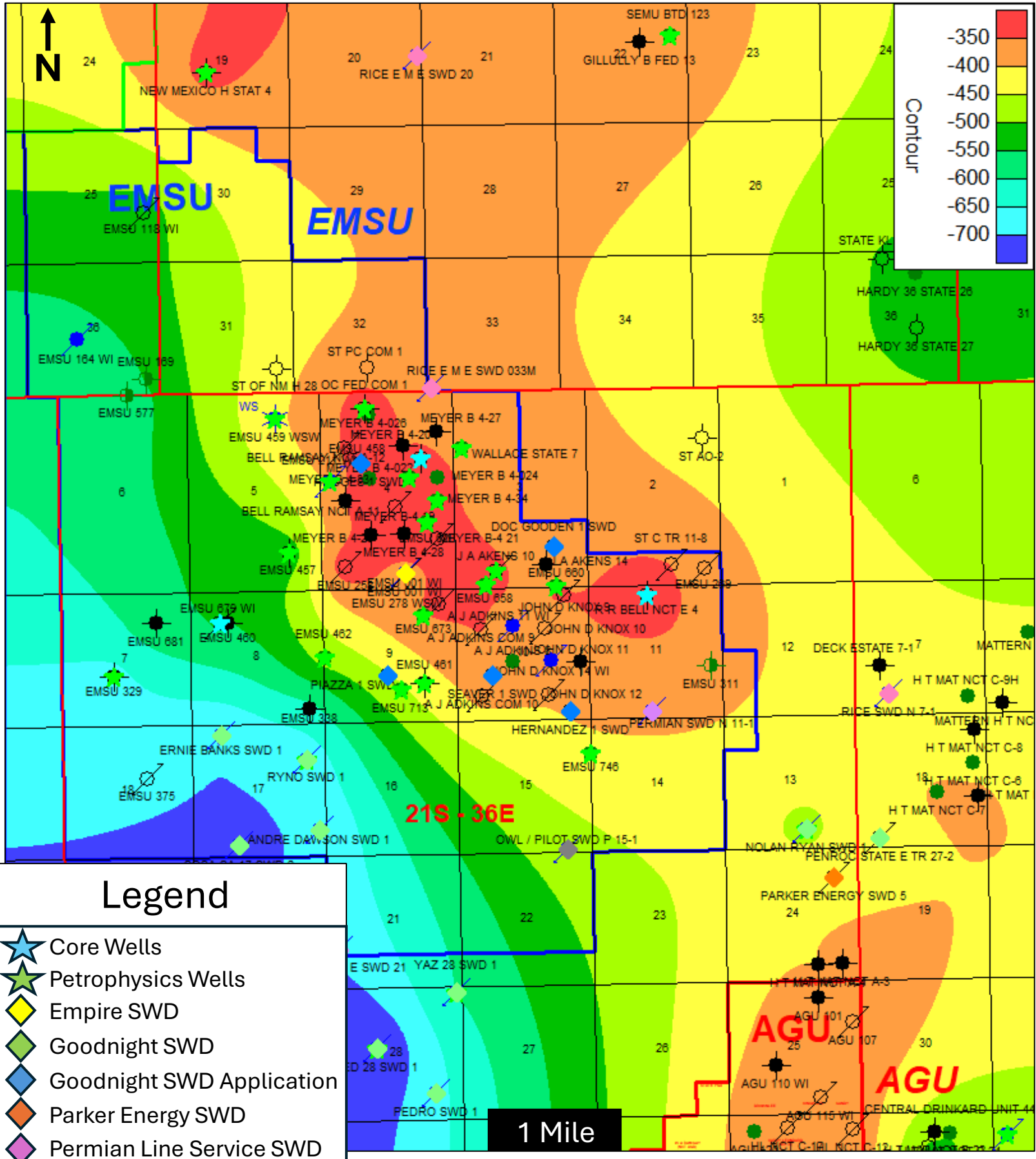


Legend

- Core Wells
- Petrophysics Wells
- Empire SWD
- Goodnight SWD
- Goodnight SWD Application
- Parker Energy SWD
- Permian Line Service SWD
- Pilot Water Solutions SWD
- Rice Operating SWD

Exhibit K-16

Upper San Andres Structure Map (SSTVD)

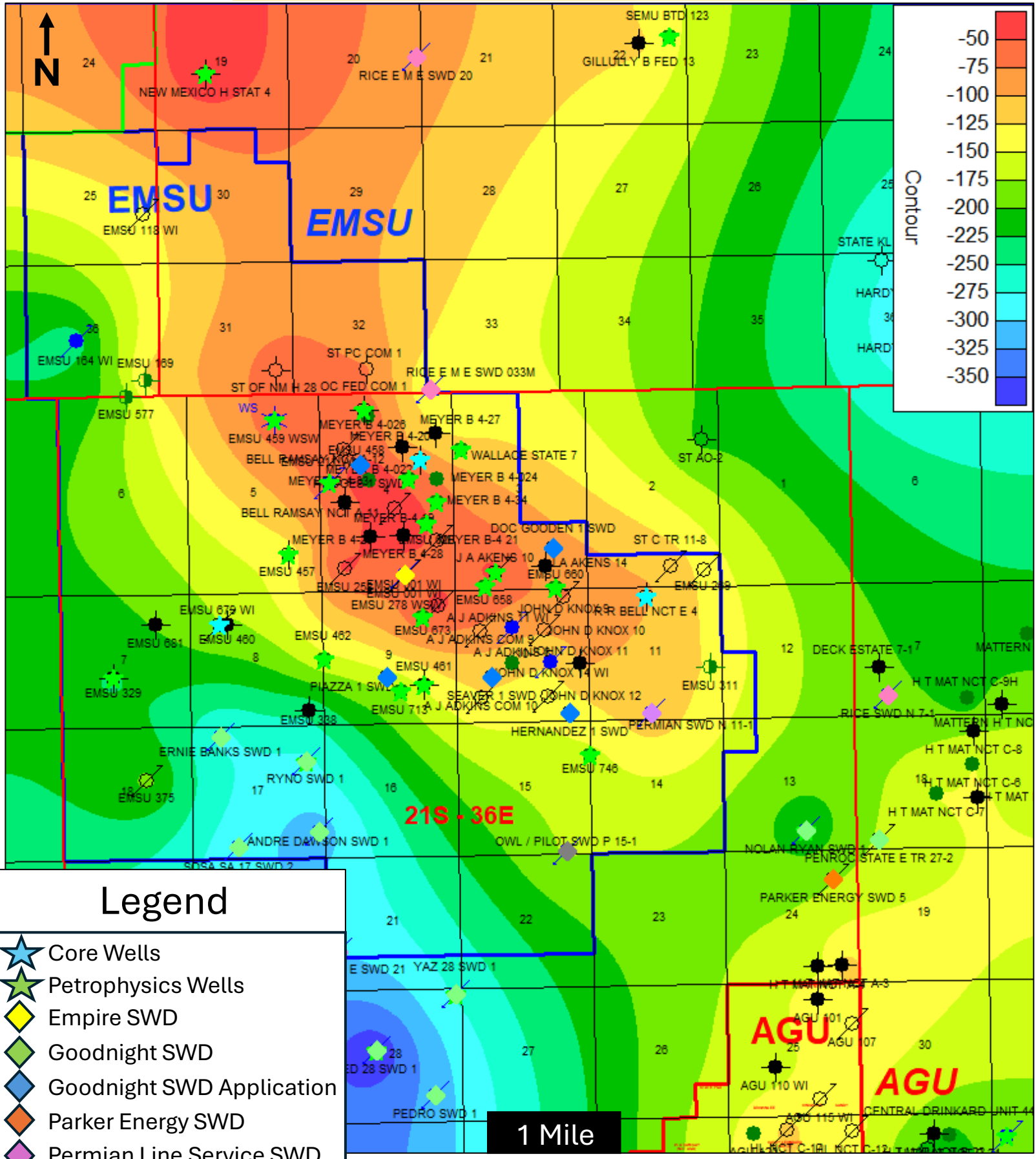


Legend

- Core Wells
- Petrophysics Wells
- Empire SWD
- Goodnight SWD
- Goodnight SWD Application
- Parker Energy SWD
- Permian Line Service SWD
- Pilot Water Solutions SWD
- Rice Operating SWD

Exhibit K-17

Grayburg Structure Map (SSTVD)

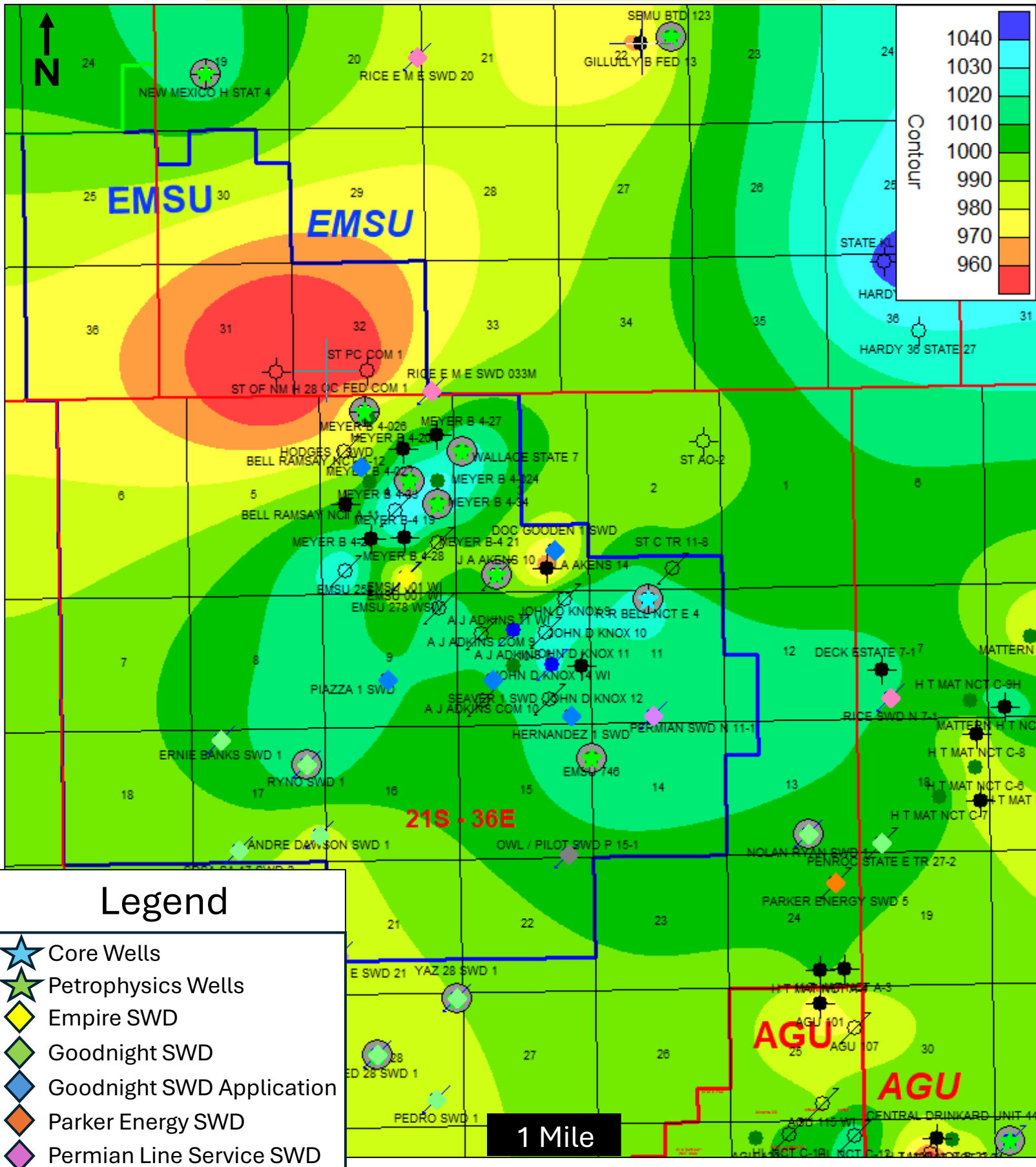


Legend

- Core Wells
- Petrophysics Wells
- Empire SWD
- Goodnight SWD
- Goodnight SWD Application
- Parker Energy SWD
- Permian Line Service SWD
- Pilot Water Solutions SWD
- Rice Operating SWD

Exhibit K-18

Lower San Andres Isopach Map (FT)

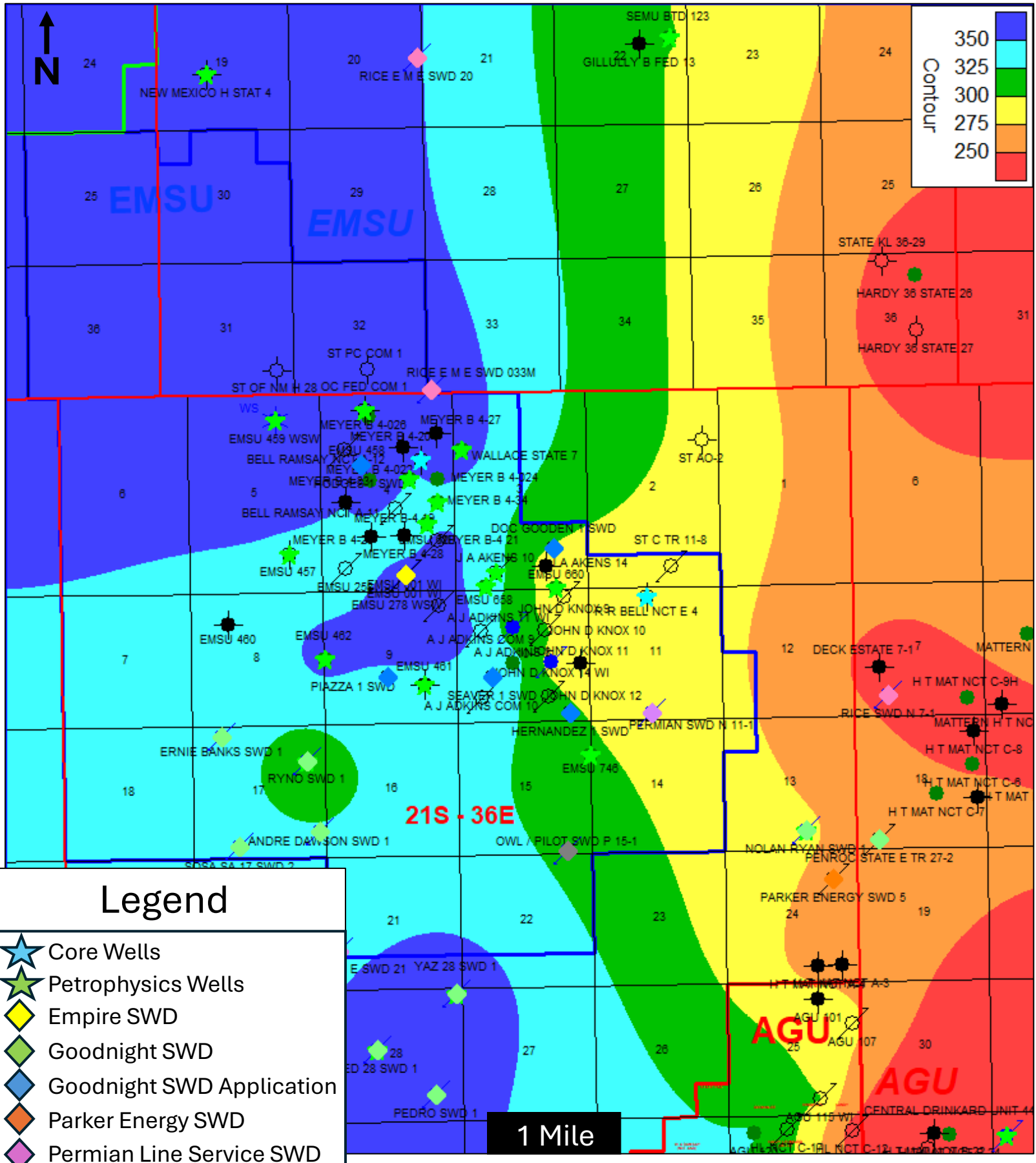


Legend

- Core Wells
- Petrophysics Wells
- Empire SWD
- Goodnight SWD
- Goodnight SWD Application
- Parker Energy SWD
- Permian Line Service SWD
- Pilot Water Solutions SWD
- Rice Operating SWD

Exhibit K-19

Upper San Andres Isopach Map (FT)



Legend

- Core Wells
- Petrophysics Wells
- Empire SWD
- Goodnight SWD
- Goodnight SWD Application
- Parker Energy SWD
- Permian Line Service SWD
- Pilot Water Solutions SWD
- Rice Operating SWD

Exhibit K-20

Grayburg Isopach Map (FT)

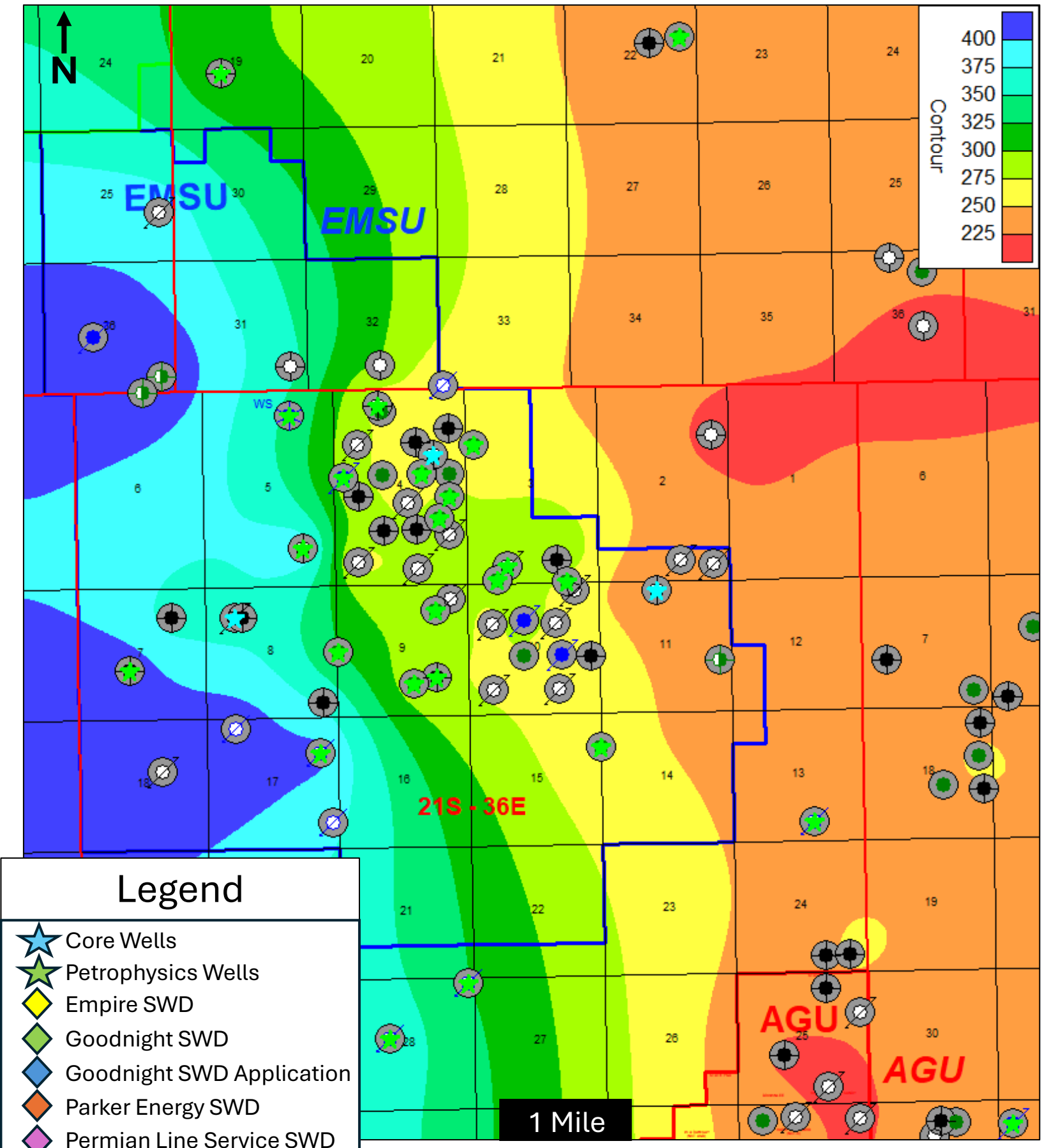
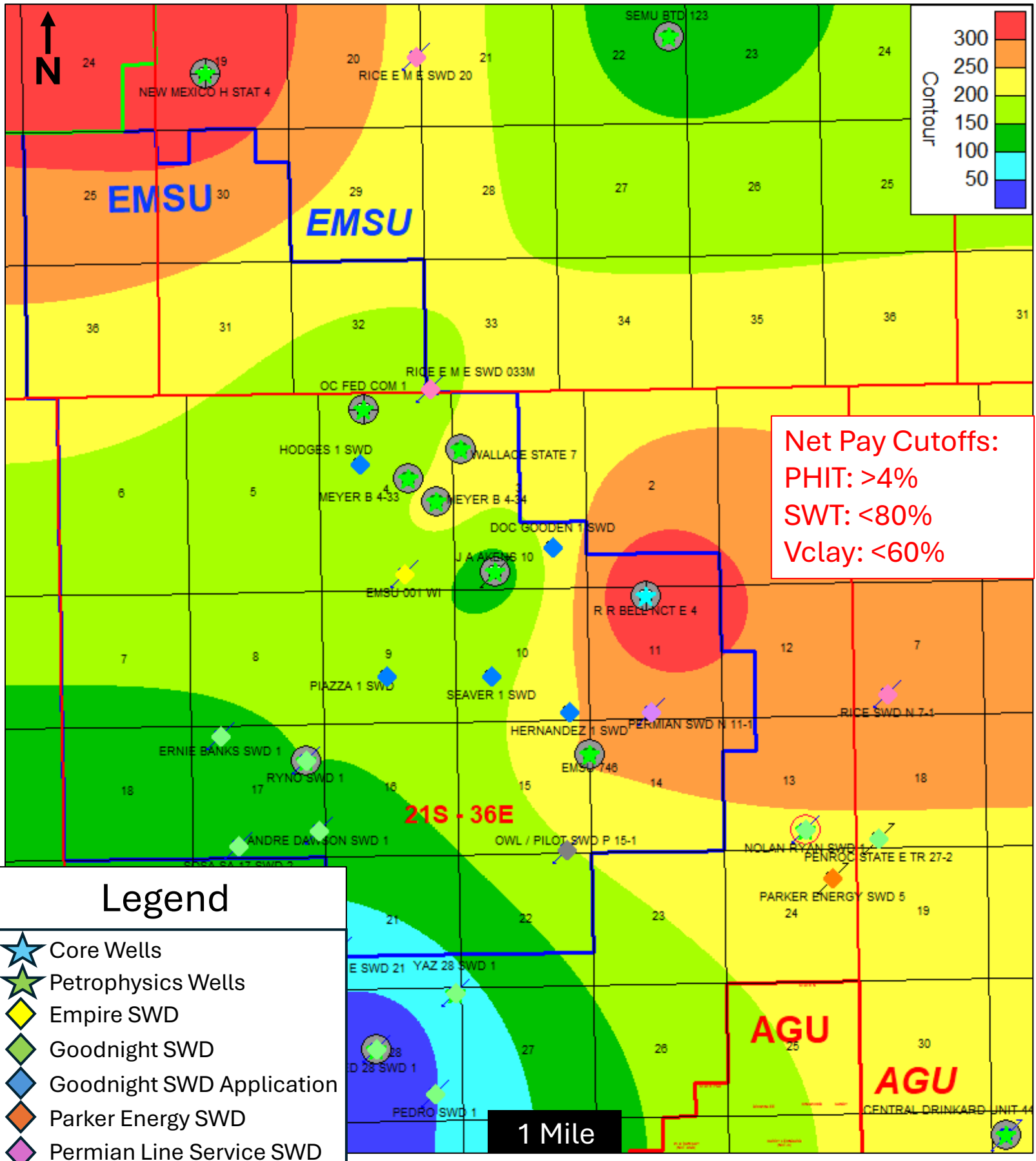


Exhibit K-21

Lower San Andres Net Pay (FT) Low Case



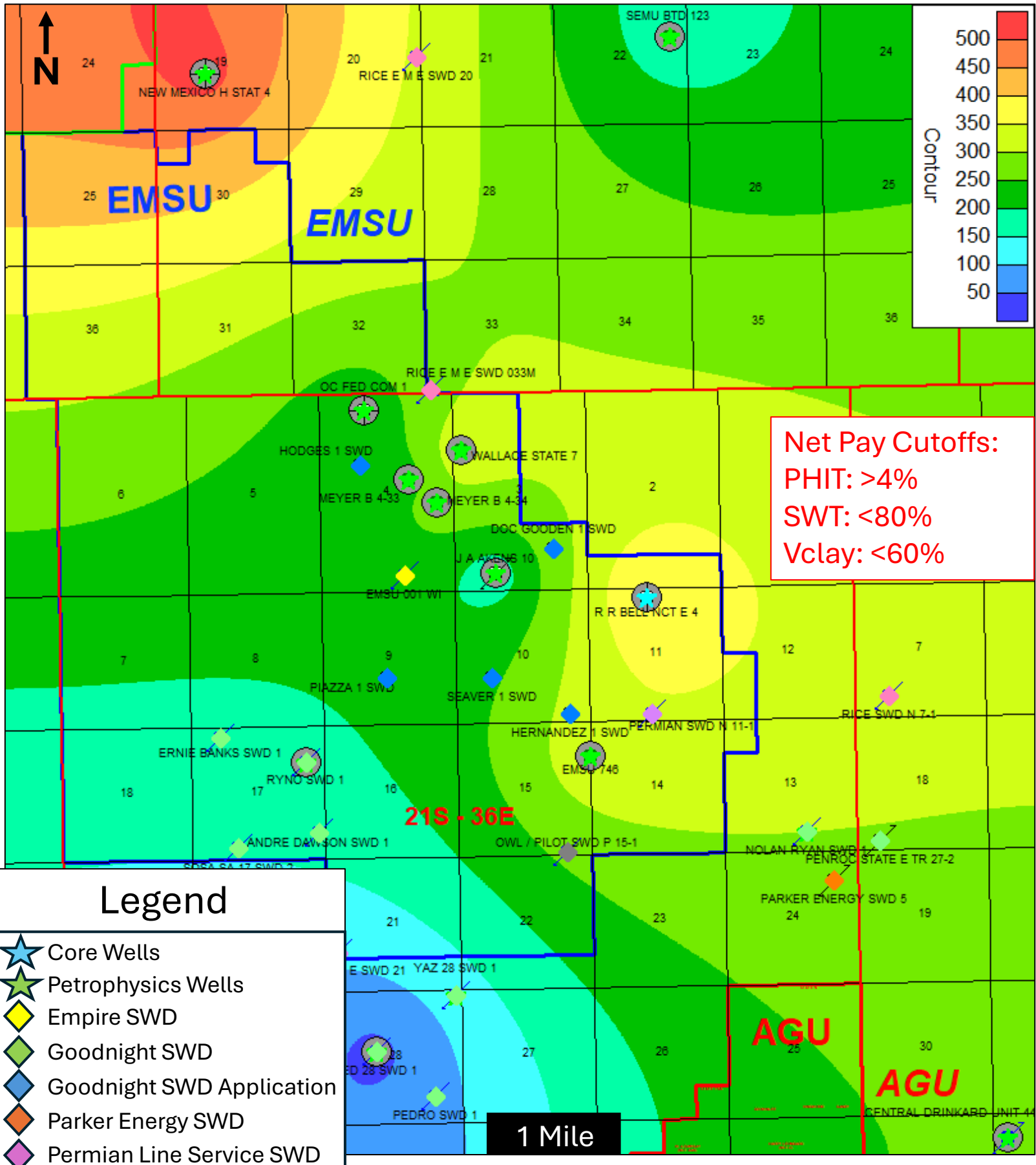
Net Pay Cutoffs:
PHIT: >4%
SWT: <80%
Vclay: <60%

Legend

- Core Wells
- Petrophysics Wells
- Empire SWD
- Goodnight SWD
- Goodnight SWD Application
- Parker Energy SWD
- Permian Line Service SWD
- Pilot Water Solutions SWD
- Rice Operating SWD

Exhibit K-22

Lower San Andres Net Pay (FT) High Case



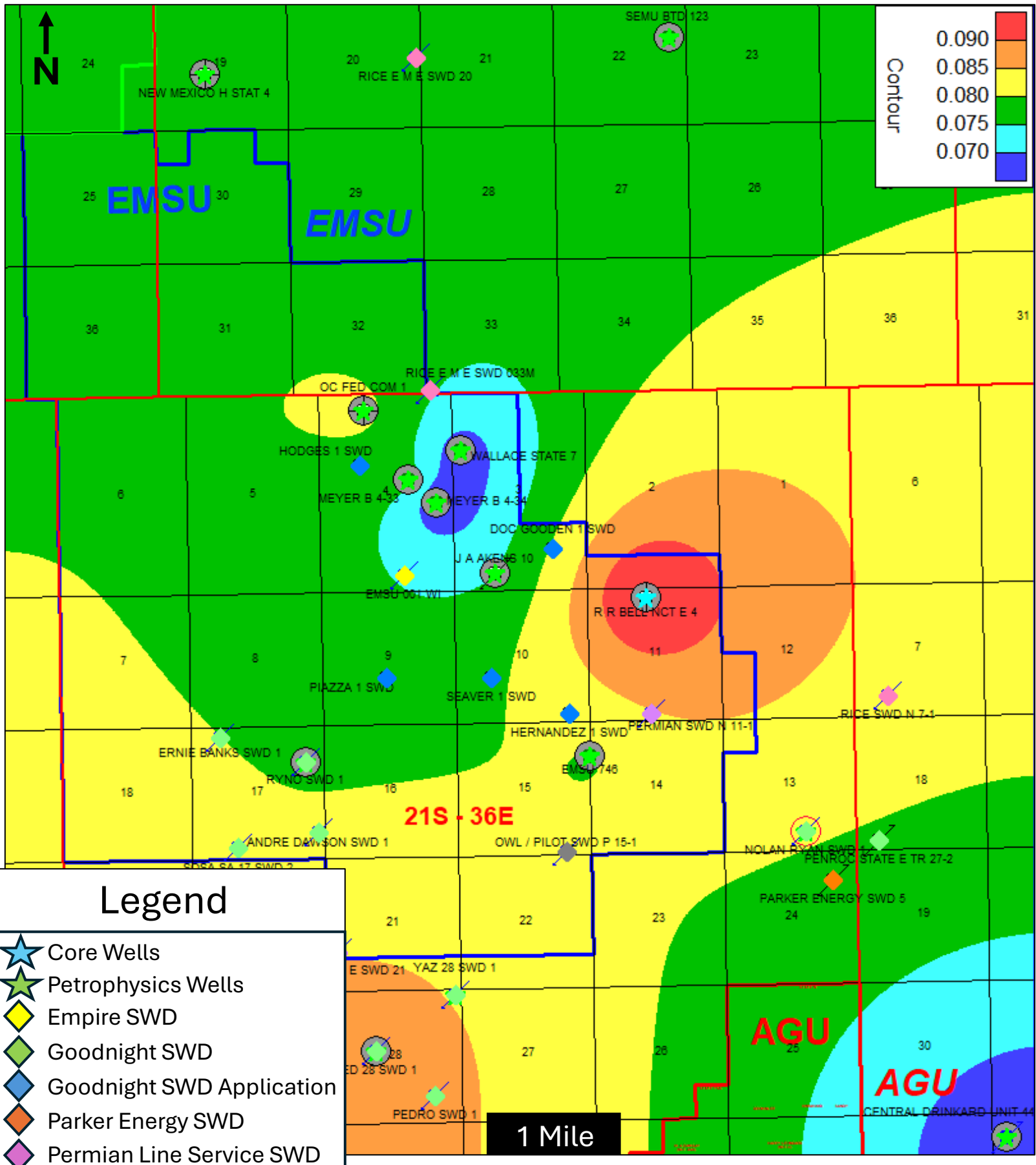
Net Pay Cutoffs:
PHIT: >4%
SWT: <80%
Vclay: <60%

Legend

- Core Wells
- Petrophysics Wells
- Empire SWD
- Goodnight SWD
- Goodnight SWD Application
- Parker Energy SWD
- Permian Line Service SWD
- Pilot Water Solutions SWD
- Rice Operating SWD

Exhibit K-23

Lower San Andres Average PHIT (%) Above 4% Cutoff

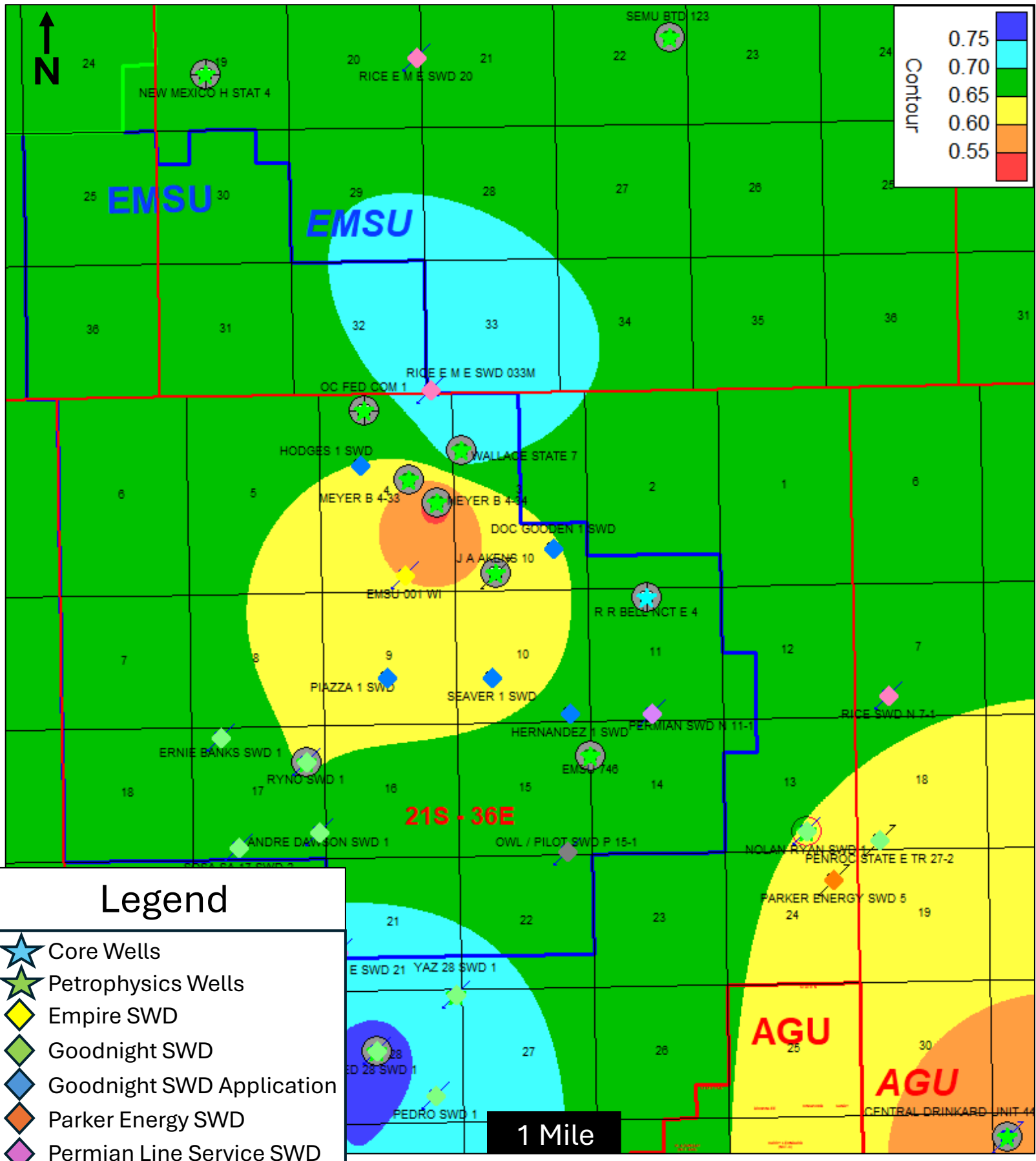


Legend

- Core Wells
- Petrophysics Wells
- Empire SWD
- Goodnight SWD
- Goodnight SWD Application
- Parker Energy SWD
- Permian Line Service SWD
- Pilot Water Solutions SWD
- Rice Operating SWD

Exhibit K-24

Lower San Andres Average SWT (%) Low Case

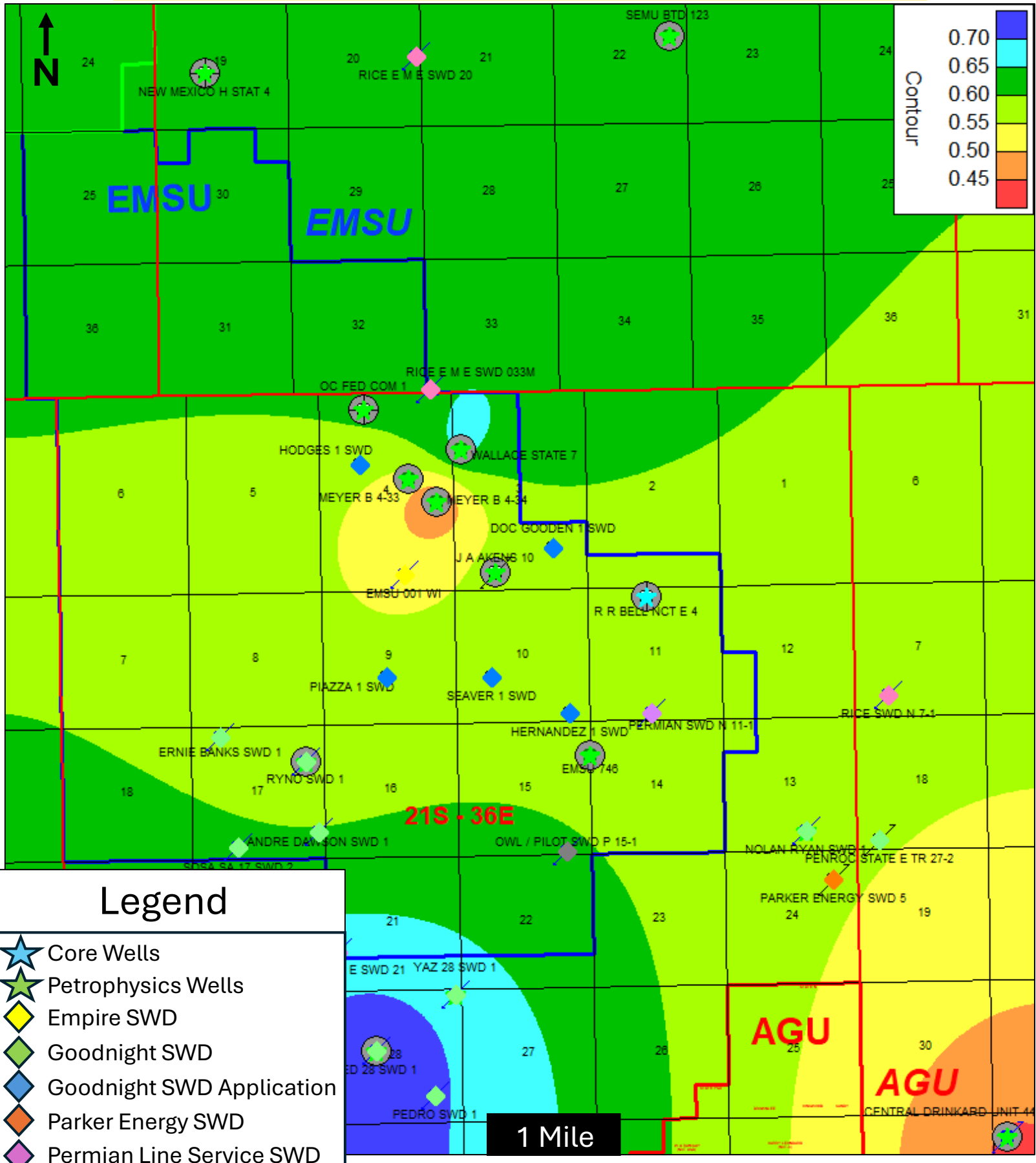


Legend

- Core Wells
- Petrophysics Wells
- Empire SWD
- Goodnight SWD
- Goodnight SWD Application
- Parker Energy SWD
- Permian Line Service SWD
- Pilot Water Solutions SWD
- Rice Operating SWD

Exhibit K-25

Lower San Andres Average SWT (%) High Case

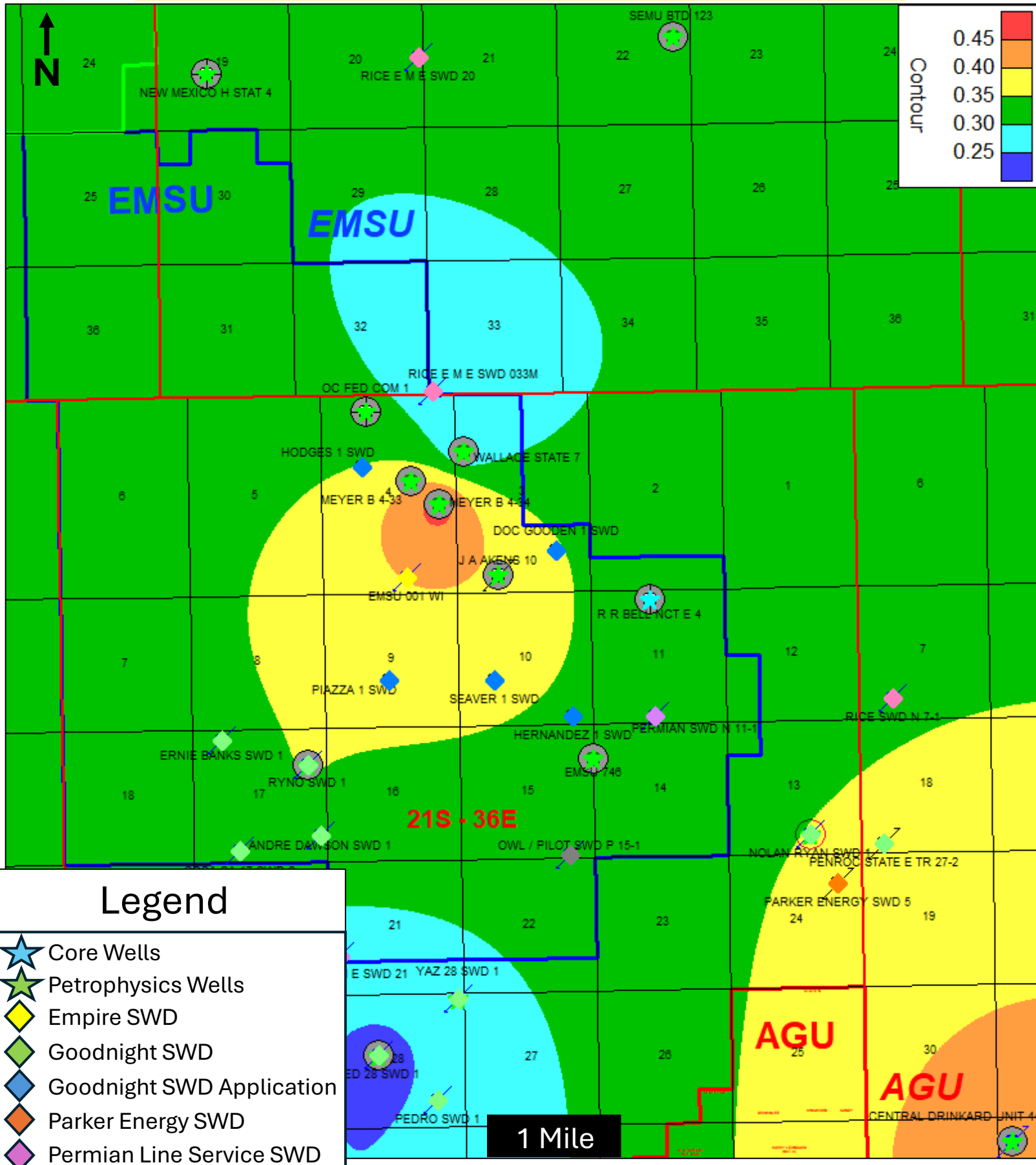


Legend

- Core Wells
- Petrophysics Wells
- Empire SWD
- Goodnight SWD
- Goodnight SWD Application
- Parker Energy SWD
- Permian Line Service SWD
- Pilot Water Solutions SWD
- Rice Operating SWD

Exhibit K-26

Lower San Andres Average So (%) Low Case

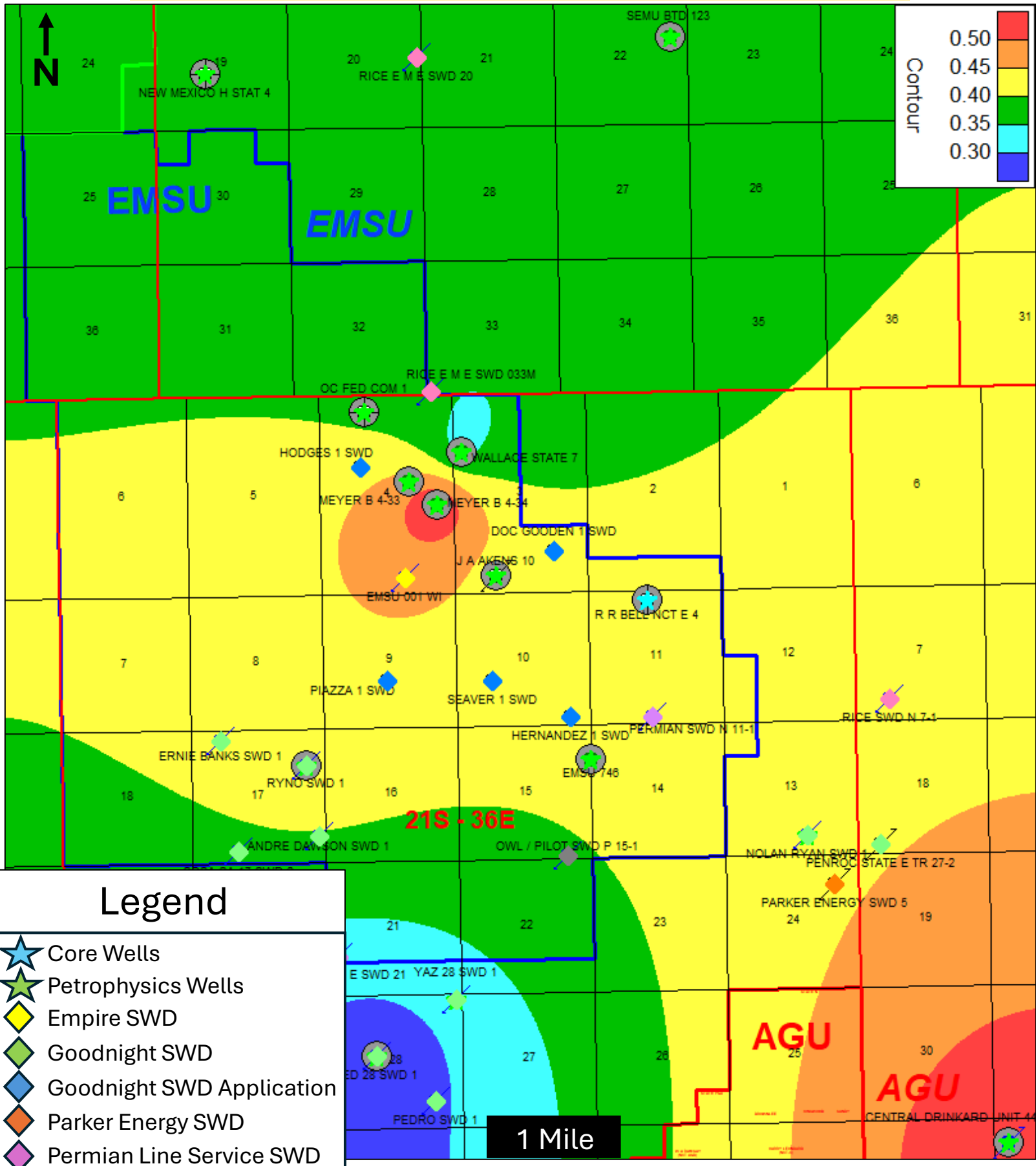


Legend

- Core Wells
- Petrophysics Wells
- Empire SWD
- Goodnight SWD
- Goodnight SWD Application
- Parker Energy SWD
- Permian Line Service SWD
- Pilot Water Solutions SWD
- Rice Operating SWD

