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

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

APPLICATIONS OF GOODNIGHT MIDSTREAM PERMIAN LLC FOR APPROVAL OF SALTWATER DISPOSAL WELLS, LEA COUNTY, NEW MEXICO. **DIV. 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. **DIV. CASE NO. 23775**

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

REVISED SELF-AFFIRMED STATEMENT OF JOSEPH A. McSHANE

1. My name is Joseph McShane. I am over eighteen years of age, have personal knowledge of the matters addressed herein, and am competent to provide this Self-Affirmed Statement. I have not previously testified before the New Mexico Oil Conservation Division ("Division").

2. I obtained a Bachelor of Science degree in Geology from Stephen F. Austin State University in August 2001. Since August 2001, I have worked as a petroleum geologist for multiple companies including Chesapeake Energy, Petrohawk Energy, Halcon Resources, Ajax Resources and now Empire Petroleum focused on the characterization, management and development of conventional and unconventional oil and gas assets across multiple geologic basins including the Central Basin Platform and Northwest Shelf in the Permian Basin. In addition to three years of post-graduate work at Stephen F. Austin State University starting in 2005, I have overseen drilling programs, developed pilot proposals for new secondary/tertiary floods, characterized residual oil zones within the San Andres formation across the Permian Basin, and assisted in modeling of carbonate ramp systems. A substantial portion of my work responsibility involves field level geologic characterization, mapping and well log interpretation in addition to well and development planning. A copy of my resume is attached.

3. In the present case, I performed a geologic review and study of the unitized interval at the Eunice Monument South Unit ("EMSU") consisting of the Grayburg and San Andres.

4. As a part of my study on this matter, I have prepared the following exhibits:

- **Geologic Overview of the EMSU**
- **Cross-sections including the proposed Goodnight SWD wells and active wells showing Empire's unitized interval**
- **Top of Grayburg and San Andres structure maps**
- **A representative sampling of seven wells across the EMSU analyzed by Nutech indicating the presence of hydrocarbons within the San Andres reservoir**
- **Confirmation of EMSU 200H Well being completed in the Grayburg**
- **Cross-section detailing lateral variability within Grayburg and San Andres**

A. Geologic Overview of the Grayburg and San Andres

5. The Grayburg formation underlying the EMSU is a mixed carbonate-siliciclastic composite sequence, with porous to non-porous ramp dolostones and interbedded less porous dolomitic sandstones. The Grayburg was deposited in a distally steepened carbonate ramp setting containing inner ramp, ramp crest shoal, and middle ramp facies. The San Andres was deposited in an open marine setting as part of a carbonate ramp setting as well and consists of middle ramp and ramp crest facies. The San Andres also has evidence of subaerial exposure with collapse breccias infilling solution enhanced karst features. The trap at EMSU is structural and stratigraphic in nature with an anticlinal closure on the west, north and south and then stratigraphic to the east where the porous dolograinstones are sealed up-dip by the inner ramp back shoal facies. In essence, the dip angle of the Grayburg and San Andres increases to 3-5 degrees on the west side of the EMSU creating the down-dip limit of the reservoir and up-dip on the eastern side the porosity degrades as a function of the depositional system.

B. Unitized Interval at EMSU

6. **Exhibit G-1(a-c)** consists of a map displaying the EMSU with a Subsea San Andres structure map. The map depicts all wells that penetrate the San Andres formation, Goodnight's active SWD wells and proposed SWDs, and the location of two cross-sections. The two cross-sections detail the unitized interval that was defined in the Commission's order approving the EMSU, which stated: "The Unitized Interval shall include the formations from a lower limit defined by the base of the San Andres formation to an upper limit defined by the top of the Grayburg formation or a -100 foot subsea datum, whichever is higher." The first cross-section depicts Empire's wells within the unit completed in the Grayburg-San Andres reservoir alongside Goodnight's active SWD wells and demonstrates that their perforated interval lies within Empire's unitized formation. The second cross-section details the same unitized interval with the pending SWD applications displayed on the NW-SE line through EMSU.

C. Subsea Structure maps for Grayburg and San Andres Reservoirs

7. **Exhibit G-2(a) and (b)** is a Grayburg Subsea Structure Map made from the top of Empire's unitized interval. The contour interval is 100' with the producing oil-water-contact (POWC) FWL marked at -350'. The map shows a NW-SE strike with dip to the SW. There are no major faults present in the Grayburg section at EMSU but natural fractures have been identified in cores and logs in both San Andres and Grayburg, a suspected cause of water influx from the San Andres. The geologic setting of EMSU is key in characterizing the stratigraphic framework and corresponding structure. The western edge of EMSU experiences a much steeper dip at around 3°-4° compared to ≤2° on the eastern edge of the unit. Deep-seated structures moved during the Laramide orogenic event, causing deformation and leading to the current asymmetric anticline.

8. The San Andres Subsea Structure Map is made from the base of Grayburg/top San Andres exposure surface that is characteristic of the top G9 (Sequence Stratigraphic top of San Andres) regionally. The contour interval is 100' with the lowest known oil from core marked at -750' for reference. The map shows a strike similar to the Grayburg at NW-SE with a SW dip.

D. Log Analysis by Nutech Showcasing Hydrocarbon Presence in San Andres

9. **Exhibit G-3(a-j)** identifies wells across the entire Eunice Monument South Unit that were chosen for detailed open hole ("OH") log analysis to evaluate the presence of hydrocarbons in the San Andres reservoir. This exhibit contains a base map detailing the location of the 7 analyzed wells, 4 of which were recently evaluated using 2005 vintage OH triple combo logs. All 7 of the wells, EMSU 628, 660, 713, 746, 673, 658, and Ryno 1 SWD wells, indicate the presence of hydrocarbons in the San Andres reservoir. The analysis uses a standard Simandoux equation approach with an m & n that fits with San Andres intervals across the Permian. For all of the Nutech logs analyzed; the far left track contains Gamma Ray and Caliper; Track 2 contains an array of Reservoir Quality Pay Flags using a range of different parameters including the free fluid flag, free hydrocarbon flag, low water flag, fair permeability flag, good permeability flag, resistivity mineral flag, permeability mineral flag, gas mineral flag, and porosity mineral flag; Track 3 is Depth; Track 4 contains Resistivity; Track 5 contains Neutron, Sonic and Density Porosity; Track 6 contains Density Correction; Track 7 contains Clay Volume Indicator; Track 8 contains the Lithology Track; Track 9 contains Bulk Volume Water, Bulk Volume Irreducible, Water Saturation and Effective Porosity; Track 10 is calculated Permeability; Track 11 contains calculated Oil in Place per 640 acre section ("OIP/sec") and Track 12 contains an estimation of fracture density.

10. EMSU-658 (Exhibit G-3d) logged 371' of the San Andres formation with 182' net oil interval (> 0.1 md permeability which contains oil) and has multiple packages of pay identified with estimated OIP of 30.29 MMBO/640-acre section. EMSU-673 (Exhibit G-3e) had a Triple Combo (TCOM) OH log run in 2005 covering 362' of the San Andres reservoir with 153' of hydrocarbons present and an estimated OIP of 31.68 MMBO/sec. EMSU-713 (Exhibit G-3f) had a TCOM OH log run in 2005 covering approximately 125'of the San Andres reservoir with 40'

net oil pay. Estimated OIP of 8.02 MMBO/sec is calculated but it is low due to the limited section of San Andres drilled and logged. EMSU-660 (Exhibit G-3g) had a TCOM OH log from 2005 that was analyzed over 431' of the San Andres reservoir and shows 313' of hydrocarbons present with an estimated OIP of 48.62 MMBO/sec. EMSU-746 (Exhibit G-3h) had a TCOM OH log run in 2005 that covers the entire unitized interval and 1223' of the San Andres. The analysis shows 508' of hydrocarbons in the San Andres with an OIP of 62.18 MMBO/sec. Goodnight's Ryno SWD #1 (formerly Snyder SWD #1 shown in Exhibit G-3i) is currently disposing water into the San Andres which is part of Empire's unitized interval. This well is near the down-dip portion of EMSU and has approximately 220' of net oil zone identified with an estimated OIP of 15.62 MMBO/sec. EMSU-628 (Exhibit G-3j) which again had a modern TCOM OH log from 2005 that was analyzed over 590' of the San Andres reservoir and has 266' net oil interval. An OIP of 40.79 MMBO/sec is calculated. These log results show there is significant ROZ in the San Andres.

E. Proof of Residual Oil Zone within the San Andres Reservoir

11. **Exhibit G-4** contains a mudlog that was run on EMSU 660 during drilling that indicates the presence of hydrocarbons. The description across 150' of the San Andres shows good to dull yellow fluorescence with regions of good cut and strong gas shows. The characteristics present in this mudlog align well with other San Andres residual oil zones actively being CO_2 flooded across the Permian Basin, including the Hobbs Unit to the northeast of EMSU. It is typical for mudlogs and well logs within the San Andres Residual Oil Zone to show hydrocarbon presence, but then drill stem tests (DSTs) and production will test 100% water. This occurs because during the Late Cretaceous, there was a regional uplift to the west, causing hydrodynamic flushing with meteoric waters low in salinity, high in sulfate that resulted in the San Andres being left in an imbibition state at residual oil saturations that can only be moved utilizing tertiary recovery methods.

F. Geochemical Evidence of a Residual Oil Zone in the San Andres

12. **Exhibit G-5** is a geochemical analysis from EMSU 679 where the ratio of immobile to mobile oil is calculated utilizing the saturates versus aromatic compounds present and then a percentage aromatics versus depth plot is shown. Literature states that a Residual Oil Zone will characteristically contain a lower percentage of aromatic compounds due to the hydrodynamic flushing of meteoric waters in the Late Cretaceous[1].

G. EMSU 200H Landing Zone

13. **Exhibit G-6** is cross-section displaying the EMSU 200H and associated landing zone accompanied by a location map. There is also a directional well view showing that the horizontal did indeed land in the Grayburg reservoir. Therefore, no production can be allocated to the San Andres. This is important, as an incorrect statement was made in the previous hearing for the Piazza well that we had in fact produced oil on primary from the EMSU 200H, but it is a producing Grayburg well.

[1] Aleidan, "Residual-Oil Zone: Paleo-Oil Characterization and Fundamental Analysis", SPE Res Eval & Eng, 20(02), (2016), Paper Number: SPE-179545-PA.

H. Geologic Barrier between Grayburg and San Andres Reservoirs

14. **Exhibit G-7(a, b)** contains two different cross-sections that look at the Grayburg and San Andres reservoir sections across the EMSU. The cross-sections show the Grayburg-San Andres reservoir section. The blue highlighting shows a dolostone package capped by collapse breccia features just beneath the unconformity surface and Premier Sandstone within the Grayburg. The highlighting is included to show that while not ubiquitous across all of the EMSU, reservoir quality rock with greater than 10% porosity exists just below the Grayburg with varying thicknesses of tight anhydrite layers at the top of San Andres. Near the crest of the structure this reservoir rock is commonly capped by collapse breccias containing fractures that act as fluid conduits. Included in this cross-section is a core description from the EMSU 679 well detailing the collapse breccia features right at the top San Andres near the unconformity, which are known to contain fractures of varying heights and occurrence. There has been extensive work done both in outcrop and in core that shows the presence of dissolution features and fractures near the top San Andres. Also, during the Laramide orogenic event the basinal structural blocks were still shifting and adjusting causing a double-humped asymmetric anticline to form resulting in flexures and fractures. The fractures happen throughout the field but are more prevalent near the crest of the structure where historically the large plumes of San Andres water were seen. The crest of the structure is where Goodnight's current proposed salt-water disposal wells are planned, increasing the risk of contaminating Empire's San Andres residual oil zone and communicating with our Grayburg operations.

I. Conclusions and Recommendations

15. Based on the above analysis and data, it's indisputable that the San Andres formation within the EMSU contains a Residual Oil Zone that can be developed with enhanced oil recovery methodologies such as CO_2 injection. As a result, Goodnight's proposal to inject produced water into the San Andres formation would result in the waste of hydrocarbons and thereby violate Empire's correlative rights.

16. The attached Exhibits were either prepared by me or under my supervision or were compiled from company business records.

17. I understand this Self-Affirmed Statement will be used as written testimony in this case. I affirm that my testimony above is true and correct and is made under penalty of perjury under the laws of the State of New Mexico. My testimony is made as of the date next to my signature below.

