Additional Information

10.24.22
Correspondence,
Updated WBD,
FSP analysis

Rose-Coss, Dylan, EMNRD

From: Nathan Alleman <nalleman@all-llc.com>
Sent: Monday, October 24, 2022 8:33 AM
To: Rose-Coss, Dylan, EMNRD
Cc: Oliver Seekins; Devin Bowes; Cody Pardue
Subject: [EXTERNAL] RE: Rev Midstream - AABCD SWD #1 & #2 Supplemental Information
Attachments: AABCD SWD #1 WBD 09202022.pdf; AABCD SWD #1 - Revised Injection Interval - Supplemental Information.pdf; AABCD SWD #2 WBD 09202022.pdf; AABCD SWD #2 - Revised Injection Interval - Supplemental Information.pdf; REV Midstream - AABCD FSPs.pdf

Dylan,

Below are responses to OCD's requests with regard to REV Midstream's C-108 applications for the AABCD SWD #1 and AABCD SWD #2. Supporting documentation (Wellbore Diagrams, Well Data Sheets, and FSP Models) is attached for OCD's review.

OCD Requests:

1. **OCD Request: Please confirm the method of determining the top cement for the 7" production casing string. The injection well data sheet indicates that the cement will be circulated to the surface, but the wellbore diagram suggests that the top will be at 9500'? The OCD requests that the 7" production string tie in 200' above the intermediate casing.**
    - **Response:** The well design has been updated to clarify cement tops and methods of determination (see attached Supplemental Information and Wellbore Diagrams). Additionally, the well designs were updated to reflect corrected depths for the Devonian Injection Interval. Wellbore Diagrams and Well Data Sheets reflecting the updated well designs are attached.

2. **OCD Request: Provide estimates for formation tops of intervals above the Capitan Reef and below the injection interval.**
    - **Response:** As requested, we reviewed geophysical logs in the area of the AABCD SWD #1 and #2 and came up with the formation tops requested by OCD (see below).
        1. **Formation Tops of Intervals Above the Capitan Reef:**
            - AABCD SWD #1: Rustler – 435 ft
            - AABCD SWD #2: Rustler – 535 ft
        2. **Formation Tops of Intervals Below the Injection Interval:** The Ellenberger Formation underlies the injection interval in both the AABCD SWD #1 & #2, but no nearby wells penetrate the formation so a formation top was not able to be determined.

3. **OCD Request: Submit a fault slip potential (FSP) model to supplement the induced seismicity analysis.**
    a. **I would refer you to case no 20964 re: Overflow Energy's Rita SWD # 1 application. In the case files nearby fault traces are identified that should be incorporated into the model.**
    b. **Include a model run scenario that incorporates a fault trace within one (1) mile of the proposed well that is optimally oriented to slip.**
        - **Response:** FSP models were run for the AABCD SWD #1 and #2 using the criteria specified above and the models resulted in a 0.00 FSP value on both the known and hypothetical faults.

Please let us know if you need anything further to complete the review of these applications.

Nate Alleman
Energy & Environmental Consultant
ALL Consulting
1718 South Cheyenne Avenue
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Cell: 918-237-0559

From: Devin Bowes <Devin@revmidstream.com>
Sent: Monday, December 27, 2021 3:50 PM
To: Mark Kidder <mkidder@all-llc.com>
Subject: FW: [EXTERNAL] RE: Rev Midstream SWD #1 Permit Status

From: "Rose-Coss, Dylan H, EMNRD" <DylanH.Rose-Coss@state.nm.us>
Date: October 14, 2021 at 12:04:18 PM CDT
To: Cody Pardue <Cody@revmidstream.com>
Cc: "Goetze, Phillip, EMNRD" <Phillip.Goetze@state.nm.us>
Subject: RE: [EXTERNAL] RE: Rev Midstream SWD #1 Permit Status

Mr. Pardue,

I've completed the technical review of the Rev Midstream SWD #1 application for the AABCD SWD No. 1 (SWD-2399; pBL2030733650) and the AABCD SWD No. 2 (SWD-2400; pBL2030734512) wells. To move forward with the reviews I will need a few items and points of clarification from Rev Midstream, namely:

1. Please confirm the method of determining the top cement for the 7" production casing string. The injection well data sheet indicates that the cement will be circulated to the surface, but the wellbore diagram suggests that the top will be at 9500'? The OCD requests that the 7" production string tie in 200' above the intermediate casing.
2. Provide estimates for formation tops of intervals above the Capitan Reef and below the injection interval
3. Submit a fault slip potential (FSP) model to supplement the induced seismicity analysis.
    a. I would refer you to case no 20964 re: Overflow Energy's Rita SWD # 1 application. In the case files nearby fault traces are identified that should be incorporated into the model.
    b. Include a model run scenario that incorporates a fault trace within one (1) mile of the proposed well that is optimally oriented to slip.