Exhibit K-27

Lower San Andres Average So (%) High Case

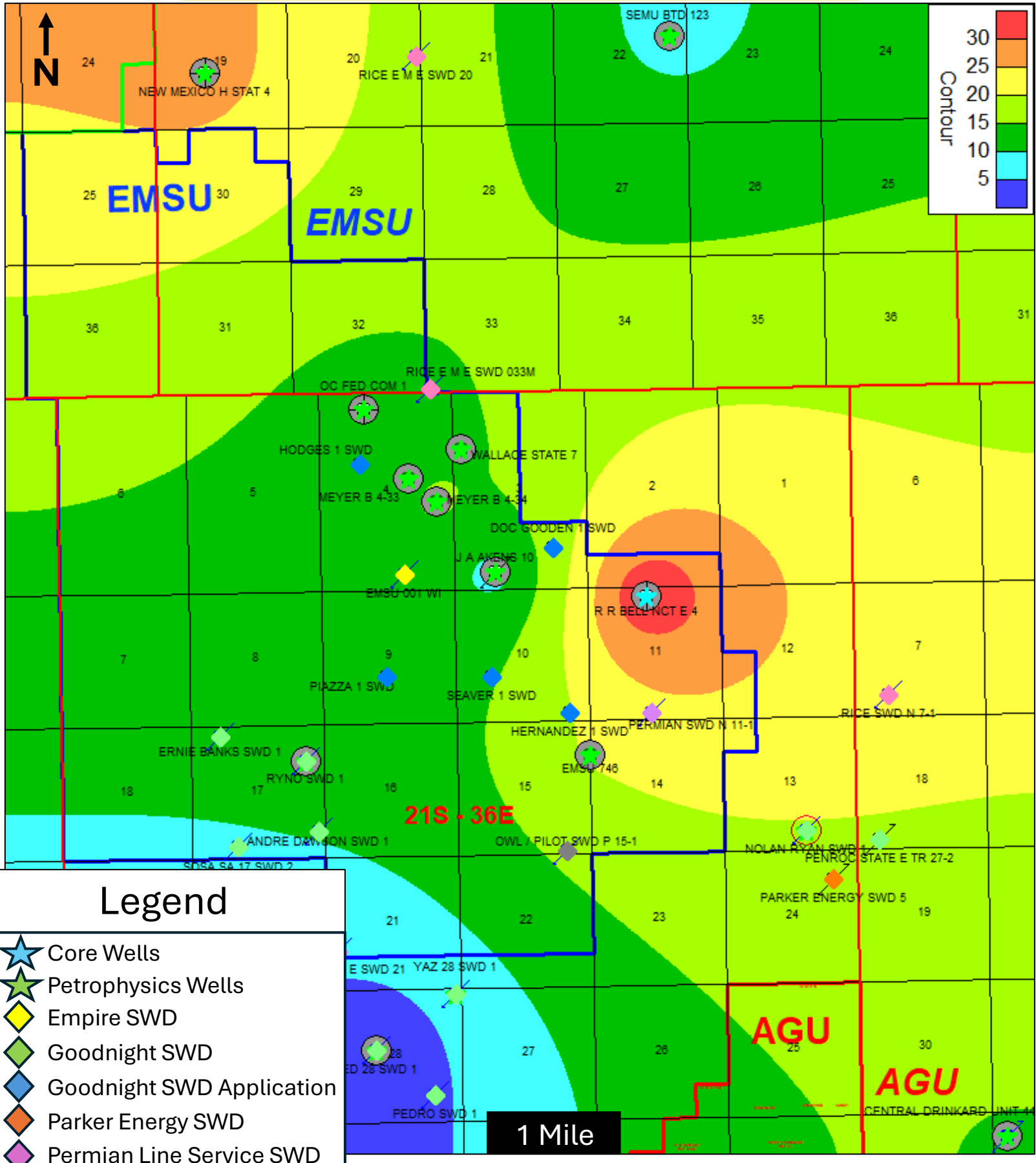


Legend

- Core Wells
- Petrophysics Wells
- Empire SWD
- Goodnight SWD
- Goodnight SWD Application
- Parker Energy SWD
- Permian Line Service SWD
- Pilot Water Solutions SWD
- Rice Operating SWD

Exhibit K-28

Lower San Andres PHIH (FT) Low Case

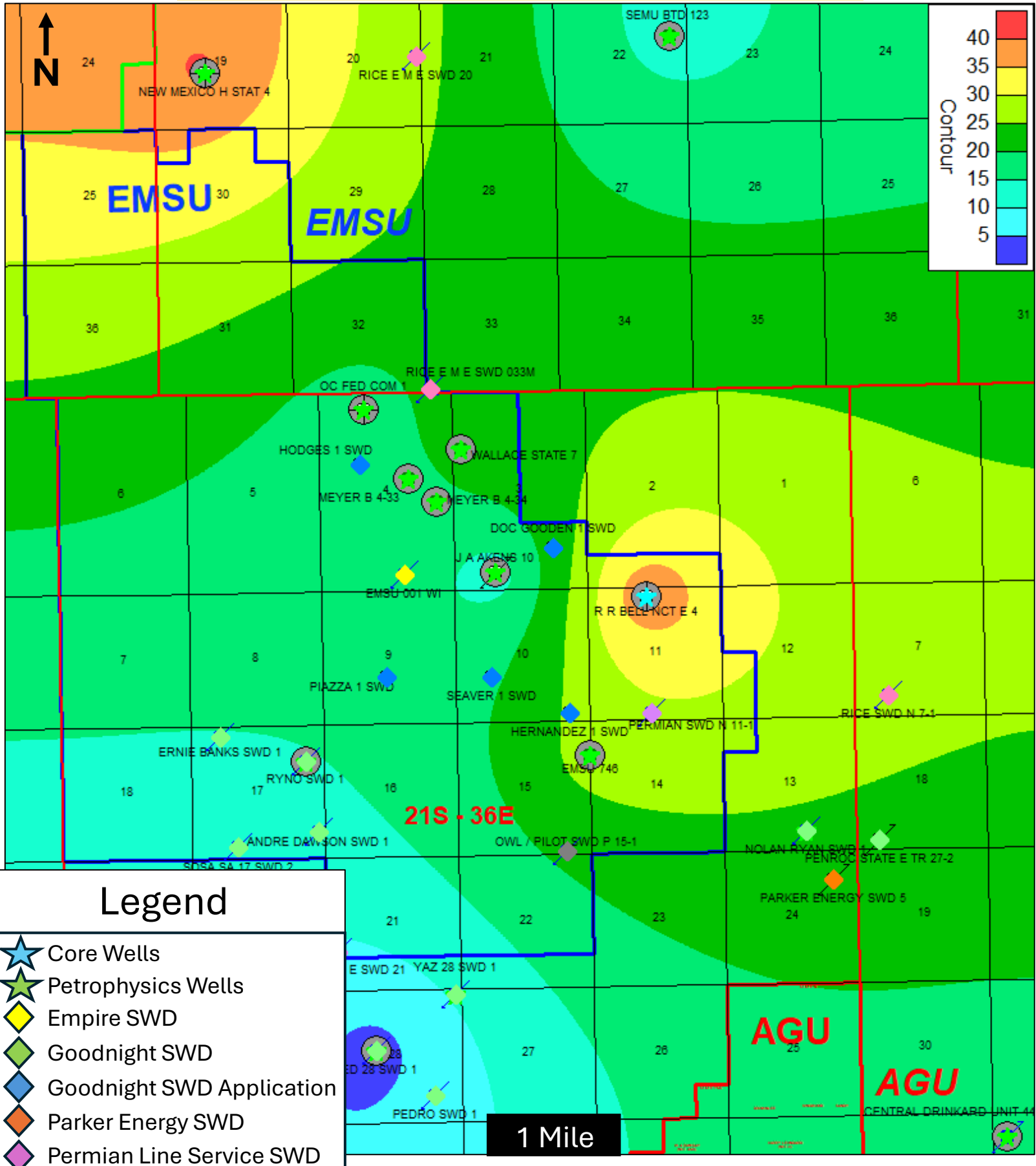


Legend

- Core Wells
- Petrophysics Wells
- Empire SWD
- Goodnight SWD
- Goodnight SWD Application
- Parker Energy SWD
- Permian Line Service SWD
- Pilot Water Solutions SWD
- Rice Operating SWD

Exhibit K-29

Lower San Andres PHIH (FT) High Case

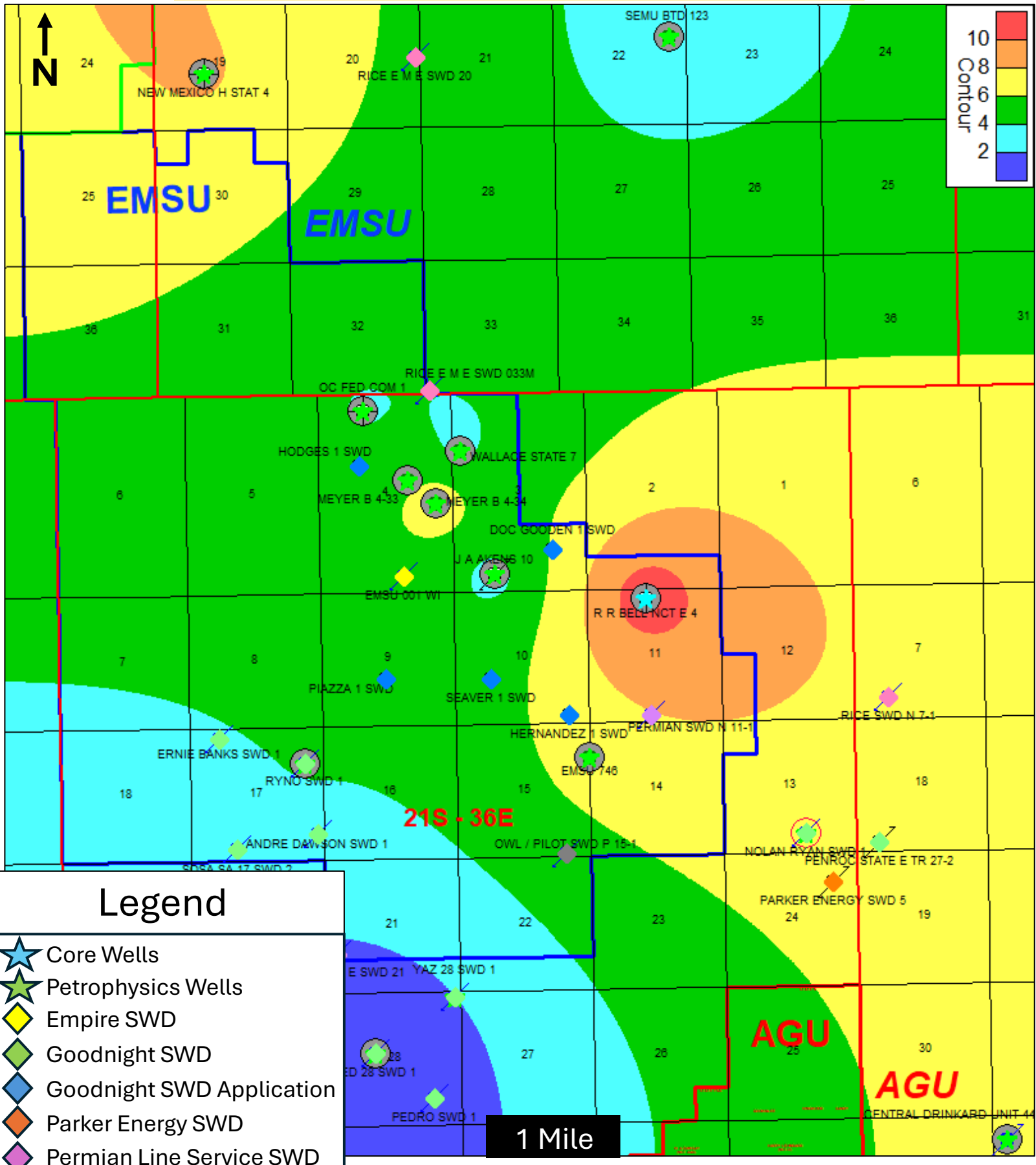


Legend

- Core Wells
- Petrophysics Wells
- Empire SWD
- Goodnight SWD
- Goodnight SWD Application
- Parker Energy SWD
- Permian Line Service SWD
- Pilot Water Solutions SWD
- Rice Operating SWD

Exhibit K-30

Lower San Andres HCPV (FT) Low Case

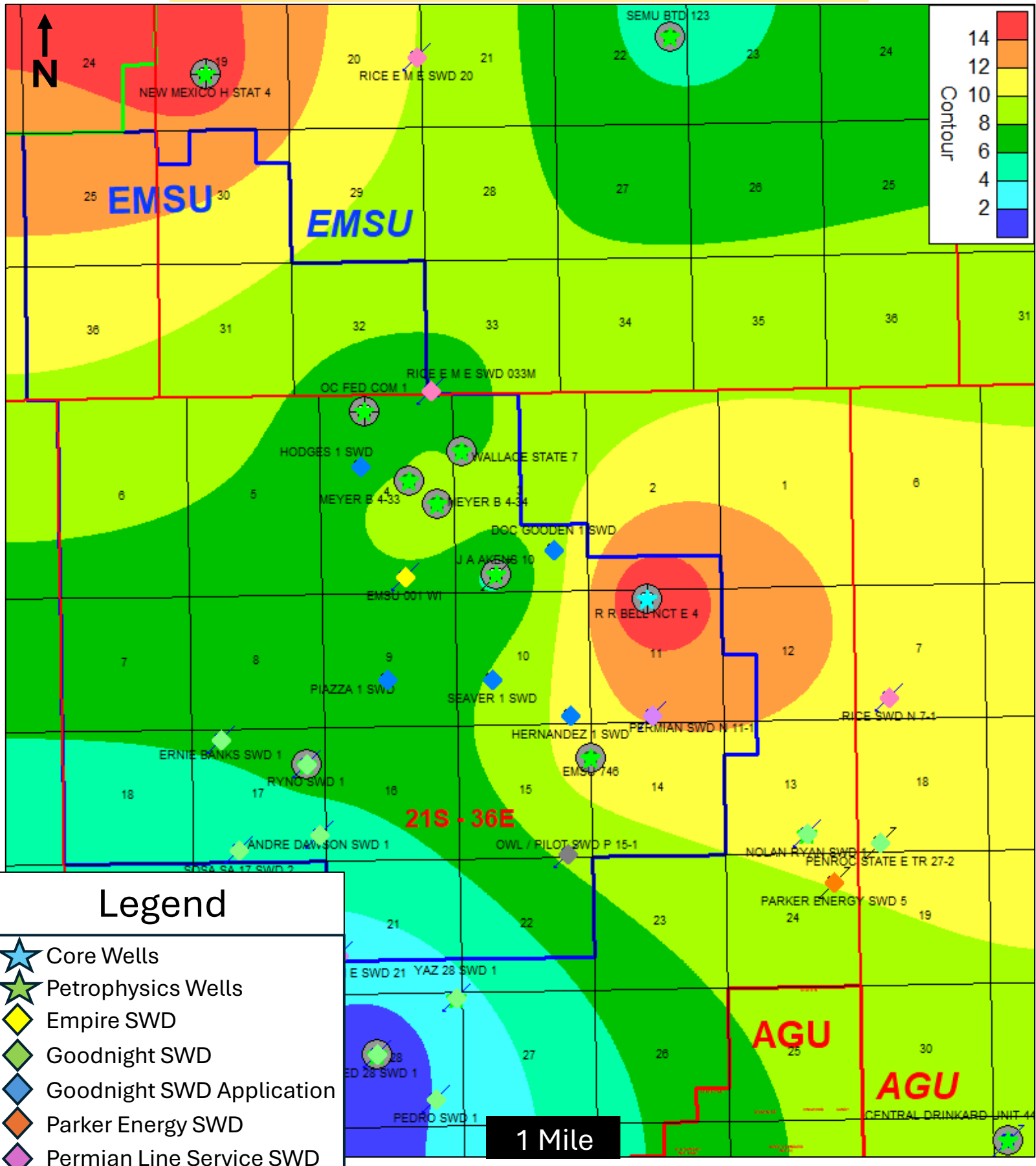


Legend

- Core Wells
- Petrophysics Wells
- Empire SWD
- Goodnight SWD
- Goodnight SWD Application
- Parker Energy SWD
- Permian Line Service SWD
- Pilot Water Solutions SWD
- Rice Operating SWD

Exhibit K-31

Lower San Andres HCPV (FT) High Case

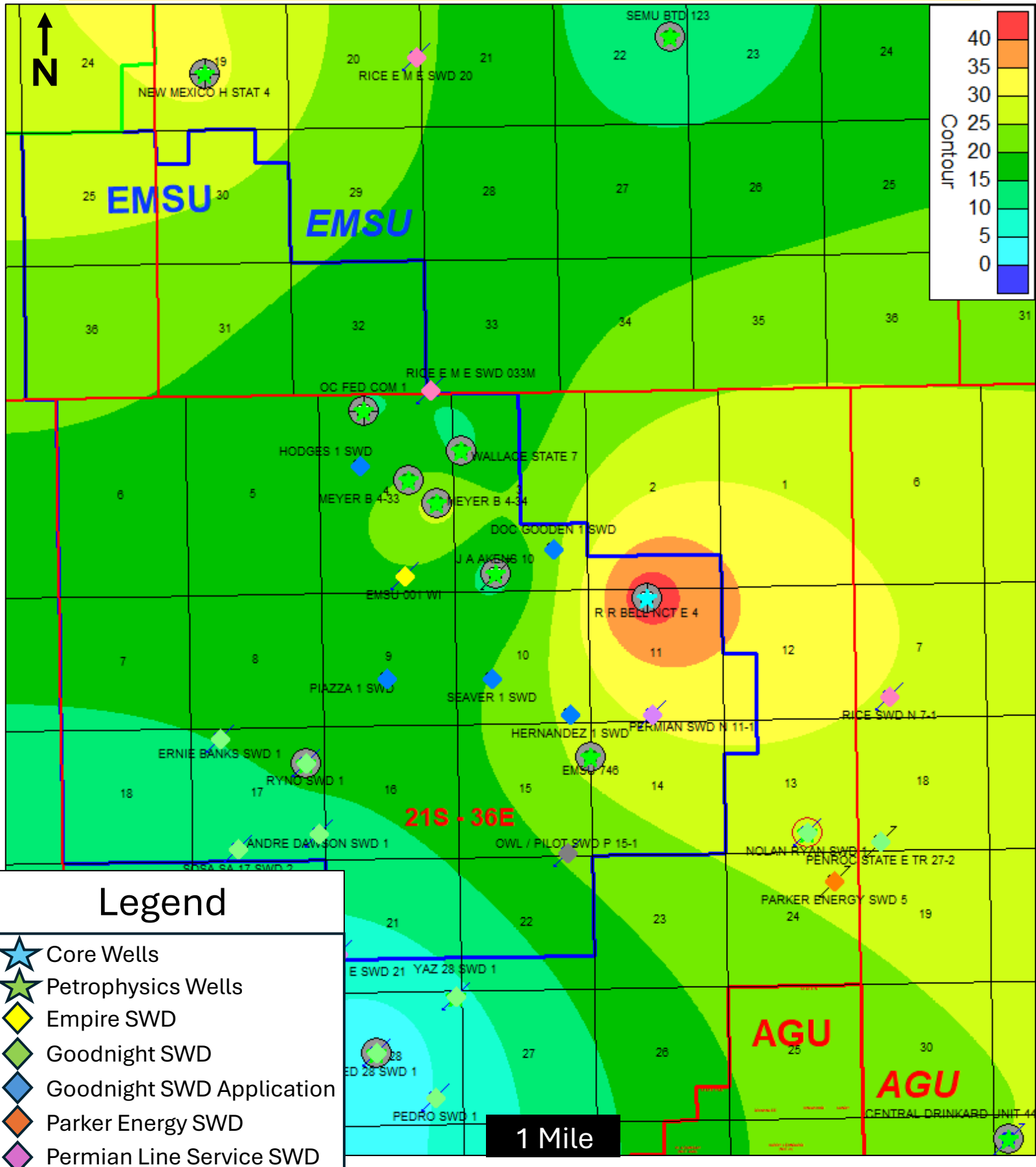


Legend

- Core Wells
- Petrophysics Wells
- Empire SWD
- Goodnight SWD
- Goodnight SWD Application
- Parker Energy SWD
- Permian Line Service SWD
- Pilot Water Solutions SWD
- Rice Operating SWD

Exhibit K-32

Lower San Andres OOIP (MMBLS/Section) Low Case

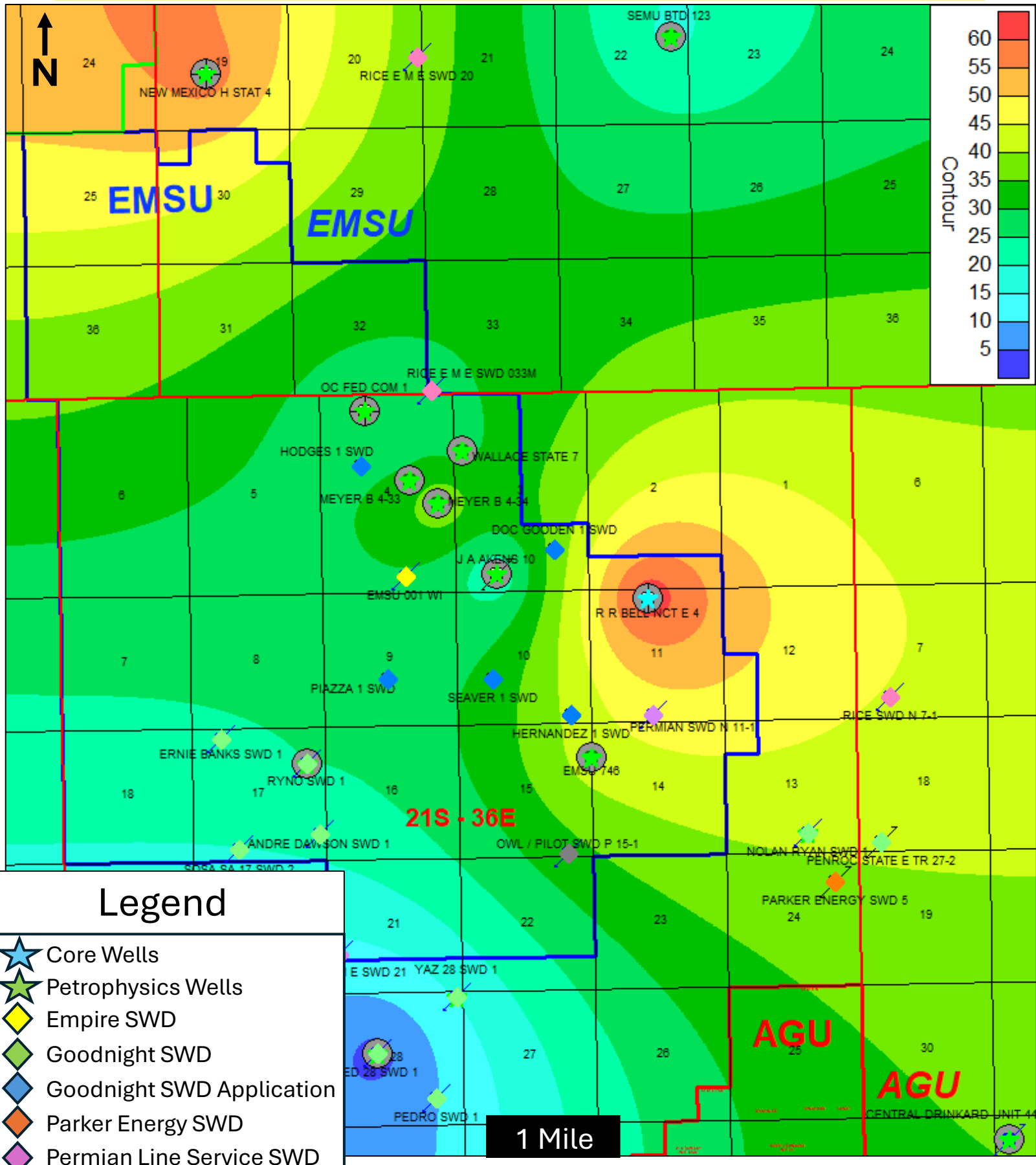


Legend

- Core Wells
- Petrophysics Wells
- Empire SWD
- Goodnight SWD
- Goodnight SWD Application
- Parker Energy SWD
- Permian Line Service SWD
- Pilot Water Solutions SWD
- Rice Operating SWD

Exhibit K-33

Lower San Andres OOIP (MMBLS/Section) High Case

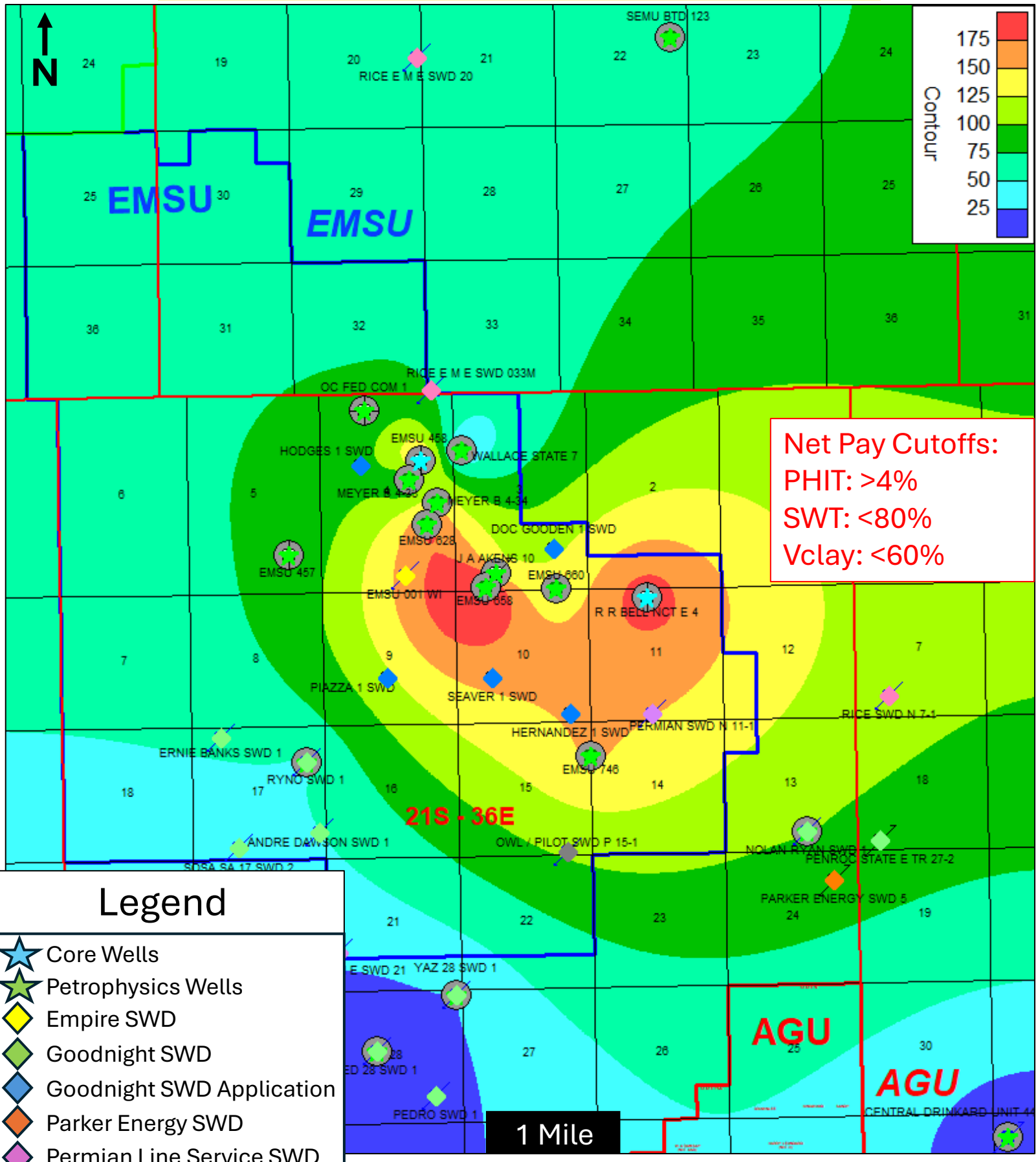


Legend

- Core Wells
- Petrophysics Wells
- Empire SWD
- Goodnight SWD
- Goodnight SWD Application
- Parker Energy SWD
- Permian Line Service SWD
- Pilot Water Solutions SWD
- Rice Operating SWD

Exhibit K-34

Upper San Andres Net Pay (FT) Low Case

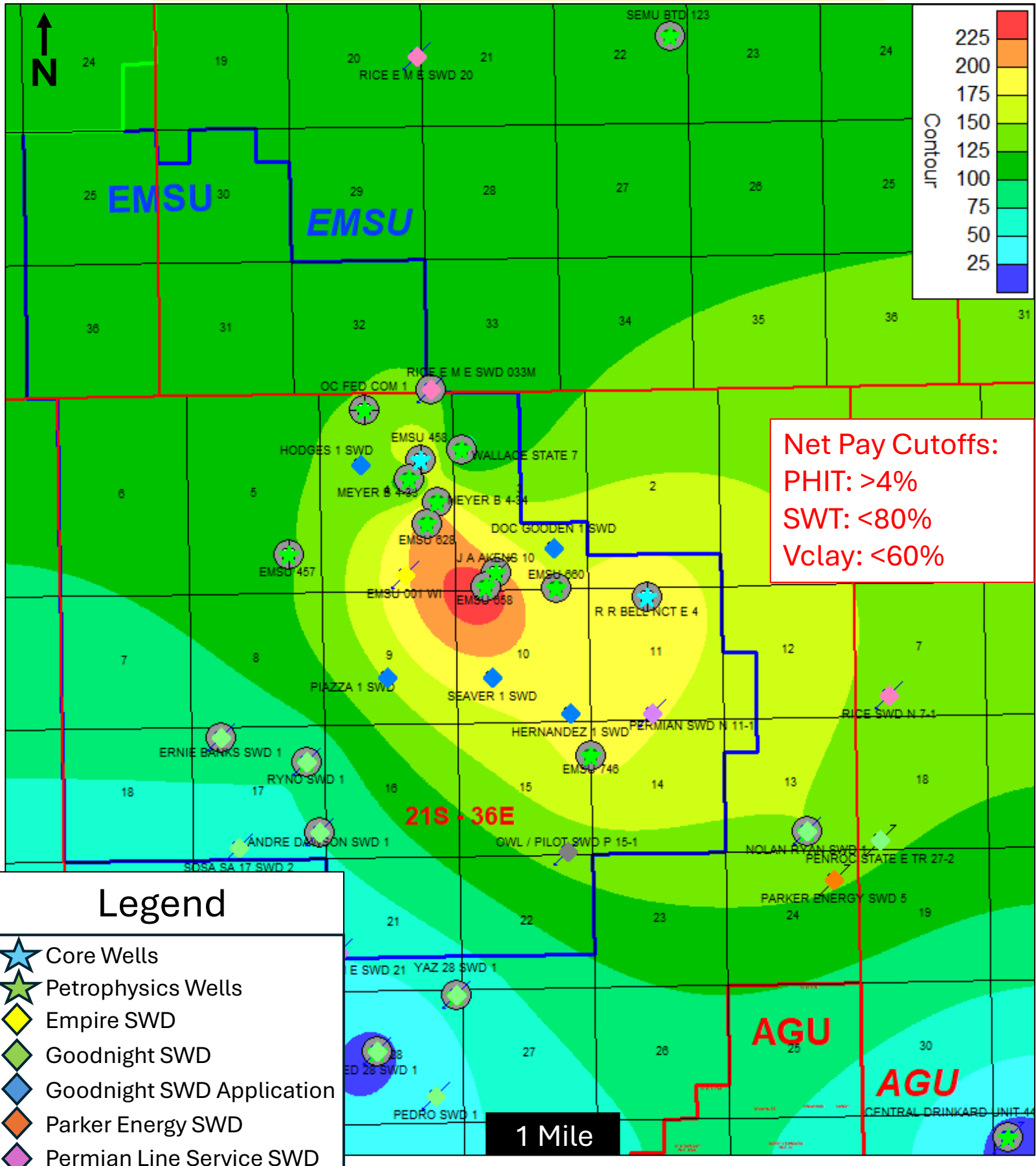


Legend

- Core Wells
- Petrophysics Wells
- Empire SWD
- Goodnight SWD
- Goodnight SWD Application
- Parker Energy SWD
- Permian Line Service SWD
- Pilot Water Solutions SWD
- Rice Operating SWD

Exhibit K-35

Upper San Andres Net Pay (FT) High Case



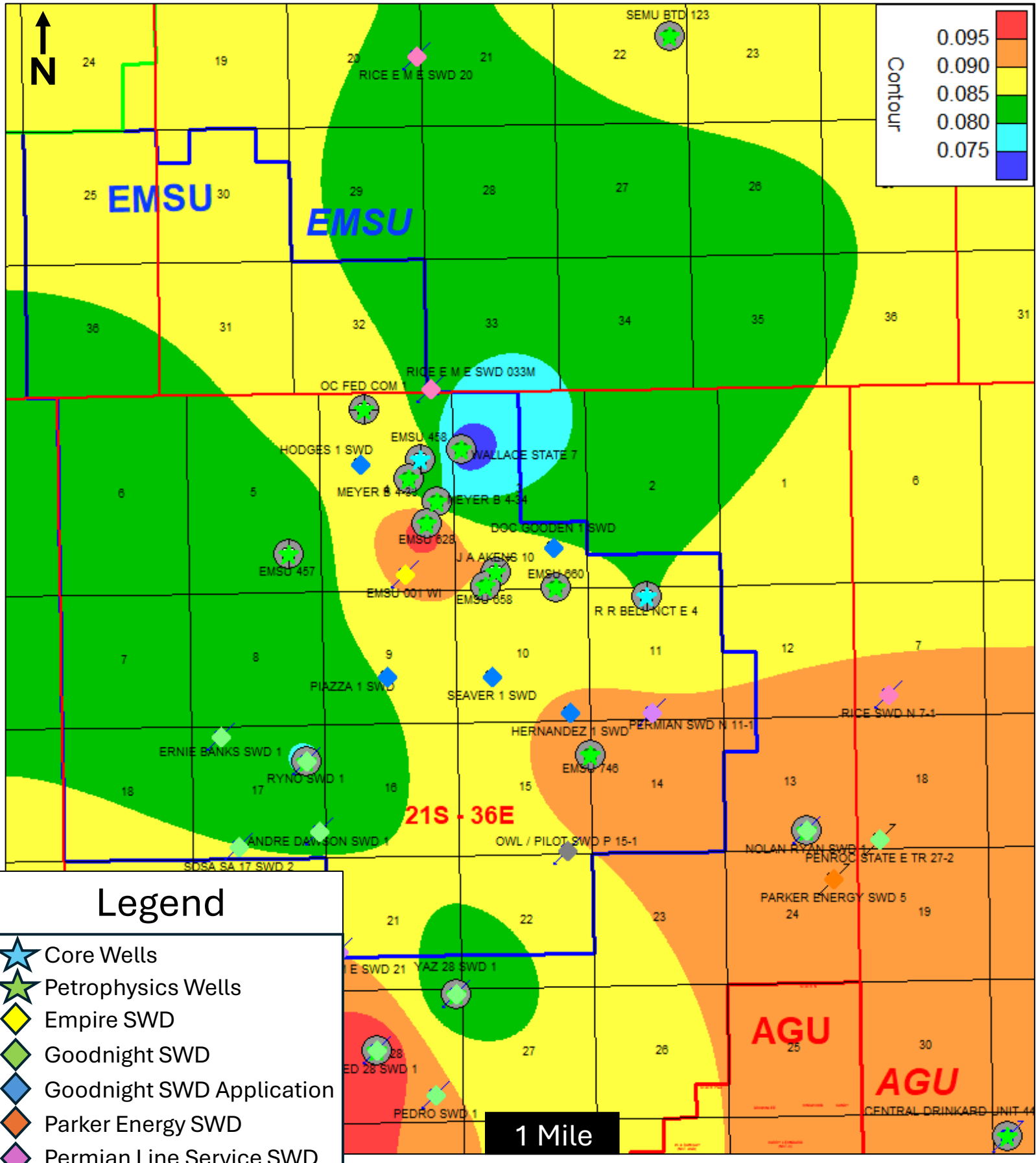
Net Pay Cutoffs:
PHIT: >4%
SWT: <80%
Vclay: <60%

Legend

- Core Wells
- Petrophysics Wells
- Empire SWD
- Goodnight SWD
- Goodnight SWD Application
- Parker Energy SWD
- Permian Line Service SWD
- Pilot Water Solutions SWD
- Rice Operating SWD

Exhibit K-36

Upper San Andres PHIT (%) Above 4% Cutoff

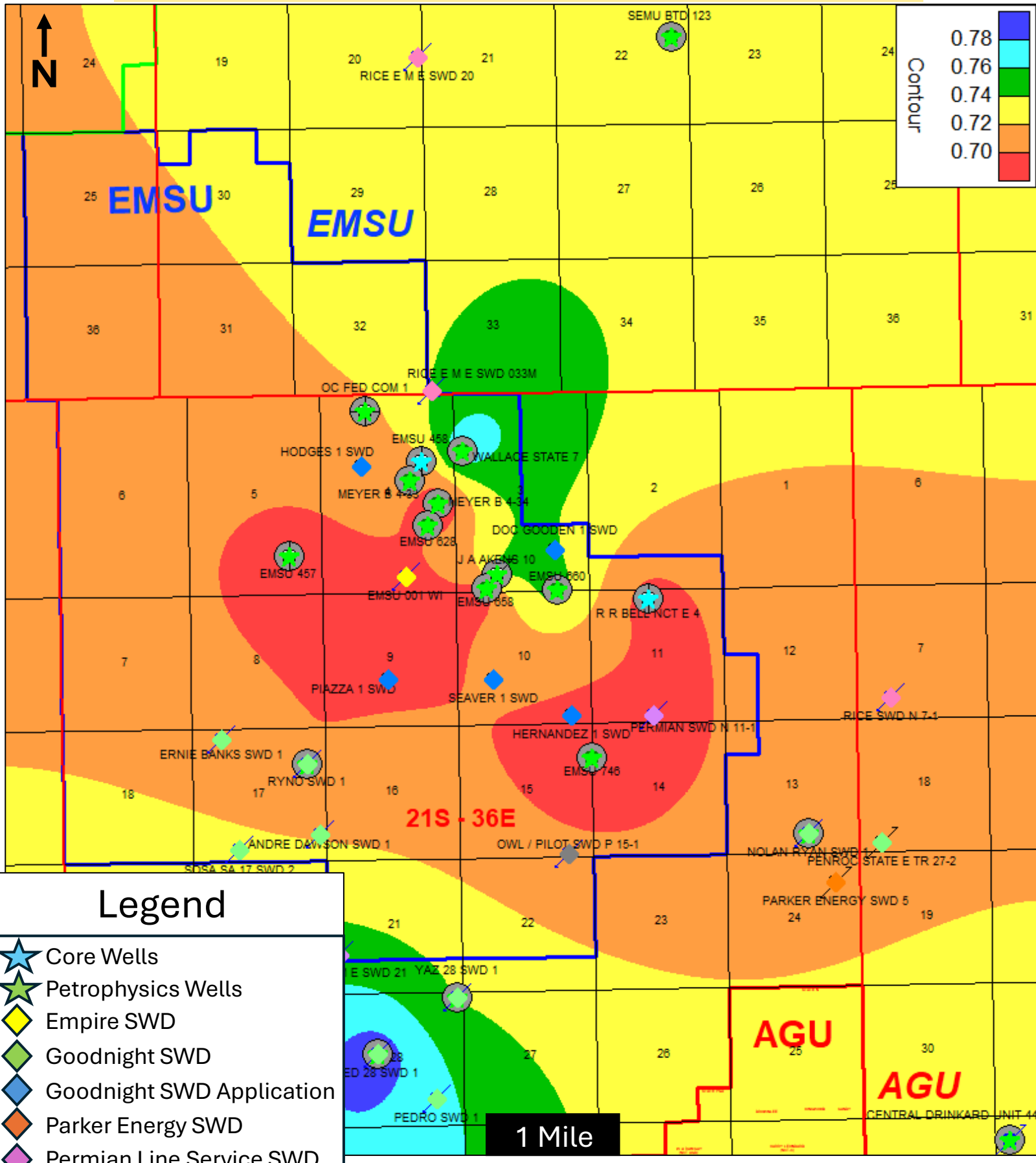


Legend

- Core Wells
- Petrophysics Wells
- Empire SWD
- Goodnight SWD
- Goodnight SWD Application
- Parker Energy SWD
- Permian Line Service SWD
- Pilot Water Solutions SWD
- Rice Operating SWD

Exhibit K-37

Upper San Andres Average SWT (%) Low Case

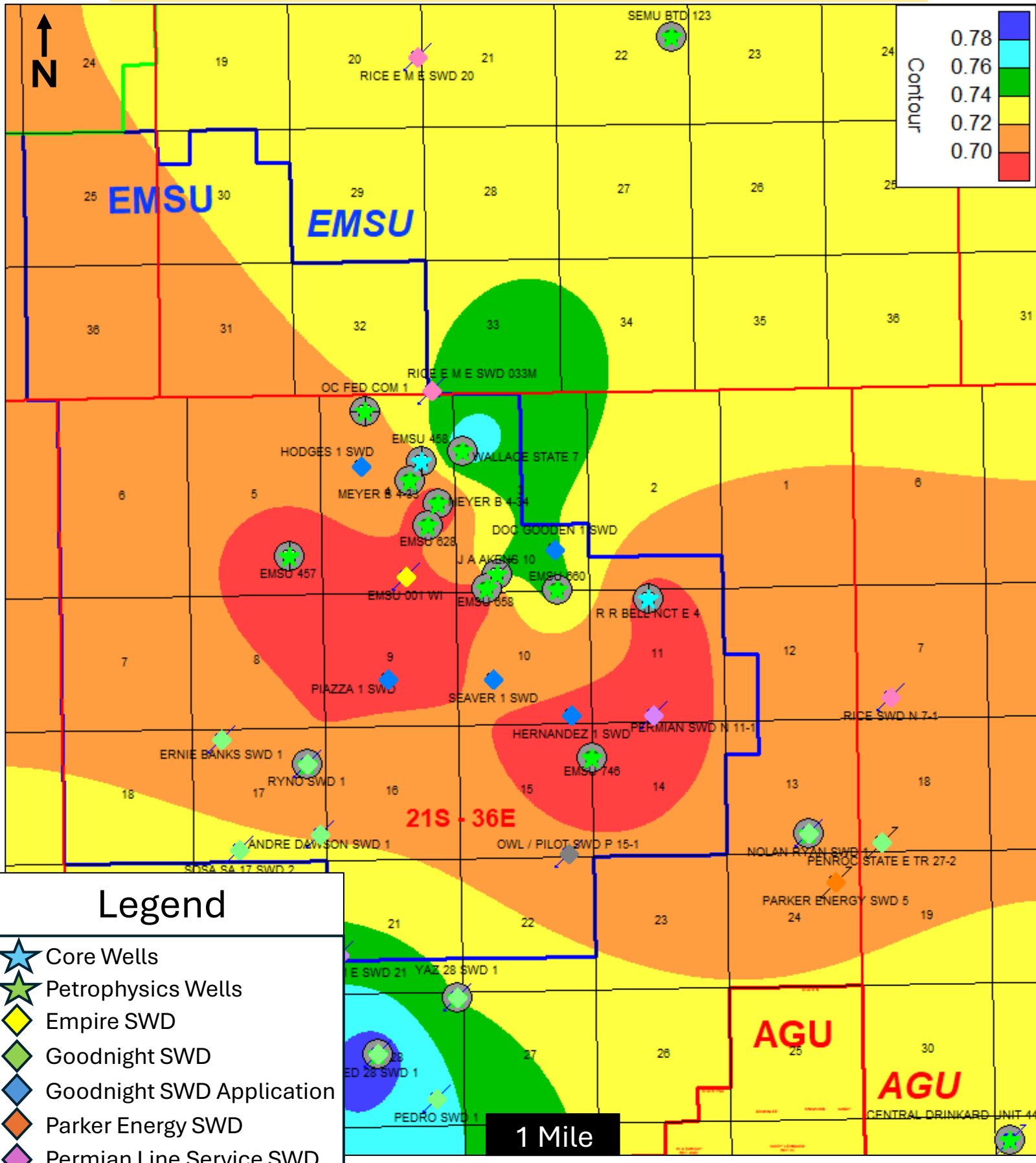


Legend

- Core Wells
- Petrophysics Wells
- Empire SWD
- Goodnight SWD
- Goodnight SWD Application
- Parker Energy SWD
- Permian Line Service SWD
- Pilot Water Solutions SWD
- Rice Operating SWD

Exhibit K-38

Upper San Andres Average SWT (%) High Case

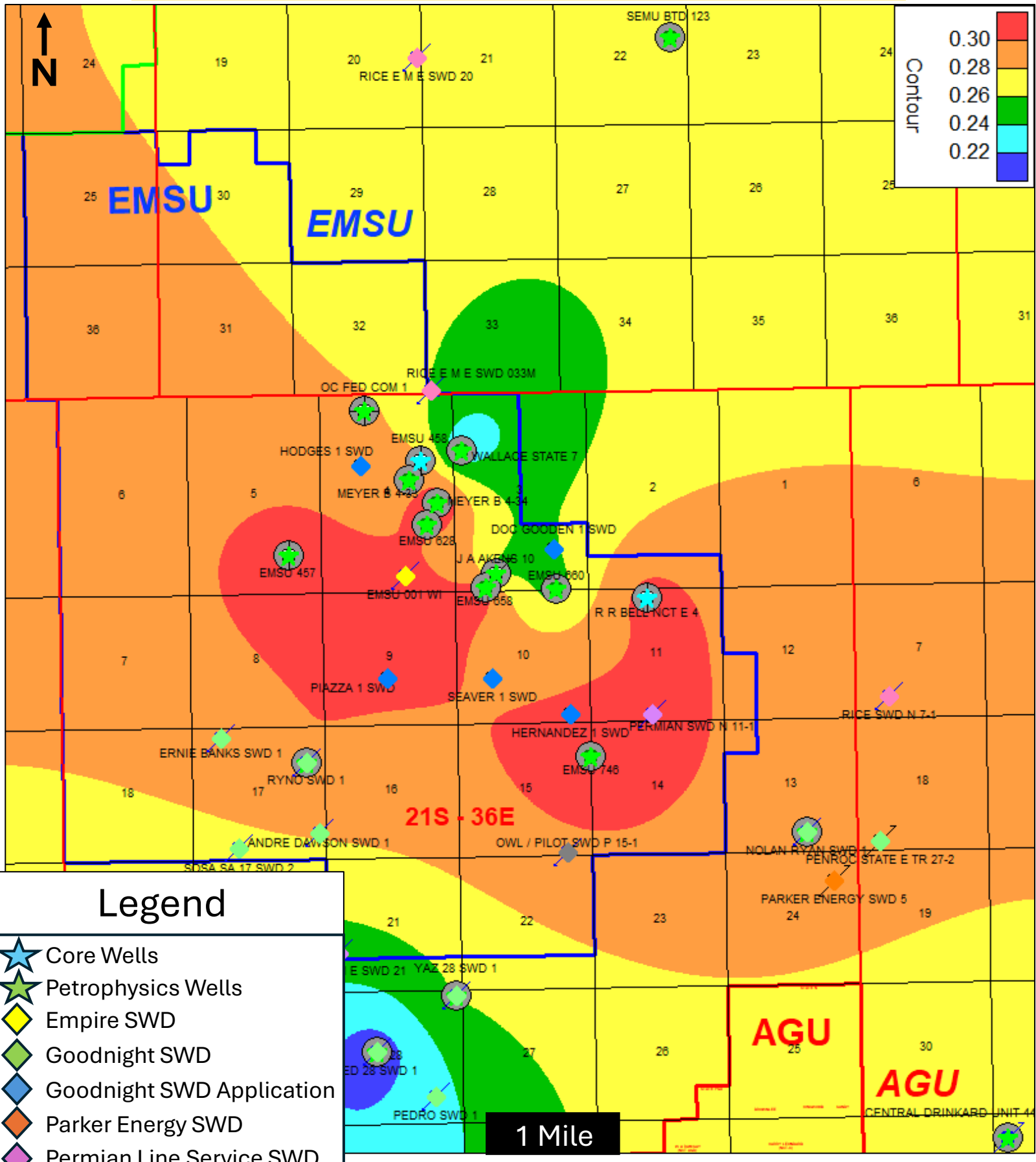


Legend

- Core Wells
- Petrophysics Wells
- Empire SWD
- Goodnight SWD
- Goodnight SWD Application
- Parker Energy SWD
- Permian Line Service SWD
- Pilot Water Solutions SWD
- Rice Operating SWD