Joseph A. McShane

12/6/24
Date

Joe McShane
31403 Imperial Bluff Ct
Spring, TX 77386
832-588-6715
mcshane.joseph@gmail.com

SUMMARY

- 19 years industry experience with 17 years supervising exploration and development projects in emerging unconventional plays and reviewing A&D projects.
- Extensive background specializing in Mesozoic shale and tight gas sand plays in Texas & Louisiana and Late Devonian/Early Mississippian in North Dakota, Lower Permian Midland and Delaware Basins
- Additional experience of similar age carbonate systems and reservoirs of the Gulf Coast Region
- Operational experience on >100 vertical tight gas sand and >300 horizontal shale wells
- Background incorporating and analyzing unconventional data (core, petrophysical logs, geochemical andgeomechanical data) in order to create basin models
- Experience creating and executing optimal development plans based on geologic data

PROFESSIONAL EXPERIENCE

Geology Consultant-Multiple Clients, Houston, TX — *Geology Consultant, 2019– 2024*

Geologic Consulting in Multiple Basins including Upper and Lower Eagleford/ Austin Chalk, Permian /Delaware Basin, Williston Basin, and Ark-La-Tex (Haynesville, Cotton Valley, Travis Peak, Pettit/Sligo etc)

- A&D Activities including technical analysis
- Provided leasing & acquisition recommendations for all property submittals in the above basins
- Developed the science program for a potential new start up from scratch in order to appraise and value company assets and aid in the development of a multi rig drilling program as well as high grading of recompletion candidates.
- Analysis and interpretation of core and petrophysical data in order to assist in the development of Basin models
- Worked with Reservoir team to analyze decline curves, develop type wells, and continually review inventory of wells including evaluations of behind pipe potential and to help maximize reserves and production potential.
- Completion reviews of wells analyzing effectiveness of completion techniques.
- Geosteered wells for multiple clients

Ajax Resources, Houston, TX — *Geologic Manager, 2015 – 2018*

Permian Spraberry and Wolfcamp Shale Exploration & Development

- Geologic manager in charge of geologists/geophysicists and geotechs who are involved in daily operations activities including geosteering, development mapping, and coordinating with other team assets (drilling engineers, etc) for Midland Basin assets located in Andrews and Martin Counties, TX.
- Developed the science program for a new start up from scratch in order to appraise and value company assets and aid in the development of a multi rig drilling program as well as high grading of recompletion candidates.
- Directed analysis and interpretation of core and petrophysical data in order to assist in the development of regional basin models
- Worked closely with Reservoir team to analyze decline curves, develop type wells, and continually review inventory of wells including evaluations of behind pipe potential and to help maximize reserves and production potential.
- Completion reviews of wells analyzing effectiveness of completion techniques.
- Responsible for developing and maintaining the geosciences department budget
- Provided leasing & acquisition recommendations for all property submittals in the above basin

Halcón Resources, Houston, TX — *Senior Geologist/Lead Operations Geology, 2012 – 2015*

Eagle Ford Shale Exploration & Development , Tuscaloosa Marine Shale Exploration & Development , Williston Bakken and Three Forks Shale Exploration & Development

- Lead Operations Geologist in charge of geologists and geotechs who were involved in daily operations activities including geosteering, development mapping, and coordinating with other team assets (drilling engineers, etc)
- Worked closely with Reservoir team to analyze decline curves, develop type wells, and continually review inventory of wells including evaluations of behind pipe potential and to help maximize reserves and production potential.
- Completion reviews of wells analyzing effectiveness of completion techniques.
- Worked to map the various depositional environments in each of the above shale basins and create fairway play maps Including HCPV, and OGIP maps
- Analysis and interpretation of core and petrophysical data in order to assist in the development of Basin models
- Provided leasing & acquisition recommendations for all property submittals in the above basins
- Coordinated master development plans with Land/ Drilling/ Reservoir counterparts
- Negotiated data trades with numerous companies ranging from small independents to majors
- Steering experience drilling 72 wells with ~10,000' laterals; drilled to ~21,000' MD

Comstock Resources, Frisco, TX *Senior Contract Geologist, 2011 – 2012*

Eagle Ford Shale and Haynesville Shale Exploration & Development, and Permian/ Delaware Basin Wolfcamp/ Bone Springs Exploration & Development

- Contributed to new play development
- Exploration and mapping of potential new prospects in South Texas, West Texas, East Texas Basin, and Ark-La-Tex region
- Worked with a team to map and model various characteristics of the Southern Eagle Ford Shale trend, and Delaware Basin
- Provided leasing & acquisition recommendations for all property submittals
- Worked to carryout master development plan of over 100,000 ac. with Land/ Drilling/ Reservoir counterparts
- Supervise data trades with numerous companies ranging from small independents to majors
- Drilled 47 wells with ~5,000' laterals; drilled to ~19,500' MD

Petrohawk Energy Corporation/ BHP Billiton, Houston, TX *Geologist, 2010 – 2011*

Eagle Ford Shale Development

- Contributed to new play development which now has 18 operating rigs, over 105 operated producing wells, >457 Bcfd And 19 Mmbc proved reserves and over 7.3 TCF 406 Mmbc risked resource potential
- Worked on team to map various characteristics of the northeastern Eagle Ford Shale trend
- Provided leasing & acquisition recommendations for all property submittals in the northeastern Eagle Ford Shale play
- Coordinated master development plan of over 150 operated units with Land/ Drilling/ Reservoir counterparts
- Worked closely with Reservoir team to analyze decline curves, develop type wells, and continually review inventory of wells including evaluations of behind pipe potential and to help maximize reserves and production potential.
- Completion reviews of wells analyzing effectiveness of completion techniques.
- Negotiated data trades with numerous companies ranging from small independents to majors
- Steering experience drilling 67 wells with ~5,000' laterals; drilled to ~19,500' MD

Chesapeake Energy Corporation, Oklahoma City, OK *Geologist, 2007 – 2010*

Haynesville Shale Exploration & Development

- Contributed to new play development which now has 40 operating rigs, over 150 operated producing wells, >450 mmcfd gross production and over 30 TCF unrisked reserves
- Worked on discovery team to map various characteristics of the Haynesville Shale trend
- Provided leasing & acquisition recommendations for all Texas property submittals in the Haynesville play
- Coordinated master development plan of over 100 operated units with Land/ Drilling/ Reservoir counterparts
- Negotiated data trades with numerous companies ranging from small independents to majors
- Steering experience drilling 55 wells with ~4,500' laterals; drilled to ~16,000' MD

James Lime Exploration

- Performed study along with other team geologist to determine potential to extend existing vertically developed trends utilizing horizontal drilling methods
- Applied well data to map reservoir characteristics in areas that were previously sub-economic using vertical drilling method
- Presented opportunities to management in several areas along the Late Mesozoic trends

Cotton Valley, Bossier & Cretaceous Travis Peak Development

- Oversaw a 4 rig drilling program with approximately $125 MM annual budget
- Performed multidisciplinary field wide study to optimize production through improvement of completion procedures
- Proposed, planned, and drilled 64 vertical Cotton Valley, Bossier & Travis Peak wells
- Mapped and recommended strategic extension opportunities to existing acreage positions

- Member of acquisition team; reviewed and provided recommendations on over 25 sales packages

Enerquest, Plano, TX *Geologist* **2005 – 2007**
- Responsible for review of logs, including petrophysical calculations and analysis
- Map structural components and depositional components of Lower Cretaceous Travis Peak Formation, in Shelby County, TX

Stephen F. Austin State University, Nacogdoches, TX *Undergraduate Teaching Assistant,* **2005 – 2007**
- Designed lab exercises with a group of Masters Students also working in the geology department
- Responsible for grading lab and test material, while providing positive feedback and advice to the students
- Provided professor with recommendations for changes to lab content at conclusion of the semester

IRCLM Lp., Houston, TX *Geologist,* **2003 – 2005**
- Conducted site investigations to determine site geology, geotechnical properties of the soils, and determine the presence or absence of contaminates.
- Supervised site remediation and closures, as well as assisted in project management and cost tracking.

Weston Solutions, Houston, TX *Geoscientist,* **2001 – 2003**
- Conducted site investigations to determine site geology, geotechnical properties of the soils, and determine the presence or absence of contaminates.
- Supervised site remediations and closures, as well as assisted in project management and cost tracking.
- Managed emergency response teams for oil spills, chemical releases, and various other responses including theColumbia space shuttle recovery.
- Clients included state, and federal agencies, as well as multiple industrial companies.

EDUCATION

Post Graduate Masters work in Geology (2005 - 2008), Stephen F Austin State University, Nacogdoches Texas, Department of Geology

Bachelor of Science in Geology (August 2001), Stephen F Austin State University, Nacogdoches Texas, Department of Geology

PROFESSIONAL AFFILIATIONS

American Association of Professional Geologists (2000 – Present)
Student Chapter Committee – Vice Chair Member (2007 – present)
Education Committee Member (2007 – 2010)
Houston Geological Society (2010 - Present)
East Texas Geological Society (2007- 2010)
Shreveport Geological Society (2007- 2010)

SOFTWARE EXPIERENCE

GeoDirect, StarSteer, SES, Petra, Landmark GeoGraphics Suite, Petrel, Kingdom SMT, Terra View, Techlog, Aries, PDWIN, SmartSection, Microsoft Office Suite, Adobe Illustrator, Spotfire, ArcGIS, HNAV

References available upon request
Citizenship: United States of America

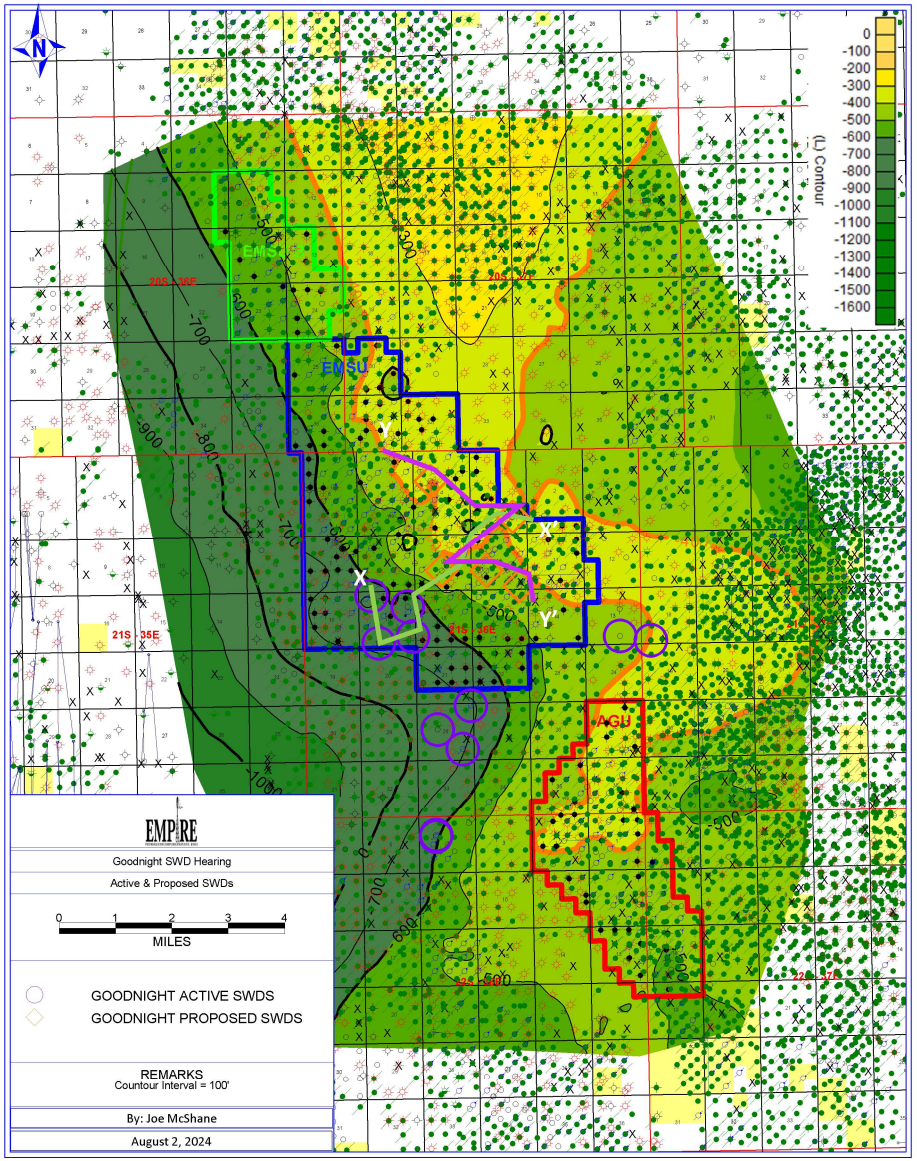
ADDITIONAL TRAINING / EDUCATION

Unconventional Resources- Shale, Coal bed methane	Chesapeake	2009
Modern Carbonate Seminar – Turks and Caicos	Jeff Dravis	2009
Carbonate Core Seminar and Lab	Jeff Dravis	2009
Reservoir Sedimentology & Stratigraphy of Continental Clastic Systems, M027a	Nautilus	2008

Basic Reservoir Engineering	Petroskills	2008
Advanced Well Log Interpretation	Petroskills	2008
Core and Core Analysis	Petroskills	2008
Sequence Stratigraphy: An Applied Workshop	Petroskills	2008
Geogrphix Seisvision	Landmark	2008
Geogrphix Prizm Log Analysis	Landmark	2007
Geogrphix Interpretative Mapping	Landmark	2007
Applied Subsurface Geologic Mapping	SCA	2007

Exhibit G-1(a)

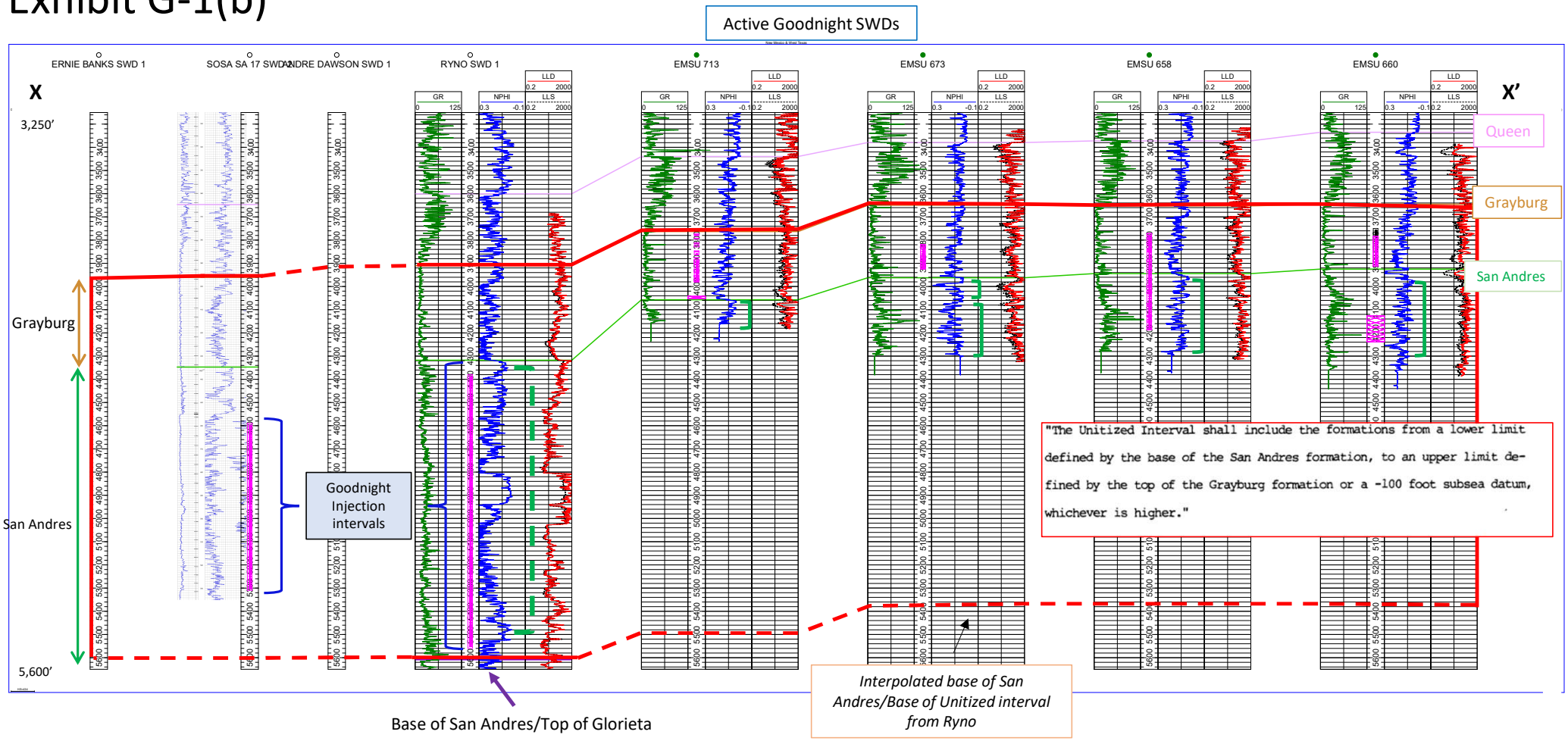
Top San Andres Structure displaying all wells in surrounding area around Eunice & Goodnights Active SWD wells and current pending applications