Once these items are submitted and reviewed, I can proceed with the Order process.

Regards,

Dylan Rose-Coss

Petroleum Specialist

Oil Conservation Division
1220 South St. Francis Drive
Santa Fe, New Mexico 87505

C: (505) 372-8687

From: Rose-Coss, Dylan H, EMNRD
Sent: Thursday, September 23, 2021 10:48 AM
To: Cody Pardue <Cody@revmidstream.com>
Cc: Goetze, Phillip, EMNRD <Phillip.Goetze@state.nm.us>
Subject: RE: [EXTERNAL] RE: Rev Midstream SWD #1 Permit Status

Mr. Pardue,

Thanks for your email. I have the Rev Midstream apps on my shortlist for review. I will indeed reach out should I need any additional information. Hopefully there will be some movement before the next every other month update, but no promises.

Regards,

Dylan Rose-Coss

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From: Cody Pardue <Cody@revmidstream.com>
Sent: Wednesday, September 22, 2021 11:15 AM
To: Rose-Coss, Dylan H, EMNRD <DylanH.Rose-Coss@state.nm.us>
Subject: [EXTERNAL] RE: Rev Midstream SWD #1 Permit Status

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Good Morning Mr. Rose-Coss,

Hope all has been well. Just hopping on to see if you have any news on our permits in queue. I'm positive you would have reached out if there were any updates, info needed

or questions for me/our team, but I received my every other month “any update on the NM permits” email this morning from our project partners and wanted to just reach out to make sure I didn’t miss anything. As always, please feel free to reach out to me at anytime if there’s anything I can do to help in the process. Have a great rest of the week!

Cody Pardue

From: Rose-Coss, Dylan H, EMNRD
Sent: Wednesday, July 28, 2021 10:45 AM
To: Cody Pardue
Cc: Ryan Bailey
Subject: RE: Rev Midstream SWD #1 Permit Status

Cody Pardue,

Thanks for reaching out regarding the pending revmidstream applications. They are indeed in my queue for review, but have yet to be processed. No further information is needed at this time, but I will be sure to reach out should that change.

Regards,

Dylan Rose-Coss

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C: (505) 372-8687

From: Cody Pardue <Cody@revmidstream.com>
Sent: Monday, July 26, 2021 9:48 AM
To: Rose-Coss, Dylan H, EMNRD <DylanH.Rose-Coss@state.nm.us>
Cc: Ryan Bailey <Ryan@revmidstream.com>
Subject: Re: Rev Midstream SWD #1 Permit Status

Good Morning Mr Rose-Coss,

I am just reaching out again to see if there’s been any change in our permit status. Being that I have yet to receive any news, I’m assuming it’s still in the queue to be processed. Please let me know of any status change that I can run up the ladder and if there’s anything I can provide you guys to help with the process. Have a great week!

Cody Pardue

On Apr 14, 2021, at 3:44 PM, Rose-Coss, Dylan H, EMNRD <DylanH.Rose-Coss@state.nm.us> wrote:

Mr. Pardue,

Members of the OCD Underground Injection Control (UIC) staff have performed an administrative completeness review for the Rev Midstream SWD #1, C-108 applications.

The AABCD #1 SWD application has been assigned the following tracking numbers: SWD-2399 & pBL2030733650. The case file associated with the application can be tracked using the following link: https://ocdimage.emnrd.state.nm.us/imaging/AEOrderFileView.aspx?appNo=pBL2030733650

The AABCD #2 SWD application has been assigned the following tracking numbers: SWD-2400 & pBL2030734512. The case file link is: https://ocdimage.emnrd.state.nm.us/imaging/AEOrderFileView.aspx?appNo=pBL2030734512

At this time no further information is needed for UIC staff to continue with the technical review. If during the technical review, it is determined that more information is required, a representative will reach out at that time. Staff appreciates your patience during the Tech review process, as there is currently a large backlog of pending C-108 applications.

Hope this information is helpful and feel free to reach out should there be any additional questions.