Exhibit K-39

Upper San Andres Average So (%) Low Case

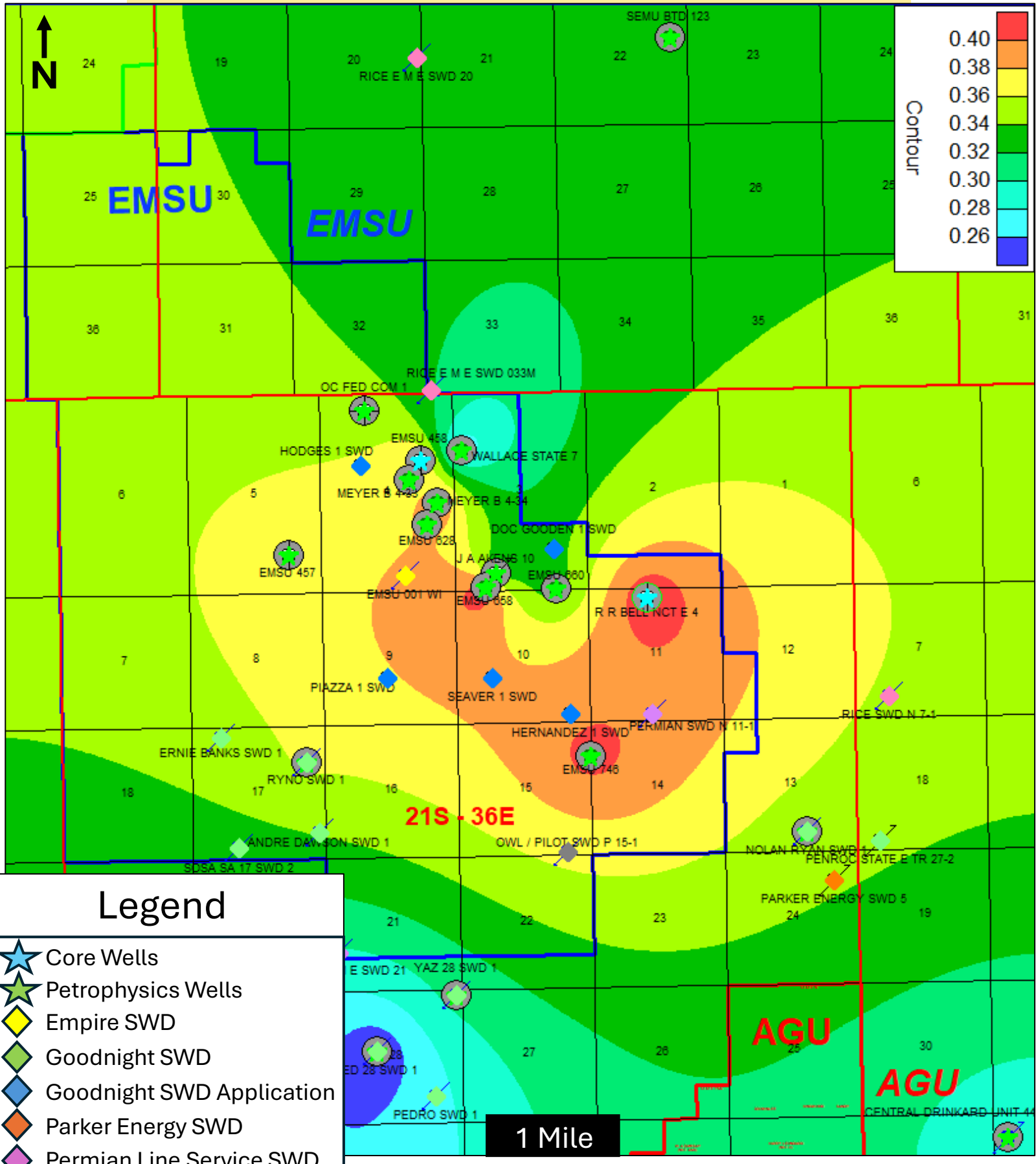


Legend

- Core Wells
- Petrophysics Wells
- Empire SWD
- Goodnight SWD
- Goodnight SWD Application
- Parker Energy SWD
- Permian Line Service SWD
- Pilot Water Solutions SWD
- Rice Operating SWD

Exhibit K-40

Upper San Andres Average So (%) High Case

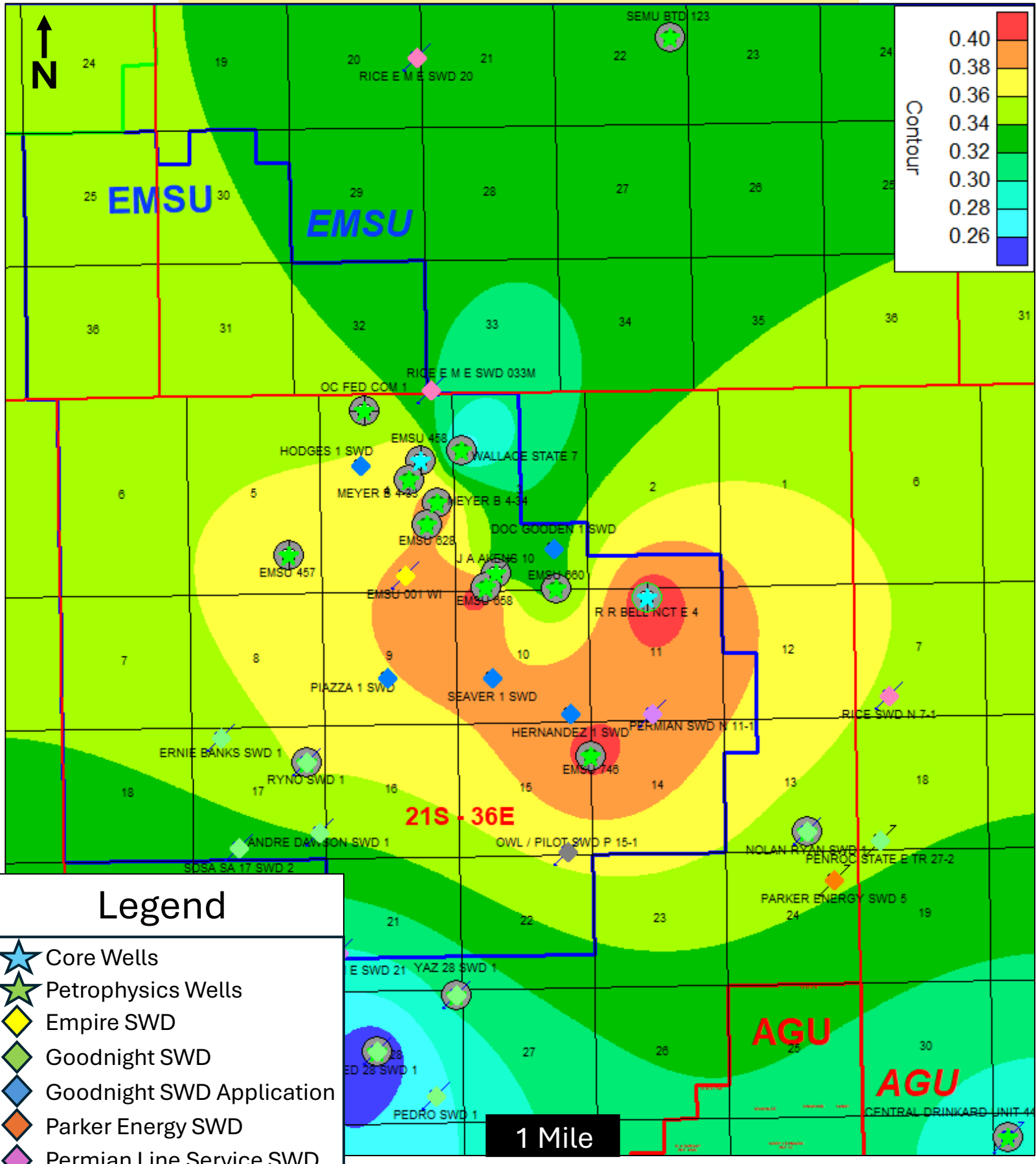


Legend

- Core Wells
- Petrophysics Wells
- Empire SWD
- Goodnight SWD
- Goodnight SWD Application
- Parker Energy SWD
- Permian Line Service SWD
- Pilot Water Solutions SWD
- Rice Operating SWD

Exhibit K-41

Upper San Andres PHIH (FT) Low Case

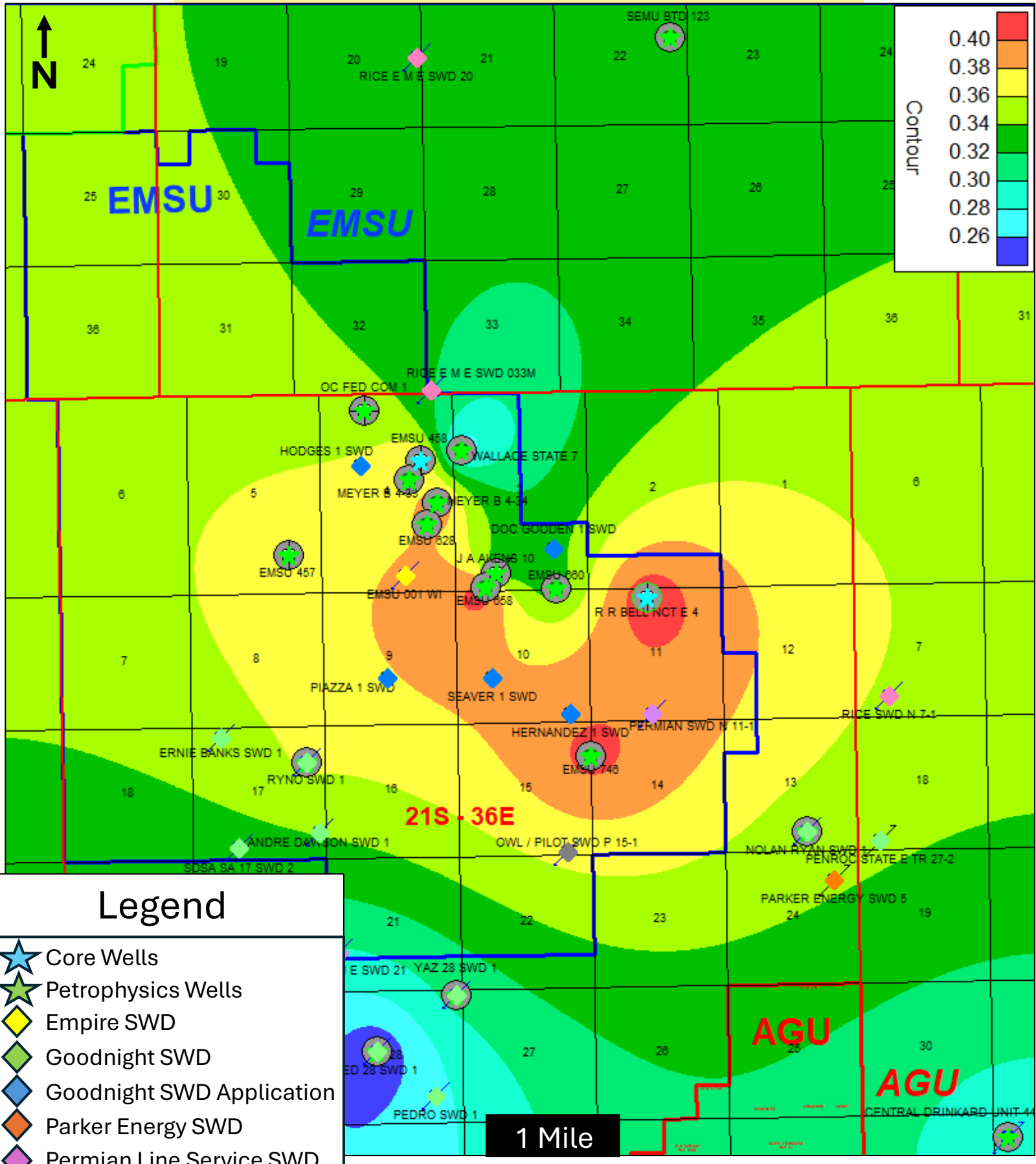


Legend

- Core Wells
- Petrophysics Wells
- Empire SWD
- Goodnight SWD
- Goodnight SWD Application
- Parker Energy SWD
- Permian Line Service SWD
- Pilot Water Solutions SWD
- Rice Operating SWD

Exhibit K-42

Upper San Andres PHIH (FT) High Case

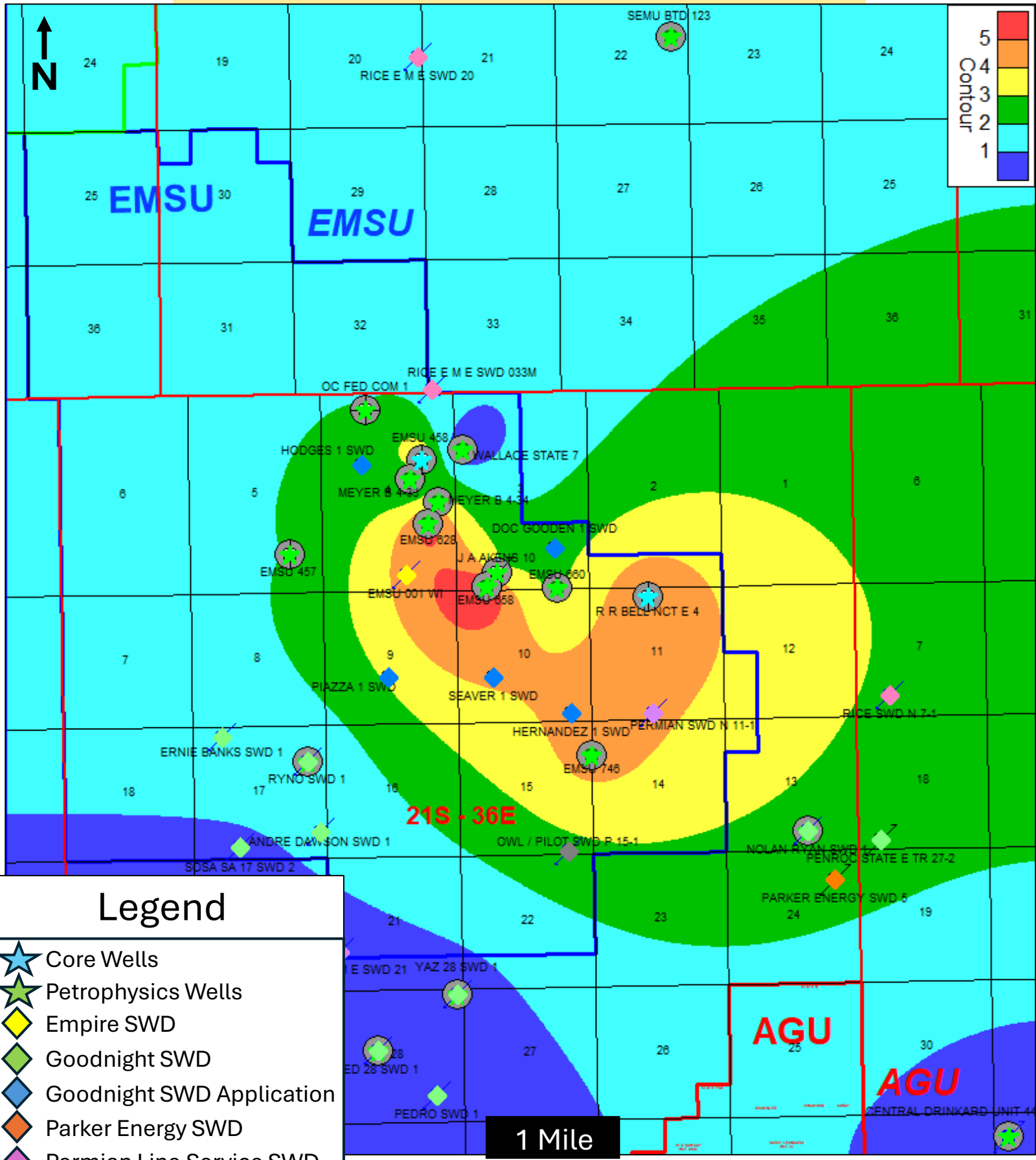


Legend

- Core Wells
- Petrophysics Wells
- Empire SWD
- Goodnight SWD
- Goodnight SWD Application
- Parker Energy SWD
- Permian Line Service SWD
- Pilot Water Solutions SWD
- Rice Operating SWD

Exhibit K-43

Upper San Andres HCPV (FT) Low Case



Legend

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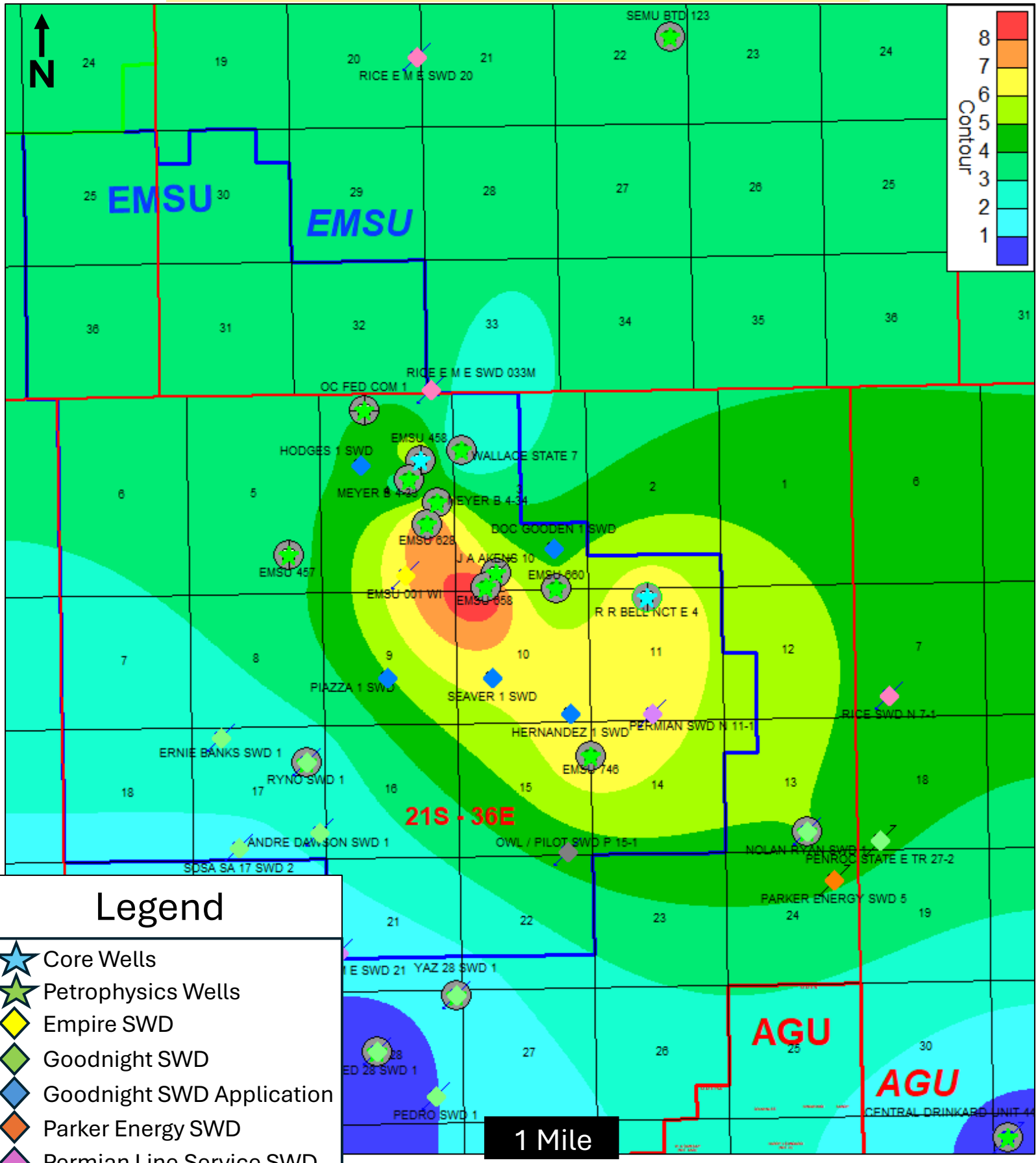
- Petrophysics Wells
- Empire SWD
- Goodnight SWD
- Goodnight SWD Application
- Parker Energy SWD
- Permian Line Service SWD
- Pilot Water Solutions SWD
- Rice Operating SWD

Exhibit K-44

Upper San Andres HCPV (FT) High Case



Legend

- Core Wells
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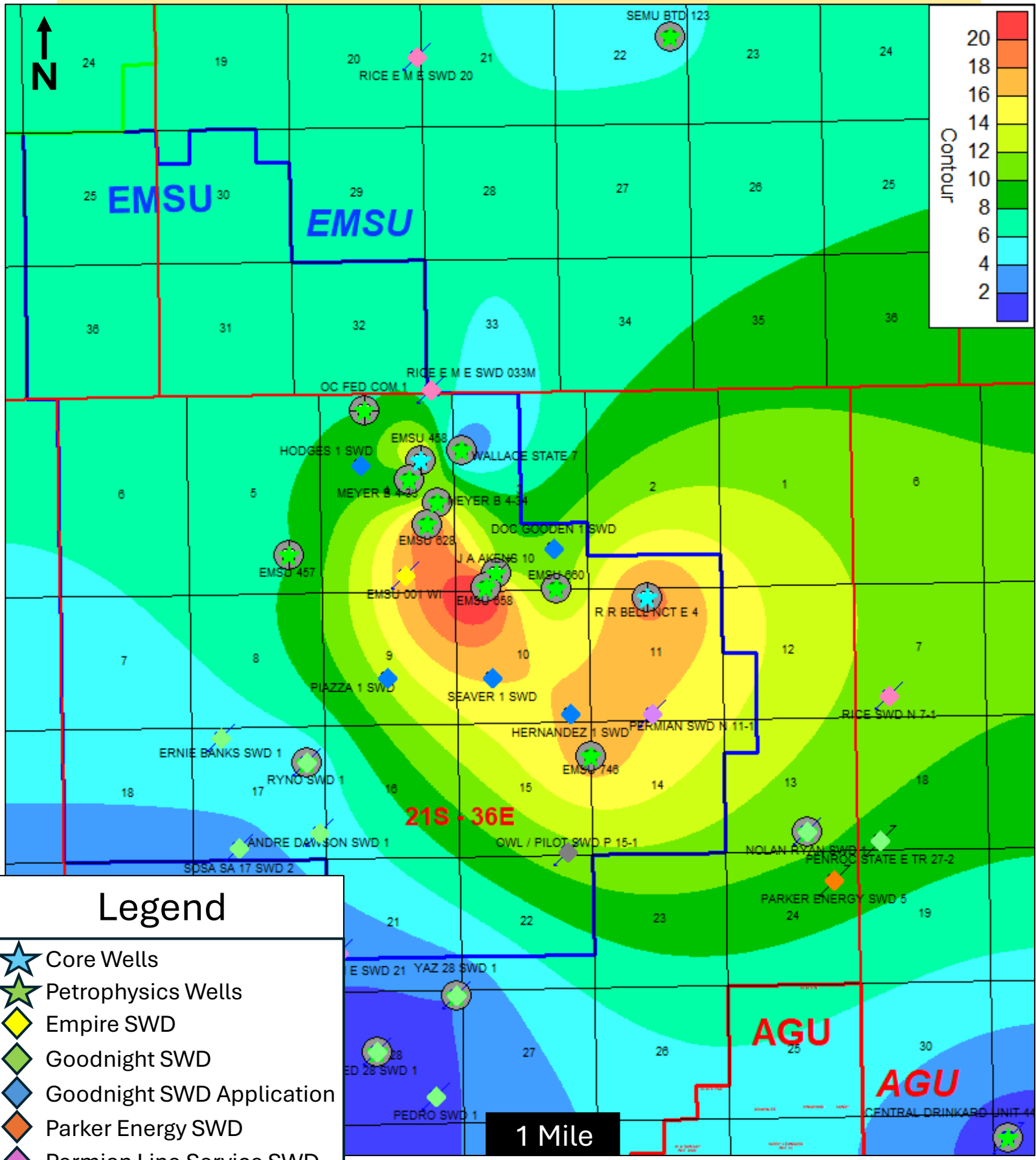
- Empire SWD
- Goodnight SWD
- Goodnight SWD Application
- Parker Energy SWD
- Permian Line Service SWD
- Pilot Water Solutions SWD
- Rice Operating SWD

Exhibit K-45

Upper San Andres OOIP (MMBLS/Section) Low Case

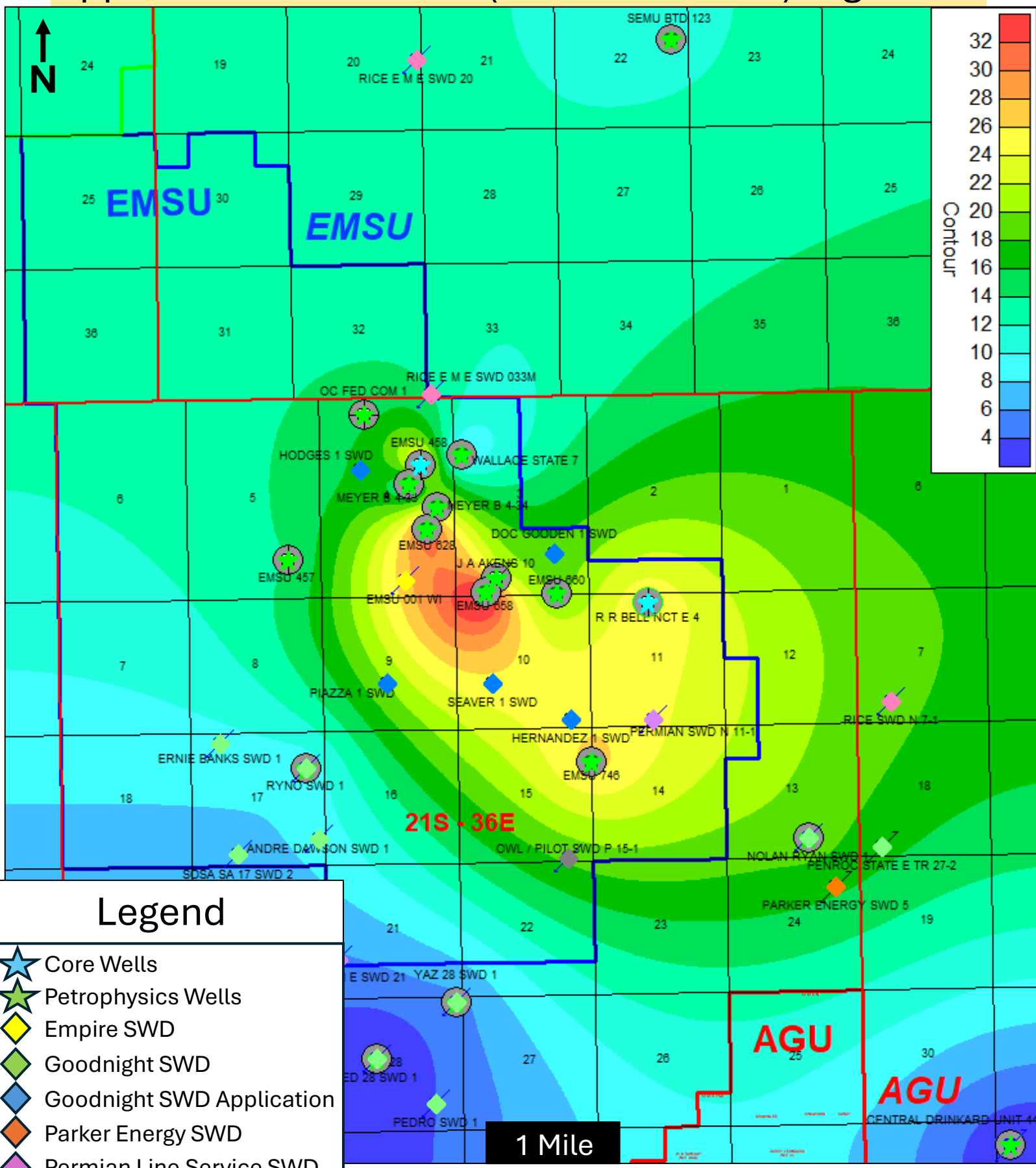


Legend

- Core Wells
- Petrophysics Wells
- Empire SWD
- Goodnight SWD
- Goodnight SWD Application
- Parker Energy SWD
- Permian Line Service SWD
- Pilot Water Solutions SWD
- Rice Operating SWD

Exhibit K-46

Upper San Andres OOIP (MMBLS/Section) High Case



Legend

- Core Wells
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- Parker Energy SWD
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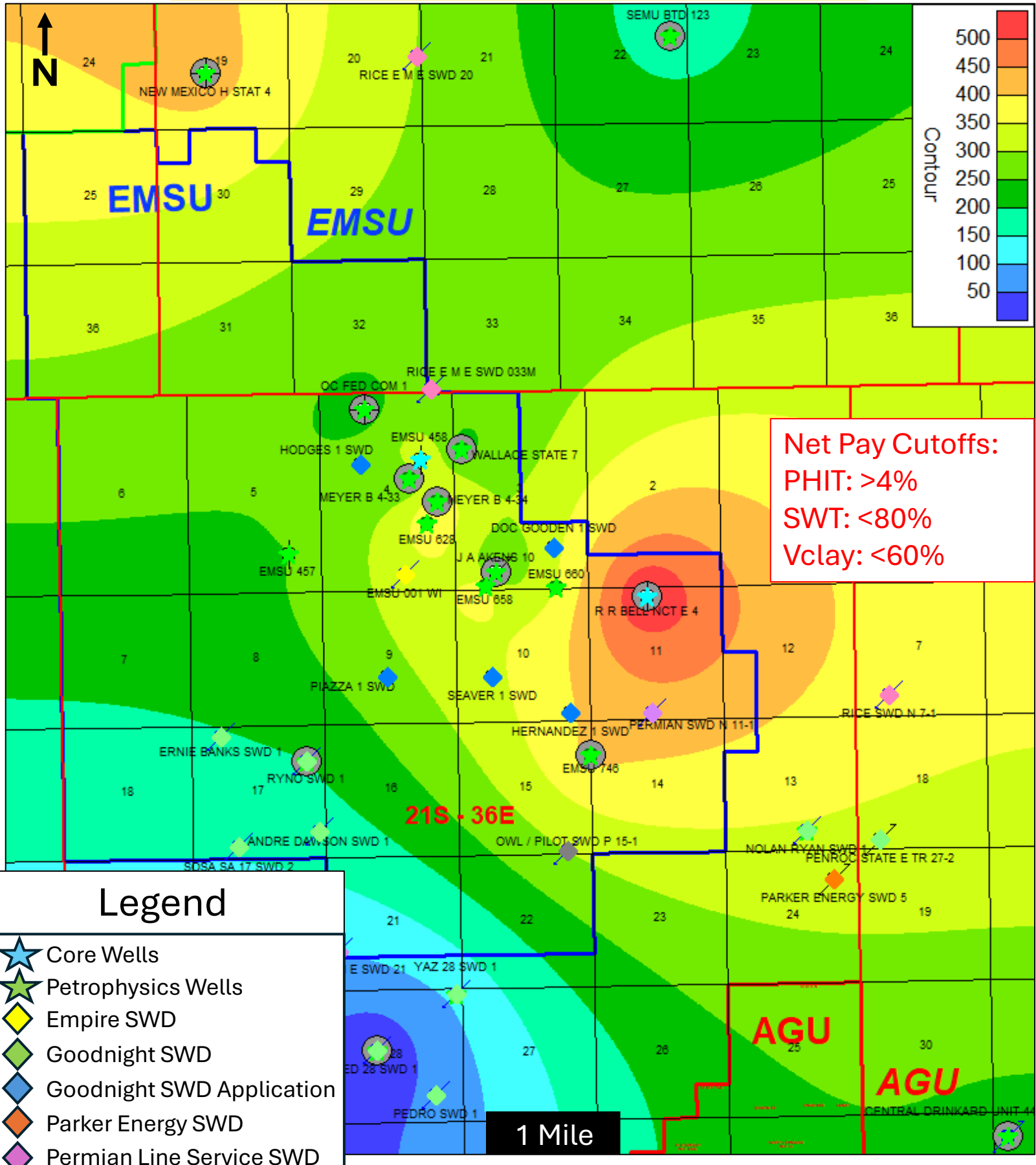
- Pilot Water Solutions SWD
- Rice Operating SWD

Exhibit K-47

Total San Andres Net Pay (FT) Low Case



Net Pay Cutoffs:
PHIT: >4%
SWT: <80%
Vclay: <60%

Legend

- Core Wells
- Petrophysics Wells
- Empire SWD
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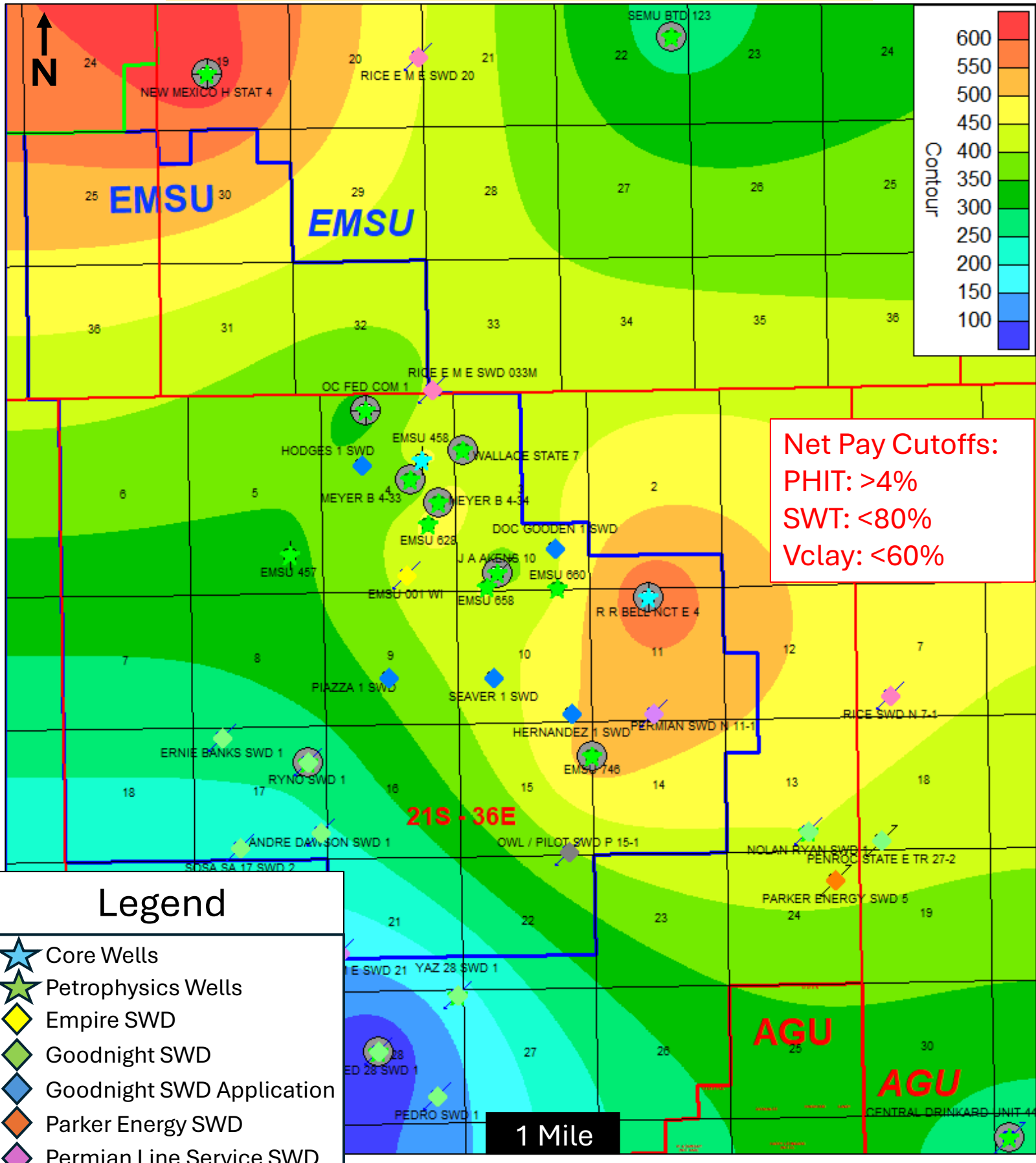
- Pilot Water Solutions SWD
- Rice Operating SWD

Exhibit K-48

Total San Andres Net Pay (FT) High Case



Legend

- Core Wells
- Petrophysics Wells
- Empire SWD
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- Goodnight SWD Application
- Parker Energy SWD
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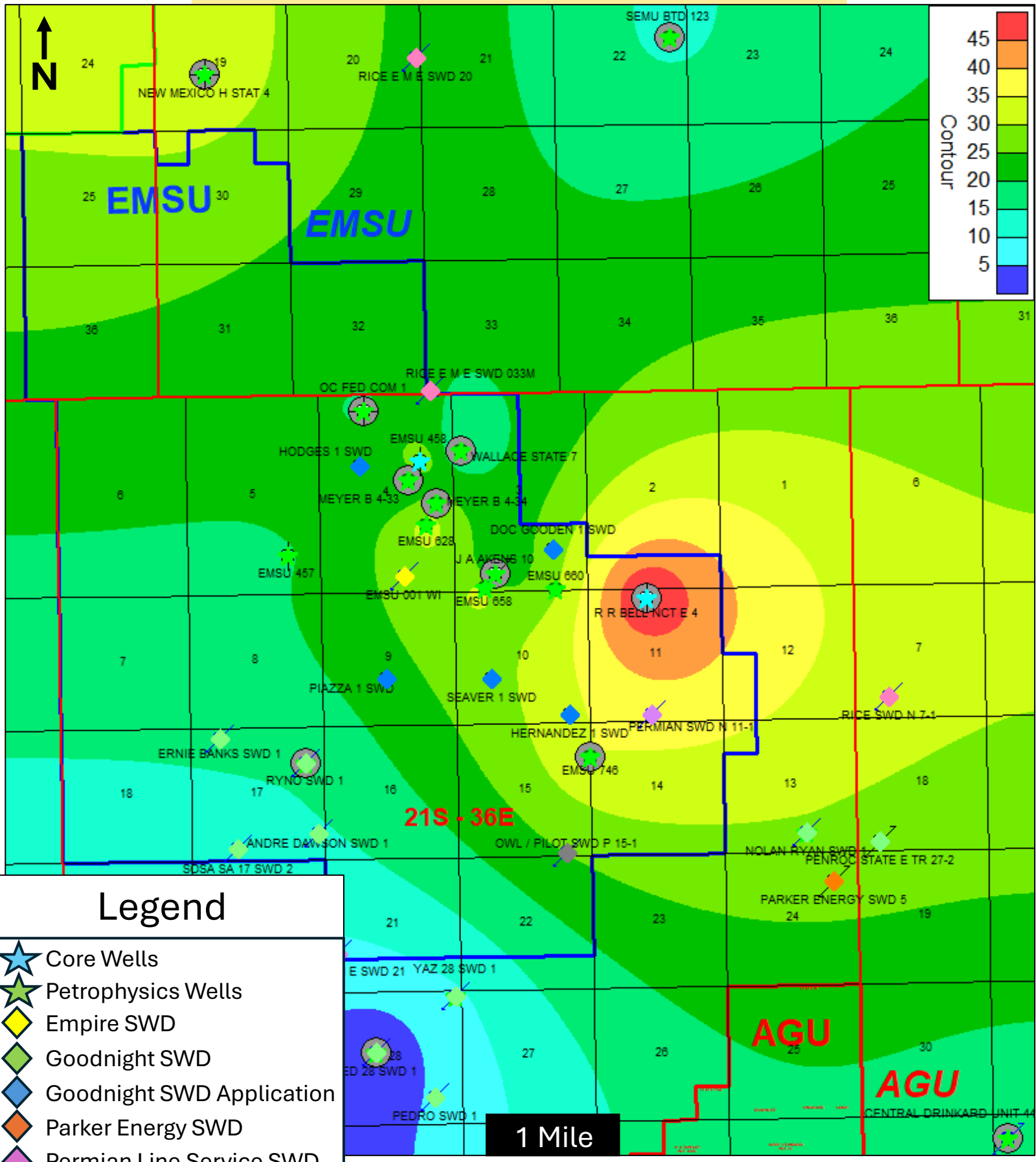
- Pilot Water Solutions SWD
- Rice Operating SWD

Exhibit K-49

Total San Andres PHIH (FT) Low Case



Legend

- Core Wells
- Petrophysics Wells
- Empire SWD
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- Goodnight SWD Application
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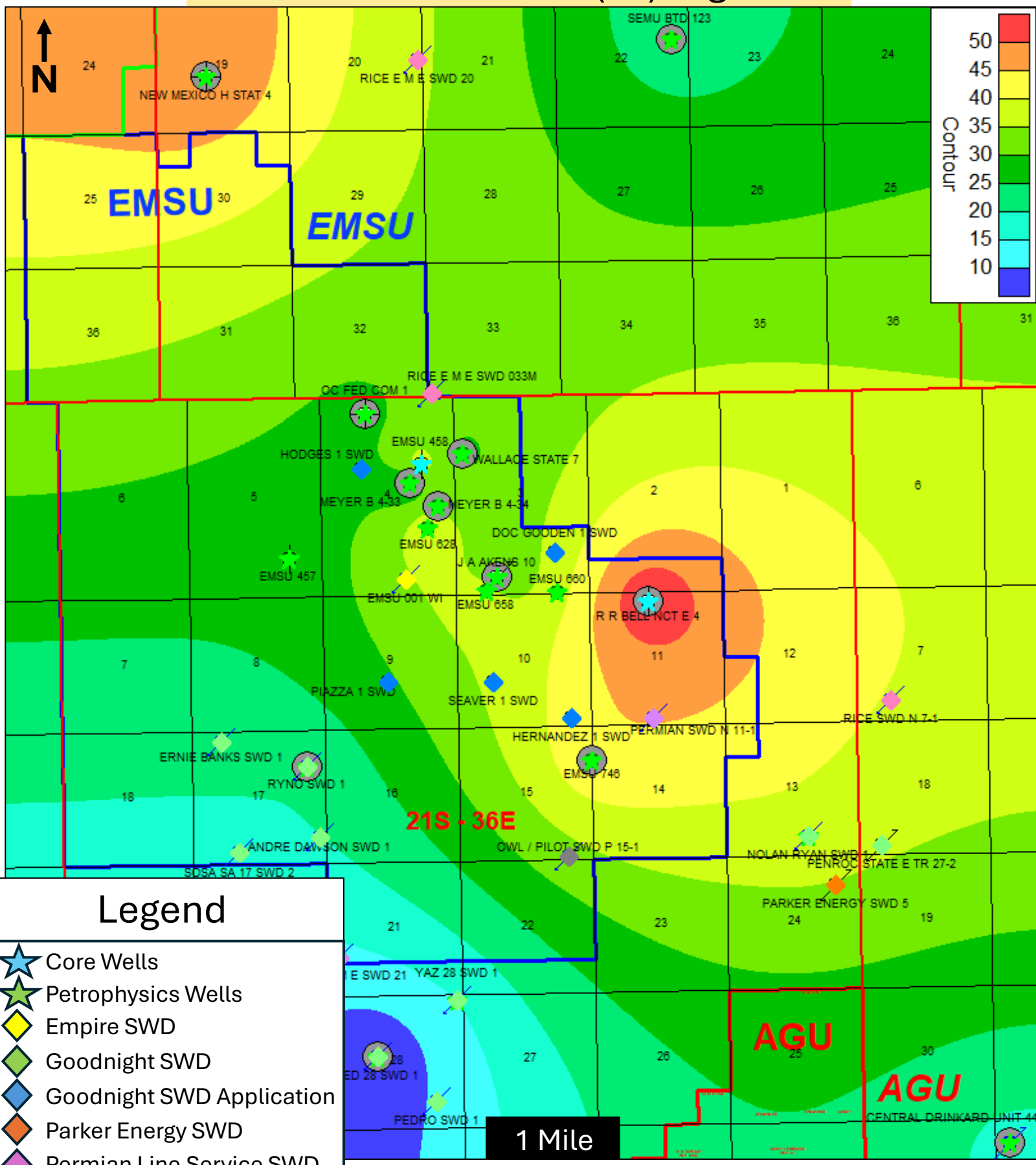
- Pilot Water Solutions SWD
- Rice Operating SWD

Exhibit K-50

Total San Andres PHIH (FT) High Case



Legend

- Core Wells
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- Goodnight SWD Application
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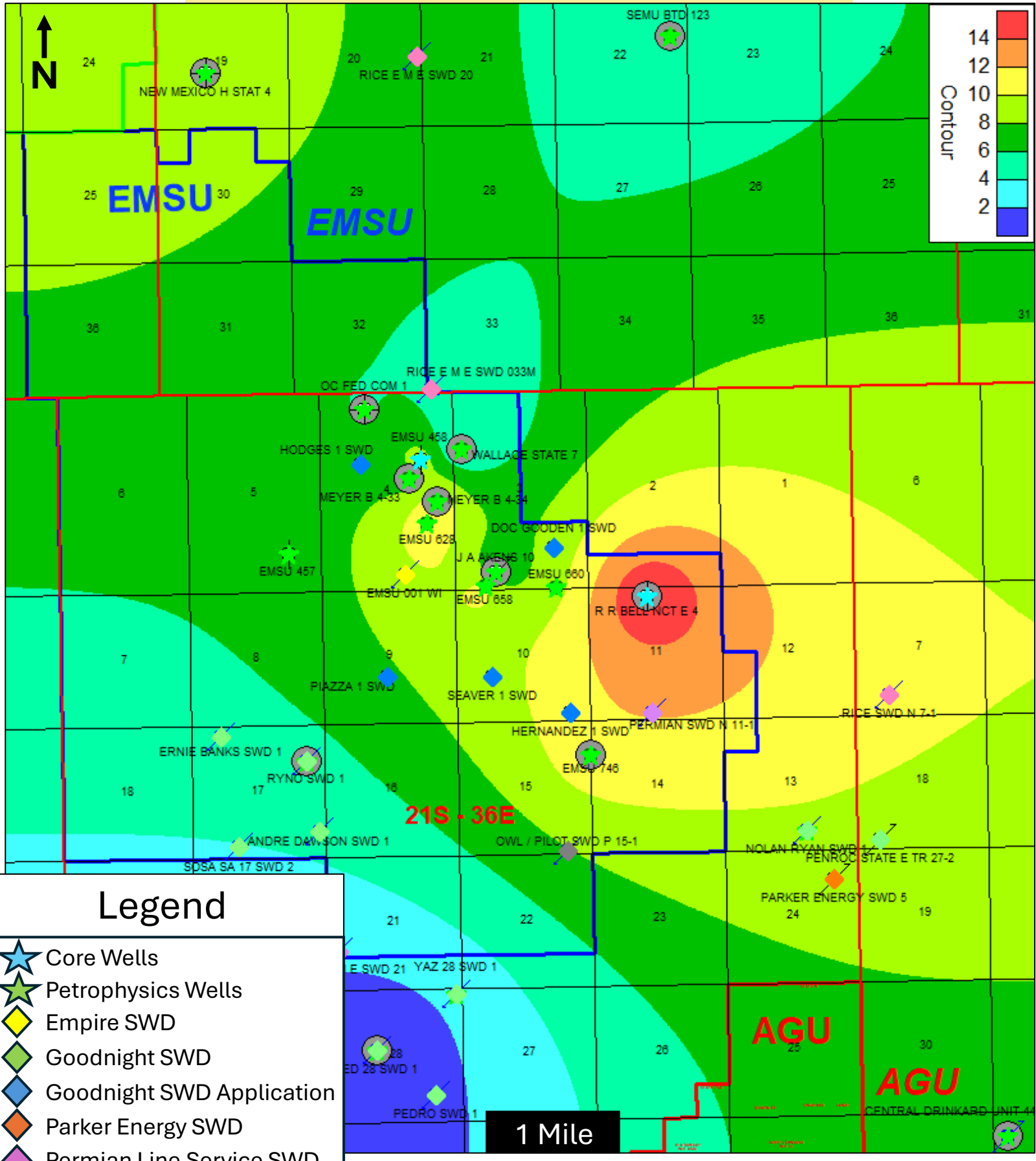
- Permian Line Service SWD
- Pilot Water Solutions SWD
- Rice Operating SWD