KEY POINTS

- There is a structural closure in the San Andres interval in the EMSU
- The disposal of water at high rates damages the reservoir and inhibits proper development of our **Unitized Interval**
- Oil in core shows that there is oil down to -762' ss at the EMSU-679

Exhibit G-1(b)



Perfs

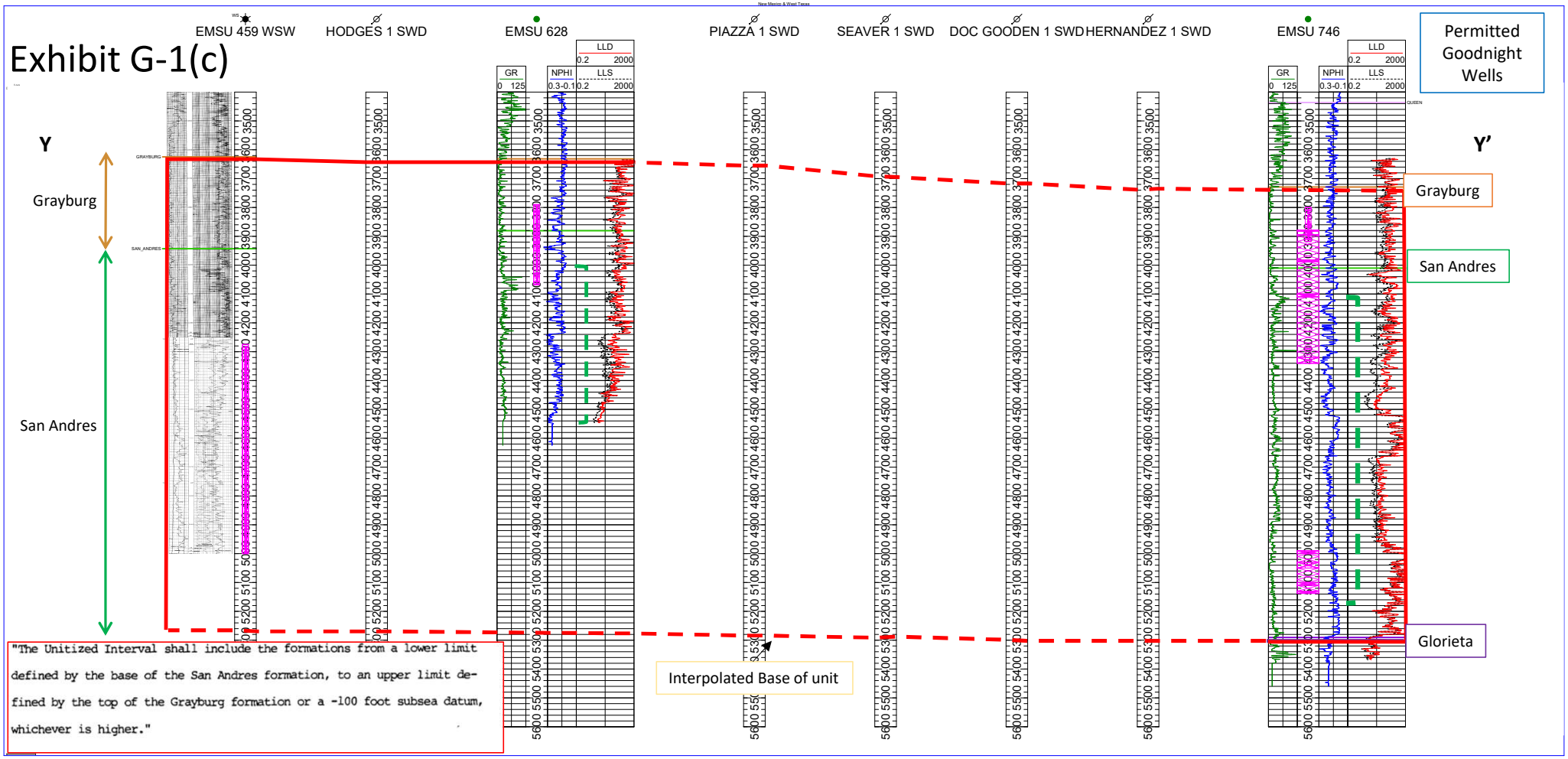
Unitized interval

Oil Saturated Residual Oil Zone

KEY POINTS

- Per the approved unitized agreement with the NMOCD our unit interval consists of the Grayburg and San Andres in their entirety
- There is oil saturation present across all of the EMSU, with some wells being tested and having produced oil from the San Andres
- The disposal of water into the San Andres therefore is damaging Empire's hydrocarbon reserves and violating their correlative rights

Exhibit G-1(c)



Unitized interval

Oil Saturated Residual Oil Zone

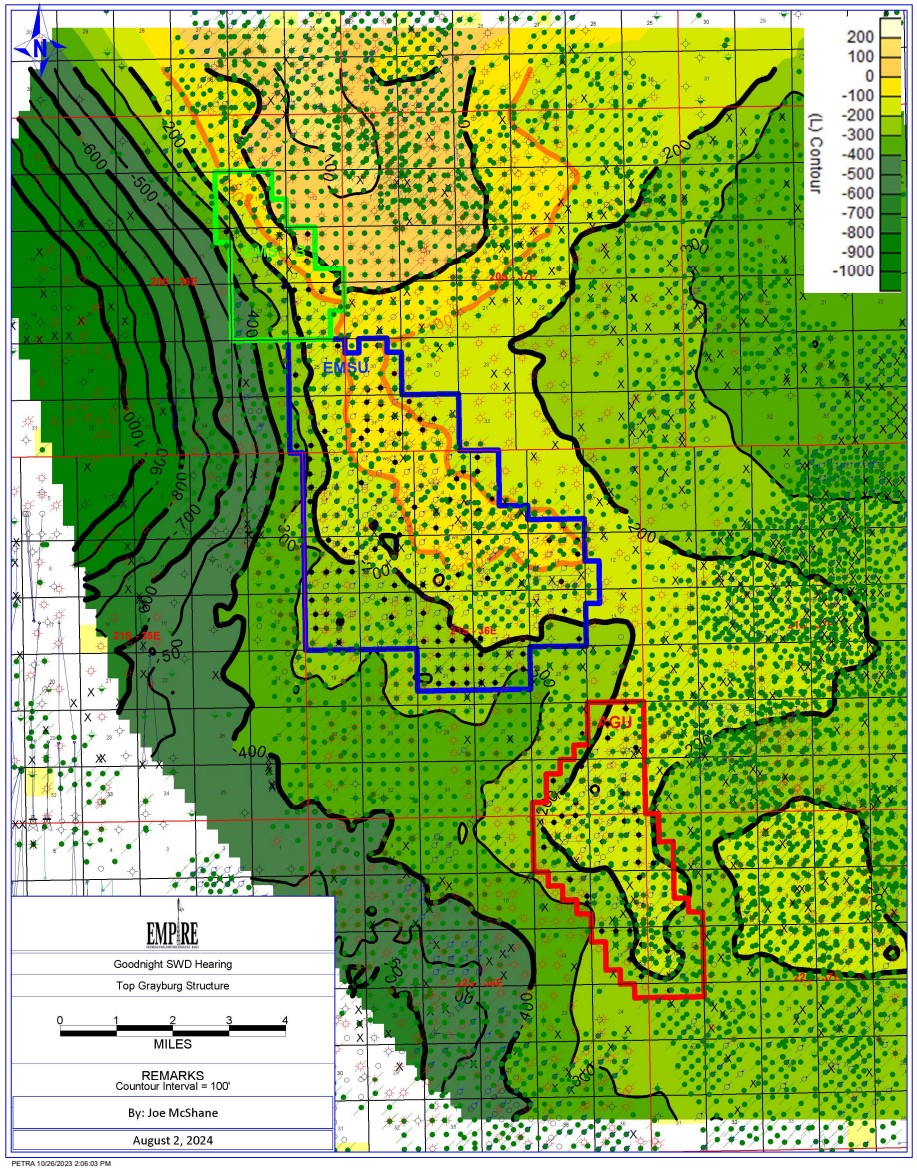
Perfs

KEY POINTS

- Per the approved unitized agreement with the NMOCD our unit interval consists of the Grayburg and San Andres in their entirety
- There is oil saturation present across all of the EMSU, with some wells being tested and having produced oil from the San Andres
- The disposal of water into the San Andres therefore is damaging Empire's hydrocarbon reserves and violating their correlative rights

Exhibit G-2(a)

Top Grayburg Structure

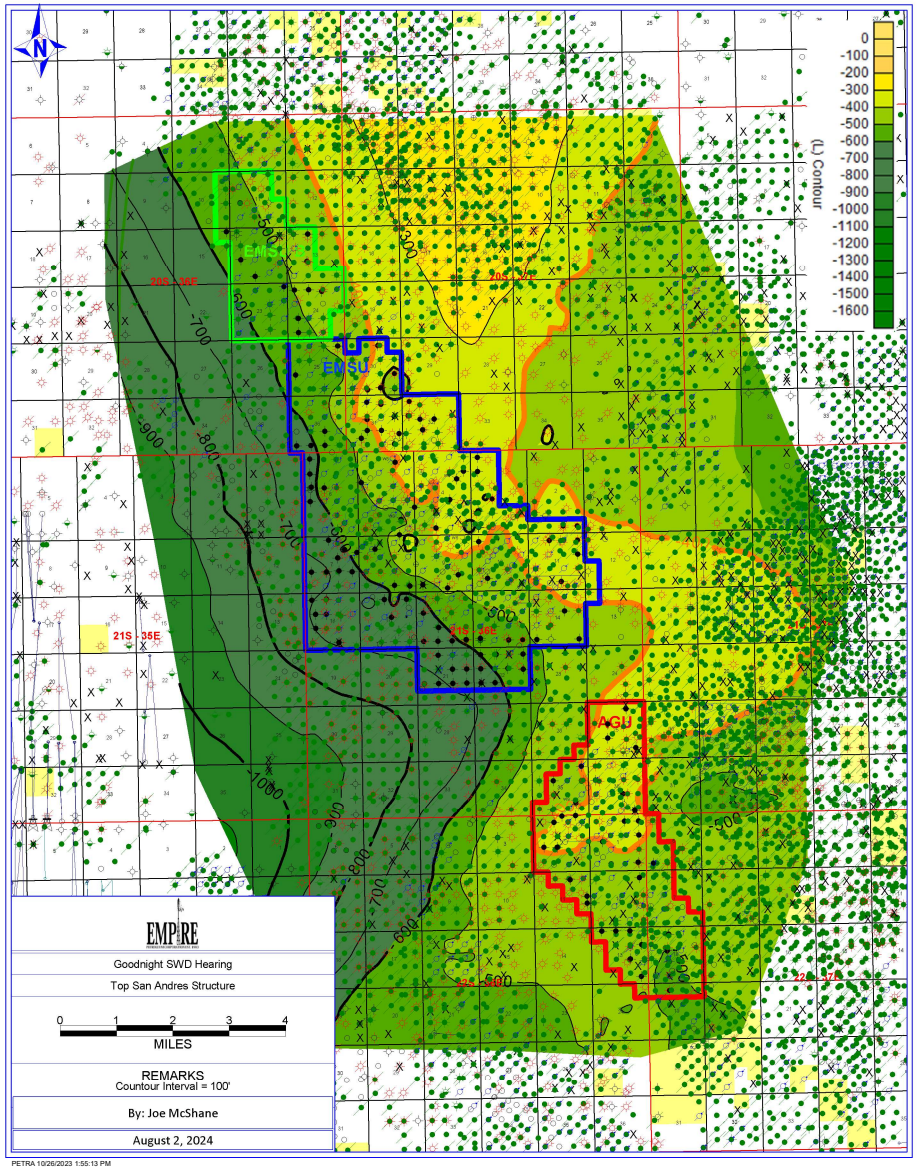


KEY POINTS

- There is a structural closure in the Grayburg interval in the EMSU
- The disposal of water at high rates into the San Andres damages existing waterflood operations in the Grayburg
- No third-party disposal should be allowed inside of the unitized interval as it damages oil and gas production

Exhibit G-2(b)