Regards,

Dylan Rose-Coss

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C: (505) 372-8687
<image001.jpg>

From: Cody Pardue <Cody@revmidstream.com>
Sent: Tuesday, April 13, 2021 12:55 PM
To: Rose-Coss, Dylan H, EMNRD <DylanH.Rose-Coss@state.nm.us>

Cc: Bob Ault <Bob@revmidstream.com>
Subject: [EXT] Rev Midstream SWD #1 Permit Status

Good Afternoon Dylan,

Josh Watkins forwarded me your contact info in regards to our pending permits that we have in the queue in Eddy County (AABCD #1 and #2). I sent an email to Mrs. Victoria Venegas earlier this morning before Josh got back in touch with me and let me know that you had been the person helping him with the process. Can you please update us with a status at your earliest convenience and let us know if there's anything you need from my team and I to keep the ball rolling? Thank you for your assistance with this, and I look forward to hearing back from you.

Regards,
Cody Pardue

Application for Authorization to Inject
Well Name: AABCD SWD #2
App Number: pBL2030734512

Well Data:

(1) General Well Information:

Operator: Rev Midstream SWD #1, LLC (OGRID No. 330316)
Lease Name & Well Number: AABCD SWD #2
Location Footage Calls: 2,416 FWL & 788 FSL
Legal Location: Unit Letter N, S31 T21S R28E
Ground Elevation: 3,131'
Proposed Injection Interval: 13,760' – 14,760'
County: Eddy

(2) Casing Information:

Type	Hole Size	Casing Size	Casing Weight	Setting Depth	Sacks of Cement	Estimated TOC	Method Determined
Surface	24"	18-5/8"	87.5 lb/ft	555'	800	Surface	Circulation
Intermediate 1	17-1/2"	13-3/8"	54.5 lb/ft	2,440'	1,460	Surface	Circulation
Intermediate 2	12-1/4"	9-5/8"	40.0 lb/ft	9,600'	2,810	Surface	CBL
Liner	8-3/4"	7-5/8"	29.7 lb/ft	9,450' – 13,760'	650	9,450'	CBL

DV Tool Set at 5,400'

(3) Tubing Information:

A. 5-1/2" x 4-1/2" IPC composite weight tubing lined with Douline with a setting depth of 13,500'.

(4) Packer Information:

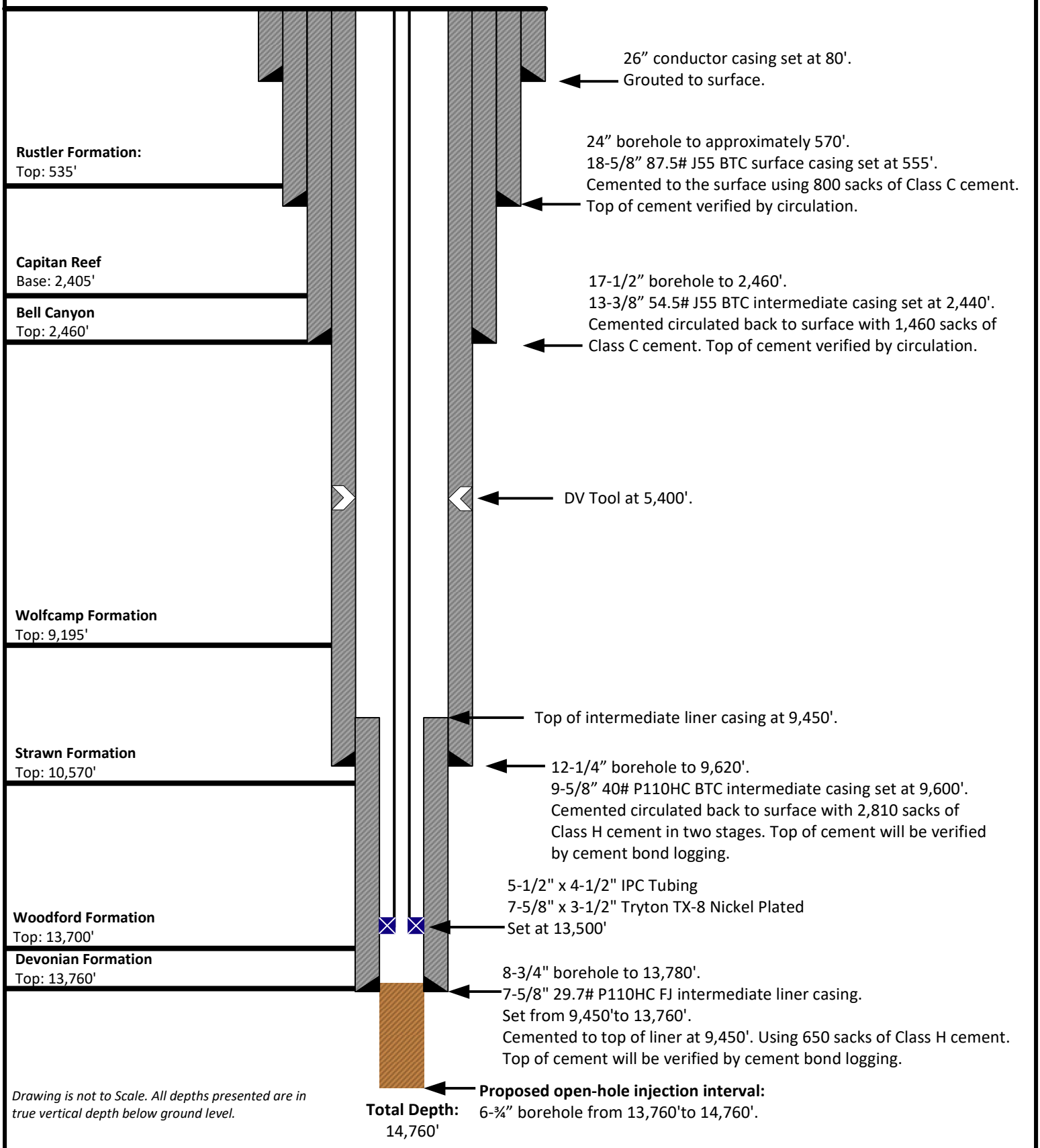
A. 7-5/8" x 3-1/2" Tryton TX-8 Nickel Plated set at 13,500'