Exhibit K-51

Total San Andres HCPV (FT) Low Case

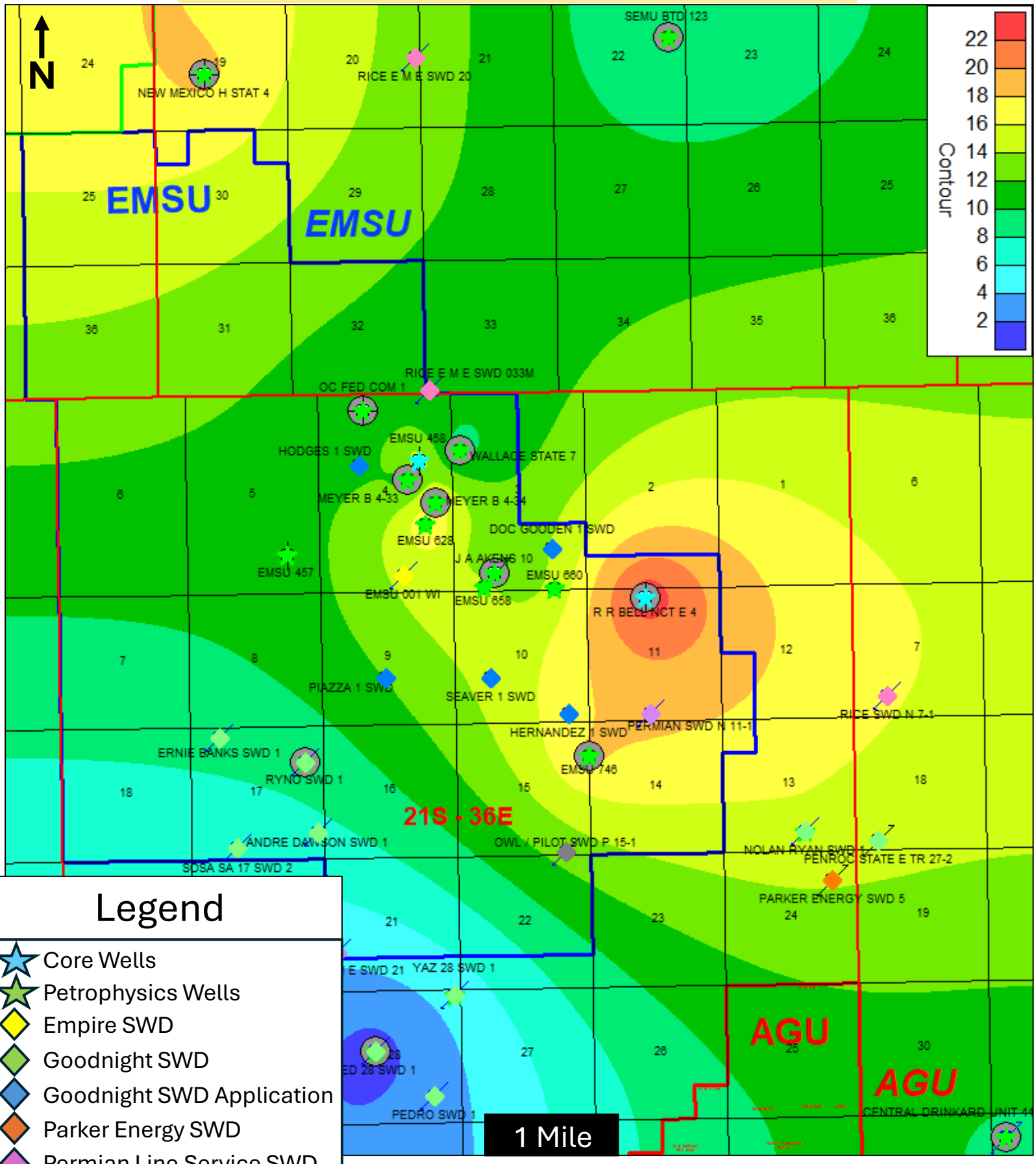


Legend

- Core Wells
- Petrophysics Wells
- Empire SWD
- Goodnight SWD
- Goodnight SWD Application
- Parker Energy SWD
- Permian Line Service SWD
- Pilot Water Solutions SWD
- Rice Operating SWD

Exhibit K-52

Total San Andres HCPV (FT) High Case

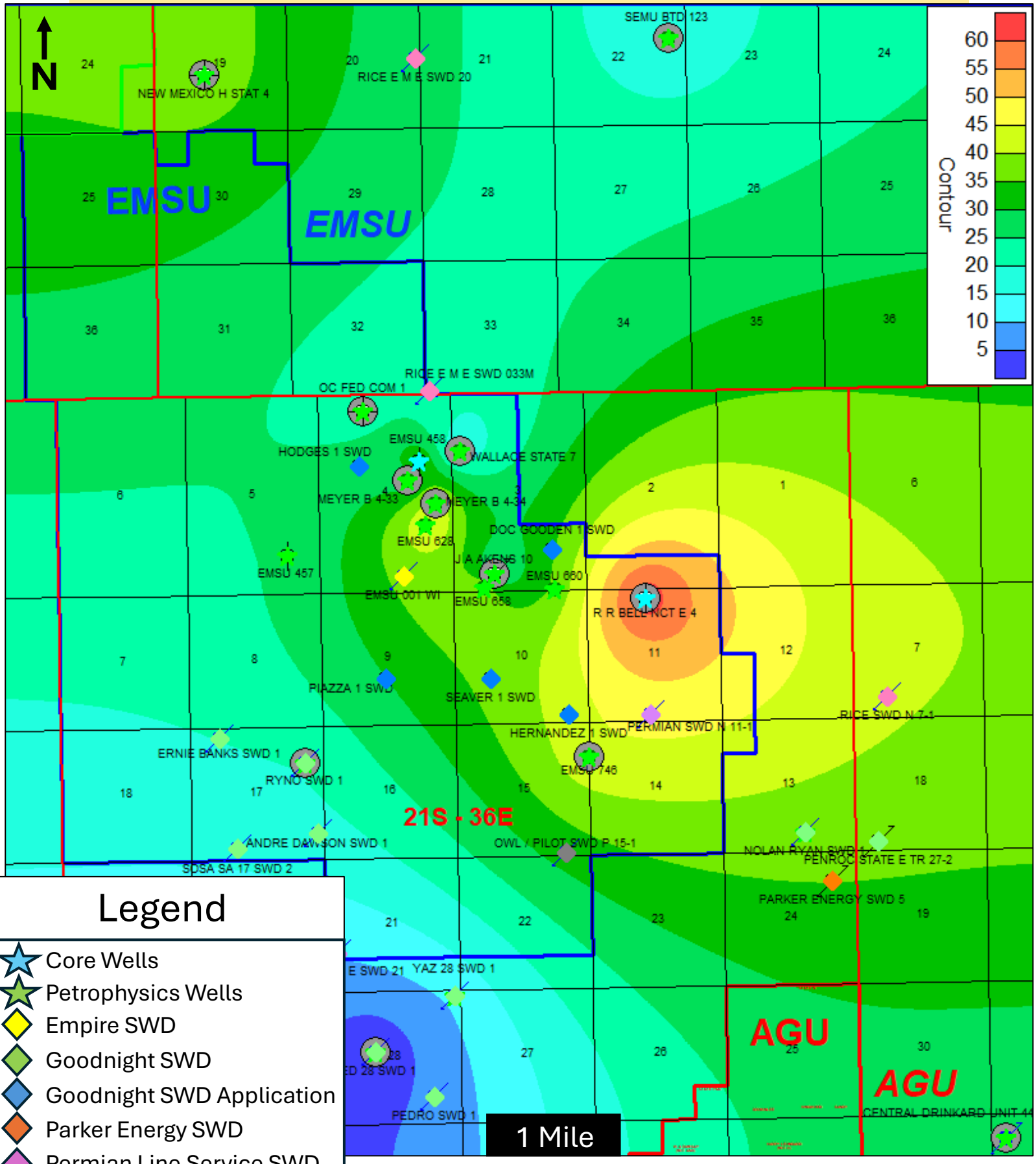


Legend

- Core Wells
- Petrophysics Wells
- Empire SWD
- Goodnight SWD
- Goodnight SWD Application
- Parker Energy SWD
- Permian Line Service SWD
- Pilot Water Solutions SWD
- Rice Operating SWD

Exhibit K-53

Total San Andres OOIP (MMBLS/Section) Low Case

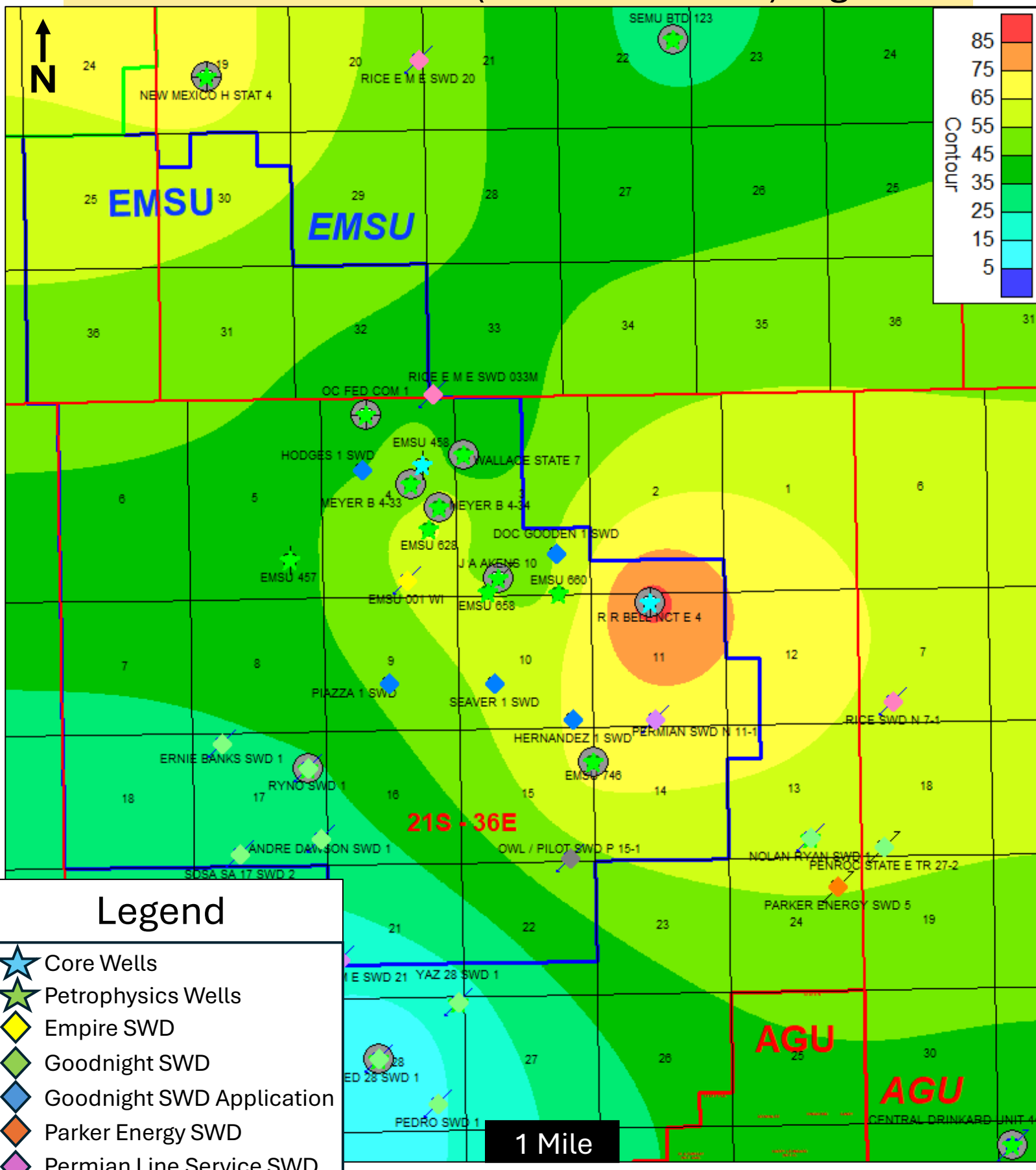


Legend

- Core Wells
- Petrophysics Wells
- Empire SWD
- Goodnight SWD
- Goodnight SWD Application
- Parker Energy SWD
- Permian Line Service SWD
- Pilot Water Solutions SWD
- Rice Operating SWD

Exhibit K-54

Total San Andres OOIP (MMBLS/Section) High Case



Legend

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- Rice Operating SWD

Exhibit K-55

San Andres EMSU OOIP Volumes

Formation	OOIP Low Case MMBLS	OOIP High Case MMBLS
Upper San Andres	190.86	331.41
Lower San Andres	438.76	718.34
Total San Andres	629.62	1,049.75

Exhibit K-56

Ryan Bailey

39 N Lansdowne Cir., The Woodlands, TX 77382
Phone: 832-585-6865 Business E-Mail: rbailey@opsgeologic.com Personal E-Mail: rmb4112@gmail.com

Summary Qualifications

- 17 years of geology and multi-disciplinary management experience in field development and exploitation of conventional and unconventional oil and gas resources across US Onshore.
- Team oriented leader with the ability to motivate staff to perform at a high level.
- Proven track history of leading multiple disciplines to execute active drilling programs.
- Delivered high quality mapping and geologic interpretations under short deadlines with technical excellence.

Experience: Ops Geologic (May 2021-Present)

Co-founder and Vice President Geoscience

- Responsible for generating client driven geoscience products from play fairway analysis and prospect generation to field development plans, data acquisition, and ultimately execution of operations.
- Recent projects include multiple M&A process evaluations of the Eagle Ford and Austin Chalk across South Texas from Gonzales to Webb County, evaluation of the Bone Spring and Wolfcamp across Lea and Eddy County, New Mexico, and exploration projects across the East Texas Basin and Texas Gulf Coast.
- Manage multi-disciplinary team of geoscientists and engineers to ensure quality, completion, and delivery of client driven projects.

Arkatex Energy Advisors (August 2020-Present)

Founder and CEO

- Provide contract geoscience services including play fairway analysis, prospect generation, field development, data acquisition, and operations support.
- Developed West Haynesville exploration prospect in the East Texas basin which included reservoir characterization utilizing log, petrophysical, and core analysis to identify the sweet spot of the play. Third party funding has secured leases on ~40k acres to date with plans to operate soon.

JBL Energy Partners (January 2020-August 2020)

Vice President Geology

- Responsible for generating regional geological and rock property maps for Pennsylvanian sands within the Ft. Worth basin, identifying prospect areas, and generating development plans for ~50k acres.
- Managed geological operations for horizontal drilling inclusive of identifying target intervals, generating geoprogs, and coordinating mudlogging, geosteering, and wireline operations.
- In addition, responsible for generating prospects, screening potential prospects, and providing geological analysis for potential acquisitions.

Anadarko Petroleum (July 2007-November 2019)

Area Asset Manager - Delaware Basin (Midland, TX) **June 2019-November 2019**

- Responsible for developing & delivering a value-based business strategy for the exploitation of Anadarko's Blacktip-Monroe asset area (55k gross acres). Identified & recommended strategic business options such as acquisitions, divestitures, trades & facility buildouts. Coordinated the efforts of multiple disciplines including geology, reservoir, drilling, completions, production, and regulatory teams to focus on critical tasks.

G&G Manager Delaware Basin (Midland, TX) **September 2016-June 2019**

- Managed a multi-disciplinary geology & geophysics staff focused on generating a series of regional geologic interpretations for the key development horizons of the Delaware Basin. Integrated the results into a multivariate analysis process to isolate key productivity drivers for each formation.
- Designed & managed appraisal studies to better describe the resource potential & development recipes for key geologic areas across the basin including the Department of Energy sponsored HFTS #2 study.
- Implemented comprehensive test programs to optimize well spacing and completion designs. Tests included production, open-hole & lateral logs, micro-seismic, fiber optic and bottom-hole pressure surveys, fluid & time-lapse geochemistry sampling.
- Sponsored the acquisition and negotiated contracts for 1,800 sq. miles of new 3D seismic data (900 sq. miles of multicomponent data) to better understand geomechanical properties and their influence on productivity.

G&G Manager - Base Assets (The Woodlands, TX) **January 2016 – September 2016**

- Managed a team of geoscientists responsible for the development of Anadarko's Eaglebine, Marcellus, East Chalk, Ozona, and Hugoton assets. Assisted with divestment of assets by providing geologic assessments of future development and potential upside targets to prospective buyers.

G&G Supervisor - Appalachian Basin (The Woodlands, TX) **September 2013 – December 2015**

- Responsible for the geoscience staff in the Appalachian Basin which delivered more than 100,000 BOEPD production.
- Identified additional deep and shallow exploitation plays within the basin.
- Assisted in the prediction of "sweet spots" through multivariate regression analyses of geologic and completions data. This model workflow was integrated into other assets.
- Mentored young staff to facilitate their understanding of operations and development as well as advancing mapping and interpretation skill sets.

Senior Geologist - Maverick Basin (The Woodlands, TX) **May 2011 – September 2013**

- Assisted the team with development of the Eagleford shale horizontal program to deliver 200,000 BOEPD of production to the company.
- Responsible for the geosteering of two rigs, designing field development plans for ~100,000 acres, and regional mapping for the Eagleford shale petrophysical and core properties.
- Presented well proposals for management approval and partner meetings.

- Mentored new geologists on development and operational roles and responsibilities and led several core workshops.
- Led an exploitation team to test two separate targets both of which were geologic successes.

Geologist I & II - US Onshore (The Woodlands, TX) **July 2007 – May 2011**

- Appalachian Basin – Lead development geologist for the start-up of the Marcellus shale horizontal drilling program. Responsibilities included designing development plans, geosteering wells for four rigs, presenting wells to management for funding, and regional mapping of core and petrophysical properties.
- East Texas/Carthage - Recommended & managed an active development drilling program as lead geologist for the Cotton Valley sand & Haynesville shale horizontal program in Oak Hill and Henderson Fields.
- Performed detailed geologic mapping studies of the Hugoton field, Kansas and Golfino field offshore Brazil.

Education

University of Alabama- M.S. & B.S. Geology **July 2007**

M.S. Thesis: Seismic Interpretation And Structural Restoration Of A Seismic Profile Through The Southern Appalachian Thrust Belt Under Gulf Coastal Plain Sediments

Undergraduate Research: Analysis of Acid Mine Drainage on The Water Quality of Lake Harris Via Geochemical Analysis

Skills

- Exceptional leadership and management ability to implement business strategy
- Excellent interpersonal and communication skills at all levels
- Strong organizational and time management skills leading geoscience & asset teams
- Experienced in managing large data acquisition & appraisal programs for value optimization
- High level community involvement in charity/fundraising (Midland Junior Achievement Board)
- Software expertise in Microsoft Office, Petra, Kingdom Suite, and Rockpilot steering software

STATE OF NEW MEXICO
DEPARTMENT OF ENERGY, MINERALS AND NATURAL RESOURCES
OIL CONSERVATION COMMISSION

APPLICATION OF GOODNIGHT MIDSTREAM PERMIAN, LLC FOR APPROVAL OF A SALTWATER DISPOSAL WELL, LEA COUNTY, NEW MEXICO
CASE NO. 24123
ORDER No. R-22869-A

APPLICATIONS OF GOODNIGHT MIDSTREAM PERMIAN, LLC FOR APPROVAL OF SALTWATER DISPOSAL WELLS LEA COUNTY, NEW MEXICO
CASE NOS. 23614-23617

APPLICATION OF GOODNIGHT MIDSTREAM PERMIAN LLC TO AMEND ORDER NO. R-22026/SWD-2403 TO INCREASE THE APPROVED INJECTION RATE IN ITS ANDRE DAWSON SWD #1, LEA COUNTY, NEW MEXICO.
CASE NO. 23775

APPLICATIONS OF EMPIRE NEW MEXICO LLC TO REVOKE INJECTION AUTHORITY, LEA COUNTY, NEW MEXICO
CASE NOS. 24018-24020, 24025

SELF-AFFIRMED STATEMENT OF STANLEY SCOTT BIRKHEAD -REBUTTAL

1. My name is Stanley Scott Birkhead. I am working with Ops Geologic, LLC as a Consulting Petrophysicist. I have been working as a professional petrophysicist since 2006. I am also the sole proprietor of Petrobrane Petrophysical Consulting, LLC founded in October of 2022 in the state of Colorado.

2. This is my first time to testify before the New Mexico Oil Conservation Division or Commission. Highlighting my degrees, experience, geographic areas worked, and responsibilities, please find my curriculum vitae attached as Empire Exhibit L-53.

3. I graduated from Texas A&M University in 2001 with a Bachelor of Arts in Geology, and in 2005 with a Master of Science in Geology. My academic course work and thesis focused on sedimentology with field work conducted on tidally influenced sandstones within the Upper Sego Sandstone Member of the Mesaverde Group. I am a member of the Society of Petrophysicists and Well Log Analysts, and volunteer with the Unconventional Resources Technology Conference (URTEC) as a reviewer and moderator in special topics and petrophysical themes.

EXHIBIT L

4. In 2005 I started my career at Kerr McGee Oil and Gas as a geologist in Gulf of Mexico Development. As part of their training program, I was chosen to do a rotation in the Petrophysics group for a fixed time. Due to an interest, a recognized aptitude in Petrophysics, as well as a merger between Anadarko Petroleum Corporation and Kerr McGee, I chose to follow the petrophysical career path. After the acquisition of Anadarko by Occidental Petroleum, I chose to leave Occidental. My next assignment was with DeGolyer and MacNaughton as a Senior Petrophysicist where I gained experience working petrophysics from the consultant's perspective with several international projects. In 2022 I founded Petrobrane Petrophysical Consulting, LLC where I have worked for several small to mid-size clients. The client base has expanded from typical oil and gas work to alternative energy development such as geothermal and energy storage and carbon sequestration.

5. I have been fortunate enough to have widespread exposure to different plays and play types across the world. Geographic locations of wells interpreted include all continents save for Antarctica.

6. My experience includes working different play types including conventional, carbonates, granite wash, and tight sandstones, as well as unconventional objectives such as shale oil and gas. The objectives of the work included rank exploration, multiwell field studies, model building, wireline and core analysis planning, core-log integration, rock typing, log quality control, wireline witnessing and management, operational well interpretation, partner and vendor communication, uncertainty analysis, reserves and dataroom assessment and presentation.

7. I have also been fortunate enough to teach internal corporate classes at Anadarko Petroleum Corporation, assisted in directing the past Unconventional Resources Special Interest Group over several years as well as volunteering with a small group (Petrophysical Interest Group) to teach occasional one day courses at smaller universities to expose students to petrophysical methods.

Ops Geologic Rebuttal's to James A. Davidson's Self Affirmed Statement

8. The following discussion was derived as a response to assertions made by the Consulting Petrophysicist for Goodnight, Dr. James A. Davidson. The main takeaway from the discussion that follows can be summarized as such: There are significant indications shown in the following document that validate the likelihood of an ROZ in the San Andres of Eunice Monument

South. While the absolute oil saturation of the Upper and Lower San Andres are currently unknown, petrophysical interpretation of the wells reveals oil saturations that fall within the range of an ROZ. Overly pessimistic interpretations by Goodnight ignore existing positive evidence. This is reflected especially in wells where Goodnight has picked the San Andres deeper than stratigraphically possible. Above their pick, and within the Ops Geologic interpreted San Andres top, Goodnight interprets oil saturations similar to Ops Geologic. The EMSU 628 and EMSU 673 are two examples of this sharp transition in interpretations. The Ops Geologic interpretation of these wells was done with the goal of exploring realistic volumes based on all the data included. The remainder of this report will first list the Goodnight statement(s) being rebutted in red text, followed by the Empire/Ops Geologic response in black text.

9. Dr. Davidson's statement at page 3: "The remaining oil saturations in both the San Andres and Grayburg are significantly lower than estimated by Empire."

10. Oil saturation of the ROZ should be viewed as a spectrum, not an absolute value. The zones with core establish the lowest the oil saturation in the San Andres could be. As explained herein, the sum of the evidence points to higher oil saturations than Goodnight posits. The available mudlogs establish shows, fluorescence and even cases of oil seen in the pits (Exhibit L-1, L-2) (EMSU 660) which matches described properties published in ROZ recognition checklists. The wireline data established very high resistivities parallel with porosity development denoting hydrocarbon, along with comparative zones of porosity with low resistivity denoting water. Core residual oil saturations are lower than the in-situ value due to degassing and flushing by water-based mud (Egbogah et al, 1997; Wisenbaker, 1973, Tu et al, 2017). Egbogah wrote, "Most authors conclude that the oil saturation in the reservoir is at least as great as, and probably appreciably greater than, the saturation measured on the core samples. Therefore, core analyses should, if possible, be supplemented by laboratory waterflood and water-oil relative permeability studies and by specific log studies." It would only increase oil saturations to use the additional studies. Published corrections for core residual to in situ oil saturation are utilized here to establish the Ops Geologic spectrum of oil saturations.

11. Dr. Davidson's statement at page 3: "A residual oil zone analogous to those where CO2 enhanced oil recovery operations have been employed exists only in the Grayburg Formation in the Eunice Monument South Unit."

12. Empire/Ops Geologic response: The recognition of a residual oil zone within a specific formation is dependent upon the data available, how it is interpreted, and how the top and base of the formation is picked. Dr. Davidson relied on formation tops for the San Andres, as picked for Goodnight by Preston McGuire. As explained by Ryan Bailey in his testimony (Exhibit K), Mr. McGuire's tops were inconsistently correlated across the study wells. Exhibit L-3 highlights the inconsistency in the Goodnight tops picked by Preston McGuire. This cross section shows a surface created from their San Andres pick. This surface shows their top of San Andres crossing the Lovington Sand in a geologically impossible manner. This sand is defined as being within the San Andres as discussed and referenced by Mr. Bailey in Exhibit K. There are several examples of the top appearing to drive the saturation and not the rest of the data. An example is in the EMSU 628 (Exhibit L-4) where the Sw from Goodnight is a relative match to Ops Geologic's Swlo curve, that is, Ops Geologic's low case of the spectrum. Goodnight appears to use their tops to artificially reduce the oil saturation in the San Andres. It appears as if Goodnight determined the saturation of the San Andres with an assumption of facies change and did not utilize the other data. In other wells, we continue to see a suspicious interpretation change happen just above Goodnight's top of San Andres. Interpretation of the ROZ as shown by Dr. Davidson, shows a change in interpretation methods driven by their deeper pick of the Grayburg base and a presumption of much poorer reservoir quality (rock types) over most of the San Andres (Exhibits L-5 –L-8). This assumption of poorer quality results in a pessimistic outcome that is inconsistent with the common definition of an ROZ and the significant evidence shown by data from these wells.

13. Table 1 highlights the impact of this tops difference. In the table the OOIP is shown as calculated by Goodnight in one column for certain provided wells. In the next column over is an OOIP calculated using their data but with the more consistent tops provided by Ops Geologic. In many cases, we see large increases in OOIP just by using the new top set with their curves. This shows two things, first, that the Goodnight interpretation of oil saturation changes based on where the tops are picked, and second, Goodnight's assertion that a barrier exists between the Grayburg and San Andres falls apart. It is important to add that regardless of the tops used, there is still an ROZ in the Upper and Lower San Andres.

Upper San Andres	Ops Geologic	Ops Geologic	Goodnight	Goodnight
	OOIP Low case	OOIP High Case	Tops and base for San Andres calculations unknown for Davidson. Ops Geologic interpreted tops used for Ops geologic OOIP calculations. Goodnight calculations show the extreme pessimistic case.	Tops and Base of San Andres and Lower San Andres based on consistently picked Ops Geologic picks. Results show increase in mmboe from Goodnight when using Ops Geologic Tops. Bo used is 1.3. Goodnights original Bo unknown. Cutoffs SW<80%
	mmboe/section	MMBOE/section		
SNYDER Ryno SWD #1	4.05	7.94		
EMSU 746	16.12	25.59		
EMSU 713	4.05	6.45		
EMSU 673	12.76	19.94		
EMSU 660	10.31	19.25		
EMSU 658	25.36	37.77		
EMSU 628	20.55	31.47		
Lower San Andres				
SNYDER Ryno SWD #1	15.81	25.09		
EMSU 746	25.55	43.88		
EMSU 660	3.67	9.17		
EMSU 628	8.10	15.81		
EMSU 658	0.90	1.11		
All San Andres			**Goodnight their tops	Goodnight/OG tops
SNYDER Ryno SWD #1	19.86	33.03	6.9	6.9
EMSU 746	41.67	69.47	13.3	14.78
EMSU 713	4.05	6.45	0	0.11
EMSU #673	12.76	13.76	3.1	8.94
EMSU 660	13.98	28.42	2.7	5.84
EMSU 628	28.65	47.28	6.8	8.4
EMSU 658	26.26	38.88	0	5.31
shading denotes incomplete section/no base seen			**from Davidson's testimony point 83	

Table 1 Comparison of OOIP volumes from Ops Geologic, and Goodnight. Ops Geologic cutoffs for calculation were SWT>= 80%, Phit>=4%. And Vcl<=60%.

14. Dr. Davidson's statement at page 4: "The intervals of residual oil in the San Andres aquifer are too thin, too widely spaced, and are not likely areally continuous enough to support efficient enhanced recovery operations."

15. Empire/Ops Geologic response: The presumption that any oil saturations are not areally continuous is purely based upon opinion, interpretive assumptions, convenience, and the contradiction of extensive saltwater injection. This subjective statement by Goodnight is not sufficient to show lack of fluid and pressure communication or areal extent. The concept of, "natures waterflood" is that a large, connected volume of rock had a significant amount of water flow through the section reducing the oil saturations down to residual, or remaining oil saturation levels. We see in the interpretation of the wireline, as well as shows in mudlogs and core for the available wells that the ROZ zone consistently appears in the same intervals with oil saturations greater than 20%. This suggests large amounts of continuity across the interval. In fact, the

statements made by Dr. Davidson in his point 77 regarding water injection volumes support the conclusion that significant connected volumes exist within and across the San Andres.

16. Dr. Davidson's statement at page 4: "The likely presence of long intervals of karsts and collapse breccias in the San Andres would further compromise the effectiveness of enhanced oil recovery operations."

17. Empire/Ops Geologic response: Intervals of karsts and collapse breccias are well known through carbonate reservoirs such as the San Andres (Trentham et al, 2015). Reviewing the "possible" karst flags provided in the report by Dr. Davidson Appendix B, the number of flags in the San Andres is relatively minimal and are discontinuous. A paper by Love et al. (1998) referenced by William J. Knight in the Revised Expert Report of: William J. Knight, P.G. January 16, 2025 reviews the existence of high perm pathways or "thief zones" and their impact on waterflood conformance and oil production. Large amounts of water were going in without a consequent increase in oil production. Results of the field test showed that of the six mitigations applied to the waterflooded wells, all of them significantly increased production. This paper was used as evidence by Goodnight to show that karst and collapse breccia fills will not allow for successful CO2 EOR. On the contrary, the paper shows that while these zones clearly exist, issues can be avoided or mitigated. Important points from the paper also include that the study only included the Grayburg formation and this quote describing the Area below zone 5 when the author wrote describing the San Andres, "*Zone 5 is typically water drive (3 to 20% oil cut) and Zone 6 overlies the top of the San Andres and contains an unconformity in its upper part. There are oil shows well down into the San Andres.*" This shows that combinations of karst and collapse breccias are not at all showstoppers for enhanced recovery.

18. Dr. Davidson's statements at pages 4, 28:

- "Given the sparse nature of the residual oil accumulations and the presence of significant karsting, Goodnight's San Andres disposal zone does not meet any reasonable definition of an ROZ."
- "Given the sparse, intermittent oil saturations, the saturation profile in the San Andres aquifer is more likely representative of abandoned oil migration pathways than of a previous oil-saturated interval."
- "The San Andres Formation, both inside the EMSU and in the areas outside the EMSU where Goodnight operates salt-water disposal wells, has an oil saturation profile that

appears to be more representative of paleo oil migration pathways. Thick, continuous intervals of oil saturation exceeding 20 percent are not present in the San Andres within the EMSU." (Davidson J. paragraph 71)

- **"**Based on the results of the core flood experiments carried out by the BEG (discussed above), the residual oil saturations in the San Andres would be expected to be higher (in the 20 to 40 percent range) if those intervals had been saturated to higher levels in the past." (Davidson J paragraph 70)

19. Empire/Ops Geologic response: There are several pieces of evidence pointing towards the existence of multiple continuous ROZs in the Upper and Lower San Andres as discussed in this document. Table 1 shows the results of OOIP calculations based upon the bracketed low and high oil saturation cases. In the table there are dramatic differences between the interpretations. While Goodnight proposed a San Andres nearly devoid of hydrocarbons, Ops Geologic provides a range of residual oil saturations that does meet the reasonable definition of an ROZ. The difference in volumes is exacerbated by the cutoff of eighty percent water saturation. Because Goodnight maintains a saturation above 80% from its facies/Sw assumptions, oil in place is often not calculated. This creates even larger differences. In Table 1, the data is for the section of San Andres logged and the calculated OOIP. The entire section was not always penetrated explaining the lower OOIP number in some wells on both sides. This is especially true in the EMSU 679 and 713 where very little was penetrated. Importantly, there are clearly defined ROZ intervals in the Upper and Lower San Andres (Table 2).

Well	San Andres Estimated Logged Interval (ft)
EMSU 628	674
EMSU 658	397
EMSU 660	464
EMSU 673	400
EMSU 679	220
EMSU 713	140
EMSU 746	1343
Ryno (Snyder SWD 1	1328

Table 2 Estimated number of feet of Upper and Lower San Andres logged in each well.

20. Differences in interpretation are highlighted in wells such as the EMSU 746. In this well, the saturations are similar in the Grayburg and Upper San Andres until a depth of ~4107 ft. Deeper than this point, the saturations diverge. The Ops Geologic solution continues to follow the resistivity and porosity while the Goodnight water saturation immediately increases to largely above 80% with no defined seal or change in resistivity to support the assertion.

21. The same thing holds true for the majority of the comparative wells. With the Goodnight saturation reduced to conveniently less than 80% near their top of San Andres, no pay, and thus no OOIP can be calculated. Dr. Davidson often states during his November deposition that for his interpretation, the tops were inconsequential. From the REMOTE ORAL DEPOSITION OF JAMES A. DAVIDSON, November 22, 2024, page 55 starting on line 6, Davidson asserts that the definition of two broad rock types, shallow water facies, and deepwater facies is based on the gamma ray. There is a critical problem using rock typing to define water saturation in an area where you have little data. (Exhibit L-9) Figure A10 from Davidson's self-affirmed statement illustrates the problem. By choosing the facies first in a field with limited data, the petrophysicist has told the logs what the water saturation will be instead of letting the logs speak for themselves. For example, looking at Exhibit L-9 (Figure A10) of Dr. Davidson, the simple choice of Wackestone or Wackestone/Packestone for facies, results in the water saturation

never being lower than about ninety-two percent. Likewise, if you choose Packestone then you are limited to an Sw that maxes out in the sixties. To be clear, the use of facies to define water saturation without local, field-specific calibration is not accepted practice. In fact, it gives you an answer before much if any of the actual work that should be done. The testimony from Dr. Davidson's deposition clearly states that they did not look into uncertainty. For fields with limited data such as this, decisions are controlled by the range of properties.

22. Oil saturation measured from core is naturally biased towards the lowest possible oil saturation that could be seen in the reservoir. In other words, it is the minimum amount of oil possible. The likelihood of the reservoir condition saturations being higher than the core measured values is almost certain. Corrections of core oil saturation can vary. Future core must be taken in the EMSU to ascertain what the correction should be to get to an accurate reservoir saturation. However, the presence of reservoir oil in the core cannot be debated. The whole core photos provided by Bob Lindsay show oil in the reservoir (Exhibits L-10, L-11, and L-12). The photos show continuous staining, as well as oil in fractures that have been dissolution widened by reservoir fluids. These are not the characteristics of a failed migration pathway or of immature toc/kerogen. Regardless of the San Andres, the agreement of oil saturation in the Grayburg clearly suggests successful migration through the San Andres at a minimum, and at other levels reservoir storage pre-(natures) waterflood. Several of the mud logs also show fluorescence, cut, and oil on the pits (Exhibits L-1, L-2). Gas chromatographs also show increased gas over these zones. Looking at the range of oil saturations interpreted by Ops Geologic in Exhibits L-13 shows that the averages of the zones with greater than 20% oil saturation. This is the same cutoff as used by Dr. Davidson with Netherland Sewell and fits with much of the literature. In the low case, the average S_oil hovers around 30%, while in the high case it approaches and sometimes exceeds 40%. Exhibit L-14 certainly illustrates the point that the net pay using those cutoffs is significant and results in a potential large volume of hydrocarbon. Large enough to meet the definition of a residual oil zone in the high case as well as the low cases. Exhibit L-15 is a visualization of the water saturation of the EMSU interpreted wells vs tvdss. This plot highlights the presence of oil saturations not only exceeding 20%, but also having oil saturation in the Lower San Andres and at TVDSS's below the -500 tvdss discussed in Revised Expert Report of: William J. Knight, P.G. January 6th, 2025. Mr. Knight discusses the lack of OIP below -500 and -700 ft tvdss. Exhibit L-15 clearly shows higher volumes than what Knight assumes. Knight's report is dependent on the

pessimistic petrophysical interpretation from Goodnight. For the data available, these wells absolutely meet the criteria for several boxes of the ROZ cookbook (Trentham et al, 2019; Melzer, 2016). This data comes from drilling, logging, mudlogging, and core analysis. (Exhibit L-16)

23. Several arguments made by Goodnight are predicated on Dr. Davidson's interpretation of low hydrocarbon volumes and the assumption that the top San Andres is much lower than previously described and currently picked by Ops Geologic and Empire.

24. General statements on Goodnight's water saturation interpretation and the use of other water saturation models below:

Dr. Davidson's statement at page 22: "Preserved organic matter has been identified in several areas of the San Andres Formation in the Northern Shelf region in West Texas. It is possible that it could be found in the Northwest shelf region of New Mexico as well."

25. Empire/Ops Geologic response: The best approach for determining the range of oil saturations integrates the local core, mudlog, and wireline data. Alternatively, Dr. Davidson's approach presumes a rock type based on limited data which results in higher Sw simply due to this choice. Dr. Davidson's analysis is unreliable because it fails to incorporate this available data and information. This faulty evaluation is evident in paragraph 33 in Appendix A, Figure A10, and Figure 8 of his testimony. The plot shows at least one of these rock types (Wackestone) with no possibility of significant oil saturations. This seems convenient, especially when defining a rock type is listed as the first element of his analysis workflow. Presumptions of the rock type as the first step of the process assumes the absolute answer and results in low oil saturations for the San Andres. Unfortunately, this also ignores the many direct hydrocarbon indicators, such as core fluorescence, oil saturation, oil seen in the pits, and increased gas over the interval. A slightly lower gamma ray in a zone is not sufficient evidence. In the North Monument Grayburg San Andres Unit #522 ("NMGSAU #522"), the Gamma ray in the San Andres slightly exceeds the peak Gamma ray in the Grayburg, and both the San Andres and the lower San Andres still show ROZ level oil saturations, some exceeding forty percent. In contrast, Empire/Ops Geologic's water saturation strategy integrates the local core, mudlog, and wireline data as the strongest way to understand the range of potential oil saturations, which is necessary to view the whole picture.

26. Dr. Davidson's suggestion that the appearance of hydrocarbons could be explained away as organic matter in the San Andres of the Northwest Shelf of West Texas is a bit grasping. I would be hard pressed to think of any ubiquitous formation that would not have organic matter

somewhere. It being somewhere does not prove it is everywhere. Exhibit L-17 displays an RI versus water saturation crossplot. This crossplot shows different trends (possibly related to rock types) largely because we had the benefit of a whole core across the entire San Andres in this North Monument well. With just wireline, we would not be able to see this relationship. In the EMSU, there is not enough core coverage over the San Andres to absolutely define a rock type and its saturation and especially not enough to discount an entire formation as Dr. Davidson suggests. The NMGSAU #522 does show residual (ROZ level) hydrocarbons in all the different slopes presented in the plot. This means that whatever rock type exists, there can still be an oil saturation greater than twenty percent.

27. In the figures (Exhibits L-18, L-19) there is a comparison of the high and low case effective water saturation (as taken as a portion of the SWT from Archie) with the output Swe from Goodnight. The results show a large variation in the degree of agreement between the interpreters across the wells. These crossplots suggest that the Upper and Lower San Andres were treated differently by Dr. Davidson, implemented through assumptions of rock quality. Dr. Davidson appears to have used bad tops he was simply given. This leads to a fatal flaw in his interpretation and his derivative assumptions when those tops are shown as not correct.

28. From the work Empire/Ops Geologic has done, there is significant evidence showing their flaws. When we investigate the direct comparison between Ops Geologic and Goodnight, we see many similarities where the Sw converges between the interpreters in the Grayburg zones as well as within the zone labeled by Empire as top of San Andres and the Goodnight top of San Andres (Exhibit L-7). Upon exiting the Goodnight top of San Andres into what Empire labels as the Lovington Sand, the good visual comparison does not continue. The Goodnight interpretation estimates higher water saturations of greater than eighty percent while the Empire interpretation continues to correlate to the mudlogs, shows, and cutting descriptions (Exhibit L-20) by showing higher hydrocarbon saturations.

29. We know that we have a least-possible oil saturation from the core that must be observed and then corrected to in situ values as well as larger core oil saturations seen in a nearby field well NMGSAU #522 where we see core saturations greater than 40% in the San Andres. That, along with the resistivity and porosity profiles that show water saturations from 100% water bearing to residual percentages of oil seen in the wells, the high and low case oil saturations presented by Ops Geologic are more reasonable than the Goodnight interpretations.

30. I could not find a specific mention of the Rw used in Dr. Davidson's testimony except for mention of Seminole Field and experimenting with the Simandoux equation to illustrate a point. Otherwise, the only mention I see in his testimony is with the use of a Pickett plot (Dr. Davidson's testimony, Paragraph 35 page 15). I presume he has established a range of values. This method is standard practice. My values for Rw were established using a calculated Rw apparent and from Pickett plot analysis from where the reservoir appears to be 100% water saturated. The salinities in the San Andres commonly varied from 18.8 kppm NaCl equivalent to around 28 kppm. In the RR Bell well, a much higher salinity had to be used due to the resistivity tool that was run. There were a few outliers that required a higher salinity of around 37 kppm and one zone of the Grayburg and top of San Andres in the EMSU 746 that went up to 46 kppm. For all of Dr. Davidson's calculations, a formation water resistivity must be determined. A key part of this study is that there are multiple parameters changing with every foot of the well. A range of possibilities regarding oil saturation is the only feasible way of assessing the potential. In the Empire/Ops Geologic EMSU field study, the low case and high case both evidence sufficient oil saturation and continuity to define an ROZ.

31. **Dr. Davidson's statements at page 29: "**Thick, impermeable anhydrites and anhydritic dolostones found near the top of the San Andres aquifer likely isolate the water disposal intervals in the Goodnight-operated wells from the overlying Grayburg residual oil zones."

32. Empire/Ops Geologic response: In this study, it is rare to find the San Andres capped by an anhydrite or anhydritic dolostone with no porosity that would significantly baffle the flow between the San Andres and the Grayburg. Actually, the predicted commonality of karsted and karsted/collapse breccias as mentioned by Dr. Davidson would have the opposite effect of a seal and would enhance communication in many cases. Points 76 and 77 from his testimony ran the gamut from describing karst events as creating enhanced communication to making great seals. Goodnight statement: "Loss circulation problems consistently experienced during drilling operations through the San Andres aquifer and the fact that high volumes of water can be injected on a vacuum in the Goodnight disposal wells, indicate that large karsted intervals are likely present." (point 77 of: SELF-AFFIRMED STATEMENT OF JAMES A. DAVIDSON). Looking at the EMSU 746 as an example in Exhibit L-7 shows a baffle flag created by Ops Geologic to show where effective porosity drops below 1.5%. The rarity of this flag on the plot suggests more continuity of pathways than extensive baffling. Honarpour et al (2010) writes regarding the

presence of Anhydrites, "*The vertical permeability, measured on full-diameter cores was mostly between 0.1 and 100% of horizontal permeability, occasionally showing much lower vertical to horizontal permeability, attributed to local discontinuous baffles. Discontinuous stylolites and anhydrites at bedding-scale create a more tortuous path for fluid flow in vertical direction. The impact of these stylolite and anhydrite baffles can be seen in vertical permeability measured on full-diameter cores. One to two orders of magnitude reduction in vertical permeability are measured when stylolite and anhydride layers appear*." Honarpour goes on to state that whole core diameter analysis often shows much higher permeabilities than at the plug scale (Exhibit L-21). These vertical to horizontal permeability ratios are not only seen in Seminole field, but also in the nearby well of NMGSAU #522 (Exhibit L-22). This plot made from data transcribed from a pdf of an old copy of the core data highlights the same type of ratios. These ratios from a nearby well, along with the comments from Honarpour quoted above suggests very limited baffling and even more limited pressure separation. The Computer Processed Interpretation (cpi's) listed as Exhibits L-25 to L-52 in Appendix A interpreted by Ops Geologic shows the continuity of porosity from most wells between the San Andres and the Grayburg. I would be remiss to not mention the differences in the top of San Andres as picked by Ops Geologic and by Goodnight. The top of the San Andres was defined by Bob Lindsay from two cored wells in the EMSU, the RR Bell 4, and the EMSU 679 shown as Exhibits B-23 and B-24. The stratigraphic detail of the top San Andres is discussed at length by Mr. Ryan Bailey in his Self-Affirmed Statement of Ryan M. Bailey-Rebuttal. The Goodnight-defined top of San Andres is typically significantly lower than what has been geologically defined in literature, core, and outcrop discussed in Mr. Bailey's rebuttal. A key point being the definitive placement of the Lovington Sand well within the Upper San Andres.

33. Dr. Davidson's statements at page 10: "Well log measurements were available for two of the three wells, R. R. Bell and EMSU 679. There is uncertainty concerning the coring interval for the core from R. R. Bell and due to the vintage of the resistivity measurements for this well, it is unlikely that the logs have a vertical resolution that would be sufficient for quantitative core analysis. The analysis for petrophysical model calibration relied primarily on the core data from EMSU 679."