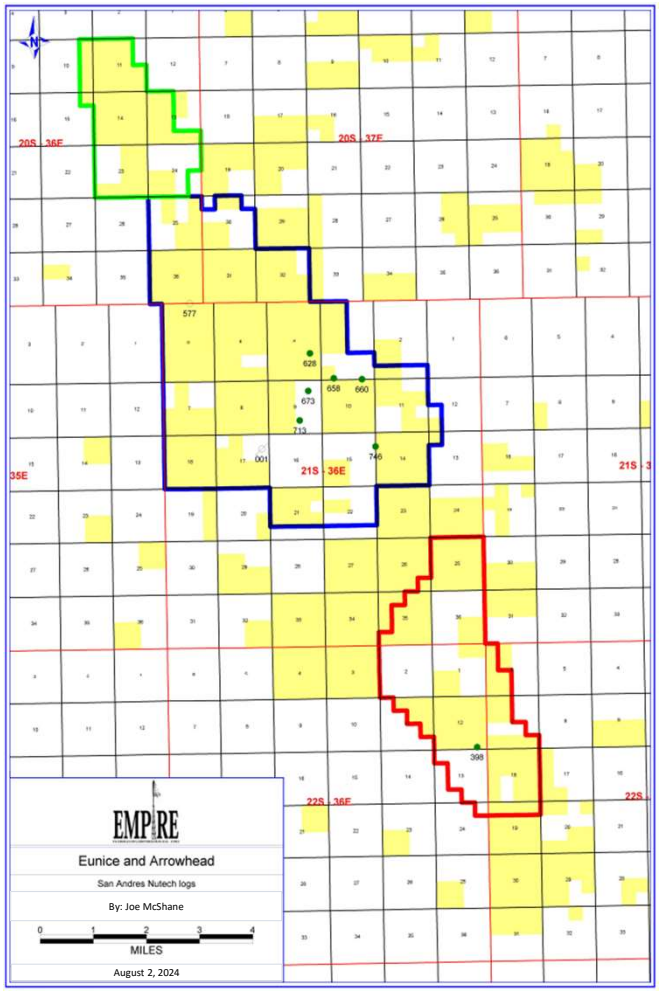
Top San Andres Structure



KEY POINTS

- There is a structural closure in the San Andres interval in the EMSU
- The disposal of water at high rates damages the reservoir and inhibits proper development of our **Unitized Interval**
- Oil in core shows that there is oil down to -762' ss at the EMSU

Exhibit G-3(a) - Nutech log analysis – 7 wells covering the San Andres



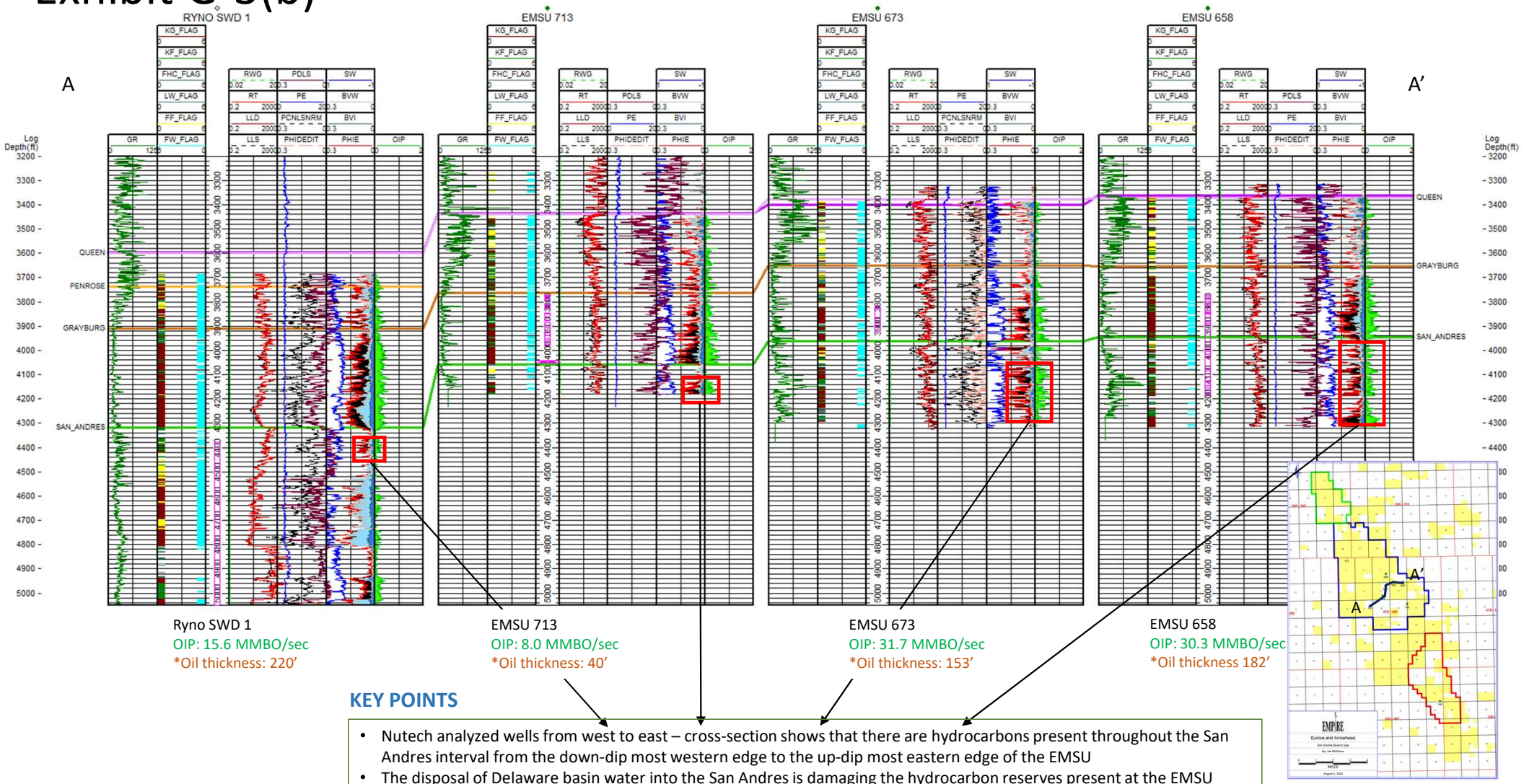
- There were 9 legacy interpreted logs done by Nutech and of those 7 covered some portion of the San Andres reservoir within the Eunice Monument South Unit

- 4 of these were performed recently on 2005 vintage OH logs to evaluate the San Andres for hydrocarbons

KEY POINTS

- One of these wells was Goodnight's Ryno SWD Well
  - According to Nutech's analysis the OIP/section for the Ryno SWD is **15.6 MMBO/sec**
- The wells are aerially distributed across the EMSU representing both down-dip and up-dip reservoir and prove hydrocarbon presence throughout the structure of the EMSU
- On average the wells cover greater than 350 feet of the San Andres reservoir with two (Ryno SWD and EMSU 746) covering over 1000 ft.
- Oil in place volumes were calculated on a per 640 section basis and range from **15.6 MMBO/sec to 62.2 MMBO/sec** if we exclude EMSU-713 which only logged 125' of the San Andres

Exhibit G-3(b)



Ryno SWD 1
OIP: 15.6 MMBO/sec
*Oil thickness: 220'

EMSU 713
OIP: 8.0 MMBO/sec
*Oil thickness: 40'

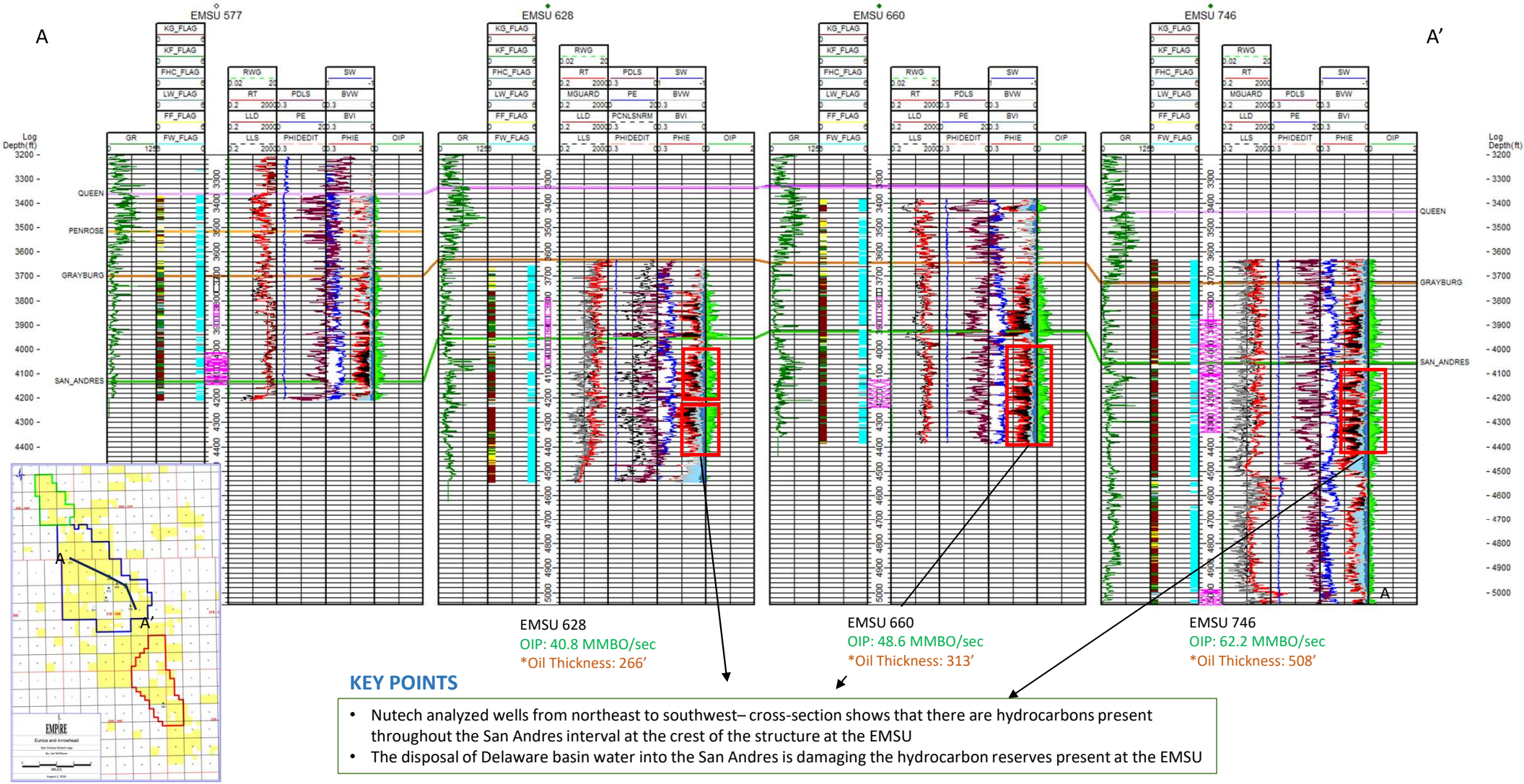
EMSU 673
OIP: 31.7 MMBO/sec
*Oil thickness: 153'

EMSU 658
OIP: 30.3 MMBO/sec
*Oil thickness 182'

KEY POINTS

- Nutech analyzed wells from west to east – cross-section shows that there are hydrocarbons present throughout the San Andres interval from the down-dip most western edge to the up-dip most eastern edge of the EMSU
- The disposal of Delaware basin water into the San Andres is damaging the hydrocarbon reserves present at the EMSU

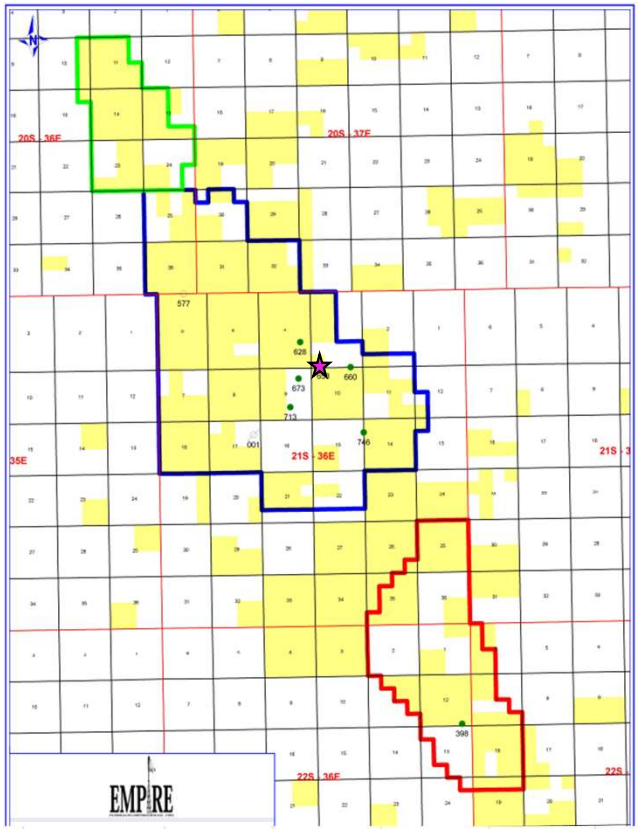
Exhibit G-3(c)



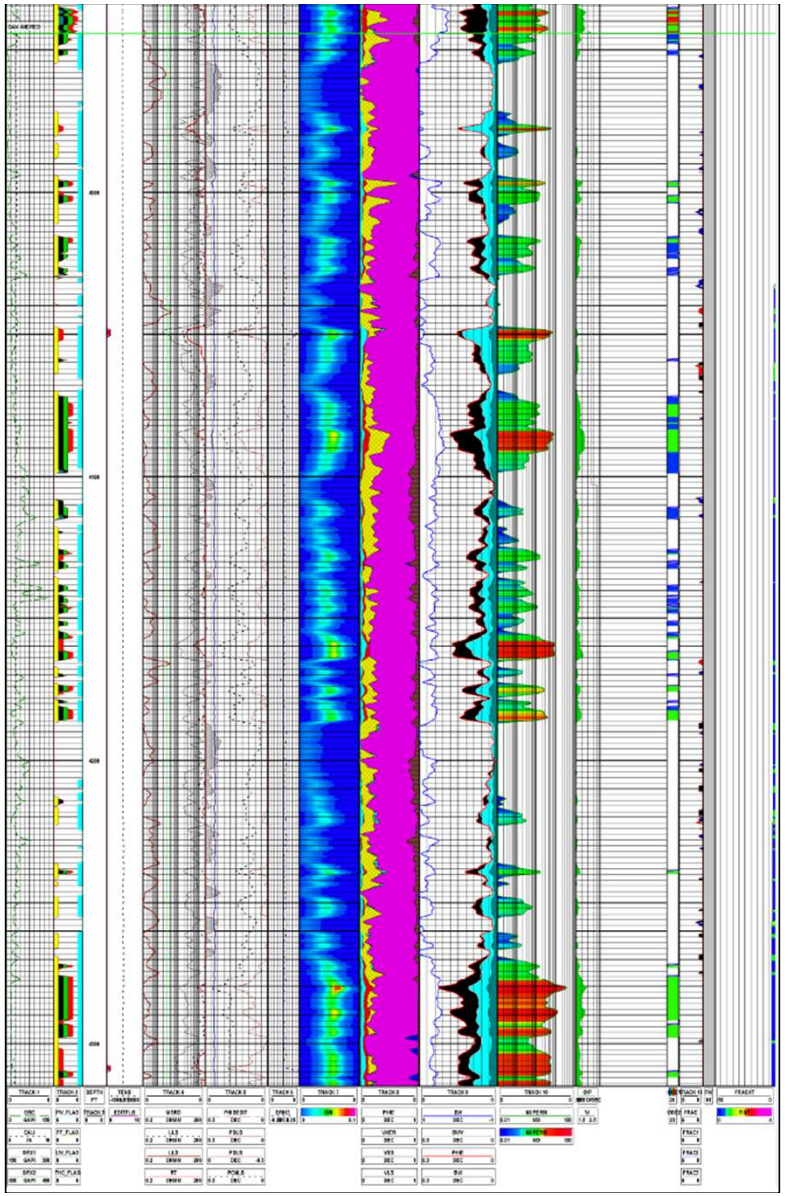
KEY POINTS

- Nutech analyzed wells from northeast to southwest– cross-section shows that there are hydrocarbons present throughout the San Andres interval at the crest of the structure at the EMSU
- The disposal of Delaware basin water into the San Andres is damaging the hydrocarbon reserves present at the EMSU

Nutech analysis of San Andres EMSU
Exhibit G-3(d)



EMSU 658



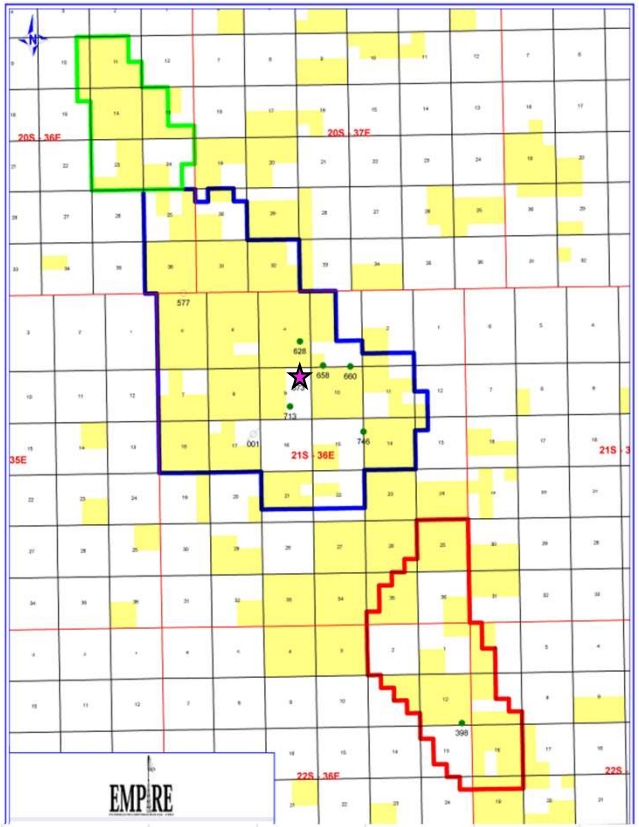
KEY POINTS

- The petrophysical analysis proves the presence of hydrocarbons in the San Andres interval
- **EMSU 658 – 30.29 MMBO/sec**

Zone	Gross Interval (feet)	Net Interval (feet)	Net Oil Interval (feet)	Average Porosity (%)	Average Permeability (md)	Average Oil Saturation (%)	Oil-in-Place Per 640-acres (MMBO/sec)
San Andres	371	184	182	10.9%	2.19	39.0%	30.29

Nutech analysis of San Andres EMSU

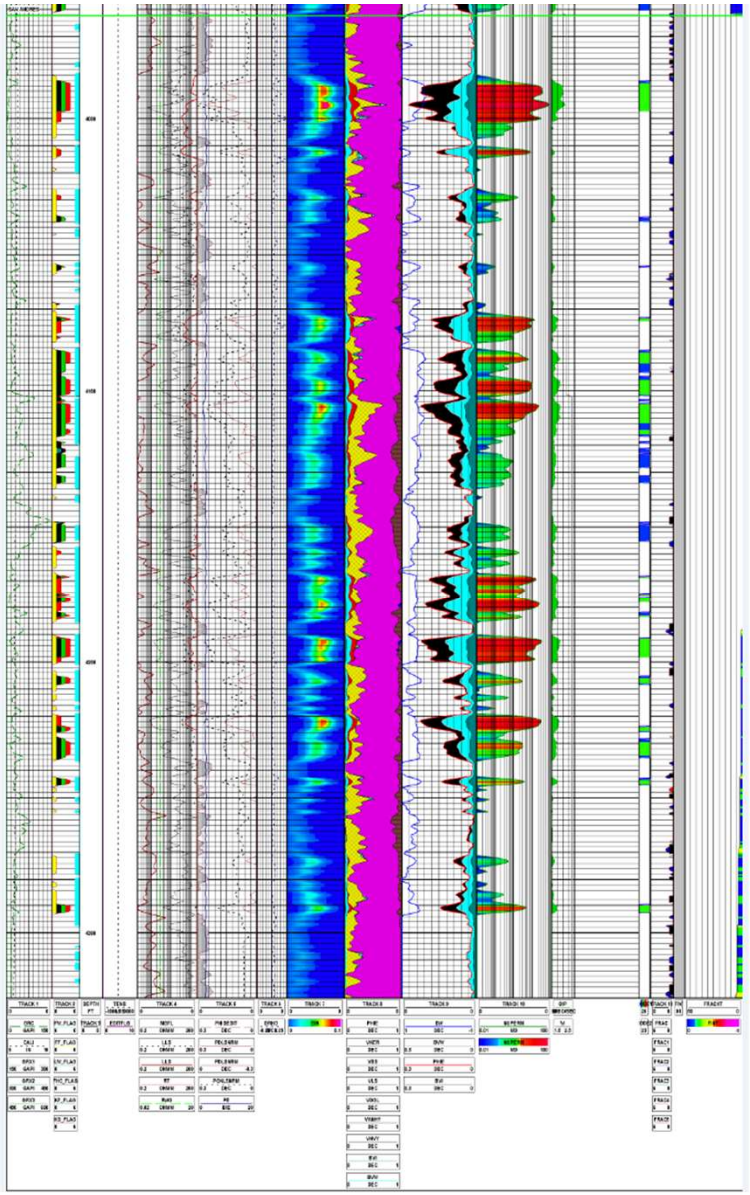
Exhibit G-3(e)



EMSU 673

KEY POINTS

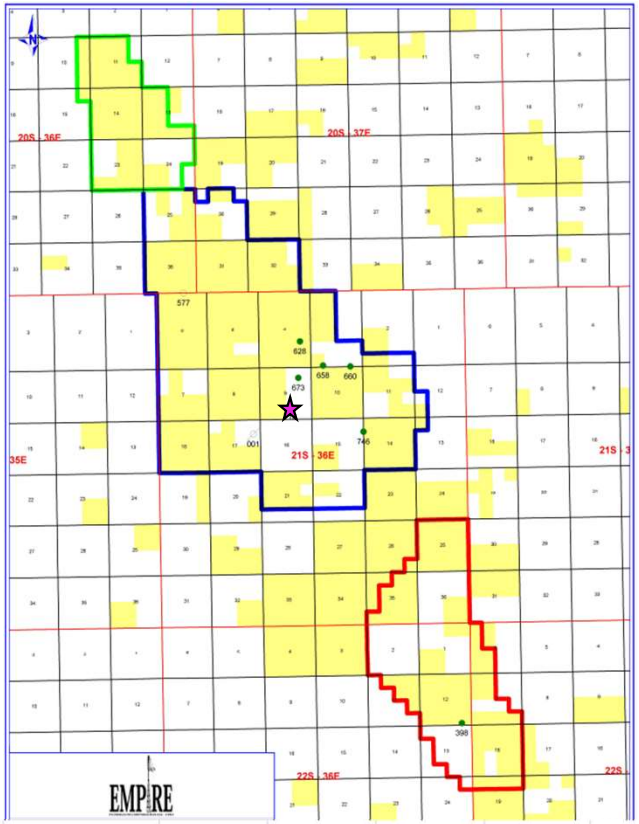
- The petrophysical analysis proves the presence of hydrocarbons in the San Andres interval
- **EMSU 673 – 31.68 MMBO/sec**



Zone	Gross Interval (feet)	Net Interval (feet)	Net Oil Interval (feet)	Average Porosity (%)	Average Permeability (md)	Average Oil Saturation (%)	Oil-in-Place Per 640-acres (MMBO/sec)
San Andres	362	157.5	153	13.0%	6.12	40.0%	31.68

Nutech analysis of San Andres EMSU

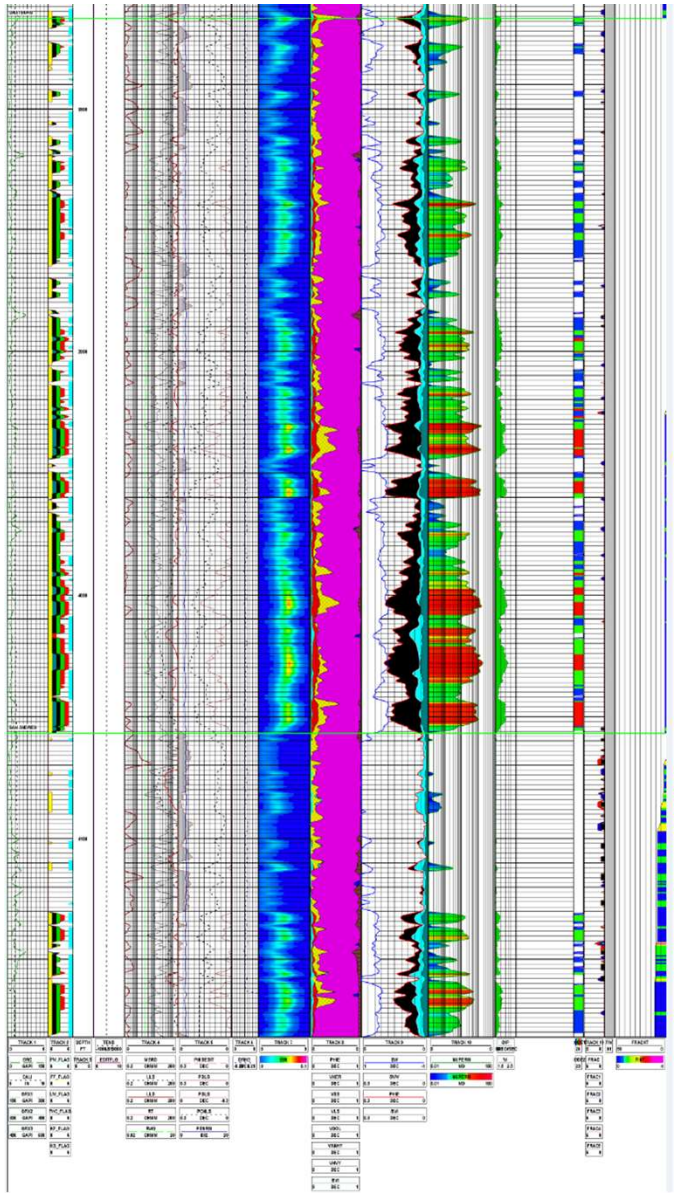
Exhibit G-3(f)



EMSU 713

KEY POINTS

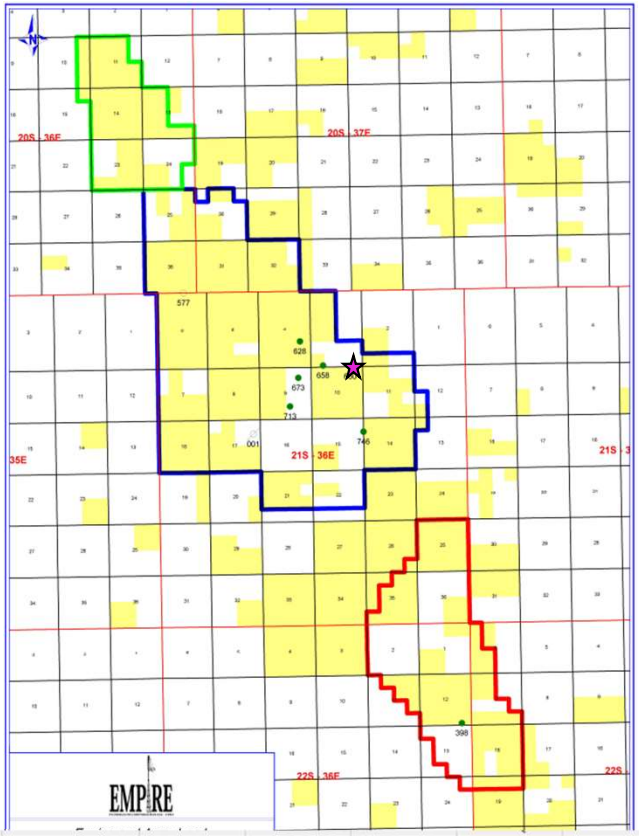
- The petrophysical analysis proves the presence of hydrocarbons in the San Andres interval
- **EMSU 713 – 8.02 MMBO/sec**