34. Empire/Ops Geologic response: The significant valuable data that the core does provide should not be ignored. Goodnight ignores the fact that the top of the San Andres is evident in the R.R. Bell core data and limits its use of data to the EMSU 679.

35. Dr. Davidson suggests that the RR Bell core should not be used for modeling. In this case, we disagree, the core was still extremely productive as a source of information for porosity and oil saturation. The resistivity acquired is absolutely a nuisance, which makes the core data even more valuable as a measure of the minimum possible oil saturation.

I affirm under penalty of perjury under the laws of the State of New Mexico that this statement is true and correct.

Stanley Scott Birkhead
Principal Petrophysicist
Petrobrane Petrophysical Consulting, LLC

2/10/2025
DATE

Data

1. All well data was transmitted to Ops Geologic by Empire Petroleum Corporation. Data was provided for over twenty-nine wells. Core data was provided for three wells with limited contextual information for lab protocols. A large number of the wells had sufficient data for a reasonable interpretation (Table 3). The Meyer B4 #22 well did not include a density or neutron curve that would allow for the exploration of a variable grain density. Fewer wells would be used in the mapping due to incomplete coverage in either the Upper or Lower San Andres. CPI's for wells are available as Exhibits L-25-through L-52 in Appendix A.

	Well	Core	GR	SP	Resistivity	Density	Pe	Neutron	Sonic	Mudlogs
1	EMSU 458	✓	✓		LLD	✓	✓	✓		
2	EMSU 459		✓		RLLD	✓		✓		
3	EMSU 679	✓	✓		LLD	✓	✓	✓		
4	Meyer B4 22		✓		LL3				✓	
5	Snyder SWD 1		✓		LLD	✓	✓	✓	✓	
6	EMSU 746		✓		LLD	✓	✓	✓		
7	EMSU 713		✓		LLD	✓	✓	✓		✓
8	EMSU 673		✓		LLD	✓	✓	✓		✓
9	EMSU 660		✓		LLD	✓	✓	✓		✓
10	EMSU 658		✓		LLD	✓	✓	✓		✓
11	EMSU 628		✓		LLD	✓	✓	✓		✓
12	RR Bell NCT E 4	✓	✓		ILD	✓	✓	✓	✓	
13	EMSU 211		✓		LLD	✓	✓	✓		
14	EMSU 457		✓		LLD	✓	✓	✓	✓	
15	EMSU 461		✓		LLD	✓	✓	✓		
16	EMSU 462		✓		LLD	✓	✓	✓		
17	EMSU 329		✓		LLD	✓	✓	✓		

18	Central Drinkard 441		✓	✓	RLA	✓	✓	✓	✓	
19	JA Akens 10		✓		LLD	✓		✓	✓	
20	SEMO 123		✓		LLD	✓	✓	✓	✓	
21	Meyers B4-33		✓		RLA	✓	✓	✓		
22	Meyers B4-34		✓		HLLD	✓	✓	✓	✓	
23	Yaz 28 SWD 1		✓		RLA	✓	✓	✓		
24	Nolan Ryan SWD 1		✓	✓	RLA	✓	✓	✓	✓	
25	OC Fed Com 1		✓		LLD	✓	✓	✓	✓	
26	Ted SWD 1		✓		LLD	✓	✓	✓	✓	
27	Wallace State 7		✓		✓	✓		✓	✓	
28	New Mexico State 4		✓	✓	AHF	✓	✓	✓		
29	NM GSA unit 5 #22	✓	✓		LLD	✓	✓	✓	✓	

Table 32 Data Inventory for wells provided for field study.

2. Core data was available for the EMSU 458, EMSU 679, and the RR Bell NCT E 4 (full diameter samples). The data was limited to porosity, horizontal, vertical perms, and fluid saturations for the three wells. In addition to this, the RR Bell NCT E 4 also included lithologic descriptions and grain density. From the whole core, several one-foot full diameter sections were measured. From Honarpour et al, (2010) we understand that properties of full diameter cores from Seminole field exceeded the properties of smaller plugs (Exhibit L-21). Differences in the two porosity measurements are to be expected and are representative of heterogeneities in properties

due to differences in rock fabric and the porosity types seen in carbonates. This extends to permeability as well. Comparisons of KH and KV for the foot plugs suggests excellent connectivity that may not be seen in smaller plugs (Exhibit L-22). The full diameter samples had two porosity measurements for each sample. The measurements were taken using a low temperature cleaning process and then following with a higher temperature pass. The difference in porosity between the two measurements may suggest either insufficient cleaning or the possibility of some damage due to potential gypsums being dehydrated and inflating the porosity (Exhibits L-23, L-24).

Appendix A
Well Logs

EMSU 679	**Exhibit L-25**
EMSU 746	**Exhibit L-26**
RR Bell NCT E-4	**Exhibit L-27**
Snyder SWD 1 Ryno	**Exhibit L-28**
EMSU 211	**Exhibit L-29**
EMSU 461	**Exhibit L-30**
EMSU 628	**Exhibit L-31**
EMSU 660	**Exhibit L-32**
EMSU 673	**Exhibit L-33**
EMSU 329	**Exhibit L-34**
EMSU 457	**Exhibit L-35**
EMSU 458	**Exhibit L-36**
EMSU 459	**Exhibit L-37**
EMSU 462	**Exhibit L-38**
EMSU 658	**Exhibit L-39**
Eunice Monument 713	**Exhibit L-40**
JA Aken 10	**Exhibit L-41**
Meyr B4 33	**Exhibit L-42**
Meyer B4 34	**Exhibit L-43**
New Mexico state NCT 4	**Exhibit L-44**
OC Fed Com 1	**Exhibit L-45**
Nolan Ryan SWD 1	**Exhibit L-46**
SEMO No 123	**Exhibit L-47**
NMGSA unit 5 22	**Exhibit L-48**
Ted SWD 1	**Exhibit L-49**
Yaz 28 SWD 1	**Exhibit L-50**
Central Drinkard 441	**Exhibit L-51**
Wallace State 7	**Exhibit L-52**

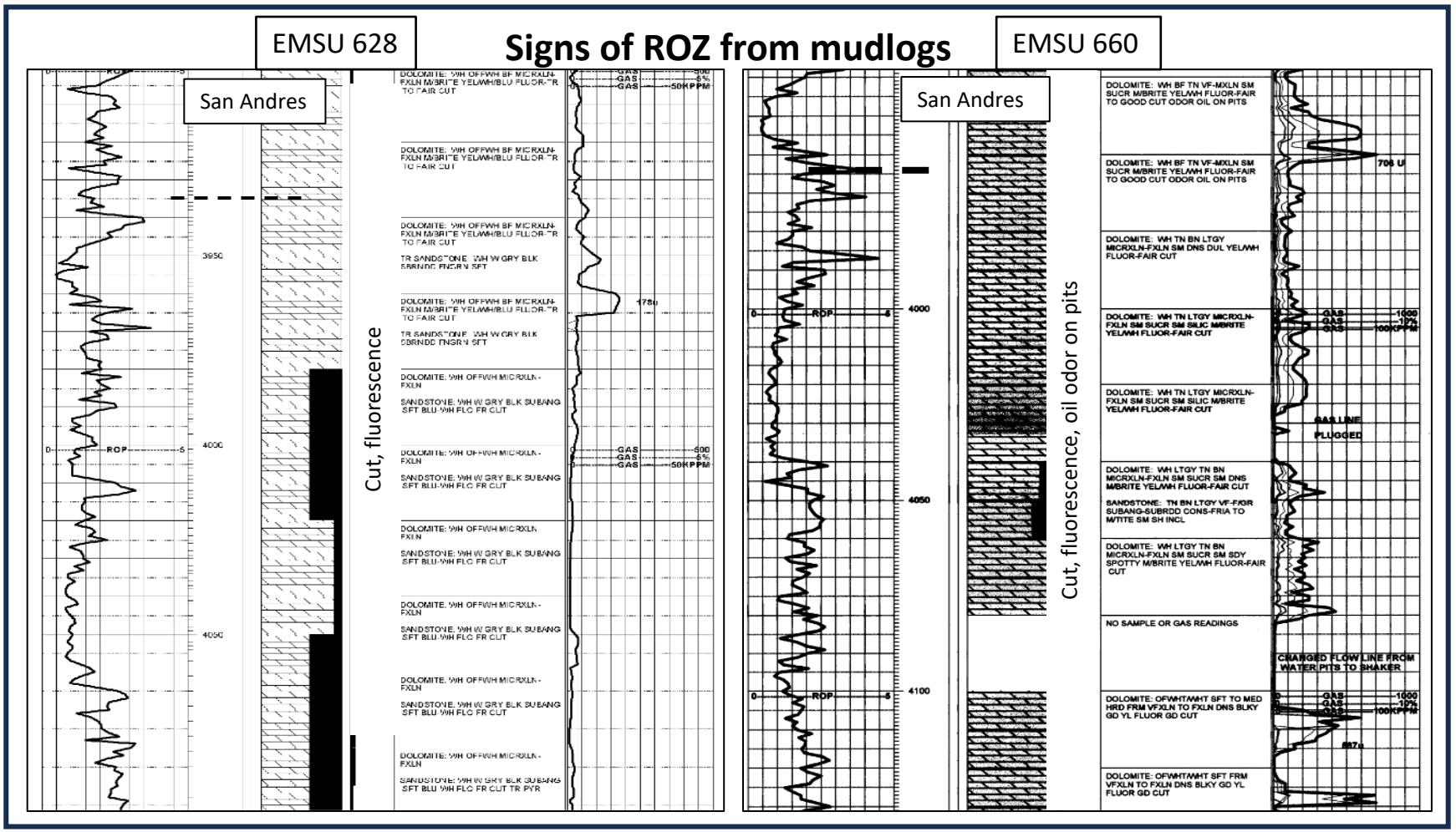


Exhibit L-1: Gas increases and with consistent reporting of fluorescence and cut as well as oil on pits.

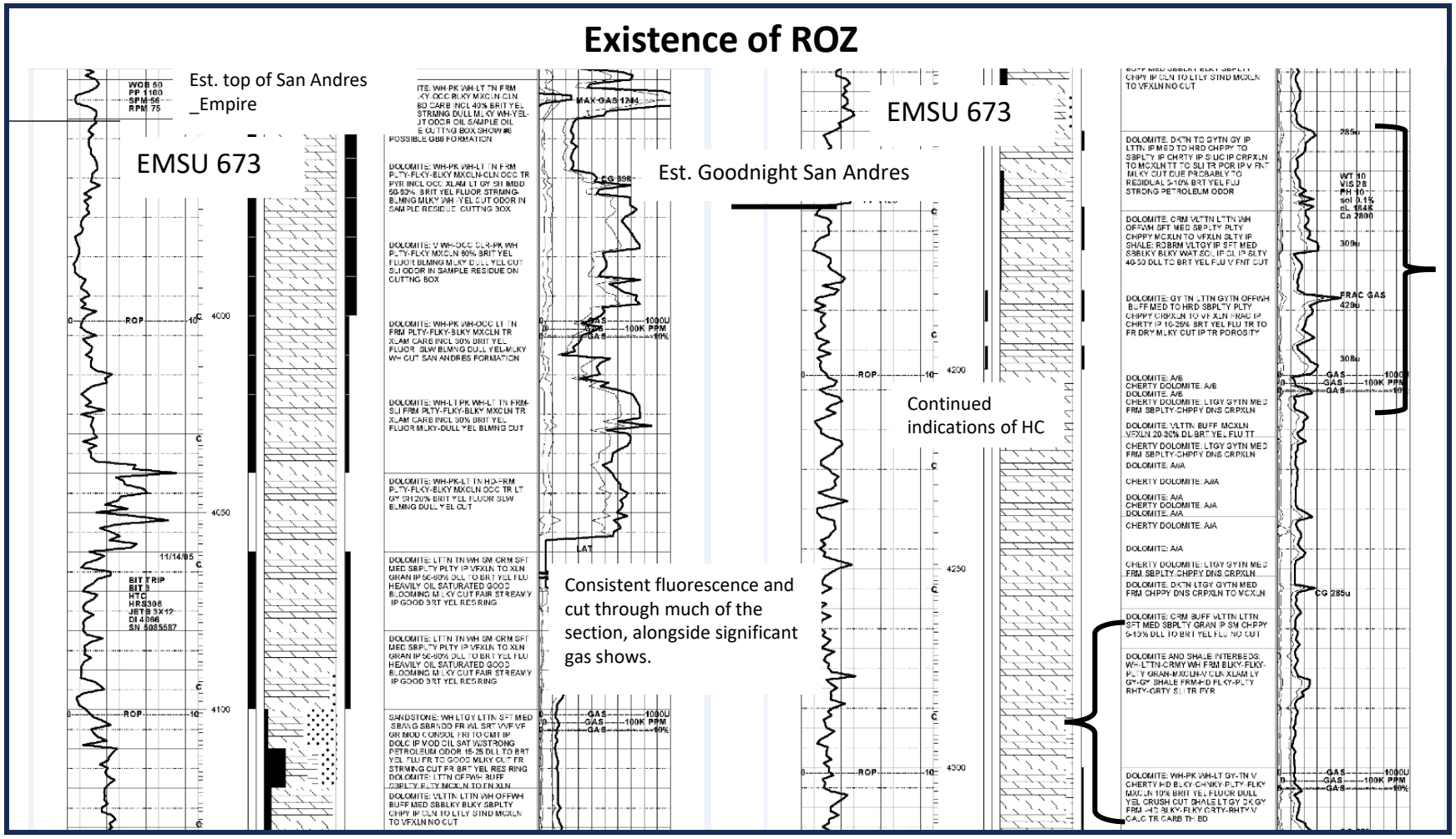


Exhibit L-2: Top of San Andres from Empire and Goodnight interpreters. Reporting of cut fluorescence suggests ROZ or better below each top pick.

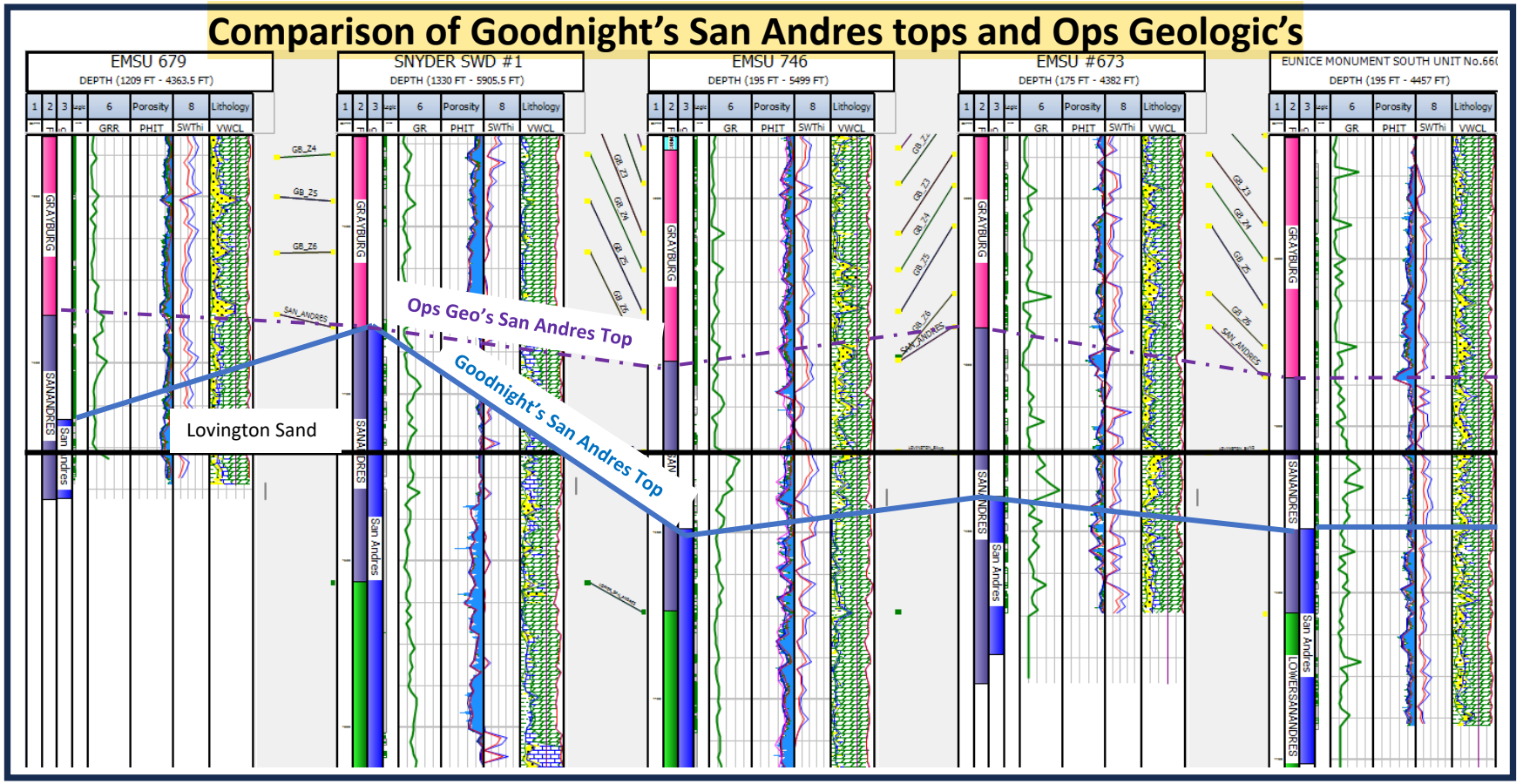


Exhibit L-3: Selection of EMSU wells where Goodnight tops were available. Results show the inconsistency of the pick sometimes above and below the Lovington Sand. Goodnight tops estimated from the Self affirmed statement of James A Davidson Appendix B.

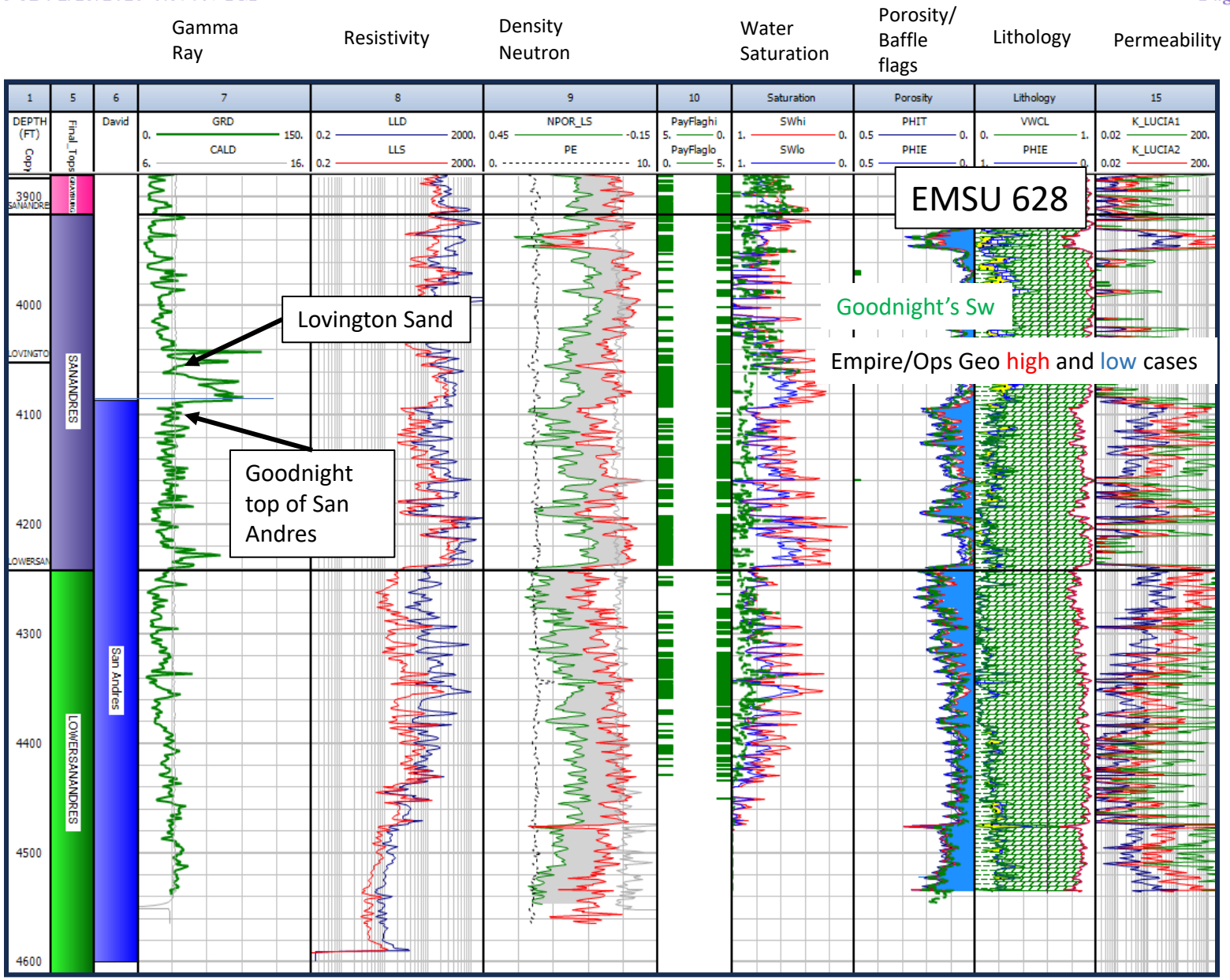


Exhibit L-4: Example of interpretive comparison between Empire and Goodnight showing the relative agreement between the Empire low case and Goodnight interpretation until reaching their top of San Andres. Lovington Sand is within the San Andres.

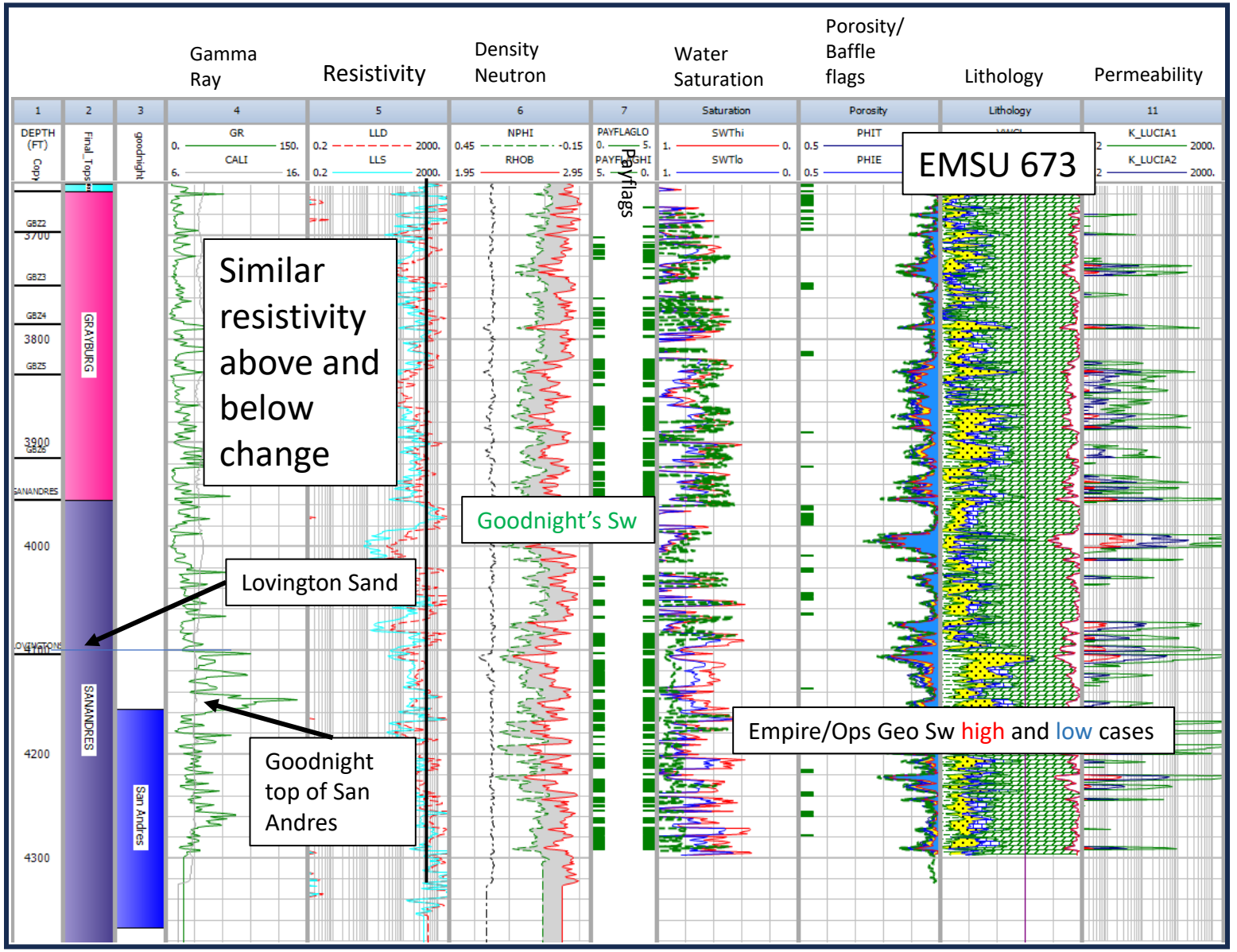


Exhibit L-5: Example of interpretive comparison between Empire and Goodnight showing the relative agreement between the Empire low case and Goodnight interpretation until reaching their top of San Andres. Lovington Sand is within the San Andres.

EMSU 679

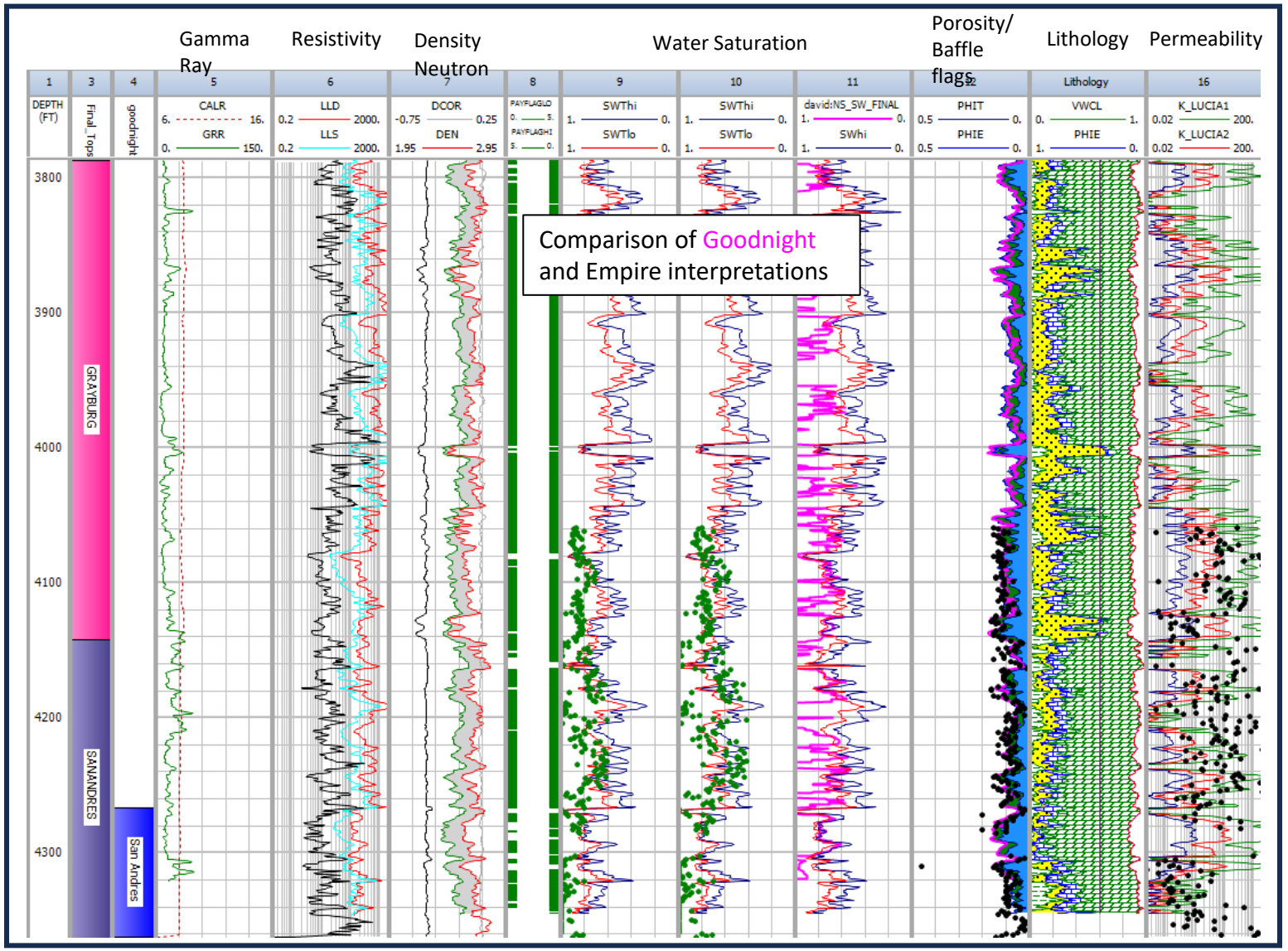


Exhibit L-6: Example of interpretive comparison between Empire and Goodnight showing the relative agreement between the Empire lo case and Goodnight interpretation until reaching their top of San Andres

EMSU 746

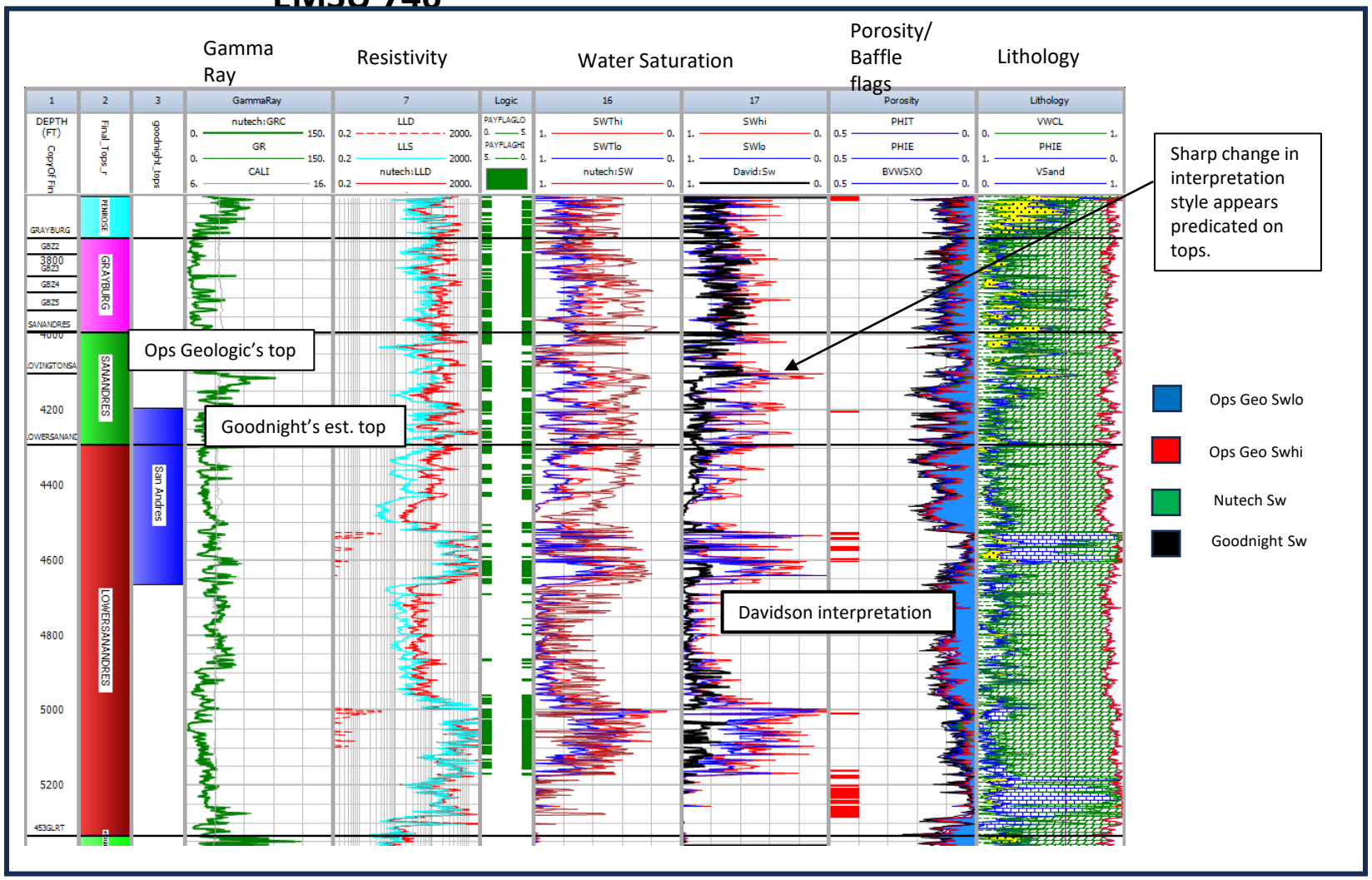


Exhibit L-7: Comparison of interpretations between Ops Geologic's and Goodnight's. Please note the range of outcomes for water saturation developed by Ops Geologic. The presumed change in facies near the top of the San Andres means that the contrast between Ops Geologic and NSAI results in a relative match in the Grayburg and a divergence for the San Andres.

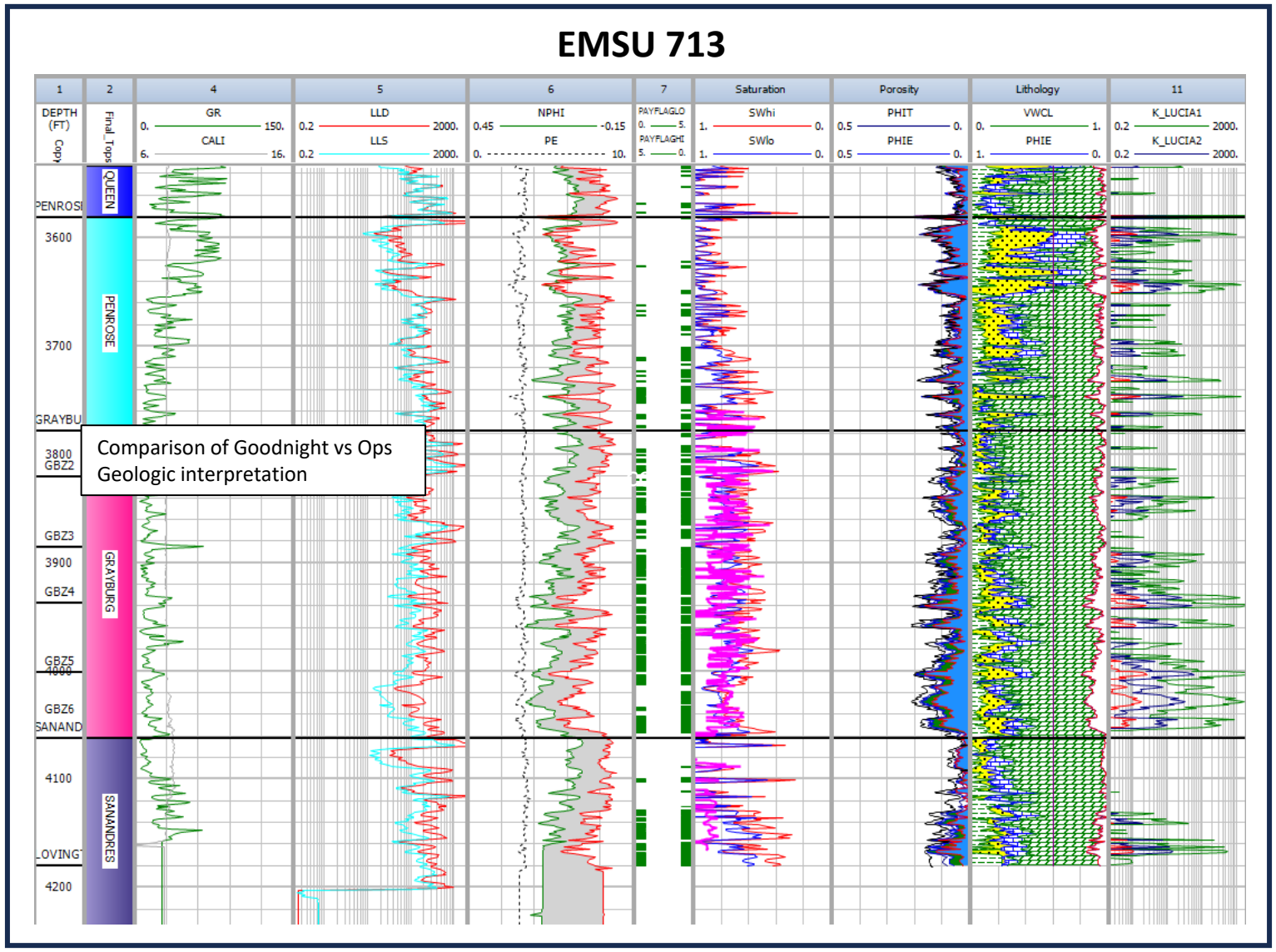


Exhibit L-8: Another comparison of Ops Geologic's and Goodnight's interpretations, highlighting the branch in interpretation style at the San Andres Top.

Additions to slide by ops geo in red:

If facies is considered Wackestone this plot suggest Sw > ~92%
If facies is considered Packestone this plot suggest Sw > ~64%
The choice of facies using this plot predetermines a negative outcome ignoring other positive indicators

NSAI NETHERLAND, SEWELL & ASSOCIATES, INC.

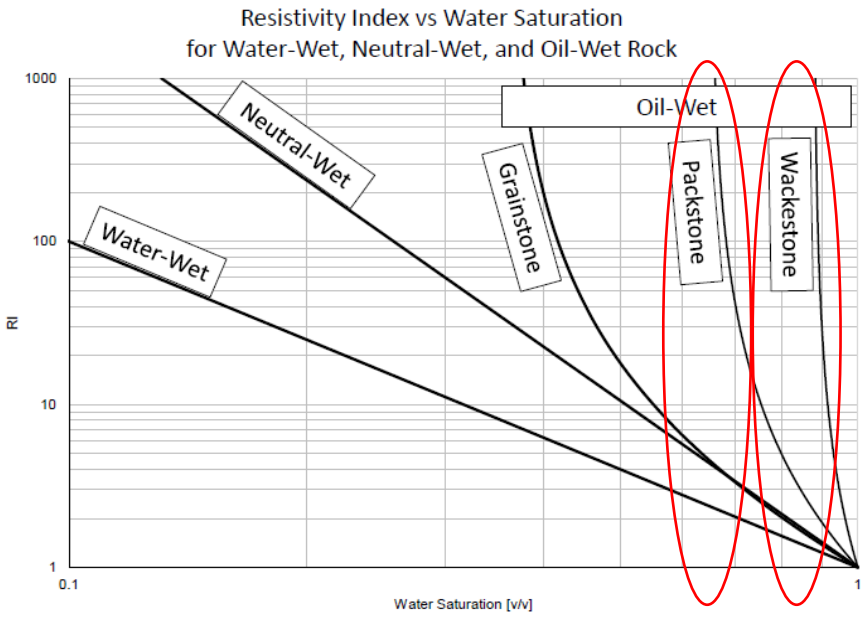
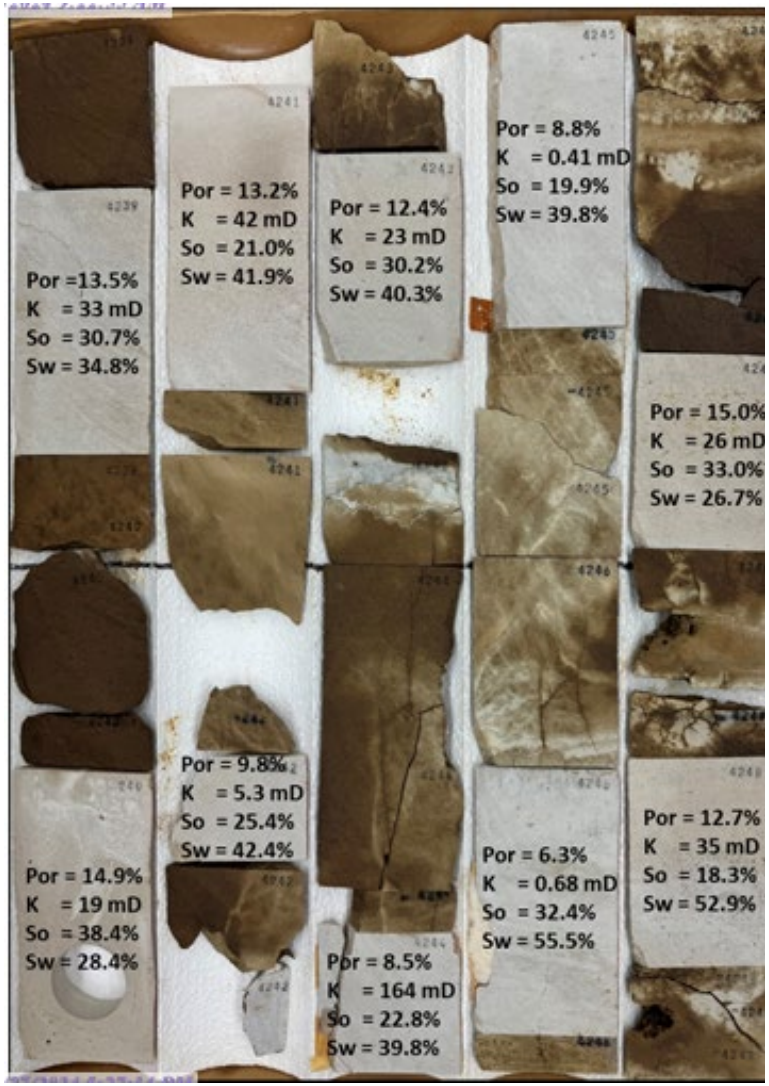


Figure A10

Exhibit L-9: Adapted plot provided by Mr. Davidson shows how the shift in saturation happens directly below the San Andres based on an assumption of facies changes

Adapted from: Self-Affirmed statement of James A. Davidson (Figure A10)



Oil saturation seen in the EMSU 679 shows significant residual oil staining in the core.

Exhibit L-10: One of the key indicators of an ROZ, the staining of the core with oil over the San Andres is strong evidence for the ROZ in the EMSU San Andres.

Exhibit L-11: One of the key indicators of an ROZ, the staining of the core with oil over the San Andres is strong evidence for the ROZ in the EMSU San Andres.

EMSU 679

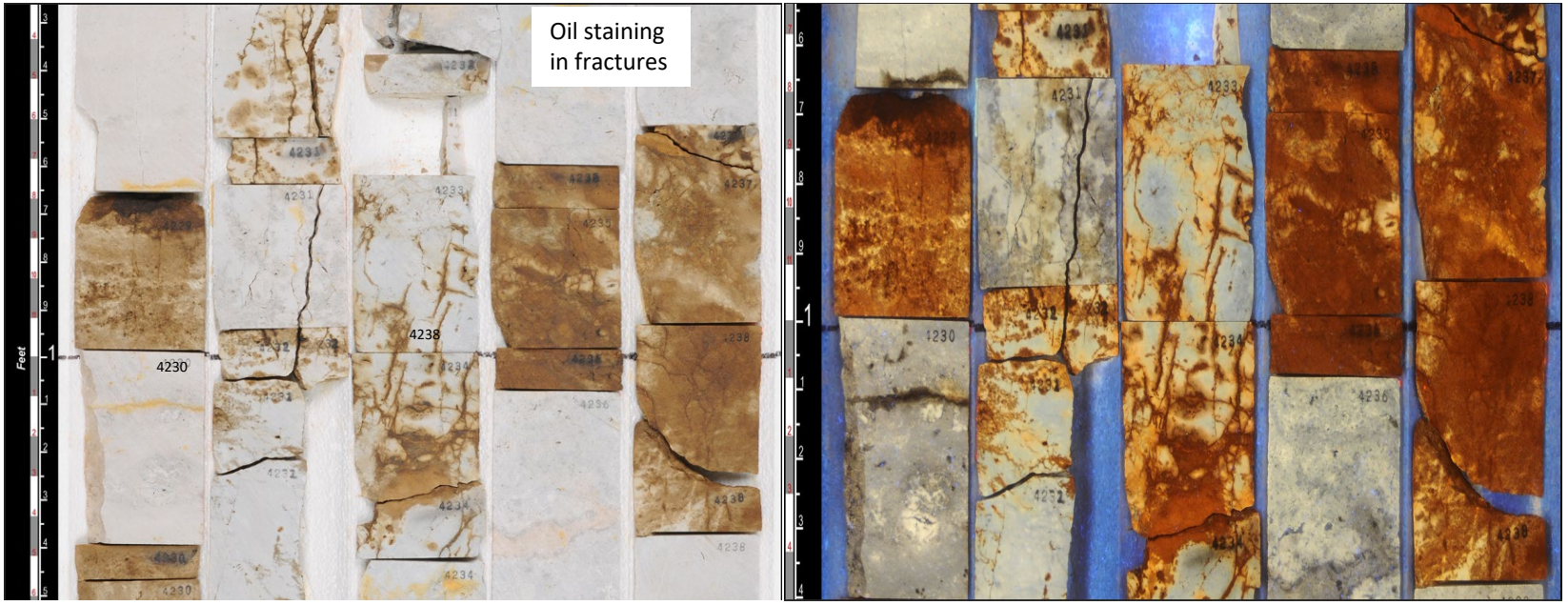


Exhibit L-12: A classic picture of oil staining in porous reservoir. This paired with fractures also stained with hydrocarbons suggesting transmissibility.