Zone	Gross Interval (feet)	Net Interval (feet)	Net Oil Interval (feet)	Average Porosity (%)	Average Permeability (md)	Average Oil Saturation (%)	Oil-in-Place Per 640-acres (MMBO/sec)
San Andres	125	40.5	40.0	10.6%	1.36	48.4%	8.02

Nutech analysis of San Andres EMSU

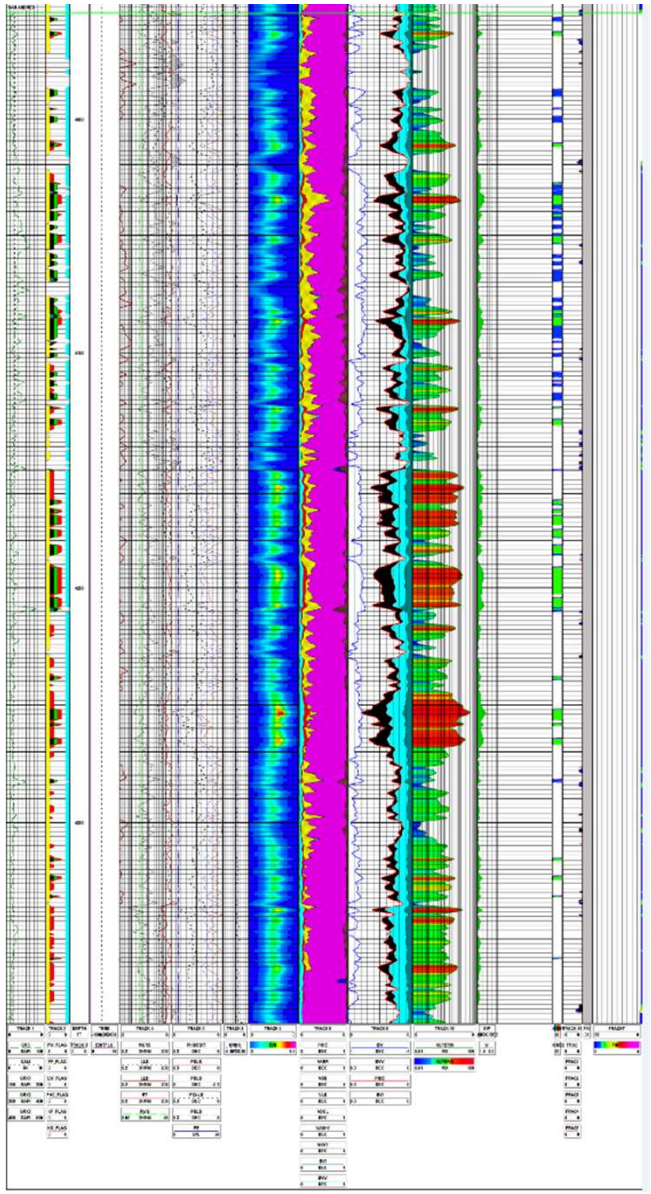
Exhibit G-3(g)



EMSU 660

KEY POINTS

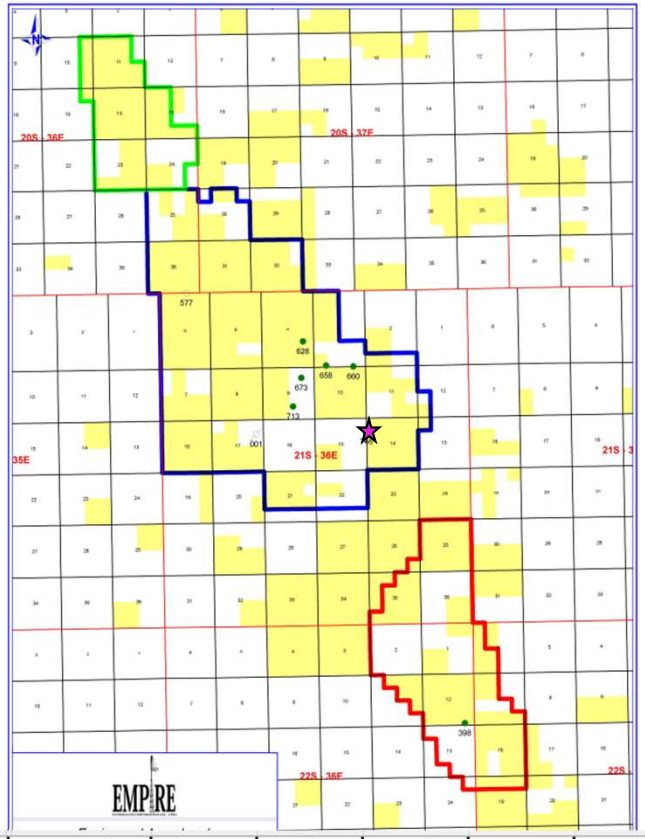
- The petrophysical analysis proves the presence of hydrocarbons in the San Andres interval
- **EMSU 660 – 48.62 MMBO/sec**



Zone	Gross Interval (feet)	Net Interval (feet)	Net Oil Interval (feet)	Average Porosity (%)	Average Permeability (md)	Average Oil Saturation (%)	Oil-in-Place Per 640-acres (MMBO/sec)
San Andres	431	320	313	11.5%	2.50	34.4%	48.62

Nutech analysis of San Andres EMSU

Exhibit G-3(h)

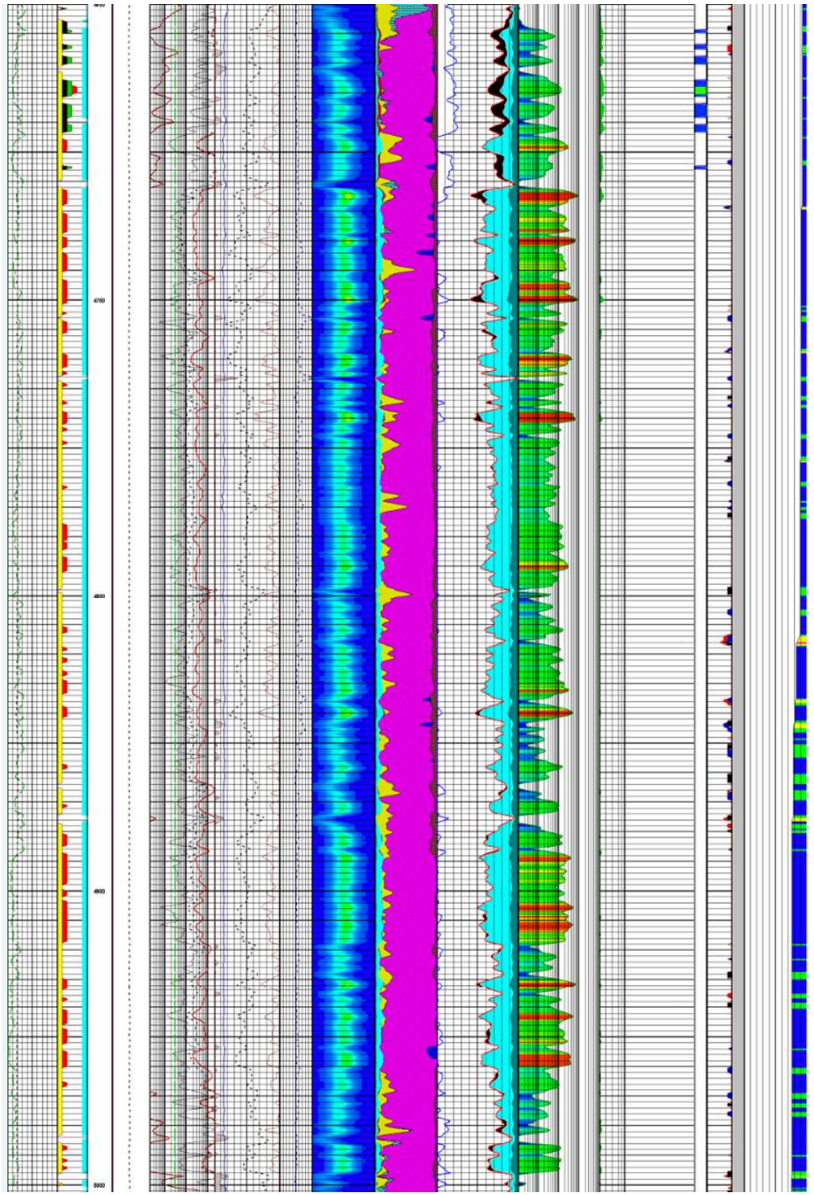


EMSU 746

KEY POINTS

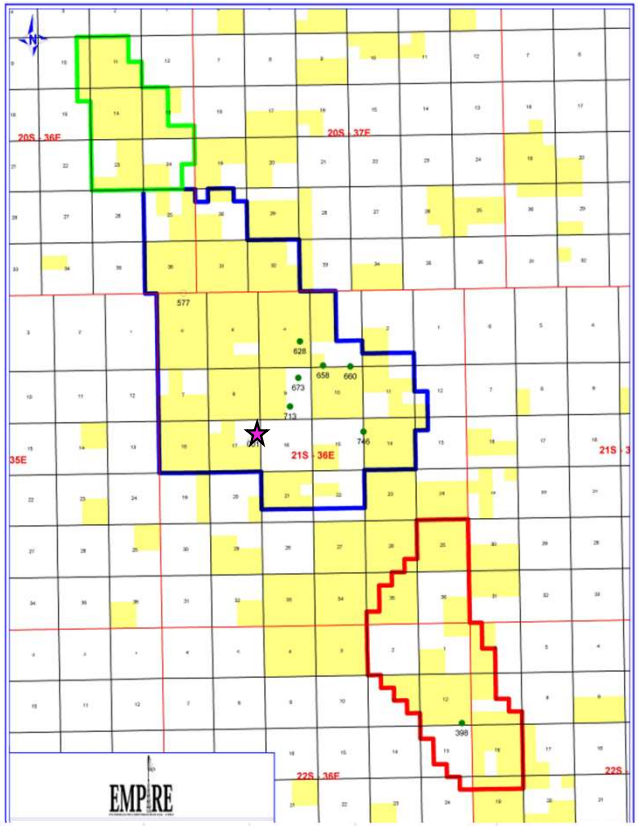
- The petrophysical analysis proves the presence of hydrocarbons in the San Andres interval
- **EMSU 746 – 62.18 MMBO/sec**

Zone	Gross Interval (feet)	Net Interval (feet)	Net Oil Interval (feet)	Average Porosity (%)	Average Permeability (md)	Average Oil Saturation (%)	Oil-in-Place Per 640-acres (MMBO/sec)
San Andres	1223	757	508	12.2%	4.16	25.1%	62.18



Nutech analysis of San Andres EMSU

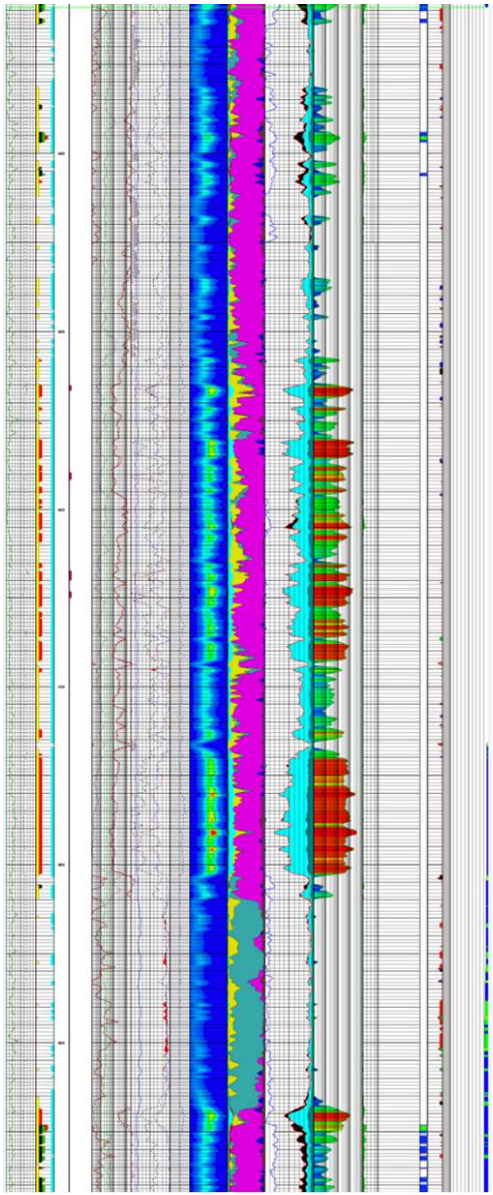
Exhibit G-3(i)



Ryno SWD #1
(Snyder #1)