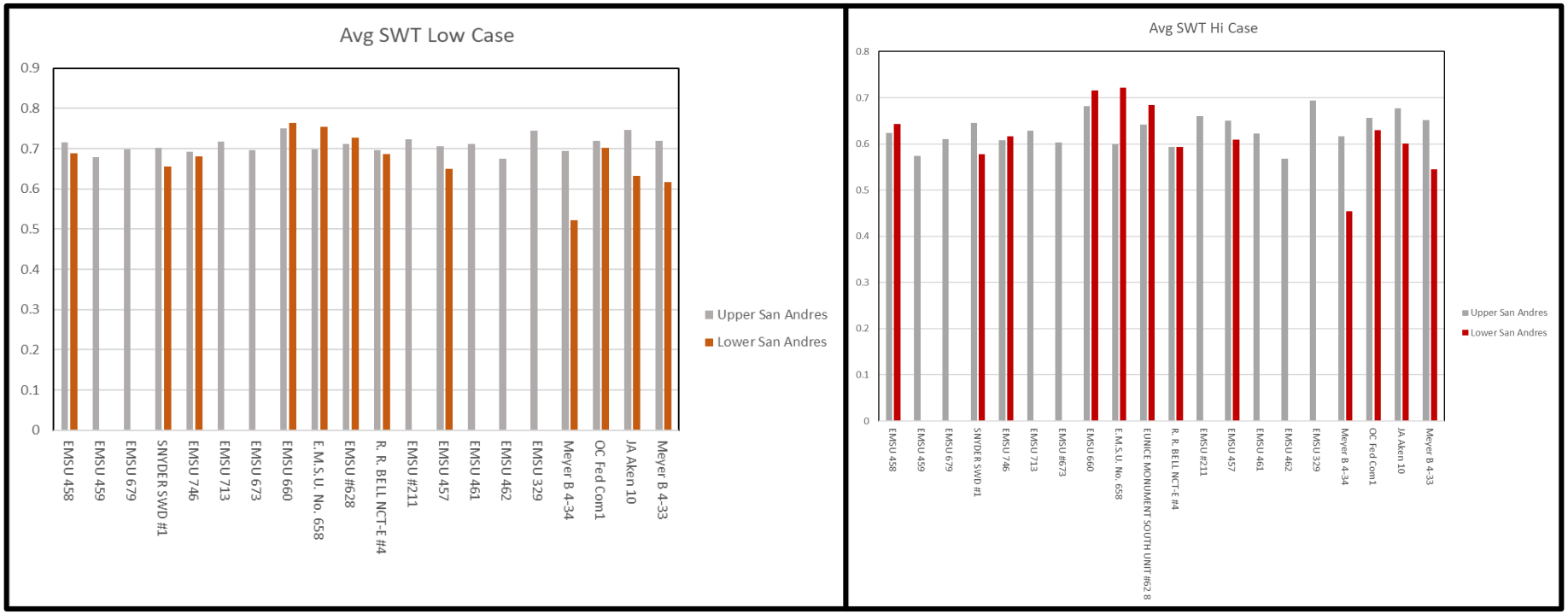
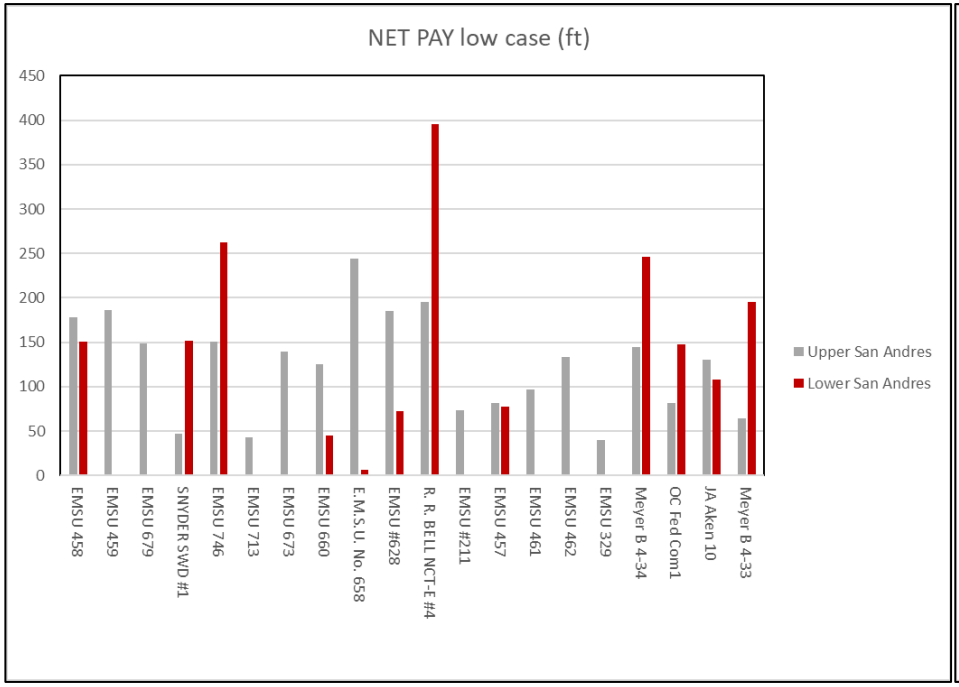


Exhibit L-13: Average total water saturation for wells interpreted by Ops Geologic for Low and High Case. Averages are well withing the typical range for an ROZ.

Exhibit L-14



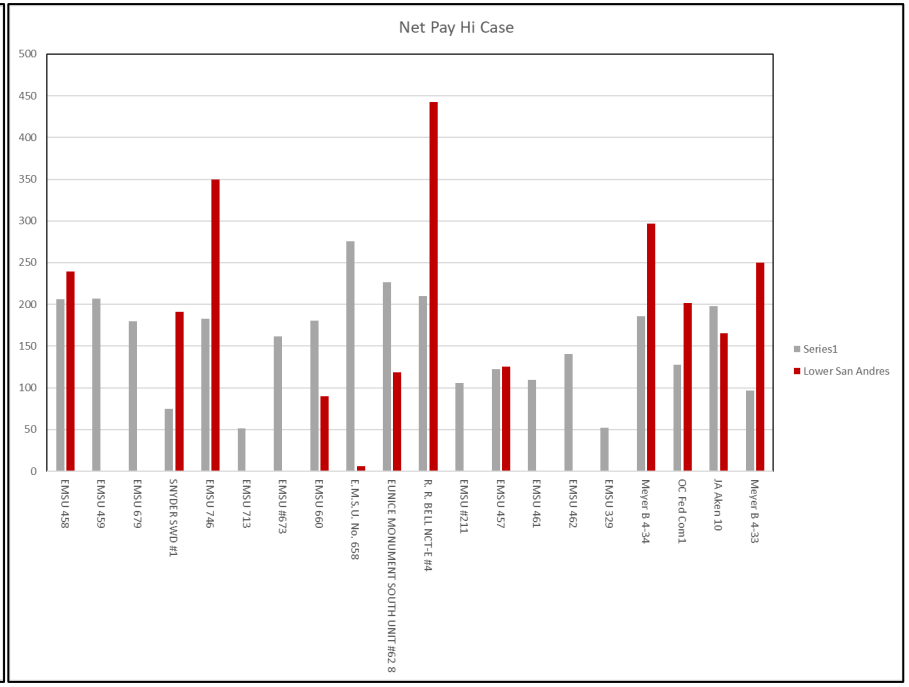


Exhibit L-13: Net pay for wells interpreted by Ops Geologic for Low and High Case

Larger diameter points from NMGSA Unit 5#22
Data from this well hand transcribed from poor quality pdf and may have some errors

Exhibit L-15: Display of calculated saturations using the low and high case saturations. The results of the study show a significant omount of oil saturation in the low(pessimistic) and Hi (Optimistic) cases. large continuous intervals of saturation shown. Large diameter points from a North Monument well that required an adaption to the used model but had core covering the entire San Andres allowing for more complexity.

TABLE 5.1 - Summary of "Classic" Observations of ROZ's and the ROZ-based Revised Interpretation of the Observations

ACTIVITY	EVIDENCE	CLASSIC INTERPRETATION	ROZ INTERPRETATION	ROZ EXPLAINATION
Drilling	Oil on pits	Transition zone/MP remnant oil	Presence of ROZ highly likely	Oil wet reservoir. Oil is released during drilling. Often seen in Roz's
	Drilling Break	Aquifer / No Significance	Good Reservoir	Open marine environment. Good cycles and flow units.
Mud Logging	Cut in samples	Transition Zone / MP Remnant	Oil saturation present	Residual Oil Saturation is present
	Dull gold Fluorescence in samples	Transition Zone / MP Remnant	"Water washed" oil	Indicative of Mother Nature's Waterflood. Reduced Saturation of oil.
	Odor in samples	Transition Zone / MP Remnant	Oil saturation present	Indicative of Mother Nature's Waterflood. Reduced Saturation of oil.
	Gas show	Not expected. From Oil Zone above if present.	Oil saturation present	Indicative of Mother Nature's Waterflood. Reduced Saturation of oil.
	"Free" Sulfur crystals	Suggest at or below O/W contact	Mother Natures Waterflood	Result of activity of Sulfate Reducing Bacteria. Indicates Meteoric Derived Flushing.
	Sulfur and Anhydrite	No significance	Mother Natures Waterflood	Result of activity of Sulfate Reducing Bacteria. Indicates Meteoric Derived Flushing.
	Sulfur and Calcite	No significance	Mother Natures Waterflood	Result of activity of Sulfate Reducing Bacteria. Indicates Meteoric Derived Flushing.
DST	Sulfur or Black Sulfur water	Not unusual / No significance	To be Expected.	Result of activity of Sulfate Reducing Bacteria. Indicates Meteoric Derived Flushing.
	Salty Sulfur water	Not unusual / No significance	To be Expected	Result of activity of Sulfate Reducing Bacteria. Indicates Meteoric Derived Flushing.
	Lower Salinity than expected	Not unusual / No significance	Meteoric Derived Flushing.	Indicative of Mother Nature's Waterflood. Meteoric Derived Flushing.
	"Skim" of Oil	Not unusual / No significance	To be Expected. Never significant oil	Oil Wet reservoir. Small amounts of Oil is released during pressure drop.
	Good to Excellent Pressure	Not unusual / No significance	To be Expected	ROZ is not in pressure communicationwith a Main Pay
Logging	Rw different than MP	Not unusual / No significance	ROZ water chemistry different than MP	Rw is different because the meteoric derived sweep is composed of lower salinity water
	So > 30% in calculations	Might be productive	ROZ. Residual to waterflood and MNW	Rw is different because the meteoric derived sweep is composed of lower salinity water
	Different M an N than MP needed	Not unusual / No significance	fabric destructive dolomitization in ROZ only	Rocks have undergone a second diagenetic event
	Excellent Porosity in dolomite	Not unusual / No significance	Open Marine + Sweep associated dolomitization	Thicker open marine cycles and Secondary dolomitization in ROZ during sweep
	"Looks like a Winner"	set casing	ROZ can have appearance of producable on completion	ROZ thicker cycles, secondary dolomitization, salinity differences make calculations difficu
Core Analysis	5 - 40% oil saturation	Zones with higher water saturation non-productive	Saturations expected following MNW	Expected. So after Mdeteoric Derived Sweep
	Oil Wet Core	Consider log analysis	Sweep related fabric destructive dolomitization >> Oil wettin	Expected after Sweep related fabric destructive dolomitization
	Open marine facies	Not unusual / No significance	Good Quality reservoir, thick cycles and flow units	ROZ's tend to be found in more open marine settings
	SHR near base and/or top	Suspect oil/water contact(s)/water washing	Water Washing from Meteoric Derived Flushing	Multiple SHR Zone suggest Multiple O/W contact, both Paleo and recent
	Better Porosity and Perm than main pay	Not unusual / No significance	Good Quality reservoir, thick cycles and flow units	ROZ's tend to be found in more open marine settings
	Sulfur Crystals	Diagenesis - no interpretation	Free sulfur often found in ROZ	Conversion by Sulfate reducing bacteria results in free sulfur
	Sulfur and Anhydrite	Diagenesis - no interpretation	Free sulfur often found in ROZ	Conversion by Sulfate reducing bacteria results in free sulfur
	Sulfur and Calcite	Diagenesis - no interpretation	Free sulfur often found in ROZ	Conversion by Sulfate reducing bacteria results in free sulfur
	Spotty Oil Stain	Consider Log Analysis	Intervals with low perm in ROZ	Intervals with low perm in ROZ can have remnat high saturations
	Leached molds	Not unusual / No significance	Leaching during MNW	Leaching during MNW
	Leached Fracture	Not unusual / No significance	Leaching during MNW	Leaching during MNW
	Fabric Destructive dolomite	Not unusual / No significance	Secondary dolomitization in ROZ during sweep	Secondary dolomitization in ROZ during sweep
	Limestone below oil stained interval	Not unusual / No significance	Zone is below Swept ROZ	Zone is below Swept ROZ
Completion	large volumes of fluid (sulfur water)	expect a decrease in water production over time	Large volumes of water cut on IP indicates an ROZ	Swept down to residual to waterflood, good porosity and perm in open marine
	Less than 5% oil	expect an increase in oil production over time	>65% water cut on IP indicatedis an ROZ	Swept down to residual to waterflood
	Good Pressure	Not unusual / No significance	ROZ not drained, to be expected	Thinner cycles in MP don't reduce pressure in ROZ
	Lower Salinity than expected	Suspect water flow	Meteoric Derived water	Meteoric Derived water has lower salinity
	Different Scale than in Main Pay	Suspect water flow	Different water chemistry	MNW changes water chemistry significantly

Exhibit L-16: Summary of rock, fluid, and production properties common to several ROZ intervals (Melzer et al 2016)

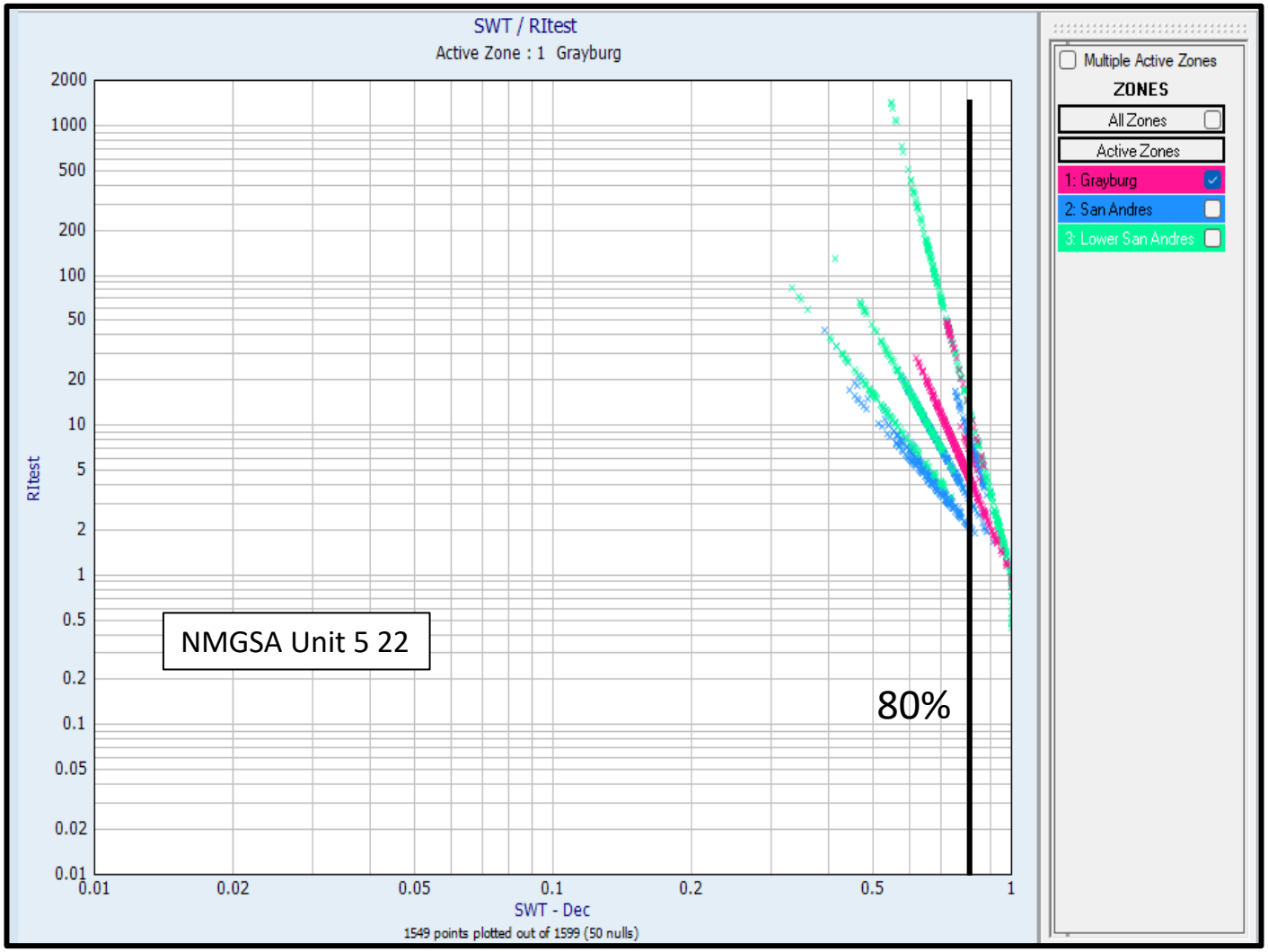


Exhibit L-17: Full core across the San Andres in the NMGSA Unit 5 22 allows the careful exploration of varying n values. The RI/Sw crossplot shows the varying slopes related to changing 'n'

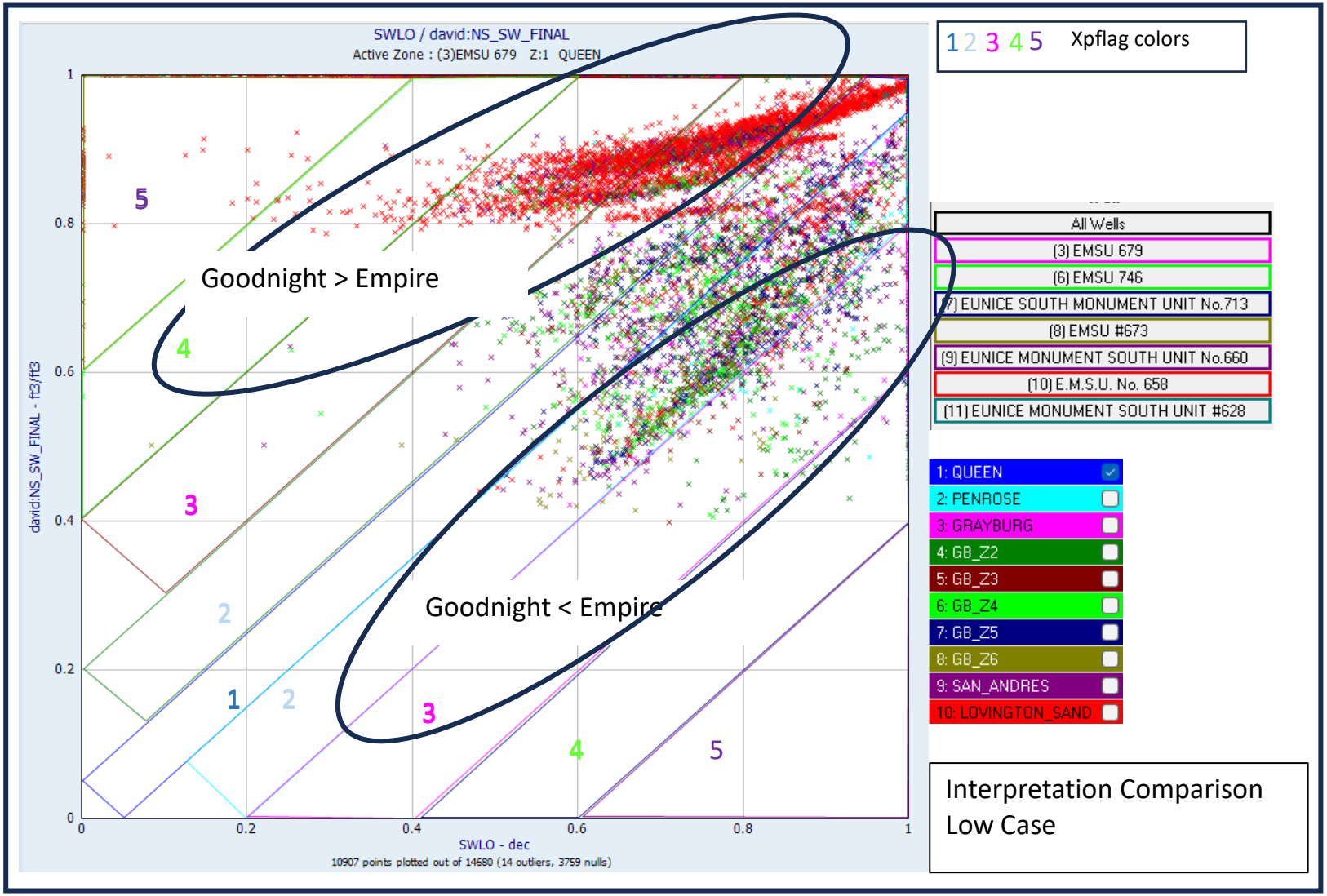


Exhibit L-18: Comparison of Goodnight's interpretation vs the High case saturation from Empire. Comparison of Goodnight and Empire Petrophysical interpretation. A large divergence of the data occurs with the San Andres and the Lovington Sand.

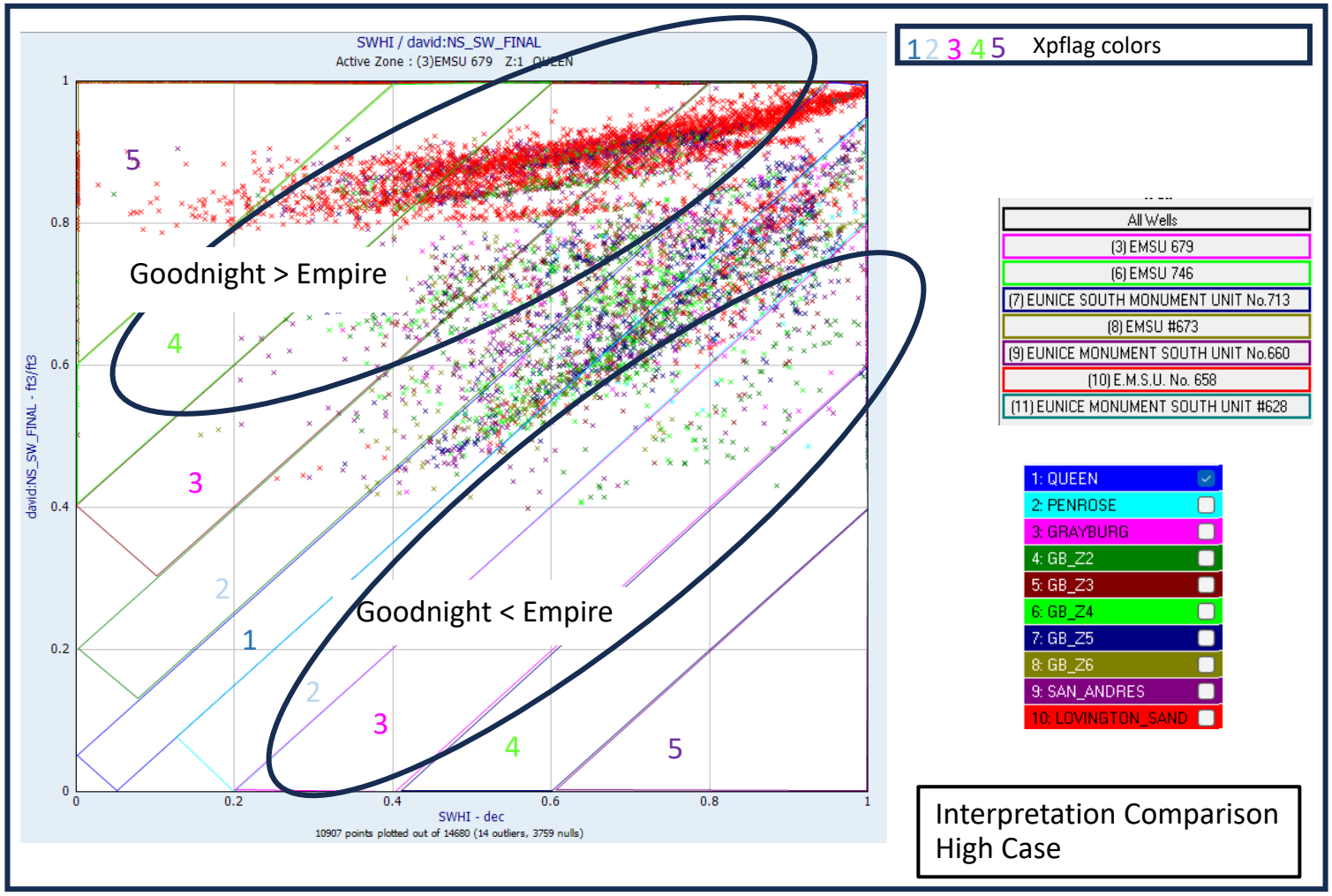
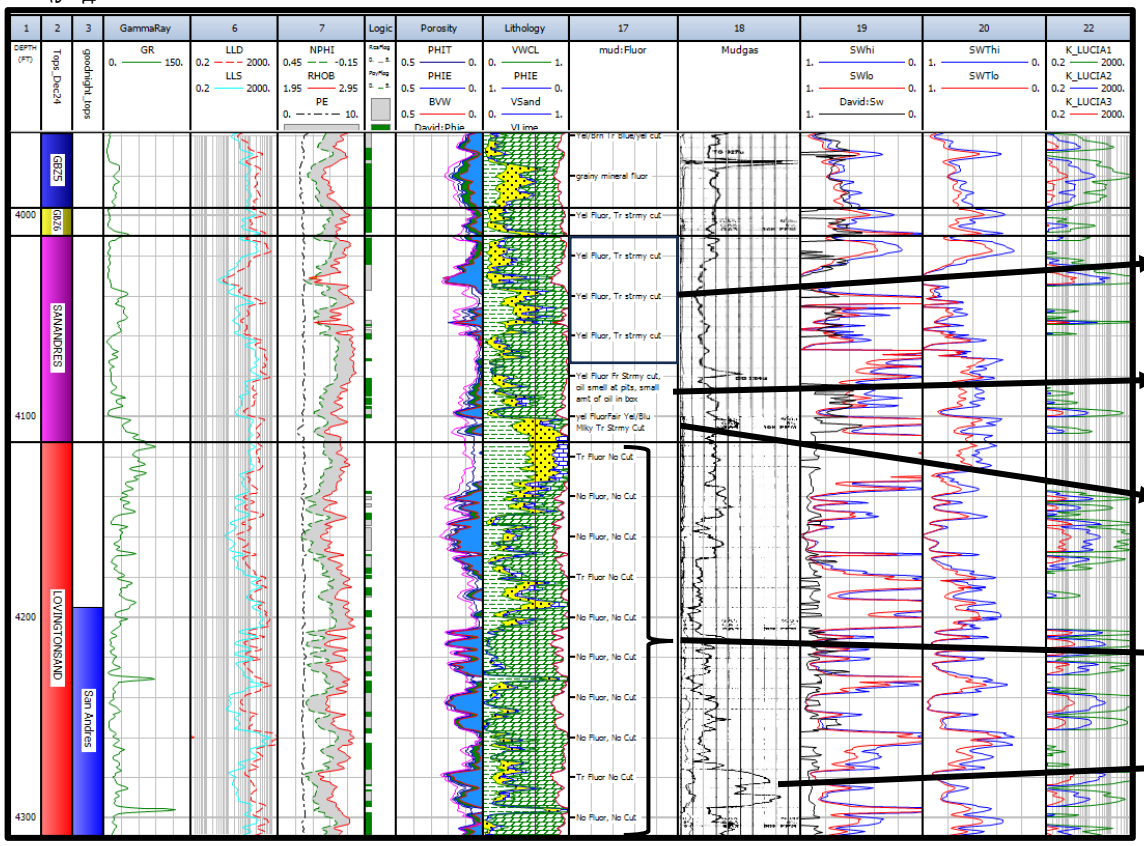


Exhibit L-19: Comparison of Goodnight's interpretation vs the High case saturation from Empire. Comparison of Goodnight and Empire petrophysical interpretation. A large divergence of the data occurs with the San Andres and the Lovington Sand.

EMSU 746 mudlog and Petrophysical comparison



Significant difference in tops between Empire and Goodnight

Yellow fluor strm cut

Yellow fluor Fr strm cut, oil smell at pit, small amt of oil in box

Yellow fluor fair yel/blu milky tr streaming cut

Mix of tr fluor/no cut, and no fluor no cut thru section

Start of large increase in gas with further fluor and cut posted below 4325 ft MD

Exhibit L-20: Several indications of hydrocarbon presence and ROZ.

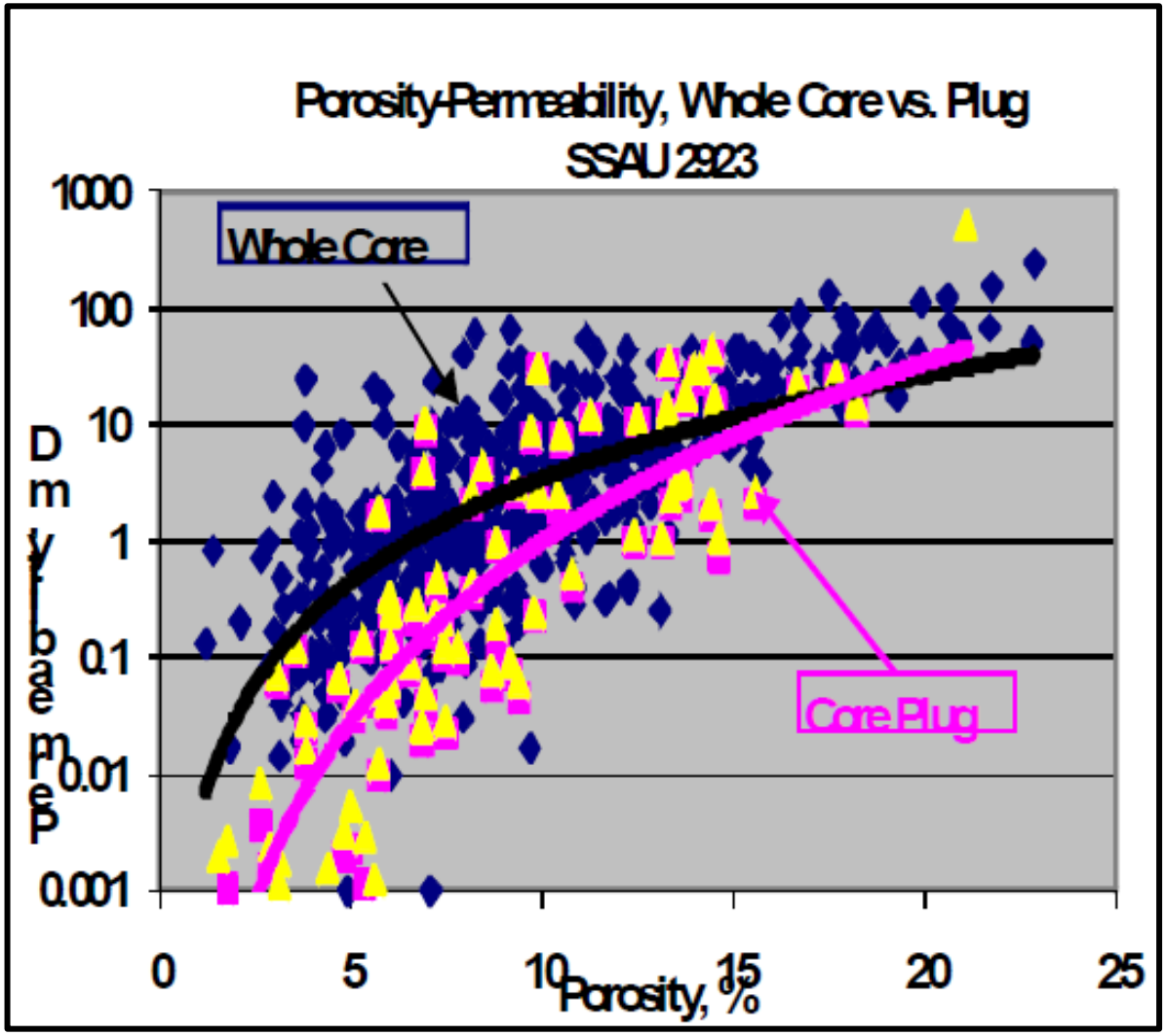
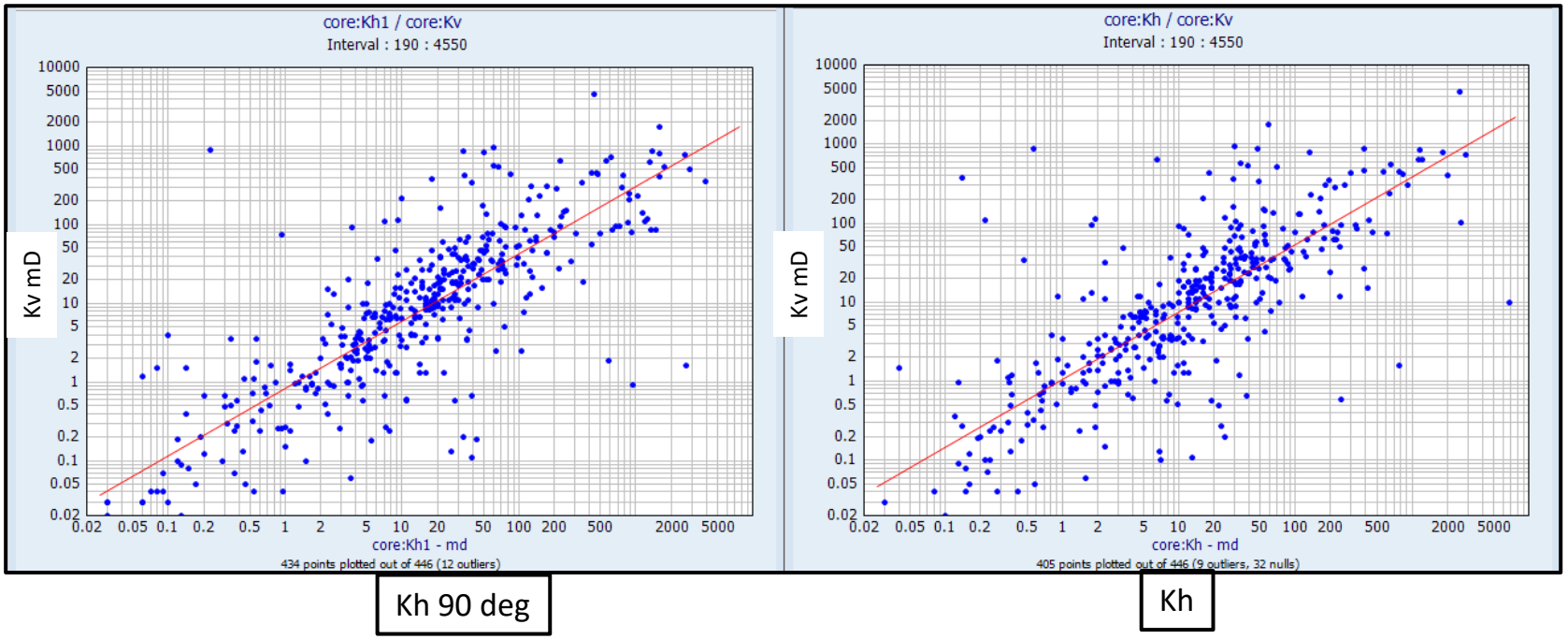


Exhibit L-21: Crossplot of porosity vs permeability for conventional vs full diameter core samples from Honarpour et al (2010). The crossplot highlights the permeability bias based on sample size. It also highlights the overall better connectivity of the well not shown through smaller sample sizes

NMGSAU Bulk 5 #22



Kh 90 deg

Kh

Core points transcribed by hand from pdf with poor resolution. Best efforts were made to correctly transfer data.

Exhibit L-22: Crossplots of vertical (y) and Horizontal permeabilities (x) to show the wide range of KV/KH ratio in the reservoir. This suggests strong vertical communication between zones in contrast to comments by Mr. Davidson

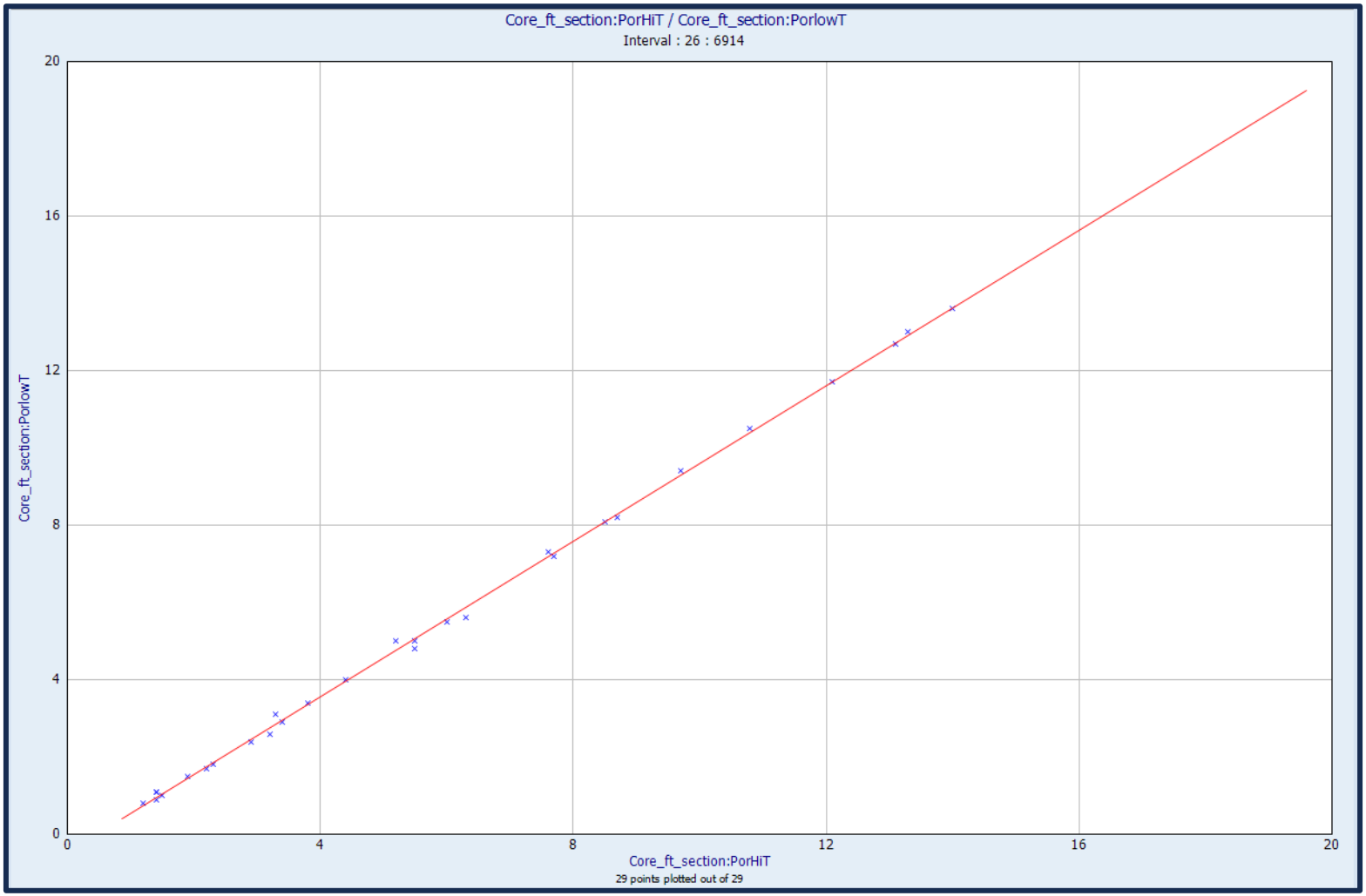


Exhibit L-23: QC plot of porosities measured using two different temperatures.

	Low temp. analysis	High temp. analysis	Increase in porosity
Gypsum (%)	Porosity (%)	Porosity (%)	Porosity (%)
4.3	2.8	3.7	0.9
14.6	2.5	8.4	5.9
14.9	3.4	8.9	5.5
11.0	6.4	11.2	4.7

$$\underset{\text{(Density 2.35)}}{\text{Gypsum } (CaSO_4 2H_2O)} + \text{heat} = \underset{\text{(Density 2.70)}}{\text{Bassanite } (CaSO_4 \cdot 0.5H_2O)} + 1.5H_2O$$

Exhibit L-24: Example of porosity increase due to increased heat during cleaning as originally attributed to Hurd and Fitch, 1959. (Lucia, 2001)

Adapted from (Lucia Carbonate Reservoir Characterization book, 2001)

Petrophysical Analysis

Company: Empire New Mexico LLC
Well Name: EMSU 679
Field: EUNICE MONUMENT
Country: US
State: New Mexico
Location: TWP 21 S - Range 36 E - Sec 8

Exhibit L-25

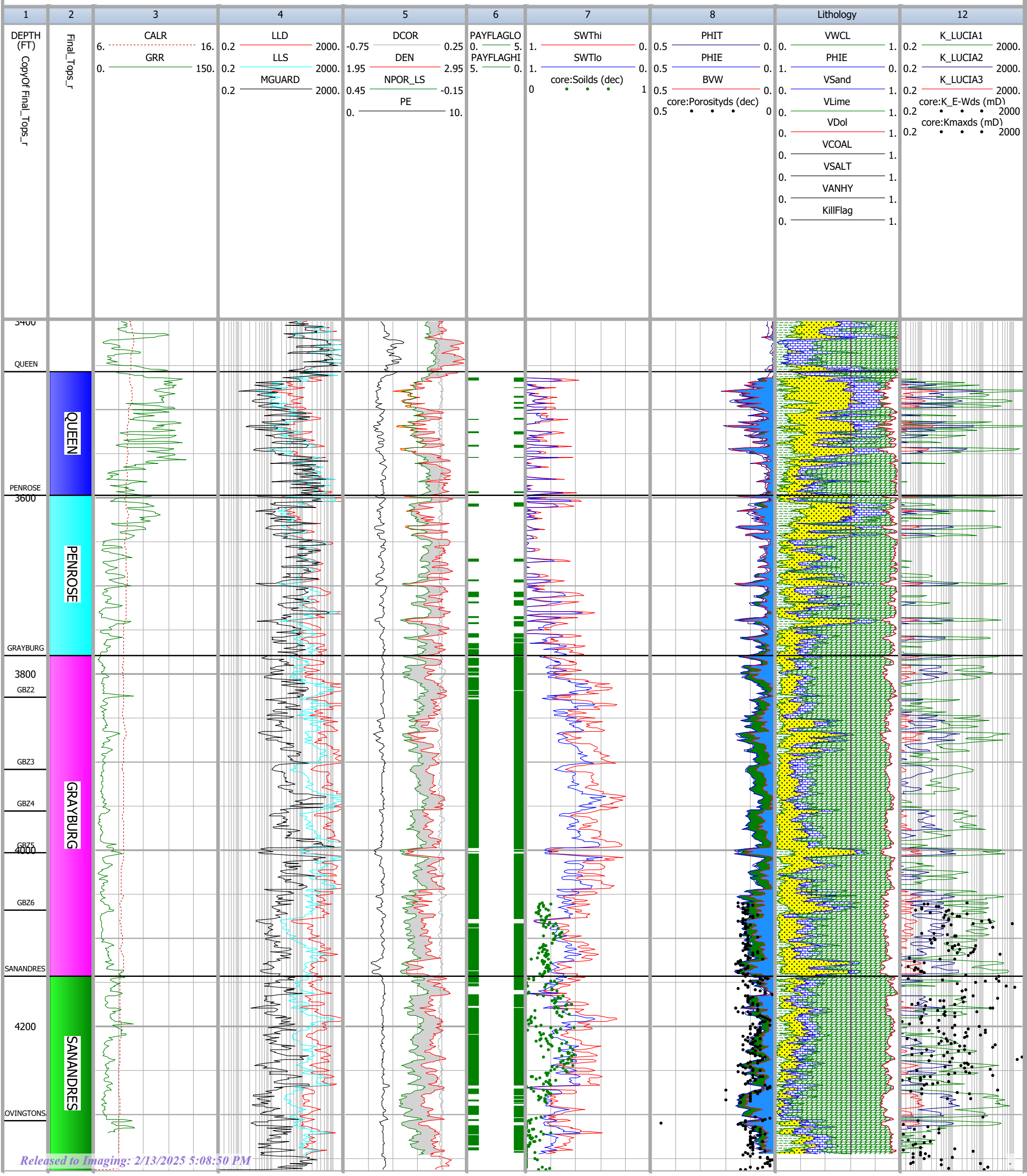
Scale : 1 : 1200

EMSU 679

DB : IP_Empire (3)

DEPTH (3400FT - 4363.5FT)

01/14/2025 17:38



Petrophysical Analysis

Company XTO ENERGY INCORPORATED

Well Name EMSU 746

Field EUNICE MONUMENT SOUTH

Country USA State NEW MEXICO

Location 380' FNL & 10' FEL

Exhibit L-26

IP 2024

Scale : 1 : 1200

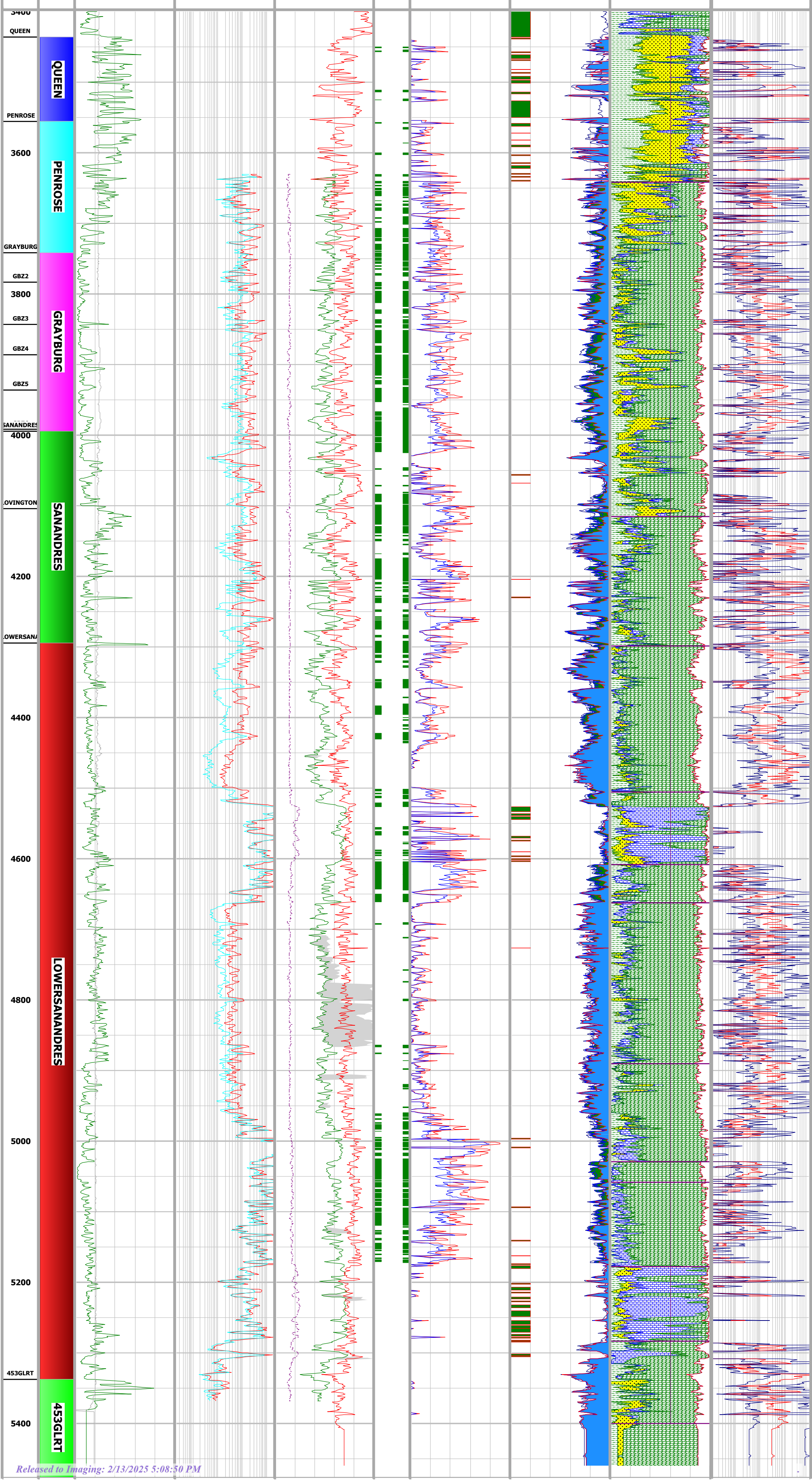
EMSU 746

DB : IP_Empire (6)

DEPTH (3400FT - 5476FT)

01/19/2025 17:46

1	2	GammaRay	6	7	Logic	15	Porosity	Lithology	19
DEPTH (FT) CopyOf Final_Tops_r	Final_Tops_r	GR 0. 150. CALI 6. 16.	nutech:LLD 0.2 2000. nutech:LLS 0.2 2000.	nutech:PCNLS 0.45 -0.15 RHOB 1.95 2.95 nutech:PE 0. 20.	PAYFLAGLO 0. 5. PAYFLAGHI 5. 0.	SWThi 1. 0. SWTlo 1. 0.	PHIT 0.5 0. PHIE 0.5 0. BVWSXO 0.5 0. BVW 0.5 0. baffle 0. 5.	VWCL 0. 1. PHIE 1. 0. VSand 0. 1. VLime 0. 1. VDol 0. 1. VCOAL 0. 1. VSALT 0. 1. VANHY 0. 1. KillFlag 0. 1.	K_LUCIA1 0.01 100. K_LUCIA2 0.01 100. K_LUCIA3 0.01 100.