KEY POINTS

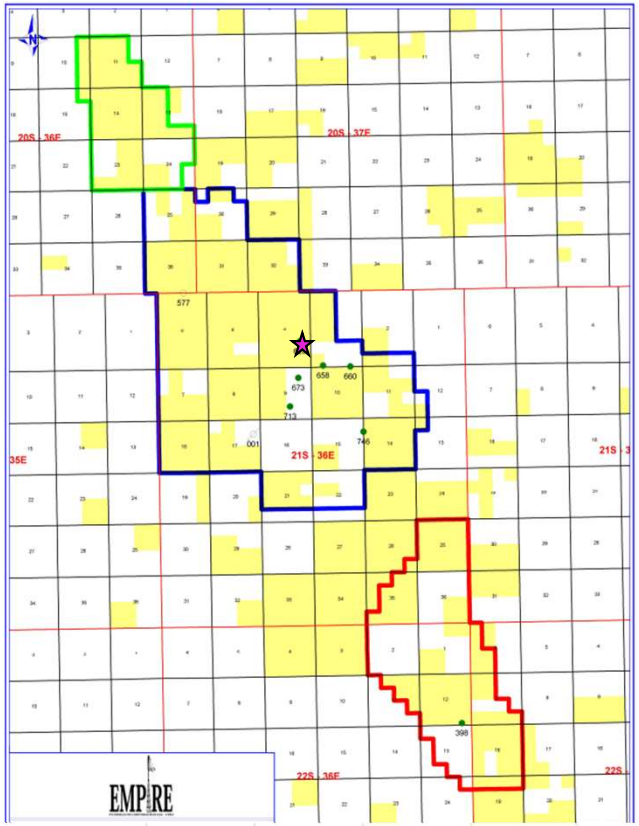
- The petrophysical analysis proves the presence of hydrocarbons in the San Andres interval
- **Ryno SWD – 15.62 MMBO/sec**



Zone	Gross Interval (feet)	Net Interval (feet)	Net Oil Interval (feet)	Average Porosity (%)	Average Permeability (md)	Average Oil Saturation (%)	Oil-in-Place Per 640-acres (MMBO/sec)
San Andres	1215	738.5	220	10.8%	2.47	20.1%	15.62

Nutech analysis of San Andres EMSU

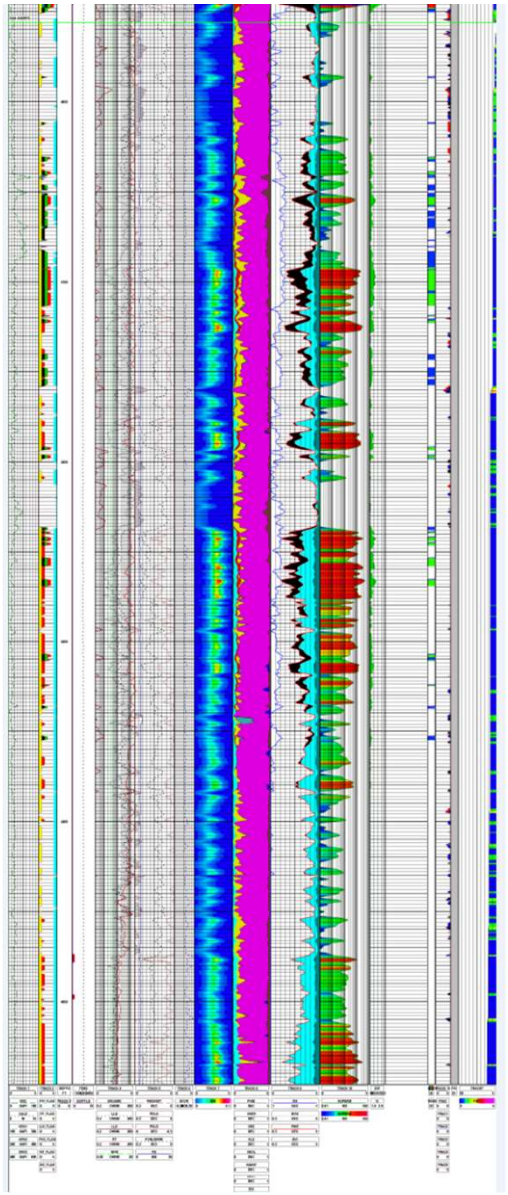
Exhibit G-3(j)



EMSU 628

KEY POINTS

- The petrophysical analysis proves the presence of hydrocarbons in the San Andres interval
- **EMSU 628 – 40.79 MMBO/sec**

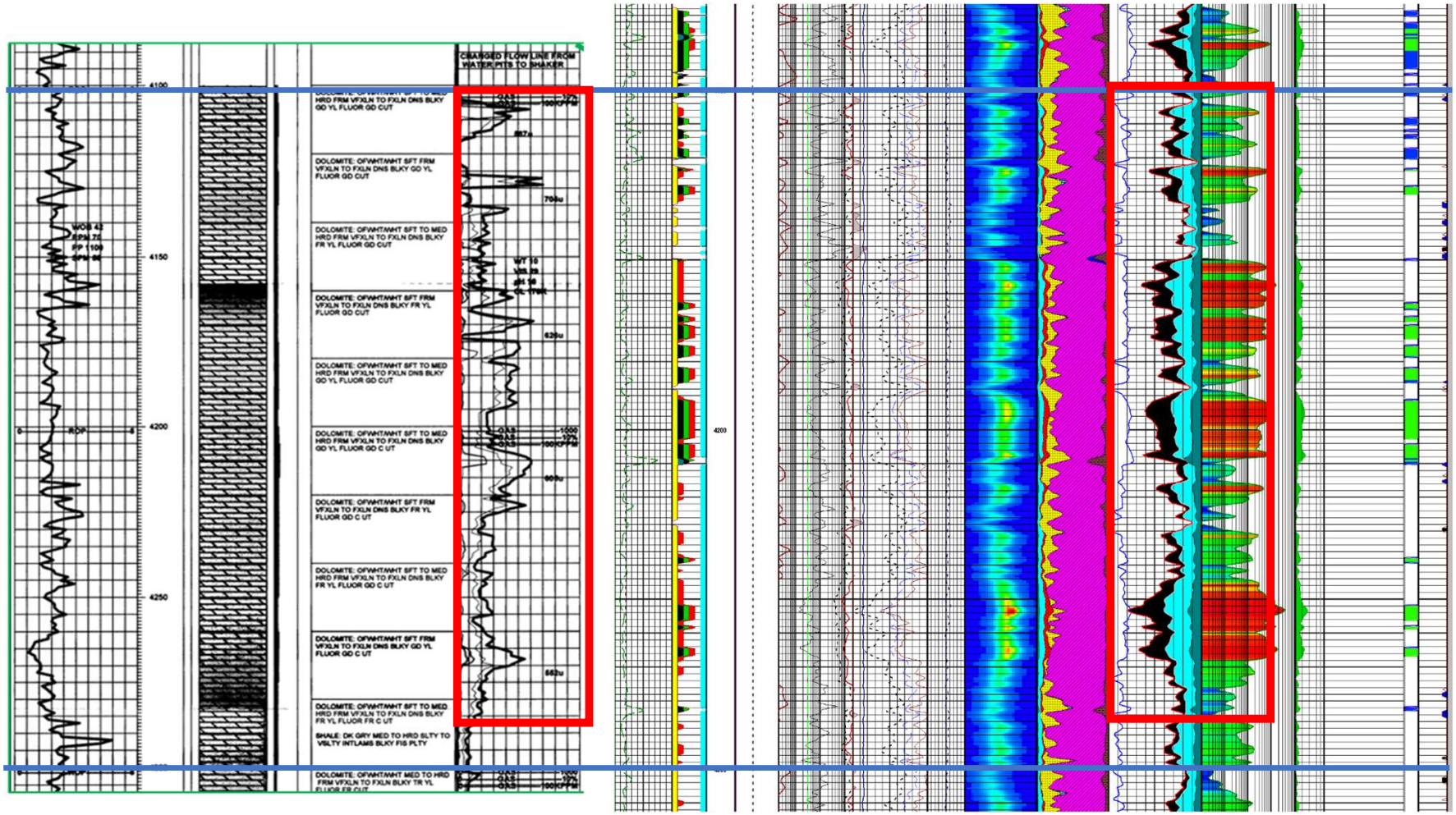


Zone	Gross Interval (feet)	Net Interval (feet)	Net Oil Interval (feet)	Average Porosity (%)	Average Permeability (md)	Average Oil Saturation (%)	Oil-in-Place Per 640-acres (MMBO/sec)
San Andres	590	376	266	12.5%	4.37	31.4%	40.79

Exhibit G-4 –Proof of Residual Oil Zone within the San Andres Reservoir

KEY POINTS

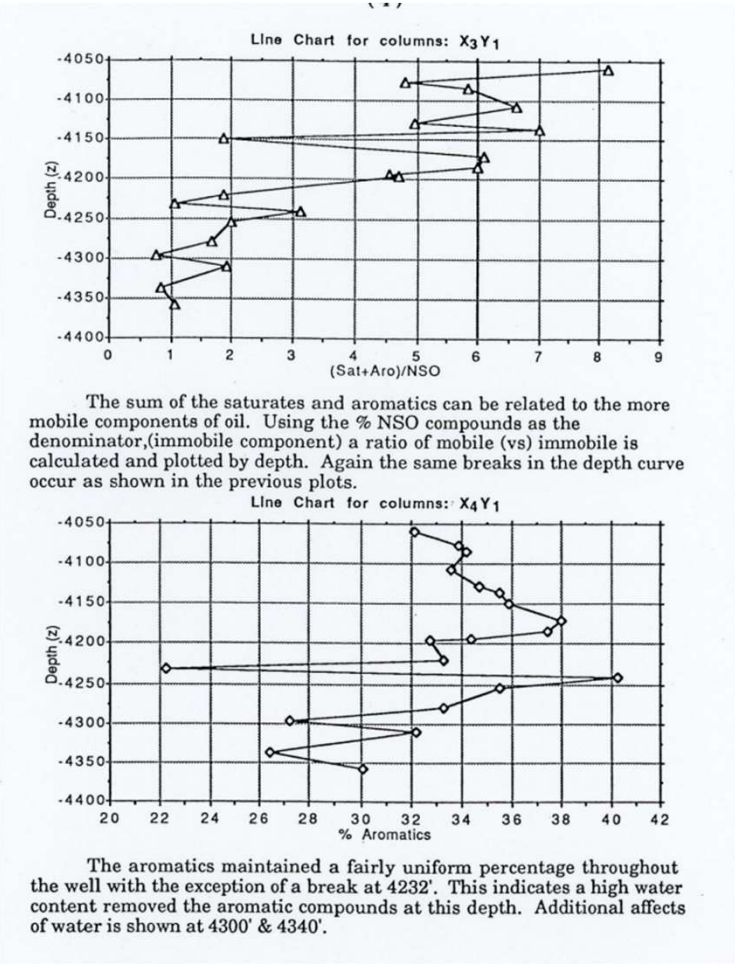
- Multiple mudlogs were run at the EMSU, all showing indications of a Residual Oil Zone in the San Andres
- As an example, the EMSU 660 has a 200’ interval of yellow fluorescence with good cut within the San Andres interval



[2]Trentham, Robert C., Melzer, Stephen, Vance, David B., Kuuskraa, Vello, Petrusak, Robin. “Identifying and developing technology for enabling small producers to pursue the residual oil zone(ROZ) fairways in the Permian Basin San Andres.” RPSEA, University of Texas, 2015.

Exhibit G-5 - Geochemical Evidence of a Residual Oil Zone in the San Andres

"A Fourier transform ion cyclotron resonance (FT-ICR) study, which zoomed into the heavier components, revealed that paleo oil has less aromaticity than MPZ oil and lacks aromatic sulfur and disulfur compounds, a negligible amount of nitrogen compounds, and no resin-type components." [1]



The sum of the saturates and aromatics can be related to the more mobile components of oil. Using the % NSO compounds as the denominator,(immobile component) a ratio of mobile (vs) immobile is calculated and plotted by depth. Again the same breaks in the depth curve occur as shown in the previous plots.

The aromatics maintained a fairly uniform percentage throughout the well with the exception of a break at 4232'. This indicates a high water content removed the aromatic compounds at this depth. Additional affects of water is shown at 4300' & 4340'.

KEY POINTS

- The core study done on the EMSU- 679 indicates the presence of a residual oil zone in the San Andres
- Aromatic compounds decrease as a result of Mother Nature's waterflood
- Mobile vs Immobile profile shows oil in the core down to -762'

[1] Aleidan, Ahmed , Kwak, Hyung , Muller, Hendrik , and Xianmin Zhou. "Residual-Oil Zone: Paleo-Oil Characterization and Fundamental Analysis." *SPE Res Eval & Eng* 20 (2017): 260–268. doi: https://doi.org/10.2118/179545-PA

Exhibit G-6 – EMSU 200H Landing Zone

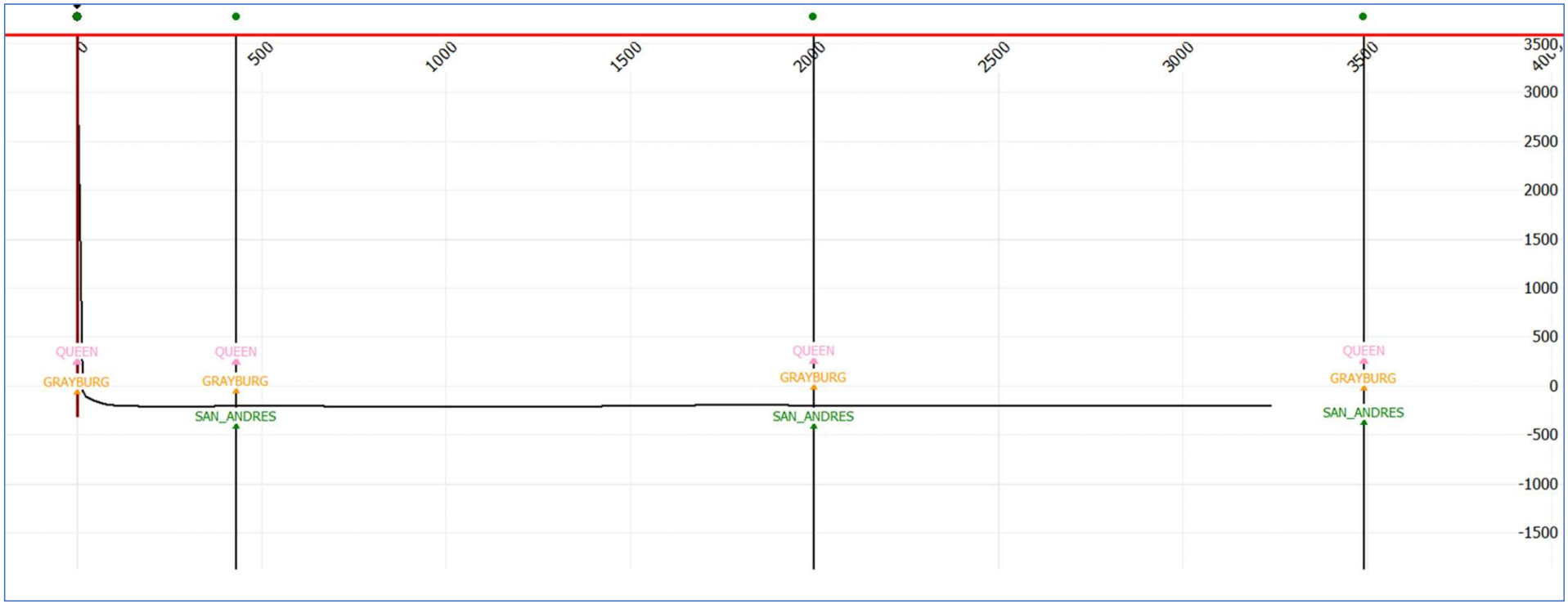


Exhibit G-7(a)