Petrophysical Analysis

Company GULF EXPLORATION AND PRODUCTION COMPANY

Well Name R. R. BELL NCT-E #4

Field

Country USA State NEW MEXICO

Location S11 T21S R36E

Exhibit L-27

IP 2024

Scale : 1 : 1200

R. R. BELL NCT-E #4

DB : IP_Empire (12)

DEPTH (3300FT - 5200FT)

01/15/2025 08:01

1	2	4	5	6	Logic	Saturation	Porosity	Lithology	11
DEPTH (FT) CopyOf Final_Tops_r	Final_Tops_r	GRD 0. 150. CALD 6. 16.	ILD 0.2 2000. ILM 0.2 2000. SFLU 0.2 2000.	PEF 0. 20. DT 140. 40. RHOB 1.95 2.95 NPHI 0.45 -0.15	PayFlaghi 5. 0.	SWThi 1. 0. SWTlo 1. 0. core:So 0 1	PHIT 0.5 0. PHIE 0.5 0. BVW 0.5 0. PHISECU 0.5 0. baffle 0. 10. core:Porosity 0.5 0	VWCL 0. 1. PHIE 1. 0. VSand 0. 1. VLime 0. 1. VDol 0. 1. VCOAL 0. 1. VSALT 0. 1. VANHY 0. 1. KillFlag 0. 1.	K_LUCIA1 0.2 2000. K_LUCIA2 0.2 2000. K_LUCIA3 0.2 2000. core:Perm Max 0.2 2000

QUEEN

3400

PENROSE

3600

GRAYBURG

GBZ2

GBZ3

GBZ4

3800

GBZ5

SANANDRES

LOVINGTON

4000

LOWERSANA

4200

4400

4600

4800

5000

453GLRT

Petrophysical Analysis

Company	GOODNIGHT MIDSTREAM PERMIAN LLC
Well Name	SNYDER SWD #1
Field	JESS BURNER
Country	USA
State	NEW MEXICO
Location	1450' FNL & 708'FEL

Exhibit L-28

IP 2024

Scale : 1 : 1200

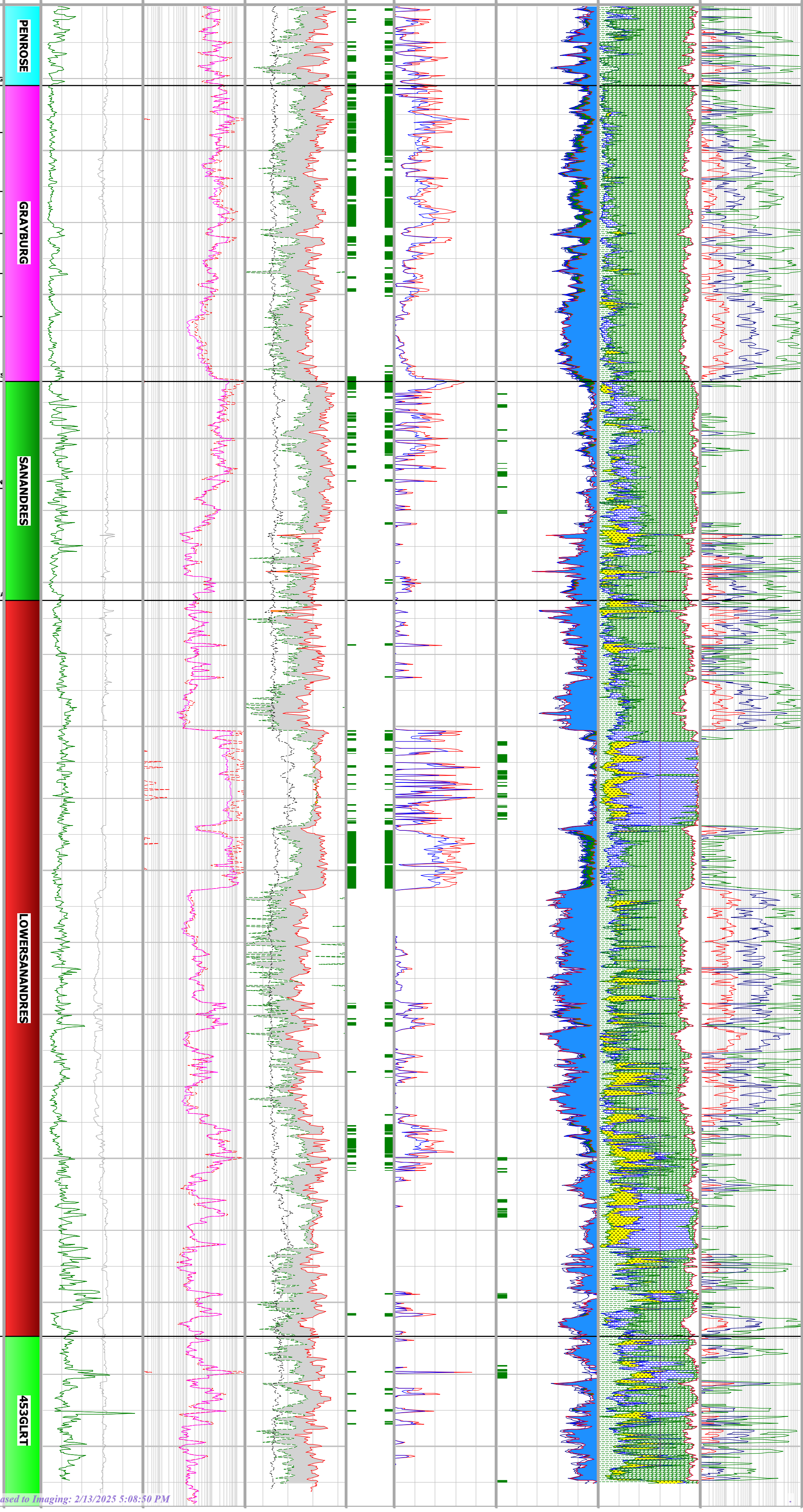
SNYDER SWD #1

DB : IP_Empire (5)

DEPTH (3800FT - 5884FT)

01/24/2025 14:32

1	2	3	4	5	6	Saturation	Porosity	Lithology	10
DEPTH (FT) CopyOf Final_Tops_r	Final_Tops_r	GR 0. 150. CALI 6. 16. GR 0. 150.	LLD 0.2 2000. LLS 0.2 2000.	NPHI 0.45 -0.15 RhoB 1.95 2.95 PE 0. 10.	PAYFLAGHI 5. 0. PAYFLAGLO 0. 5.	SWThi 1. 0. SWTlo 1. 0.	PHIT 0.5 0. PHIE 0.5 0. BVWSXO 0.5 0. BVW 0.5 0. baffle 0. 10.	VWCL 0. 1. PHIE 1. 0. VSand 0. 1. VLime 0. 1. VDol 0. 1. VCOAL 0. 1. VSALT 0. 1. VANHY 0. 1. KillFlag 0. 1.	K_LUCIA1 0.2 2000. K_LUCIA2 0.2 2000. K_LUCIA3 0.2 2000.



Petrophysical Analysis

Company	CHEVRON U.S.A. INC.
Well Name	EMSU #211
Field	EUNICE MONUMENT
Country	UNITED STATES OF AMERICA
State	NEW MEXICO
Location	S4 T21S R36E

Exhibit L-29

Scale : 1 : 1200

EMSU #211

DB : IP_Empire (13)

DEPTH (3300FT - 4120FT)

01/15/2025 08:06

1	4	5	6	7	8	Saturation	Porosity	Lithology	12
DEPTH (FT) CopyOf Final_Tops_r	Final_Tops_r	GRD 0. 150. CALD 6. 16. CALD 6. 16. DRHO -0.75 0.25	LLD 2. 20000. LLS 2. 20000.	NPHI_LS 0.45 -0.15 PEF 0. 20. RHOB 1.95 2.95	PAYFLAGLO 0. 5. PAYFLAGHI 5. 0.	SWThi 1. 0. SWTlo 1. 0.	PHIT 0.5 0. PHIE 0.5 0. BVW 0.5 0. baffle 0. 10.	VWCL 0. 1. PHIE 1. 0. VSand 0. 1. VLime 0. 1. VDol 0. 1. VCOAL 0. 1. VSALT 0. 1. VANHY 0. 1. KillFlag 0. 1.	K_LUCIA1 0.02 200. K_LUCIA2 0.02 200. K_LUCIA3 0.02 200.

QUEEN

3400

PENROSE

3600

GRAYBURG

GBZ2

GBZ3

GBZ4

3800

GBZ5

GBZ6

SANANDRES

4000

OVINGTONS.

1 | 4 | 5 | 6 | 7 | 8 | Saturation | Porosity | Lithology | 12
DEPTH (FT) CopyOf Final_Tops_r | Final_Tops_r | GRD 0. 150. CALD 6. 16. CALD 6. 16. DRHO -0.75 0.25 | LLD 2. 20000. LLS 2. 20000. | NPHI_LS 0.45 -0.15 PEF 0. 20. RHOB 1.95 2.95 | PAYFLAGLO 0. 5. PAYFLAGHI 5. 0. | SWThi 1. 0. SWTlo 1. 0. | PHIT 0.5 0. PHIE 0.5 0. BVW 0.5 0. baffle 0. 10. | VWCL 0. 1. PHIE 1. 0. VSand 0. 1. VLime 0. 1. VDol 0. 1. VCOAL 0. 1. VSALT 0. 1. VANHY 0. 1. KillFlag 0. 1. | K_LUCIA1 0.02 200. K_LUCIA2 0.02 200. K_LUCIA3 0.02 200.

Petrophysical Analysis

Company
Well Name EMSU 461
Field EUNICE MONUMENT
Country State
Location

Exhibit L-30

IP 2024

Scale : 1 : 1200

EMSU 461

DB : IP_Empire (15)

DEPTH (3400FT - 5000FT)

01/15/2025 08:33

1	3	4	5	6	7	Saturation	Porosity	Lithology	11
DEPTH (FT) CopyOf Final_Tops_r	Final_Tops_r	GRD 0. 150. CALD 6. 16. CALD 6. 16. GRD 0. 150.	LLD 0.2 2000. LLS 0.2 2000.	NPHI 0.45 -0.15 RHOB 1.95 2.95 DRHO -0.75 0.25	PAYFLAGLO 0. 5. PAYFLAGHI 5. 0.	SWThi 1. 0. SWTlo 1. 0.	PHIT 0.5 0. PHIE 0.5 0. BVW 0.5 0. baffle 0. 10.	VWCL 0. 1. PHIE 1. 0. VolSnd2Min 0. 1. VolLst2Min 0. 1. VolDol2Min 0. 1. VCOAL 0. 1. VSALT 0. 1. VANHY 0. 1. KillFlag 0. 1.	K_LUCIA1 0.02 200. K_LUCIA2 0.02 200. K_LUCIA3 0.02 200.

Exhibit L-31

Petrophysical Analysis

Company	XTO ENERGY
Well Name	EUNICE MONUMENT SOUTH UNIT #628
Field	EUNICE MONUMNET; GRAYBURG-ANDRES
Country	USA
State	NEW MEXICO
Location	2550' FSL & 1085' FEL

Scale : 1 : 1200

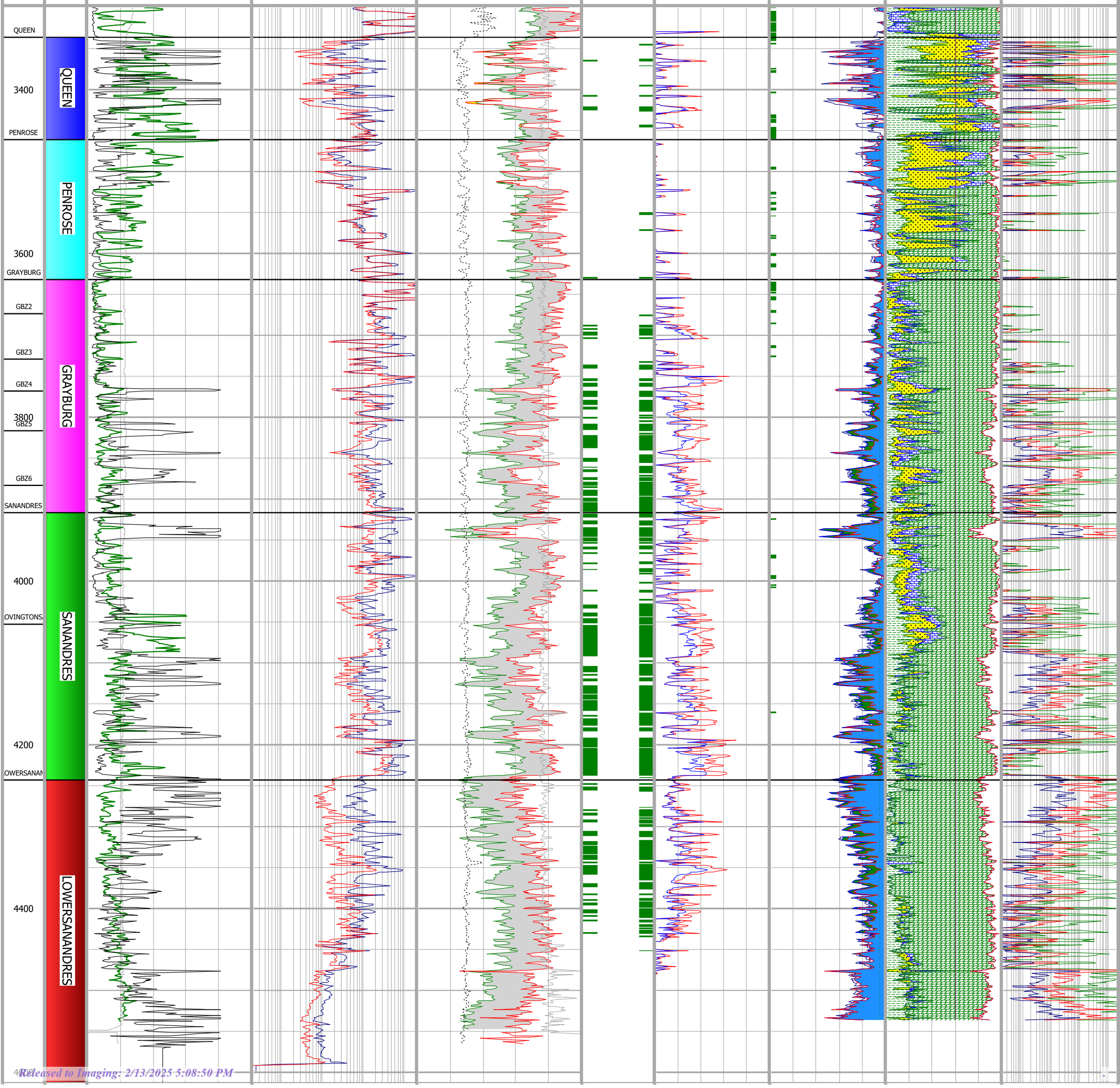
EUNICE MONUMENT SOUTH UNIT #628

DB : IP_Empire (11)

DEPTH (3300FT - 4612FT)

01/14/2025 18:36

1	5	6	7	8	9	Saturation	Porosity	Lithology	14
DEPTH (FT) CopyOf Final_Tops_r	Final_Tops_r	GRD 0. 150. CALD 6. 16. nvarpoly 1.58 14.4	LLD 0.2 2000. LLS 0.2 2000.	NPOR_LS 0.45 -0.15 PE 0. 10. RHOB 1.95 2.95 DCOR -0.75 0.25	PayFlaghi 5. 0. PayFlaglo 0. 5.	SWThi 1. 0. SWTlo 1. 0.	PHIT 0.5 0. PHIE 0.5 0. BVW 0.5 0. baffle 0.5 10.	VWCL 0. 1. PHIE 1. 0. VSand 0. 1. VLime 0. 1. VDol 0. 1. VCOAL 0. 1. VSALT 0. 1. VANHY 0. 1. KillFlag 0. 1.	K_LUCIA1 0.02 200. K_LUCIA2 0.02 200. K_LUCIA3 0.02 200.



Petrophysical Analysis

Company	XTO ENERGY
Well Name	EUNICE MONUMENT SOUTH UNIT No.660
Field	EUNICE MONUMENT; GRAYBURG-ANDRES
Country	US
State	NEW MEXICO
Location	10' FSL & 1250' FWL

Exhibit L-32

IP 2024

Scale : 1 : 1200

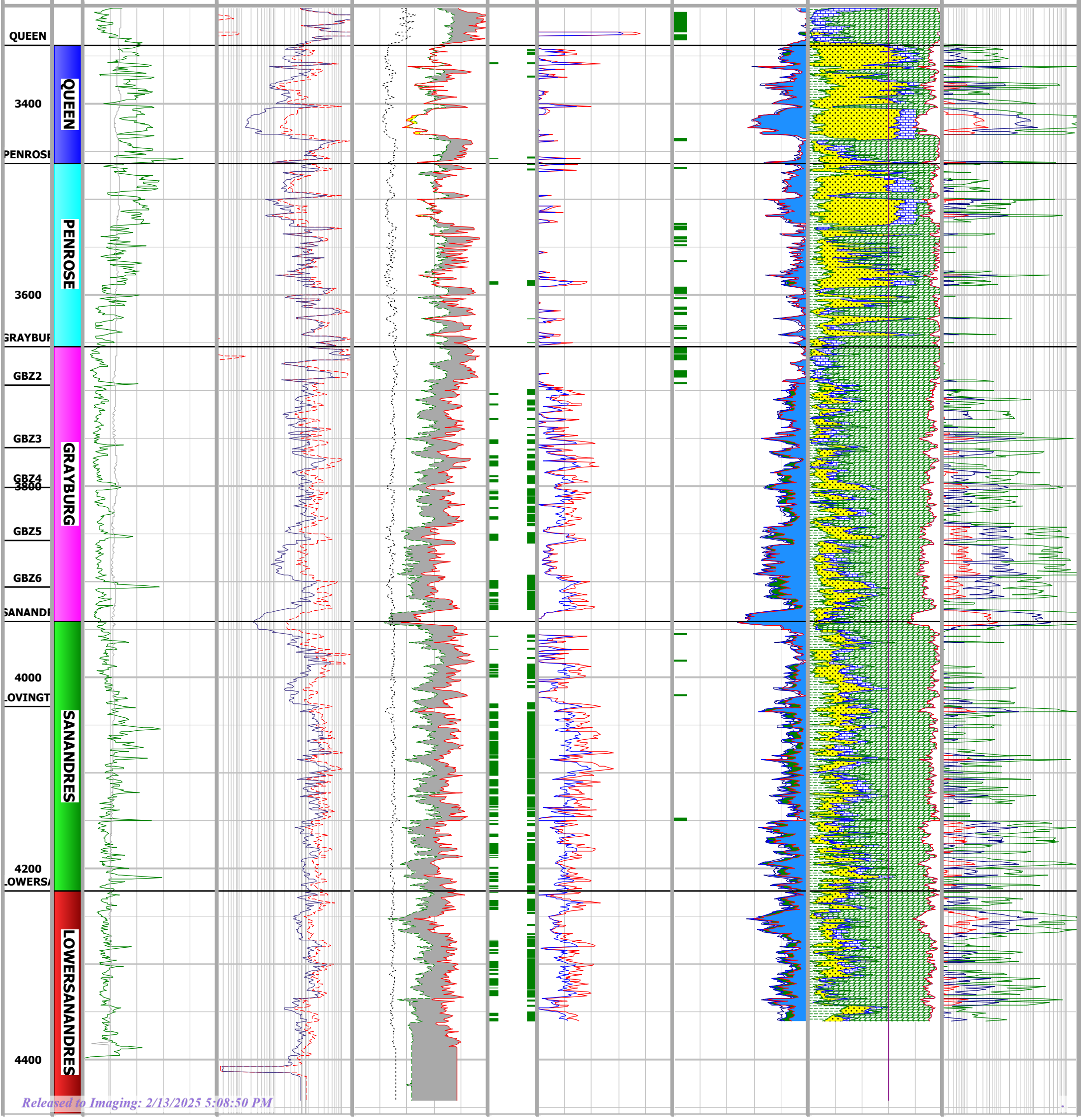
EUNICE MONUMENT SOUTH UNIT No.660

DB : IP_Empire (9)

DEPTH (3300FT - 4457FT)

01/14/2025 18:24

1	2	4	5	6	Logic	Saturation	Porosity	Lithology	16
DEPTH (FT) CopyOf Final_Tops_r	Final_Tops_r	CBL:GR 0. 150. CALI 6. 16.	LLD 0.2 2000. LLS 0.2 2000.	NPHI 0.45 -0.15 RHOB 1.95 2.95 PE 0. 10.	PAYFLAGHI 5. 0. PAYFLAGLO 0. 5.	SWThi 1. 0. SWTlo 1. 0.	PHIT 0.5 0. PHIE 0.5 0. BVW 0.5 0. baffle 0. 10.	VWCL 0. 1. PHIE 1. 0. VSand 0. 1. VLime 0. 1. VDol 0. 1. VCOAL 0. 1. VSALT 0. 1. VANHY 0. 1. KillFlag 0. 1.	K_LUCIA1 0.2 2000. K_LUCIA2 0.2 2000. K_LUCIA3 0.2 2000.



Petrophysical Analysis

Company	XTO Energy, Inc
Well Name	EMSU #673
Field	Eunice Monument; Grayburg-Andres
Country	US
State	NEW MEXICO
Location	1060' FNL & 1305' FEL

Exhibit L-33

IP 2024

Scale : 1 : 1200

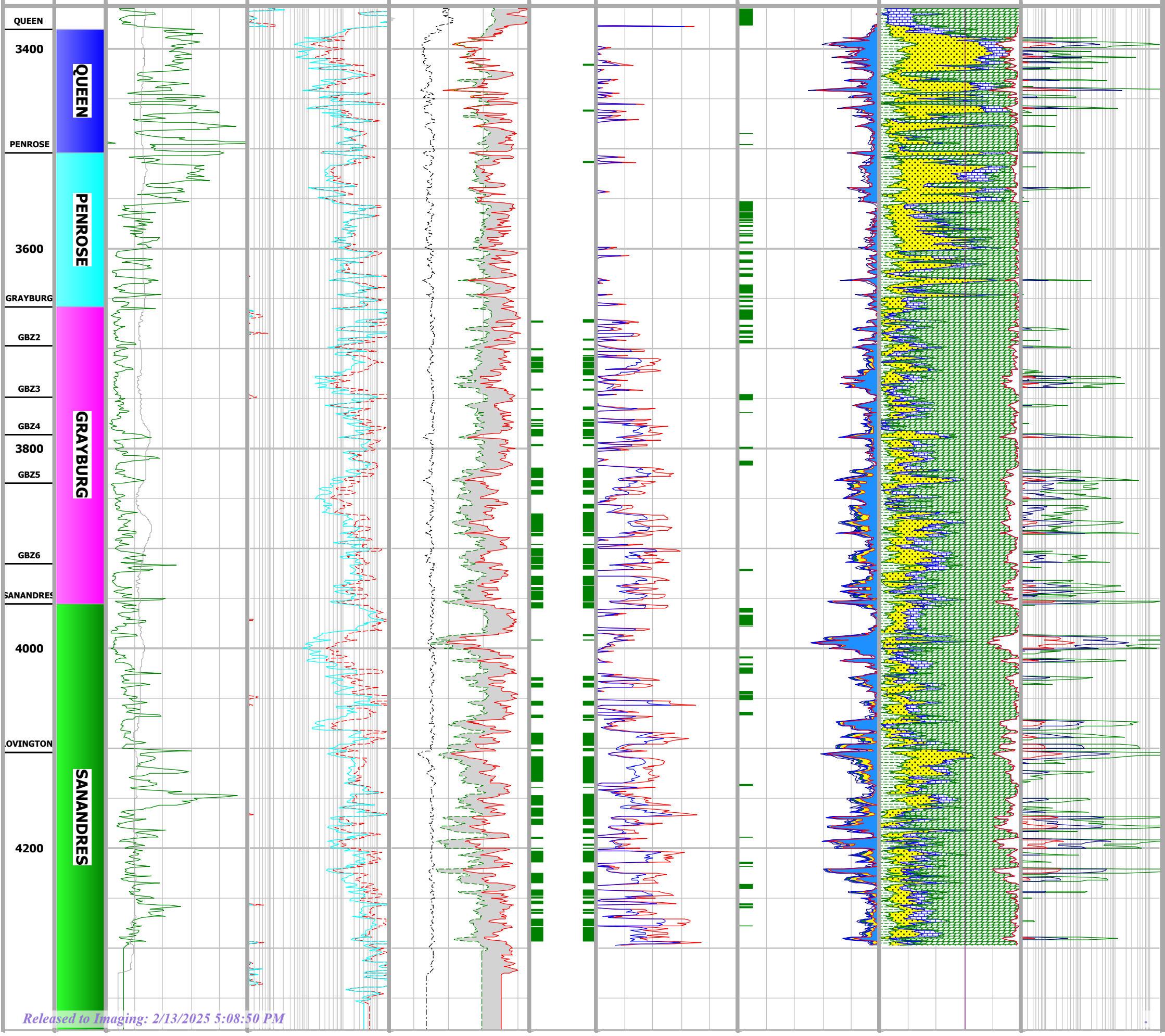
EMSU #673

DB : IP_Empire (8)

DEPTH (3360FT - 4382FT)

01/14/2025 18:12

1	2	3	4	5	6	Saturation	Porosity	Lithology	10
DEPTH (FT) CopyOf Final_Tops_r	Final_Tops_r	GR 0. 150. CALI 6. 16.	LLD 0.2 2000. LLS 0.2 2000.	NPHI 0.45 -0.15 RHOB 1.95 2.95 PE 0. 10.	PAYFLAGLO 0. 5. PAYFLAGHI 5. 0.	SWThi 1. 0. SWTlo 1. 0.	PHIT 0.5 0. PHIE 0.5 0. BVWSXO 0.5 0. BVW 0.5 0. baffle 0. 10.	VWCL 0. 1. PHIE 1. 0. VSand 0. 1. VLime 0. 1. VDol 0. 1. VCOAL 0. 1. VSALT 0. 1. VANHY 0. 1. KillFlag 0. 1.	K_LUCIA1 0.2 2000. K_LUCIA2 0.2 2000. K_LUCIA3 0.2 2000.



Petrophysical Analysis

Company
Well Name EMSU 329
Field EUNICE MONUMENT
Country State
Location

Exhibit L-34

IP 2024

Scale : 1 : 1200

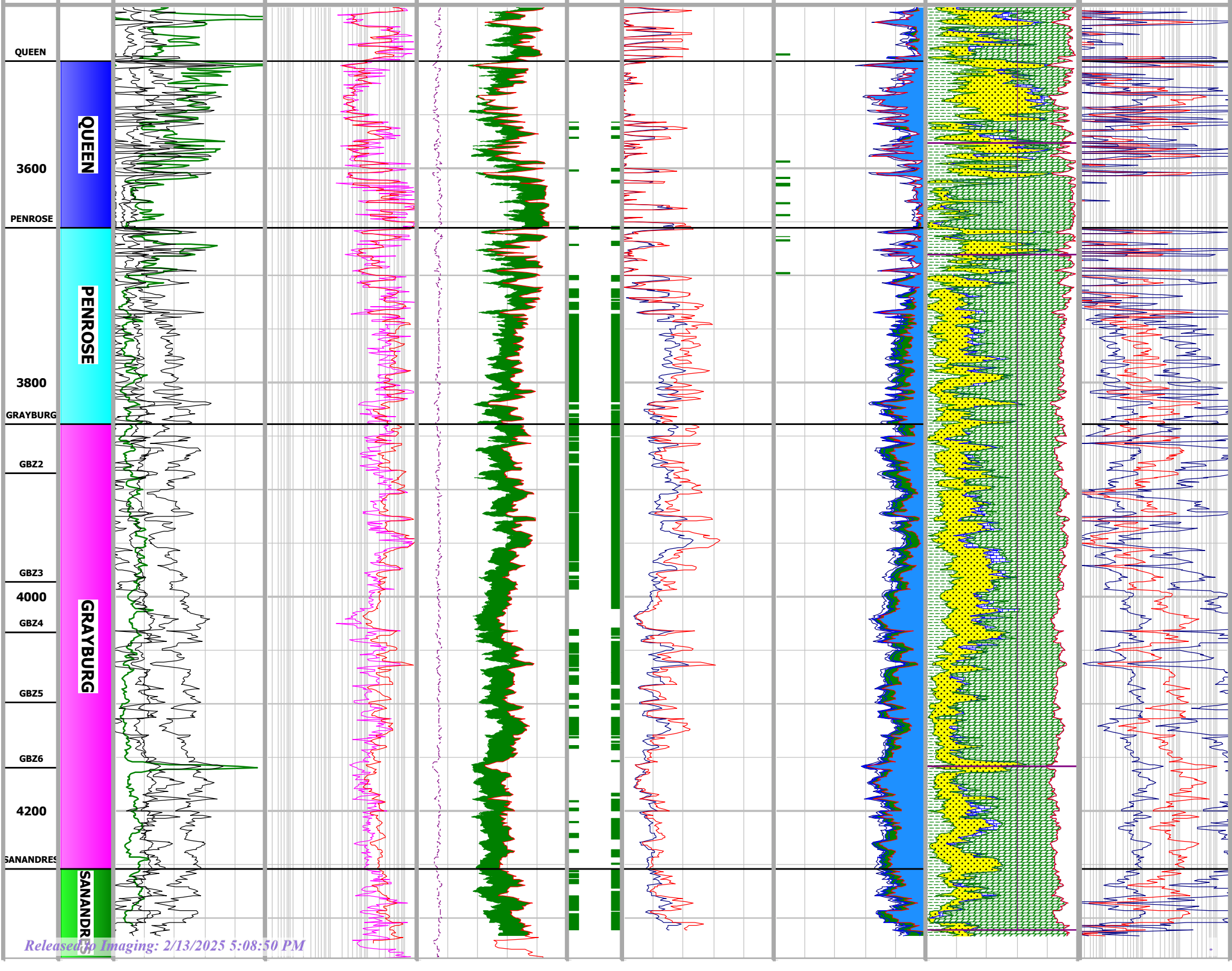
EMSU 329

DB : IP_Empire (17)

DEPTH (3450FT - 4337.5FT)

01/15/2025 08:55

1	3	GammaRay	6	7	14	15	Porosity	Lithology	19
DEPTH (FT) CopyOf Final_Tops_r	Final_Tops_r	GRD 0. 150. MFOCKE2 2.3 3.93086 MFOCKE3 1.20084 3.64052 MFOCKE4 1.20084 3.64052 MGOMEZ 0. 0. MHASSANI 0.08258 120.96097	MSFL 0.2 2000. LLD 0.2 2000.	NPHI_LS 0.45 -0.15 RHOB 1.95 2.95 PEF 0. 20.	PayFlaglo 0. 5. PayFlaghi 5. 0.	SWTlo 1. 0. SWThi 1. 0.	PHIT 0.5 0. PHIE 0.5 0. BVWSXO 0.5 0. BVW 0.5 0. baffle 0. 10.	VWCL 0. 1. PHIE 1. 0. VSand 0. 1. VLime 0. 1. VDol 0. 1. VCOAL 0. 1. VSALT 0. 1. VANHY 0. 1. KillFlag 0. 1.	K_LUCIA1 0.02 200. K_LUCIA2 0.02 200. K_LUCIA3 0.02 200.



Petrophysical Analysis

Company
Well Name EMSU 457
Field EUNICE MONUMENT
Country State
Location

Exhibit L-35

IP 2024

Scale : 1 : 1200

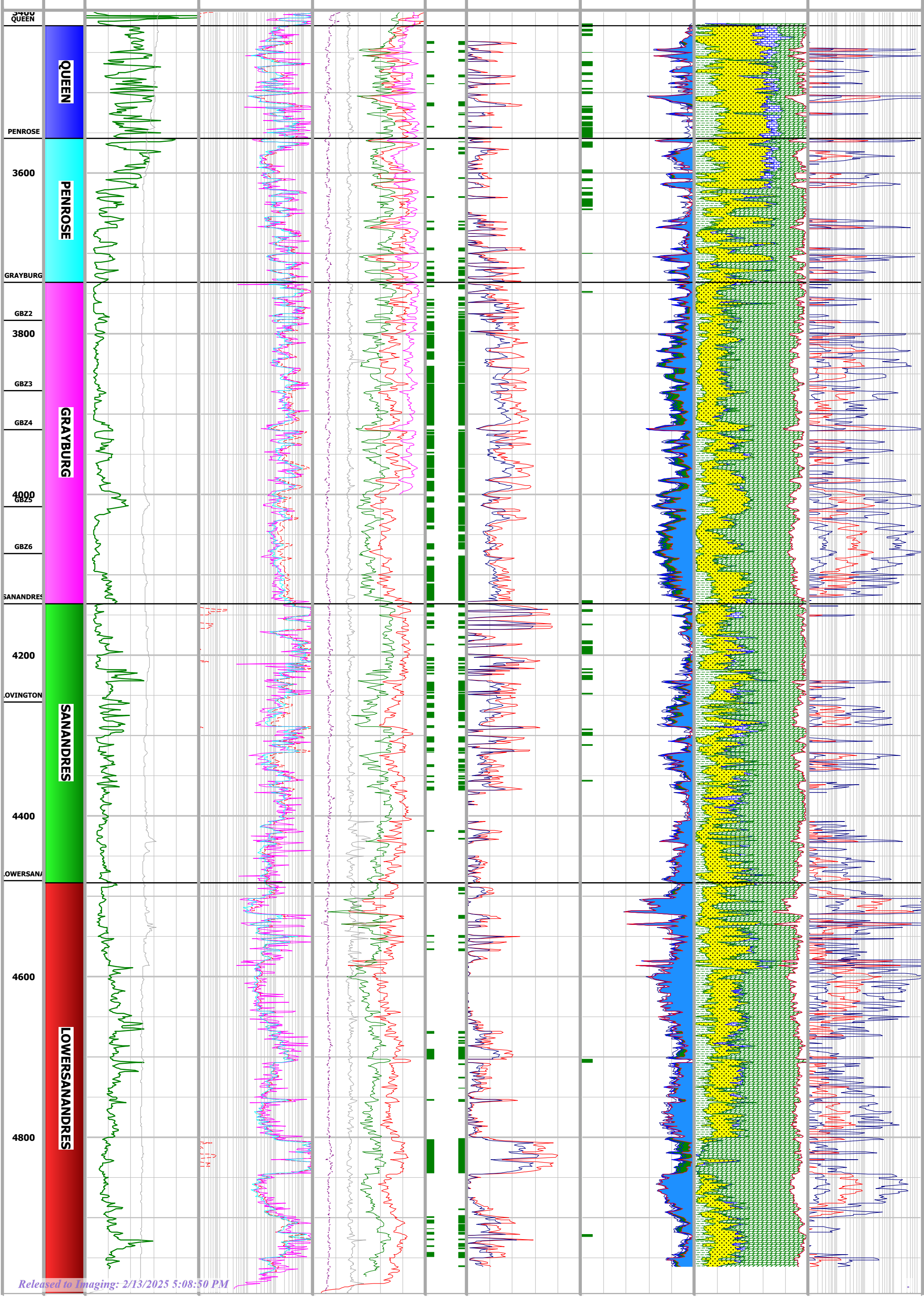
EMSU 457

DB : IP_Empire (14)

DEPTH (3400FT - 4994.5FT)

01/15/2025 08:26

1	2	GammaRay	5	6	Logic	Saturation	Porosity	Lithology	16
DEPTH (FT) CopyOf Final_Tops_r	Final_Tops_r	SGR 0. 150. SGR 0. 150. CALD 6. 16.	LLD 0.2 2000. MSFL 0.2 2000. LLS 0.2 2000.	RHOB 1.95 2.95 PEF 0. 20. NPHI 0.45 -0.15 DT 140. 40. DRHO -0.75 0.25	PAYFLAGHI 5. 0. PAYFLAGLO 0. 5.	SWThi 1. 0. SWTlo 1. 0.	PHIT 0.5 0. PHIE 0.5 0. BVWSXO 0.5 0. BVW 0.5 0. baffle 0. 10.	VWCL 0. 1. PHIE 1. 0. VSand 0. 1. VLime 0. 1. VDol 0. 1. VCOAL 0. 1. VSALT 0. 1. VANHY 0. 1. KillFlag 0. 1.	K_LUCIA1 0.2 2000. K_LUCIA2 0.2 2000. K_LUCIA3 0.2 2000.



Petrophysical Analysis

Company
Well Name EMSU 458
Field EUNICE MONUMENT
Country State
Location

Exhibit L-36

IP 2024

Scale : 1 : 1200

EMSU 458

DB : IP_Empire (1)

DEPTH (3400FT - 4997.5FT)

01/19/2025 17:52

1	2	GammaRay	5	6	Logic	Saturation	Porosity	Lithology	16
DEPTH (FT) CopyOf Final_Tops_r	Final_Tops_r	GRD 0. 150. CALD 6. 16.	LLD 0.2 2000. MSFL 0.2 2000. LLS 0.2 2000.	NPHI_LS 0.45 -0.15 RHOB 1.95 2.95 PEF 0. 20.	PAYFLAGLO 0. 5. PAYFLAGHI 5. 0.	SWThi 1. 0. SWTlo 1. 0. core:PVOil 0 1	PHIT 0.5 0. PHIE 0.5 0. BVWSXO 0.5 0. BVW 0.5 0. baffle 0. 10. core:Porosity 0.5 0	VWCL 0. 1. PHIE 1. 0. VSand 0. 1. VLime 0. 1. VDol 0. 1. VCOAL 0. 1. VSALT 0. 1. VANHY 0. 1. KillFlag 0. 1.	K_LUCIA1 0.01 100. K_LUCIA2 0.01 100. K_LUCIA3 0.01 100. core:PermMax (mD) 0.01 100

3400
QUEEN
PENROSE
PENROSE
3600
GRAYBURG
GRAYBURG
GBZ2
GBZ3
GBZ4
3800
GBZ6
SANANDRES
SANANDRES
4000
LOVINGTON
4200
LOWERSANA
LOWERSANDRES
4400
4600
4800

Petrophysical Analysis

Company
Well Name EMSU 459
Field EUNICE MONUMENT
Country State
Location

Exhibit L-37

Scale : 1 : 1200

EMSU 459

DB : IP_Empire (2)

DEPTH (3300FT - 5002.5FT)

01/14/2025 17:36

1	2	5	6	7	8	Saturation	Porosity	Lithology	12
DEPTH (FT) CopyOf Final_Tops_r	Final_Tops_r	CALXD 6. 16. GRD 0. 75.	RLLD 0.2 2000. RLLS 0.2 2000. RMSFL 0.2 2000.	CNS_LS 0.45 -0.15 DRHO -0.75 0.25 RHOB 1.95 2.95	PAYFLAGLO 0. 5. PAYFLAGHI 5. 0.	SWThi 1. 0. SWTlo 1. 0.	PHIT 0.5 0. PHIE 0.5 0. BVWSXO 0.5 0. BVW 0.5 0. baffle 0. 10.	VWCL 0. 1. PHIE 1. 0. VolSnd2Min 0. 1. VolLst2Min 0. 1. VolDol2Min 0. 1. VCOAL 0. 1. VSALT 0. 1. VANHY 0. 1. KillFlag 0. 1. VCL 0. 1.	K_LUCIA1 0.2 2000. K_LUCIA2 0.2 2000. K_LUCIA3 0.2 2000.

QUEEN
3400
PENROSE
3600
GRAYBURG
GBZ2
GBZ3
GBZ4
3800
GBZ5
GBZ6
SANANDRES
4000
OVINGTONS
4200
OWERSANAN
4400
4600
4800
5000

Petrophysical Analysis

Company
Well Name EMSU 462
Field EUNICE MONUMENT
Country State
Location

Exhibit L-38

Scale : 1 : 1200

EMSU 462

DB : IP_Empire (16)

DEPTH (3450FT - 4990FT)

01/15/2025 08:48

1	2	5	6	7	8	Saturation	Porosity	Lithology	12
DEPTH (FT) CopyOf Final_Tops_r	Final_Tops_r	GRD_spl 0. 150. CALD_SPL 6. 16.	LLD 0.2 2000. LLS 0.2 2000.	NPHI_spl 0.45 -0.15 DRHO_SPL -0.75 0.25 RHOB_spl 1.95 2.95 PEF 0. 20.	PAYFLAGLO 0. 5. PAYFLAGHI 5. 0.	SWThi 1. 0. SWTlo 1. 0.	PHIT 0.5 0. PHIE 0.5 0. BVW 0.5 0. baffle 0. 10.	VWCL 0. 1. PHIE 1. 0. VSand 0. 1. VLime 0. 1. VDol 0. 1. VCOAL 0. 1. VSALT 0. 1. VANHY 0. 1. KillFlag 0. 1.	K_LUCIA1 0.2 2000. K_LUCIA2 0.2 2000. K_LUCIA3 0.2 2000.

Exhibit L-39

Petrophysical Analysis

Company	XTO ENERGY
Well Name	E.M.S.U. No. 658
Field	E.M.S.U.
Country	USA
State	NEW MEXICO
Location	155 FSL AND 1240 FWL

Scale : 1 : 1200

E.M.S.U. No. 658

DB : IP_Empire (10)

DEPTH (3350FT - 4373FT)

01/14/2025 18:30

1	2	3	4	5	6	Saturation	Porosity	Lithology	10
DEPTH (FT) CopyOf Final_Tops_r	Final_Tops_r	GR 0. 150. CALA 6. 16.	LLD 0.2 200. LLS 0.2 200.	NPHI 0.45 -0.15 PE 0. 10. RHOB 1.95 2.95	PAYFLAGHI 5. 0. PAYFLAGLO 0. 5.	SWThi 1. 0. SWTlo 1. 0.	PHIT 0.5 0. PHIE 0.5 0. BVW 0.5 0. baffle 0. 10.	VWCL 0. 1. PHIE 1. 0. VSand 0. 1. VLime 0. 1. VDol 0. 1. VCOAL 0. 1. VSALT 0. 1. VANHY 0. 1. KillFlag 0. 1.	K_LUCIA1 0.2 2000. K_LUCIA2 0.2 2000. K_LUCIA3 0.2 2000.

Petrophysical Analysis

Company	XTO ENERGY
Well Name	EUNICE SOUTH MONUMENT UNIT No.713
Field	EUNICE MONUMENT; GRAYBURG-ANDRES
Country	USA
State	NEW MEXICO
Location	1310' FSL & 2205' FEL

Exhibit L-40

Scale : 1 : 1200

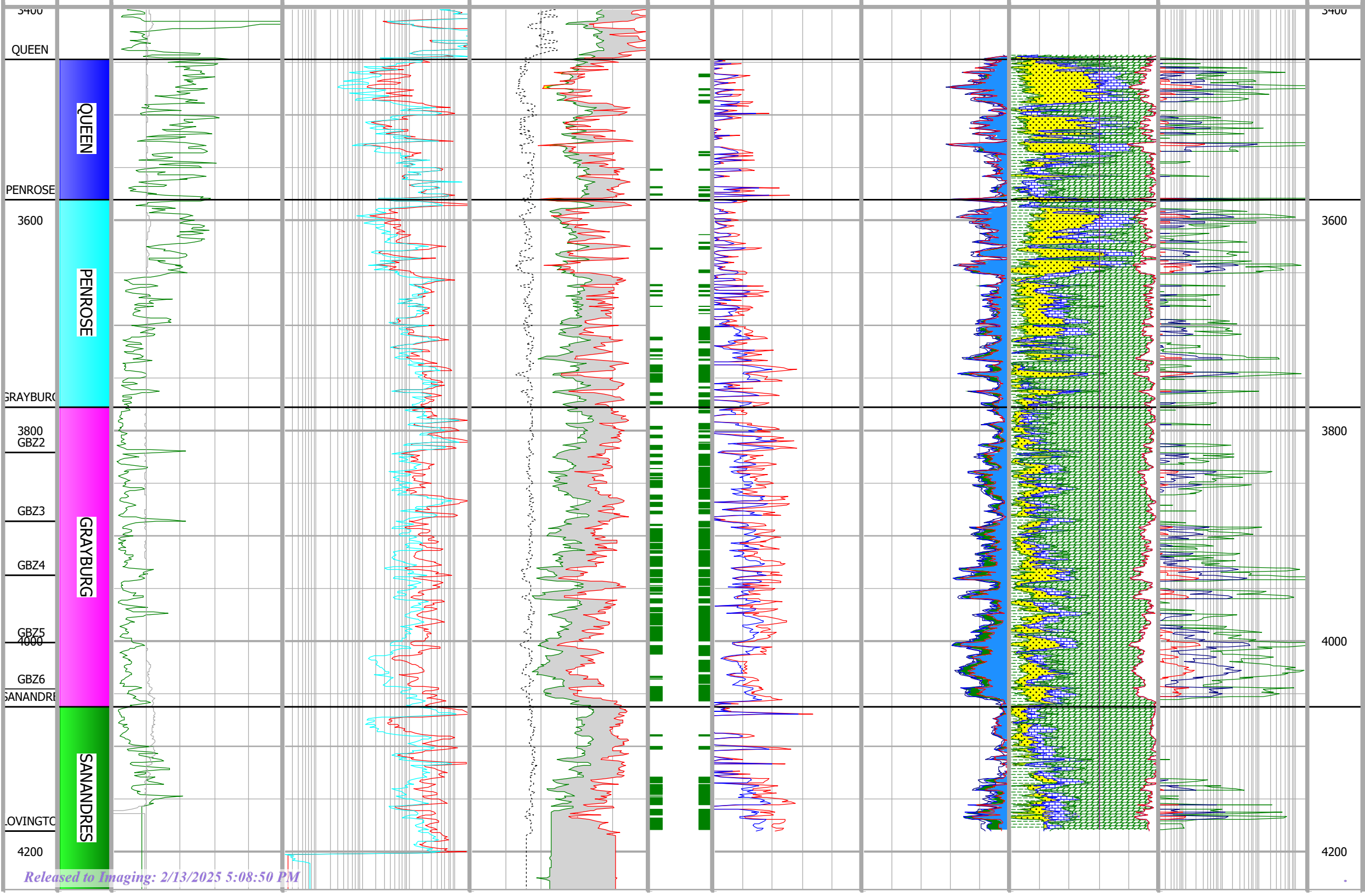
EUNICE SOUTH MONUMENT UNIT No.713

DB : IP_Empire (7)

DEPTH (3400FT - 4236FT)

01/14/2025 18:06

1	2	3	4	5	6	Saturation	Porosity	Lithology	10	11
DEPTH (FT) CopyOf Final_Tops_r	Final_Tops_r	GR 0. 150. CALI 6. 16.	LLD 0.2 2000. LLS 0.2 2000.	NPHI 0.45 -0.15 PE 0. 10. RHOB 1.95 2.95	PAYFLAGLO 0. 5. PAYFLAGHI 5. 0.	SWThi 1. 0. SWTlo 1. 0.	PHIT 0.5 0. PHIE 0.5 0. BVW 0.5 0.	VWCL 0. 1. PHIE 1. 0. VSand 0. 1. VLime 0. 1. VDol 0. 1. VCOAL 0. 1. VSALT 0. 1. VANHY 0. 1. KillFlag 0. 1.	K_LUCIA1 0.2 2000. K_LUCIA2 0.2 2000. K_LUCIA3 0.2 2000.	DEPTH (FT)



Petrophysical Analysis

Company
Well Name JA Aken 10
Field OIL CENTER
Country State
Location

Exhibit L-41

IP 2024

Scale : 1 : 1200

JA Aken 10

DB : IP_Empire (22)

DEPTH (3300FT - 5400FT)

01/15/2025 09:51

1	3	GammaRay	6	7	14	15	Porosity	Lithology	19
DEPTH (FT) CopyOf Final_Tops_r	Final_Tops_r	GRD 0. 150. CALI 6. 16.	LLS 0.2 2000. LLD 0.2 2000.	NPHI_LS 0.45 -0.15 RHOB 1.95 2.95	PayFlaglo 0. 5. PayFlaghi 5. 0.	SWTlo 1. 0. SWThi 1. 0.	PHIT 0.5 0. PHIE 0.5 0. BVW 0.5 0. baffle 0. 10.	VWCL 0. 1. PHIE 1. 0. VSand 0. 1. VLime 0. 1. VDol 0. 1. VCOAL 0. 1. VSALT 0. 1. VANHY 0. 1. KillFlag 0. 1.	K_LUCIA1 0.02 200. K_LUCIA2 0.02 200. K_LUCIA3 0.02 200.

Petrophysical Analysis

Company
Well Name Meyer B 4-33
Field OIL CENTER
Country State
Location

Exhibit L-42

IP 2024

Scale : 1 : 1200

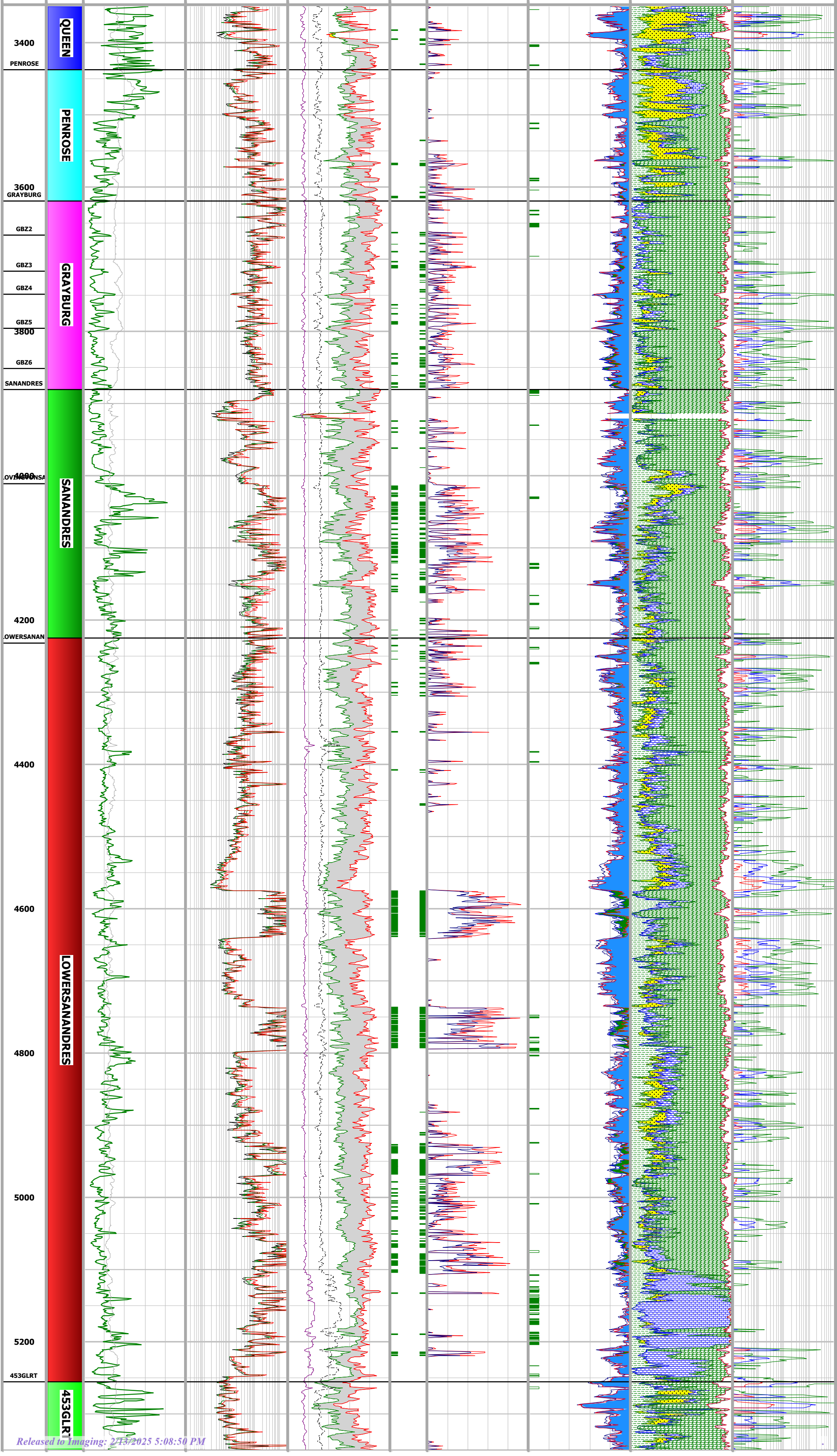
Meyer B 4-33

DB : IP_Empire (23)

DEPTH (3350FT - 5350FT)

01/15/2025 09:54

2	3	GammaRay	6	7	Logic	Saturation	Porosity	Lithology	17
DEPTH (FT) Sand Picks	Final_Tops_r	GRD 0. 150. HCALD 6. 16.	RLA3 0.2 2000. RLA4 0.2 2000. RLA5 0.2 2000.	TNPH_LS 0.45 -0.15 RHOZ 1.95 2.95 PEFZ 0. 10. RHOZ 1.95 2.95 TNPH_LS 0.45 -0.15 PEFZ 0. 20.	PayFlaglo 0. 5. PayFlaghi 5. 0.	SWThi 1. 0. SWTlo 1. 0.	PHIT 0.5 0. PHIE 0.5 0. BVW 0.5 0. baffle 0. 10.	VWCL 0. 1. PHIE 1. 0. VSand 0. 1. VLime 0. 1. VDol 0. 1. VCOAL 0. 1. VSALT 0. 1. VANHY 0. 1. KillFlag 0. 1.	K_LUCIA1 0.2 2000. K_LUCIA2 0.2 2000. K_LUCIA3 0.2 2000.



Petrophysical Analysis

Company
Well Name Meyer B 4-34
Field OIL CENTER
Country State
Location

Exhibit L-43

IP 2024

Scale : 1 : 1200

Meyer B 4-34

DB : IP_Empire (18)

DEPTH (3350FT - 5460FT)

01/15/2025 09:02

2	3	GammaRay	6	7	Logic	Saturation	Porosity	Lithology	17
DEPTH (FT) Sand Picks	Final_Tops_r	GRD 0. 150. HCALD 6. 16.	HLLD 0.2 2000. HLLS 0.2 2000.	TNPH_LS 0.45 -0.15 RHOZ 1.95 2.95 PEFZ 0. 10. RHOZ 1.95 2.95 TNPH_LS 0.45 -0.15 DT 140. 40. PEFZ 0. 20.	PayFlaglo 0. 5. PayFlaghi 5. 0.	SWThi 1. 0. SWTlo 1. 0.	PHIT 0.5 0. PHIE 0.5 0. BVW 0.5 0. baffle 0. 10.	VWCL 0. 1. PHIE 1. 0. VSand 0. 1. VLime 0. 1. VDol 0. 1. VCOAL 0. 1. VSALT 0. 1. VANHY 0. 1. KillFlag 0. 1.	K_LUCIA1 0.2 2000. K_LUCIA2 0.2 2000. K_LUCIA3 0.2 2000.

Petrophysical Analysis

Company	TEXACO E&P INC.
Well Name	NEW MEXICO "H" STATE NCT-4
Field	PERMIAN DEVONIAN
Country	USA
State	NEW MEXICO
Location	2200' FSL & 1960' FWL NESW

Exhibit L-44

IP 2024

Scale : 1 : 1200

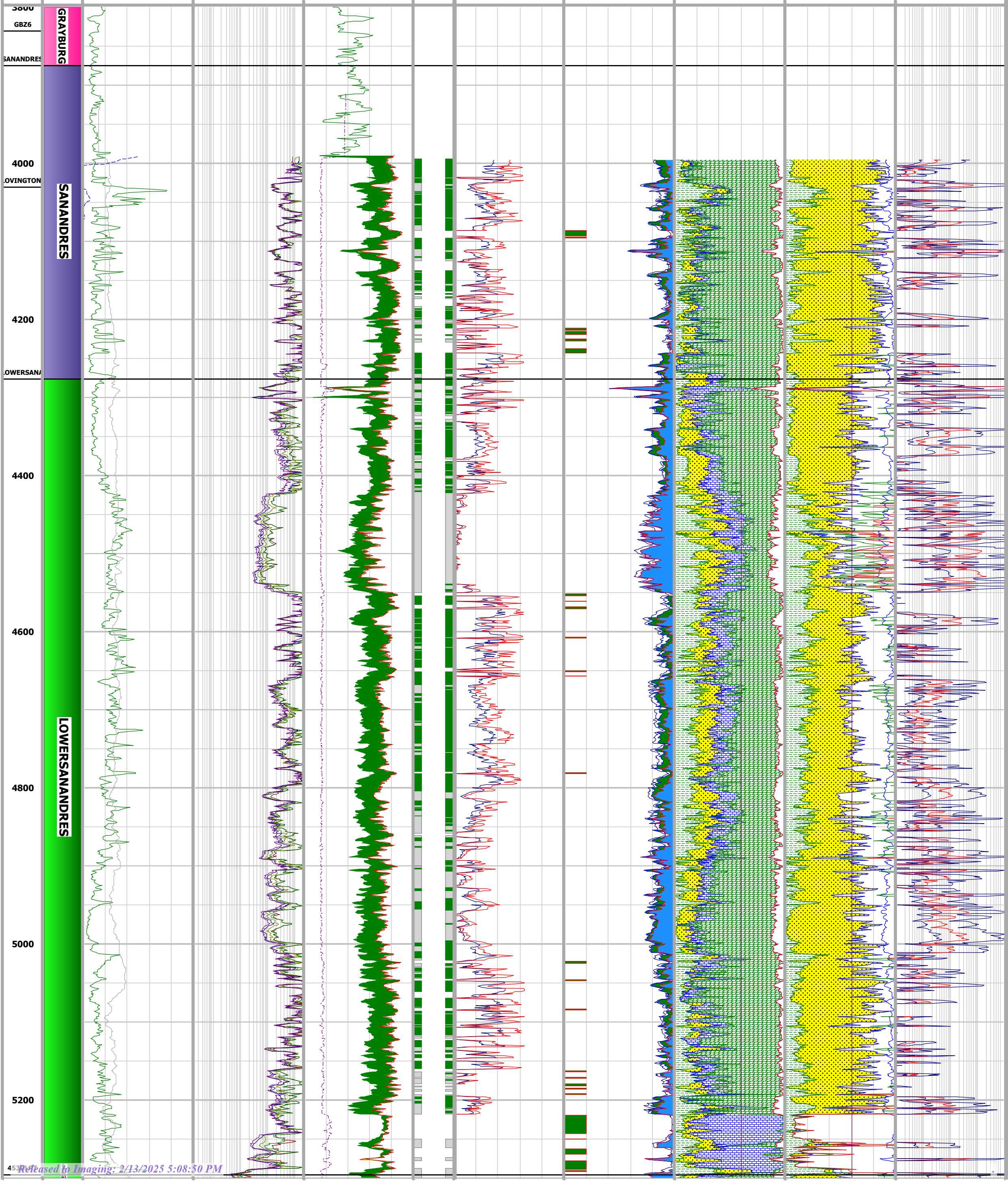
NEW MEXICO "H" STATE NCT-4

DB : IP_Empire (31)

DEPTH (3800FT - 5300FT)

01/28/2025 21:38

3	4	GammaRay	7	8	Logic	Saturation	Porosity	Lithology	Lithology	21
DEPTH (FT) CopyOf Final_Tops_r	Final_Tops_r	GR 0. 150. CALI 6. 16. SP 0. 150.	AHF10 0.2 2000. AHF20 0.2 2000. AHF30 0.2 2000. AHF60 0.2 2000. AHF90 0.2 2000.	PEFZ 0. 20. NPHI 0.45 -0.15 RHOZ 1.95 2.95	ResFlaglo 0. 5. PayFlaglo 0. 5. ResFlaghi 5. 0. PayFlaghi 5. 0.	SWTlo 1. 0. SWThi 1. 0.	PHIT 0.5 0. PHIE 0.5 0. BVW 0.5 0. baffle 0. 5.	VWCL 0. 1. PHIE 1. 0. VSand 0. 1. VLime 0. 1. VDol 0. 1. VCOAL 0. 1. VSALT 0. 1. VANHY 0. 1. KillFlag 0. 1.	VWCL 0. 1. PHIE 1. 0. VDol 0. 1. VDol 0. 1. VCOAL 0. 1. VSALT 0. 1. VANHY 0. 1. KillFlag 0. 1.	K_LUCIA1 0.01 100. K_LUCIA2 0.01 100. K_LUCIA3 0.01 100.



Petrophysical Analysis

Company
Well Name OC Fed Com1
Field WILDCAT
Country State
Location

Exhibit L-45

IP 2024

Scale : 1 : 1200

OC Fed Com1

DB : IP_Empire (21)

DEPTH (3300FT - 5400FT)

01/15/2025 09:48

1	3	GammaRay	6	7	14	15	Porosity	Lithology	19
DEPTH (FT) CopyOf Final_Tops_r	Final_Tops_r	CALI 6. 16. GR 0. 150.	LLS 0.2 2000. LLD 0.2 2000.	RHOB 1.95 2.95 PEF 0. 20. NPHI 0.45 -0.15	PayFlaglo 0. 5. PayFlaghi 5. 0.	SWTlo 1. 0. SWThi 1. 0.	PHIT 0.5 0. PHIE 0.5 0. BVWSXO 0.5 0. BVW 0.5 0. baffle 0. 10.	VWCL 0. 1. PHIE 1. 0. VSand 0. 1. VLime 0. 1. VDol 0. 1. VCOAL 0. 1. VSALT 0. 1. VANHY 0. 1. KillFlag 0. 1.	K_LUCIA1 0.02 200. K_LUCIA2 0.02 200. K_LUCIA3 0.02 200.

QUEEN

3400

PENROSE

QUEEN

3600

GRAYBURG

PENROSE

GBZ2

GBZ3

GBZ4

GBZ5

3800

GBZ6

SANANDRES

GRAYBURG

4000

LOVINGTON

4200

LOWERSANA

SANANDRES

4400

4600

4800

LOWERSANANDRES

5000

5200

453GLRT

453GLRT

Petrophysical Analysis

Company: Goodnight Midstream Permian, LLC
Well Name: Nolan Ryan SWD #1
Field: Eunice
Country: StateNew Mexico
Location: 779' FSL & 1995' FEL

Exhibit L-46

IP 2024

Scale : 1 : 1200

Nolan Ryan SWD #1

DB : IP_Empire (26)

DEPTH (3550FT - 4813FT)

01/28/2025 21:12

1	2	GammaRay	5	6	Logic	Saturation	Porosity	Lithology	16
DEPTH (FT) CopyOf Final_Tops_r	Final_Tops_r	GRD 0. 150. CALI 6. 16.	RLA5 0.2 2000. RLA4 0.2 2000. RLA3 0.2 2000.	NEUT_TGSAR 0.45 -0.15 RHOZ 1.95 2.95 PEFZ 0. 20.	PayFlaglo 0. 5. PayFlaghi 5. 0.	SWThi 1. 0. SWTlo 1. 0.	PHIT 0.5 0. PHIE 0.5 0. BVWSXO 0.5 0. BVW 0.5 0. baffle 0. 10.	VWCL 0. 1. PHIE 1. 0. VSand 0. 1. VLime 0. 1. VDol 0. 1. VCOAL 0. 1. VSALT 0. 1. VANHY 0. 1. KillFlag 0. 1.	K_LUCIA1 0.01 100. K_LUCIA2 0.01 100. K_LUCIA3 0.01 100.

QUEEN
PENROSE
3600
PENROSE
GRAYBURG
3800
GBZ2
GBZ3
GBZ4
GBZ5
4000
SANANDRES
LOVINGTON
SANANDRES
4200
LOWERSANA
4400
LOWERSANANDRES
4600
4800

Petrophysical Analysis

Company CONOCO INC
Well Name SEMO NO 123
Field MONUMENT TUBB /HEIR DRINKAR
Country USA StateNM
Location 1860 AL AND 660 FEL SENE

Exhibit L-47

IP 2024

Scale : 1 : 1200

SEMO NO 123

DB : IP_Empire (29)

DEPTH (3400FT - 4997.5FT)

01/28/2025 20:34

1	2	GammaRay	5	6	Logic	Saturation	Porosity	Lithology	16
DEPTH (FT) CopyOf Final_Tops_r	Final_Tops_r	GR 0. 150. CALI 6. 16.	LLD 0.2 2000. MSFL 0.2 2000. LLS 0.2 2000.	NEUT_TGSAR 0.45 -0.15 RhoB 1.95 2.95 PE 0. 20.	PayFlaglo 0. 5. PayFlaghi 5. 0.	SWThi 1. 0. SWTlo 1. 0.	PHIT 0.5 0. PHIE 0.5 0. BVWSXO 0.5 0. BVW 0.5 0. baffle 0. 10.	VWCL 0. 1. PHIE 1. 0. VSand 0. 1. VLime 0. 1. VDol 0. 1. VCOAL 0. 1. VSALT 0. 1. VANHY 0. 1. KillFlag 0. 1.	K_LUCIA1 0.01 100. K_LUCIA2 0.01 100. K_LUCIA3 0.01 100.

QUEEN
PENROSE
3600
PENROSE
GRAYBURG
GBZ2
GBZ3
3800
GBZ5
GBZ6
SANANDRES
SANANDRES
4000
LOWERSANA
4200
LOWERSANDRES
4400
4600
4800

Exhibit L-48

Petrophysical Interpretation

Company	AMERADA HESS CORPORATION
Well Name	NORTH MONUMENT G SA UNIT BULK 5 #22
Field	EUNICE-MONUMENT
Country	UNITED STATES OF AMERICA
State	NEW MEXICO
Location	S19 T19S R37E

IP 2024

Scale : 1 : 1200

NORTH MONUMENT G SA UNIT BULK 5 #22

DB : IP_Empire (34)

DEPTH (3960FT - 4550FT)

01/28/2025 21:17

1	2	4	6	7	8	Logic	Saturation	Porosity	Lithology
DEPTH (FT) CopyOf Final_Tops_r	tvdss ()	Final_Tops_r	GR_TGSAR 0. 150. CALI 6. 16.	AR:LLD 0.2 2000. AR:LLS 0.2 2000. RES_TGSAR 0.2 2000.	AR:NPHI 0.45 -0.15 AR:RHOB 1.95 2.95 AR:DT 140. 40. AR:PEF 0. 20. AR:DRHO -0.75 0.25	PayFlag 0. 5.	SW 1. 0. SWT 1. 0. core:Soil (%) 0 100	PHIT 0.5 0. PHIE 0.5 0. BVWSXO 0.5 0. BVW 0.5 0. PHISECU -0.1 0.4 core:phit (%) 50 0 Hydrocarbon Water	VWCL 0. 1. PHIE 1. 0. VSand 0. 1. VLime 0. 1. VDol 0. 1. VCOAL 0. 1. VSALT 0. 1. VANHY 0. 1. KillFlag 0. 1. Clay Porosity Sandstone Limestone Dolomite Silt Coal Salt Anhydrite No Analysis

San Andres

Lovington

Lower San A

4000 4200 4400

-300 -350 -400 -450 -500 -550 -600 -650 -700 -750 -800

San Andres

Lower San Andres

1	2	4	6	7	8	Logic	Saturation	Porosity	Lithology
DEPTH (FT) CopyOf Final_Tops_r	tvdss ()	Final_Tops_r	GR_TGSAR 0. 150. CALI 6. 16.	AR:LLD 0.2 2000. AR:LLS 0.2 2000. RES_TGSAR 0.2 2000.	AR:NPHI 0.45 -0.15 AR:RHOB 1.95 2.95 AR:DT 140. 40. AR:PEF 0. 20. AR:DRHO -0.75 0.25	PayFlag 0. 5.	SW 1. 0. SWT 1. 0. core:Soil (%) 0 100	PHIT 0.5 0. PHIE 0.5 0. BVWSXO 0.5 0. BVW 0.5 0. PHISECU -0.1 0.4 core:phit (%) 50 0 Hydrocarbon Water	VWCL 0. 1. PHIE 1. 0. VSand 0. 1. VLime 0. 1. VDol 0. 1. VCOAL 0. 1. VSALT 0. 1. VANHY 0. 1. KillFlag 0. 1. Clay Porosity Sandstone Limestone Dolomite Silt Coal Salt Anhydrite No Analysis

Petrophysical Analysis

Company	Goodnight Midstream Permian, LLC
Well Name	Ted SWD 1
Field	SWD
Country	StateNew Mexico
Location	2,402' FNL & 1,911' FWL--Sec 28, T21S, R 36E.

Exhibit L-49

IP 2024

Scale : 1 : 1200

Ted SWD 1

DB : IP_Empire (24)

DEPTH (3730FT - 5750FT)

01/15/2025 10:03

1	3	GammaRay	6	7	14	15	Porosity	Lithology	19
DEPTH (FT) CopyOf Final_Tops_r	Final_Tops_r	GRRED 3.655 – 186.916 CALR 6. – 16.	LLS 0.2 – 2000. LLD 0.2 – 2000.	NPHI_LS 0.45 – -0.15 RhoB 1.95 – 2.95 PE 0. – 10.	PayFlaglo 0. – 5. PayFlaghi 5. – 0.	SWTlo 1. – 0. SWThi 1. – 0.	PHIT 0.5 – 0. PHIE 0.5 – 0. BVWSXO 0.5 – 0. BVW 0.5 – 0. baffle 0. – 10.	VWCL 0. – 1. PHIE 1. – 0. VSand 0. – 1. VLime 0. – 1. VDol 0. – 1. VCOAL 0. – 1. VSALT 0. – 1. VANHY 0. – 1. KillFlag 0. – 1.	K_LUCIA1 0.02 – 200. K_LUCIA2 0.02 – 200. K_LUCIA3 0.02 – 200.

Petrophysical Analysis

Company GOODNIGHT MIDSTREAM PERMIAN, LLC

Well Name YAZ 28 SWD 1

Field Eunice

Country USA State New Mexico

Location 230’ FNL & 236’ FEL

Exhibit L-50

IP 2024

Scale : 1 : 1200

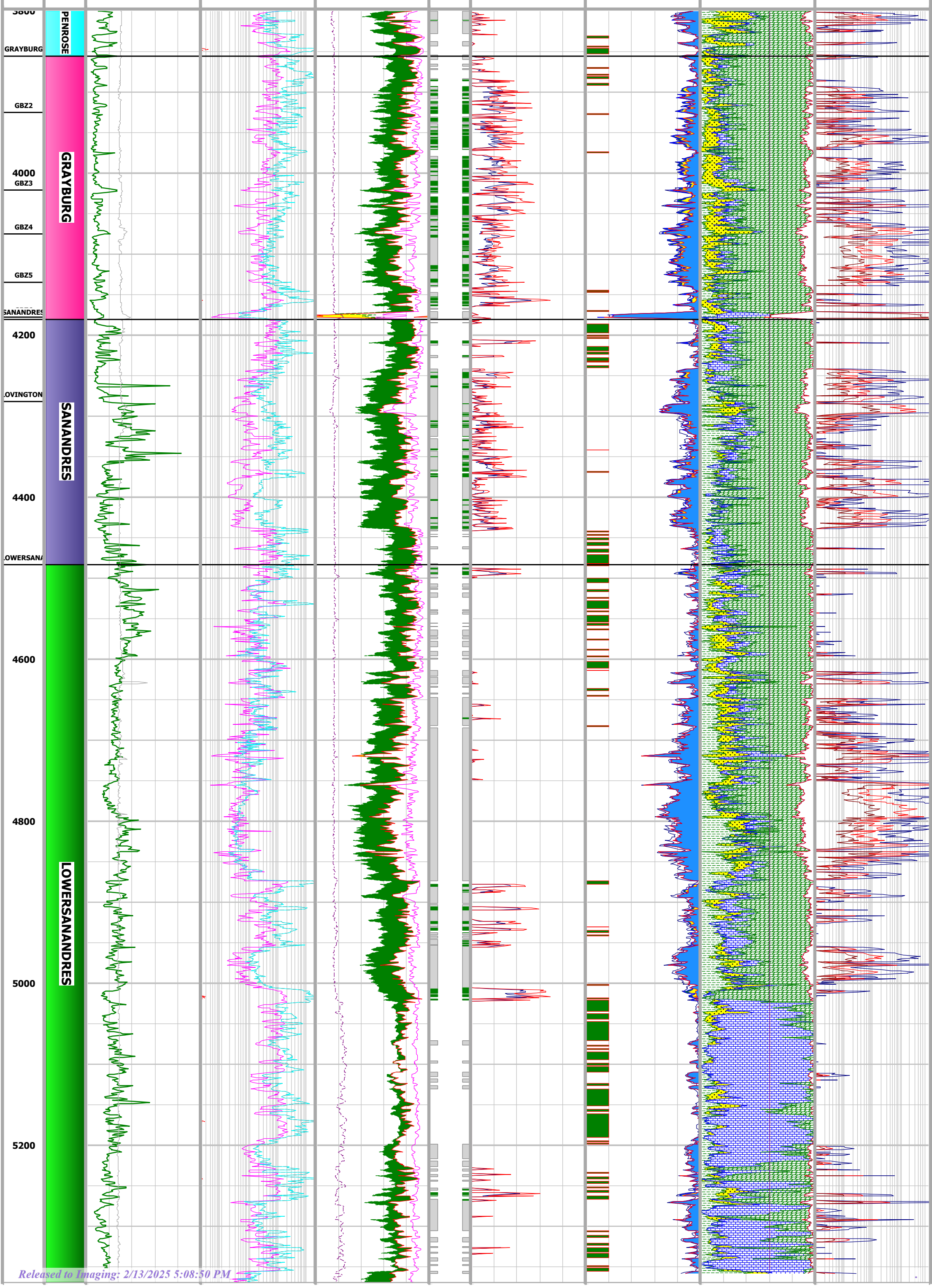
YAZ 28 SWD 1

DB : IP_Empire (27)

DEPTH (3800FT - 5370FT)

01/28/2025 21:06

1	2	GammaRay	6	7	Logic	Saturation	Porosity	Lithology	20
DEPTH (FT) CopyOf Final_Tops_r	Final_Tops_r	GRD 0. 150. CALI 6. 16.	RLA3 0.2 2000. RXOZ 0.2 2000. RLA3ED 0.2 2000.	NEUT_TGSAR 0.45 -0.15 RHOZ 1.95 2.95 PEFWS 0. 20. DTCO 140. 40.	ResFlaglo 0. 5. PayFlaglo 0. 5. ResFlaghi 5. 0. PayFlaghi 5. 0.	SWTlo 1. 0. SWThi 1. 0.	PHIT 0.5 0. PHIE 0.5 0. BVWSXO 0.5 0. BVW 0.5 0. baffle 0. 5.	VWCL 0. 1. PHIE 1. 0. VSand 0. 1. VLime 0. 1. VDol 0. 1. VCOAL 0. 1. VSALT 0. 1. VANHY 0. 1. KillFlag 0. 1.	K_LUCIA1 0.01 100. K_LUCIA2 0.01 100. K_LUCIA3 0.01 100.



Petrophysical Analysis

Company CHEVRON USA INC
Well Name CENTRAL DRINKARD UNIT ##441
Field DRINKARD
Country U.S.A. State NEW MEXICO
Location SWNWNW

Exhibit L-51

IP 2024

Scale : 1 : 1200

CENTRAL DRINKARD UNIT ##441

DB : IP_Empire (30)

DEPTH (3400FT - 4997.5FT)

01/28/2025 20:26

1	2	GammaRay	5	6	Logic	13	Porosity	Lithology	17
DEPTH (FT) CopyOf Final_Tops_r	Final_Tops_r	SGR 0. 150. SP 0. 150. HCAL 6. 16.	RXOZ 0.2 2000. RLA5 0.2 2000. RLA3 0.2 2000.	PEFZ 0. 20. RHOZ 1.95 2.95 TNPH 0.45 -0.15	ResFlaglo 0. 5. PayFlaglo 0. 5. ResFlaghi 5. 0. PayFlaghi 5. 0.	SWTlo 1. 0. SWThi 1. 0.	PHIT 0.5 0. PHIE 0.5 0. BVWSXO 0.5 0. BVW 0.5 0. baffle 0. 5.	VWCL 0. 1. PHIE 1. 0. VSand 0. 1. VLime 0. 1. VDol 0. 1. VCOAL 0. 1. VSALT 0. 1. VANHY 0. 1. KillFlag 0. 1.	K_LUCIA1 0.01 100. K_LUCIA2 0.01 100. K_LUCIA3 0.01 100.

3400
QUEEN
3600
GRAYBURG
GBZ2
GBZ3
3800
GBZ4
GBZ5
GBZ6
SANANDRES
LOVINGTON
4000
LOWERSANA
4200
4400
4600
4800

QUEEN
GRAYBURG
SANANDRES
LOWERSANANDRES

Petrophysical Analysis

Company
Well Name WALLACE STATE 7
Field OIL CENTER
Country State
Location

Exhibit L-52

IP 2024

Scale : 1 : 1200

WALLACE STATE 7

DB : IP_Empire (32)

DEPTH (3600FT - 5300FT)

01/28/2025 21:36

3	4	GammaRay	7	8	Logic	Saturation	Porosity	Lithology	20
DEPTH (FT) CopyOf Final_Tops_r	Final_Tops_r	GR_TGSAR 0. 150. CALI 6. 16.	RES_TGSAR 0.2 2000.	NEUT_TGSAR 0.45 -0.15 DEN_TGSAR 1.95 2.95 DT 140. 40.	ResFlaglo 0. 5. PayFlaglo 0. 5. ResFlaghi 5. 0. PayFlaghi 5. 0.	SWTlo 1. 0. SWThi 1. 0.	PHIT 0.5 0. PHIE 0.5 0. BVW 0.5 0. baffle 0. 5.	VWCL 0. 1. PHIE 1. 0. VSand 0. 1. VLime 0. 1. VDol 0. 1. VCOAL 0. 1. VSALT 0. 1. VANHY 0. 1. KillFlag 0. 1.	K_LUCIA1 0.01 100. K_LUCIA2 0.01 100. K_LUCIA3 0.01 100.

3600
PENROSE
GRAYBURG
GBZ2
GBZ3
GBZ4
3800
GBZ5
GBZ6
SANANDRES
4000
LOVINGTON
4200
LOWERSANA
4400
4600
4800
5000
5200
4536LPT

EXHIBIT L-53

Curriculum Vitae

Stanley 'Scott' Birkhead (M.Sc.)
Principal Petrophysicist/Owner
Petrobrane Petrophysical Consulting LLC

Profile

Extensive knowledge and experience in the petrophysical evaluation and assessment of conventional, unconventional, carbonate, multimineral, CO2 injection, and geothermal wells	Wide experience working with core data and with core/log integration including mudlogs
Field studies, Operational Petrophysics, Reserves calculation, Experimental Design	Low Resistivity Low Contrast Pay evaluation expertise
Formation Evaluation Planning, wireline tendering and execution	Exploration and development petrophysics
Years of experience and great love of training and mentoring in Petrophysics from the intern to the classroom level	Broad experience working with modern, historic, as well as Eastern European logs

Education

Texas A&M University
2001 Bachelor of Arts: Geology
2005 Master of Science: Geology
Thesis: Architecture of the Upper Sego Sandstone, Book Cliffs, Utah
Advisor: Dr. Brian Willis

Professional Experience

Independent Petrophysical Consulting
Principal Petrophysicist (full time) 9/15/22 – 10/05/2022

Petrobrane Petrophysical Consulting LLC
Owner, Principal Petrophysicist 10/05/2022 - current
Clients:

Projeo Corporation 07/2024

- Petrophysical consultant evaluating the petrophysical potential for upcoming CCUS project and for input into reservoir models

ARI (Advanced Resources International, Inc) 07/2024 - current

- Petrophysical mentoring
- Evaluating planned logging programs for operational wells, meeting with vendors
- Recommendations for logging strategies, sticking mitigation, etc.

- Evaluating the petrophysical potential for upcoming CCUS project and for input into reservoir models

Alpha Energy 06/2024 - 08/2024

- Petrophysical field study for field optimization

Armstrong Oil and Gas 12/2023 - present

- Petrophysical consultant for spring drilling campaign on North Slope of Alaska
- Worked wellsite wireline operations on company's behalf
- Consulted on Wireline program with operator and partners
- Troubleshot wellsite issues and ensured data quality
- Petrophysical interpretation

Quidnet Energy 11/2023 - present

- Petrophysical consultant reviewing appropriateness of reservoirs for application and testing of new technology

Ops Geologic 9/2022 - present

- Petrophysical consultant to clients of Ops Geologic
- Projects include exploration, field studies, bypassed pay, LRLC, conventional, and unconventional reservoirs
- Worked on multiple projects in the continental US

Criterion Energy Partners 9/2022-7/2023

- Consulting Petrophysicist to Criterion geothermal projects
- Projects include exploration, field studies, outputs for modelling, correlation, delineation of objective zones for production and salt water disposal

Talos Low Carbon Solutions 10/2022-4/2024

- Planned, executed, and interpreted the formation evaluation of the first offshore CCUS well in the Gulf Coast
- Consulting Petrophysicist for Talos Low Carbon Solutions
- Assessed viability of several areas in the Gulf Coast arena for CCUS
- Petrophysical support and guidance for multiple projects
- Wireline tendering, vendor selection, program design
- Formation evaluation related Class VI permitting experience
- Communication and integration with partners
- Work with modelers to ensure proper distribution of properties

Western Midstream 10/2022-present

- Operations Petrophysics for Western Midstream salt-water disposal wells
- Communication and instruction to wireline crews regarding logging
- Interpretation of data in near real time for wells being evaluated.
- Deliver high quality interpretation to client.
- Detailed work on Geomechanics to support permitting and geology
- Petrophysical support for assessing new objectives for water injection

DeGolyer and MacNaughton

Independent Consultant 11/2/20 - 4/19/21

Senior Petrophysicist (full time) 4/19/21 – 5/20/22

Highlights: Work in the Reservoir Studies Division included petrophysical reserve reviews, reserve upgrades, exploration concept assessment, and uncertainty analysis. Part of a select group that developed a new workflow to correctly bracket client uncertainty deterministically. Also improved communication and morale between petrophysicists by instigating monthly technical Zoom meetings.

Responsibilities:

- Developed petrophysical models and characterized reservoir properties for numerous projects
- Quality control of well logging data from modern, vintage, and Russian sources
- Managed simultaneous projects while maintaining stakeholder communication
- Utilized data specific petrophysical techniques to deal with poor and/or uncalibrated data
- Communicated results through detailed and peer reviewed technical documentation and figures, verbally with clients using translators when necessary, and through a series of presentations documenting the phases of the project.
- Collaborated closely with geologists to ensure quality results with tight deadlines

Kerr McGee | Anadarko Petroleum Corporation | Occidental Petroleum
9/26/2005 – 6/25/2020
Senior Staff Petrophysicist

Highlights: Principal petrophysicist for major assets at different times during their life cycle including Ghana, Mozambique, and unconventional assets. In Mozambique, I worked the multi-billion dollar project to the Final Investment Decision. Post FID and sale of the asset to Total, I finalized the complex multiscale petrophysical model and transferred the knowledge to the new owners. I also have extensive experience in fresh water and low resistivity/low contrast reservoirs.

Responsibilities:

- Extensive international experience
- Developed petrophysical models, characterized reservoir properties for numerous projects, and presented results to management, partners, and NOCs.
- Communicated with drilling rig regarding operations and evaluation program.
- Characterized reservoirs for geologic environments using an array of petrophysical techniques.
- Developed workflows for new techniques and new experiments in log and core analysis.
- Integrated with the teams for major studies, technical documentation, data analytics, peer reviews, wireline tendering, dataroom evaluation, asset sales, and new ventures work.
- Handed off projects, interpretations, and data to new companies such as Total post-acquisition of multi-billion dollar assets such as Golfinho and Prosperidade.
- Trained and mentored staff and secondees.

Regions worked

International: Algeria, Australia, Benin, Brazil, China, Colombia, Equatorial Guinea, The Falklands, Gabon, Ghana, India, Indonesia, Ivory Coast, Kenya, Liberia, Madagascar, Mozambique, Namibia, Newfoundland, New Zealand, Nigeria, Nova Scotia, Peru, Poland, Russian Federation, Senegal, Sierra Leone, South Africa, Trinidad and Tobago, Tunisia, U.K., Ukraine, Uzbekistan, and others

US: Marcellus, Carthage, GOM Deepwater, Gulf Coast (Texas, Louisiana), Natural Buttes, Haynesville, Wamsutter, Eagleford, Eaglebine, Wattenberg, Alaska, Permian Basin, South Texas, Delaware Basin, Wyoming, Mississippi, and more

External Experience

URTEC
Member of volunteer group planning the technical program for the Petrophysical portion of the conference. Involved for 2023, 2024, and starting planning for 2025.
Responsibilities: Part of committee in charge of building Theme 2 (Petrophysics) for the program. Also part of the committee to build a program of special topics and lunches.

Unconventional Resources Special Interest Group/SPWLA
Steering Committee Member holding various officer positions.
Responsibilities: Key planning member of the group that hosted several annual one-day conferences and funded several college scholarships focused on unconventional petrophysical topics. The special interest group has now been dissolved.

Petrophysical Interest Group/AAPG
Steering Committee Member / Instructor
Responsibilities: While still in its formational years, an established goal of the group is education and awareness. Group is currently on hiatus.

Leukemia and Lymphoma Society's Light the Night Walk
Team Captain
Responsibilities: A key leader in Anadarko's main fundraising efforts for this charity for several years.

URTEC 2023-2024

Session Chair/Reviewer/moderator volunteering within the Petrophysical themes and topicals for the conventions

Professional Interests

Teaching, mentoring, research/data integration, freshwater aquifers, low resistivity/low contrast pay, upscaling, modern sedimentary processes, uncertainty analysis, unconventional reservoirs, CO2 sequestration and capture, multimineral analysis, bridging between geology and data science.

References

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Honarpour, M. M., Nagarajan, N. R., Grijalba, A. C., Valle, M., and K. Adesoye. "Rock-Fluid Characterization for Miscible CO2 Injection: Residual Oil Zone, Seminole Field, Permian Basin." Paper presented at the SPE Annual Technical Conference and Exhibition, Florence, Italy, September 2010. doi: https://doi.org/10.2118/133089-MS

Kuukstra, Petrusak, and Wallace, An Eight-County Appraisal of the San Andres Residual Oil Zone (ROZ) “Fairway” of the Permian Basin,1Advanced Resources International, Inc. (ARI), 2020

Love, Tracy, McCarty, Andrew, Miller, Matthew J., and Mark Semmelbeck. "Problem Diagnosis, Treatment Design, and Implementation Process Improves Waterflood Conformance." Paper presented at the SPE Annual Technical Conference and Exhibition, New Orleans, Louisiana, September 1998. doi: https://doi.org/10.2118/49201-MS

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Trentham, Melzer, A "Cookbook" Approach to Evaluating Residual Oil Zones Completed as Horizontal Depressurizing (DUROZ) Wells in the San Andres Formation* Search and Discovery Article #51570 (2019)** Posted May 27, 2019 *Adapted from oral presentation given at 2019 AAPG Southwest Section Annual Convention, Dallas, Texas, April 6-9, 2019

Trentham, Robert C., et al. "Case Studies of the ROZ CO2Flood and the Combined ROZ/MPZ CO2Flood at the Goldsmith Landreth Unit, Ector County, Texas. Using "Next Generation" CO2EOR Technologies to Optimize the Residual Oil Zone CO2Flood." , Jun. 2015. https://doi.org/10.2172/1224947

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Wisenbaker et al, 1973, A course in the fundamentals of Core Analysis, Core Laboratories, Inc.

EXHIBIT D

From: Dana Hardy
To: Adam Rankin; Moander, Chris, EMNRD (Chris.Moander@emnrd.nm.gov)
Cc: Sharon T. Shaheen; Ernest Padilla; jessek.tremaine@emnrd.nm.gov; Dana Hardy
Subject: RE: Goodnight/Empire: Preliminary Agenda - OCC Meeting on April 11, 2024
Date: Wednesday, April 10, 2024 8:34:53 PM
Attachments: image001.png
Commission applications - Proposed Scheduling Order (01693310xB76D6)(1617459.1).docx

External Email

Adam and Chris,

I'm attaching a proposed scheduling order. Please let us know if this works.

Thanks,
Dana

2014 Hinkle Logo

Dana S. Hardy
Partner
Hinkle Shanor LLP
218 Montezuma
Santa Fe, New Mexico 87501
(505) 982-4554 telephone
(505) 930-5702 direct
(505) 982-8623 facsimile
dhardy@hinklelawfirm.com

From: Adam Rankin <AGRankin@hollandhart.com>
Sent: Wednesday, April 10, 2024 9:31 AM
To: Dana Hardy <DHardy@hinklelawfirm.com>; Moander, Chris, EMNRD (Chris.Moander@emnrd.nm.gov) <Chris.Moander@emnrd.nm.gov>
Cc: Sharon T. Shaheen <sshaheen@montand.com>; Ernest Padilla <PadillaLawNM@outlook.com>; jessek.tremaine@emnrd.nm.gov
Subject: RE: Goodnight/Empire: Preliminary Agenda - OCC Meeting on April 11, 2024

Dana and Chris,

I've been able to poll our witnesses. We propose the following one-week slots for a hearing before the OCC on the schedule outlined in my previous email.

- August 26-30
- September 16-20 (OCC regular meeting 9/19)
- September 23-27

The Commission is scheduled for a regular meeting on 9/19, but we should be able to work around that meeting on that day. I understand the PFAS rulemaking is likely going to go in the October/November timeframe, so there shouldn't be a timing conflict over that issue.

Let me know if any of these proposed dates work for Empire and the Division and whether the sequencing outlined below works.

Best,
Adam

Adam Rankin
Partner, Holland & Hart LLP
agrankin@hollandhart.com | **T:** (505) 954-7294 | **M:** (505) 570-0377

From: Adam Rankin
Sent: Monday, April 8, 2024 6:10 PM
To: Dana Hardy <DHardy@hinklelawfirm.com>
Cc: Sharon T. Shaheen <sshaheen@montand.com>; Ernest Padilla <PadillaLawNM@outlook.com>; jessek.tremaine@emnrd.nm.gov; Moander, Chris, EMNRD (Chris.Moander@emnrd.nm.gov) <Chris.Moander@emnrd.nm.gov>
Subject: Goodnight/Empire: Preliminary Agenda - OCC Meeting on April 11, 2024

Dana,

As discussed, we propose a scheduling order that sets out the following:

- Last day to serve subpoenas/discovery – 45 days in advance of hearing (TBD);
- One-week hearing before the Commission (dates TBD and subject to completion of discovery and resolution of discovery objections in advance of the hearing);
- 4 weeks in advance of hearing file direct testimony and prehearing statements in the following cases:
  - 24018-24027 (Empire Cases to Revoke Injection Authority)
    - 24018-24020, 24025 (Inside EMSU)
    - 24021-24024, 24026-24027 (Outside EMSU) [subject to motion to stay cases pending resolution of "EMSU" cases – to be filed]
  - 23775 (Andre Dawson Rate Increase)
  - 24123 (Piazza De Novo)
  - 24277-24278 (Applications Amend to EMSU Orders)
- 2 weeks in advance of hearing file:
  - Objections to direct testimony and exhibits
  - Rebuttal testimony and exhibits in all cases

Can you let us know if this framework is acceptable to Empire?

Chris and Jesse, does this work for the Division?

We are waiting for confirmation on witness availability, but I am asking for dates in late August and September. I hope to have available dates before the status conference on Thursday.

Best,
Adam

Adam Rankin
Partner, Holland & Hart LLP
agrankin@hollandhart.com | **T:** (505) 954-7294 | **M:** (505) 570-0377

From: Dana Hardy <DHardy@hinklelawfirm.com>
Sent: Thursday, April 4, 2024 3:07 PM
To: Adam Rankin <AGRankin@hollandhart.com>
Cc: Sharon T. Shaheen <sshaheen@montand.com>; Ernest Padilla <PadillaLawNM@outlook.com>
Subject: FW: Preliminary Agenda - OCC Meeting on April 11, 2024

External Email

Hi Adam,

We have an Empire/Goodnight status conference next week, and we haven't discussed a proposal for the hearing. Can you send me Goodnight's proposal or let me know if you have time to discuss tomorrow or on Monday? I'm travelling for meetings on Tuesday and Wednesday.

Thanks,
Dana

2014 Hinkle Logo

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From: Apodaca, Sheila, EMNRD <Sheila.Apodaca@emnrd.nm.gov>
Sent: Thursday, April 4, 2024 2:49 PM
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Subject: RE: Preliminary Agenda - OCC Meeting on April 11, 2024

Attached please find the Preliminary Agenda for the OCC Meeting on April 11, 2024.

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EXHIBIT D-1

STATE OF NEW MEXICO
ENERGY, MINERALS AND NATURAL RESOURCES DEPARTMENT
OIL CONSERVATION COMMISSION

APPLICATION OF GOODNIGHT MIDSTREAM PERMIAN, LLC TO AMEND ORDER NO. R-7767 TO EXCLUDE THE SAN ANDRES FORMATION FROM THE EUNICE MONUMENT OIL POOL WITHIN THE EUNICE MONUMENT SOUTH UNIT AREA, LEA COUNTY, NEW MEXICO.	**CASE NO. 24277**
APPLICATION OF GOODNIGHT MIDSTREAM PERMIAN, LLC TO AMEND ORDER NO. R-7765, AS AMENDED TO EXCLUDE THE SAN ANDRES FORMATION FROM THE UNITIZED INTERVAL OF THE EUNICE MONUMENT SOUTH UNIT, LEA COUNTY, NEW MEXICO.	**CASE NO. 24278**
APPLICATIONS OF GOODNIGHT MIDSTREAM PERMIAN, LLC FOR APPROVAL OF SALTWATER DISPOSAL WELLS LEA COUNTY, NEW MEXICO	**CASE NOS. 23614-23617**
APPLICATIONS OF EMPIRE NEW MEXICO LLC TO REVOKE INJECTION AUTHORITY, LEA COUNTY, NEW MEXICO	**CASE NOS. 24018-24027**
APPLICATION OF GOODNIGHT MIDSTREAM PERMIAN LLC TO AMEND ORDER NO. R-22026/SWD-2403 TO INCREASE THE APPROVED INJECTION RATE IN ITS ANDRE DAWSON SWD #1, LEA COUNTY, NEW MEXICO.	**CASE NO. 23775**

[PROPOSED] PRE-HEARING ORDER

This Pre-Hearing Order follows the status conference held on April 11, 2024 before the Oil Conservation Commission. The above-referenced matters shall proceed as follows:

1. These matters will be heard and evidence presented on [DATE]-[DATE 5 DAYS LATER] beginning at 9 am.

2. The last day for issuance of subpoenas shall be 60 days in advance of the hearing.

3. Written direct testimony and exhibits shall be filed 4 weeks prior to the hearing.

4. Dispositive motions shall be filed 4 weeks prior to the hearing, answers will be due 3 weeks prior to the hearing, and replies will be due 1 week prior to the hearing.

5. Other motions, including motions to compel, shall be filed 6 weeks prior to the hearing and answers will be due 5 weeks prior to the hearing. No replies shall be filed. Rulings shall be made on the papers without hearing.

6. Pre-hearing statements shall be filed 2 weeks prior to the hearing and shall include a list of issues common to all of the applications and a list of issues unique to any specific application.

Commented [DH1]: Adam - we think it makes sense to file the prehearing statements once we have each other's direct testimony so we can set out the issues.

7. Rebuttal testimony and exhibits shall be filed 2 weeks prior to the hearing.

8. Objections to testimony and exhibits shall be filed 1 week prior to the hearing.

9. Hearing, if any, on pending dispositive motions shall be held at the start of the evidentiary hearing.

DONE at Santa Fe, New Mexico on the _____ day of _____, 2024.

STATE OF NEW MEXICO
OIL CONSERVATION COMMISSION

_____
Greg Bloom, Commissioner

_____
William Ampomah, Commissioner

_____
Dylan Fuge Chair