KEY POINTS

- Due to lateral facies changes across the EMSU, there is not a consistent barrier between the San Andres and Grayburg reservoirs
- There are proven examples of communication throughout the field
- Basal blocks moved post deposition causing fractures to form creating pathways for fluid communication

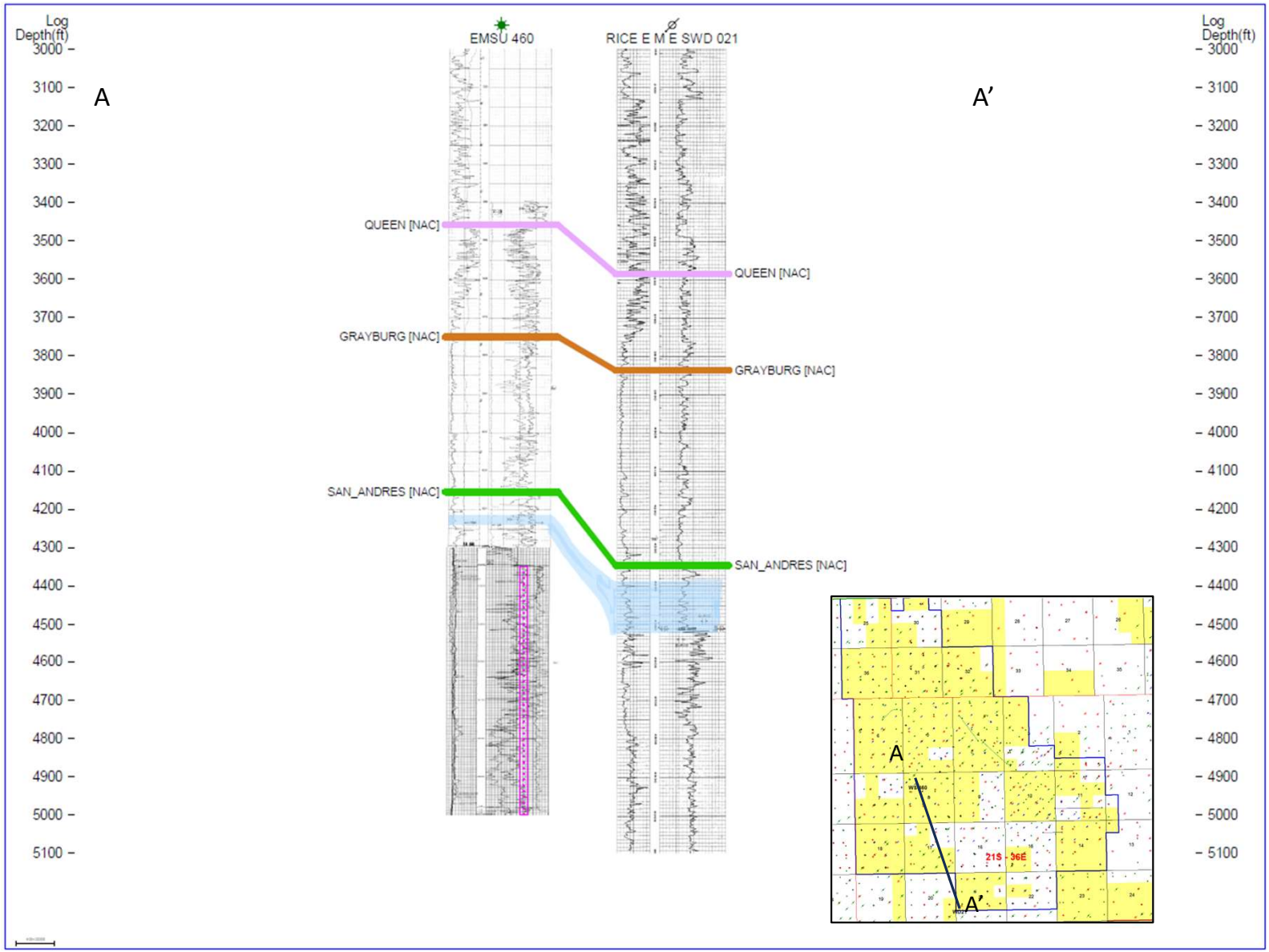
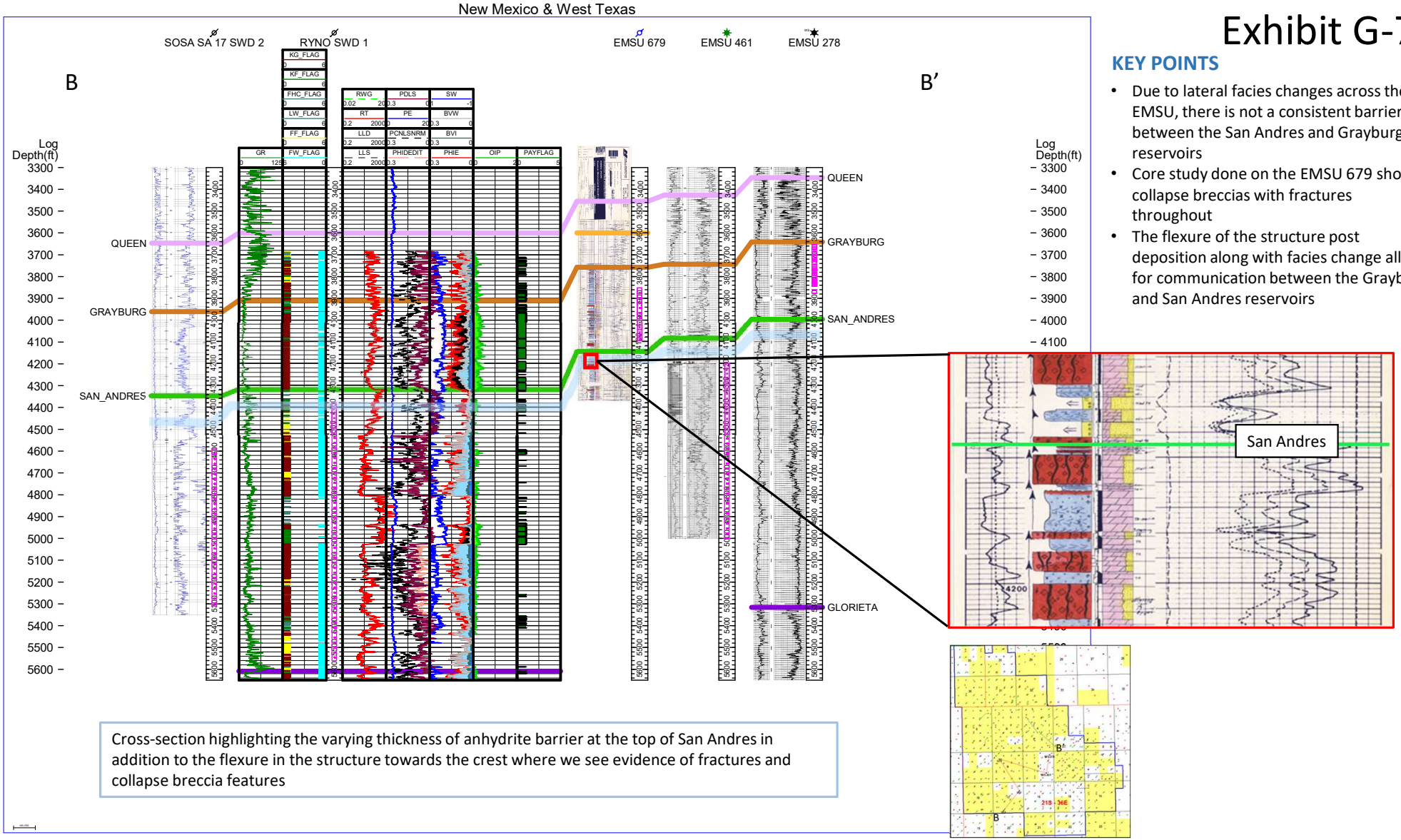


Exhibit G-7(b)

KEY POINTS

- Due to lateral facies changes across the EMSU, there is not a consistent barrier between the San Andres and Grayburg reservoirs
- Core study done on the EMSU 679 shows collapse breccias with fractures throughout
- The flexure of the structure post deposition along with facies change allows for communication between the Grayburg and San Andres reservoirs



Cross-section highlighting the varying thickness of anhydrite barrier at the top of San Andres in addition to the flexure in the structure towards the crest where we see evidence of fractures and collapse breccia features

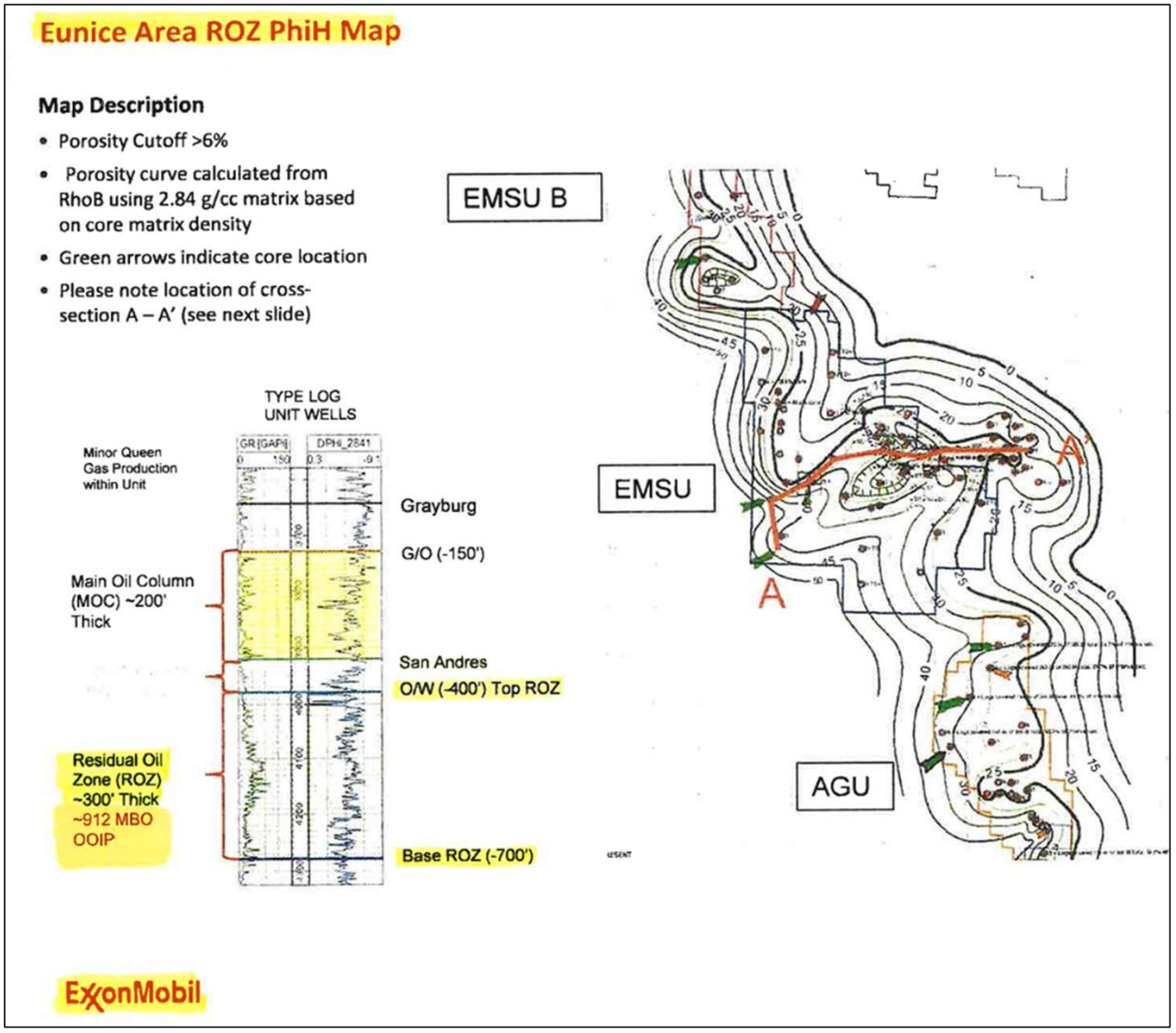


Exhibit G-8

KEY POINTS

- In ExxonMobil's 2021 sales package for EMSU, EMSU-B, and AGU, they mention the ROZ on 5 of 7 pages, with their estimates of original oil-in-place at 912 MMBO.
- Protecting this oil resource is critical to the future of EMSU, EMSU-B, and AGU and should be protected by the unitization agreement between State, Federal, and Private mineral owners.
- It will take more than 40 years to develop and produce this oil resource, therefore Empire should no be forced into hasty decisions as a result of a trespassing SWD company.
- Core, well log, and some production tests (particularly AGU) confirm that the oil is there and CO_2-EOR can recover substantial reserves.