(5) Injection Formation Data:

A. Injection Formation Name: Devonian
   1. Pool Name: SWD; Devonian
   2. Pool Code: 96101
B. Injection Interval: Open-hole injection between 13,760' – 14,760'

(6) Proposed Operation:

A. Proposed Injection Rate:
   1. Average Injection Rate: 38,000 bpd
   2. Maximum Injection Rate: 45,000 bpd
B. Proposed Injection Pressure:
   1. Average Injection Pressure: ~ 2,064 psi (surface)
   2. Maximum Injection Pressure: 2,752 psi (surface)



Drawing is not to Scale. All depths presented are in true vertical depth below ground level.

Prepared by: ALL CONSULTING *Prepared for:* REVMIDSTREAM	Drawn by: Joshua Ticknor Project Manager: Nathan Alleman Date: 9/15/2022	AAABCD SWD #2 Wellbore Diagram 2416' FWL & 788' FSL S-31 T-21S R-28E Lat: 32.431558° Long: -104.126617° Eddy County, New Mexico

REV Midstream LLC
AABCD SWDs #1 & #2 FSP

Fault Slip Potential Analysis (FSP)

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FSP Methodology

Model Methodology

- FSP provides a probabilistic estimate of fault slip due to nearby fluid injection.
  - Calculates probability of a fault exceeding the Mohr-Coulomb slip criteria (failure point between normal and shear stresses).
  - Utilizes Monte Carlo simulation to account for potential errors in input parameters.

Model Inputs

- Stress gradients and pore pressure gradients derived from previous FSP models performed in the region.
- Injection interval thickness, porosity, and permeability estimated from nearby geophysical logs.
- One known fault in the 6-mile radius area of review (USGS, BEG, NMOCD, and TXRRC Fault Data 2021).

Parameters

Parameter	Value	Source
Vertical Stress Gradient (psi/ft)	1.05	ALL Research (2022)
Horizontal Stress Direction (degrees azimuth)	20	Lund Snee (2020)
Reference Depth (ft)	13,650	Blackbuck Resources (2022)
Initial Reservoir Pressure Gradient (psi/ft)	0.43	ALL Research (2022)
Min. Horizontal Stress Gradient (psi/ft)	0.71	Nearby Frac Report (2022)
Max Horizontal Stress Gradient (psi/ft)	0.86465	Nearby Frac Report (2022)
Friction Coefficient	0.6	Lund Snee (2020)
Injection Interval Thickness (ft)	1000	Nearby Geophysical Logs (2022)
Porosity (%)	5	ALL Research (2022)
Permeability (mD)	35	ALL Research (2022)
Fault Strike (degrees)	Varies	NMOCD Request / Data (2022)
Fault Dip	80	Lund Snee (2020)
Fluid Density (kg/m^3)	1000	ALL Research and Reynolds (2022)
Dynamic Viscosity (Pa*s)	0.0003	ALL Research and Reynolds (2022)
Fluid Compressibility (Pa^-1)	4.70E-10	ALL Research and Reynolds (2022)
Rock Compressibility (Pa^-1)	8.70E-10	ALL Research and Reynolds (2022)

Injection Data

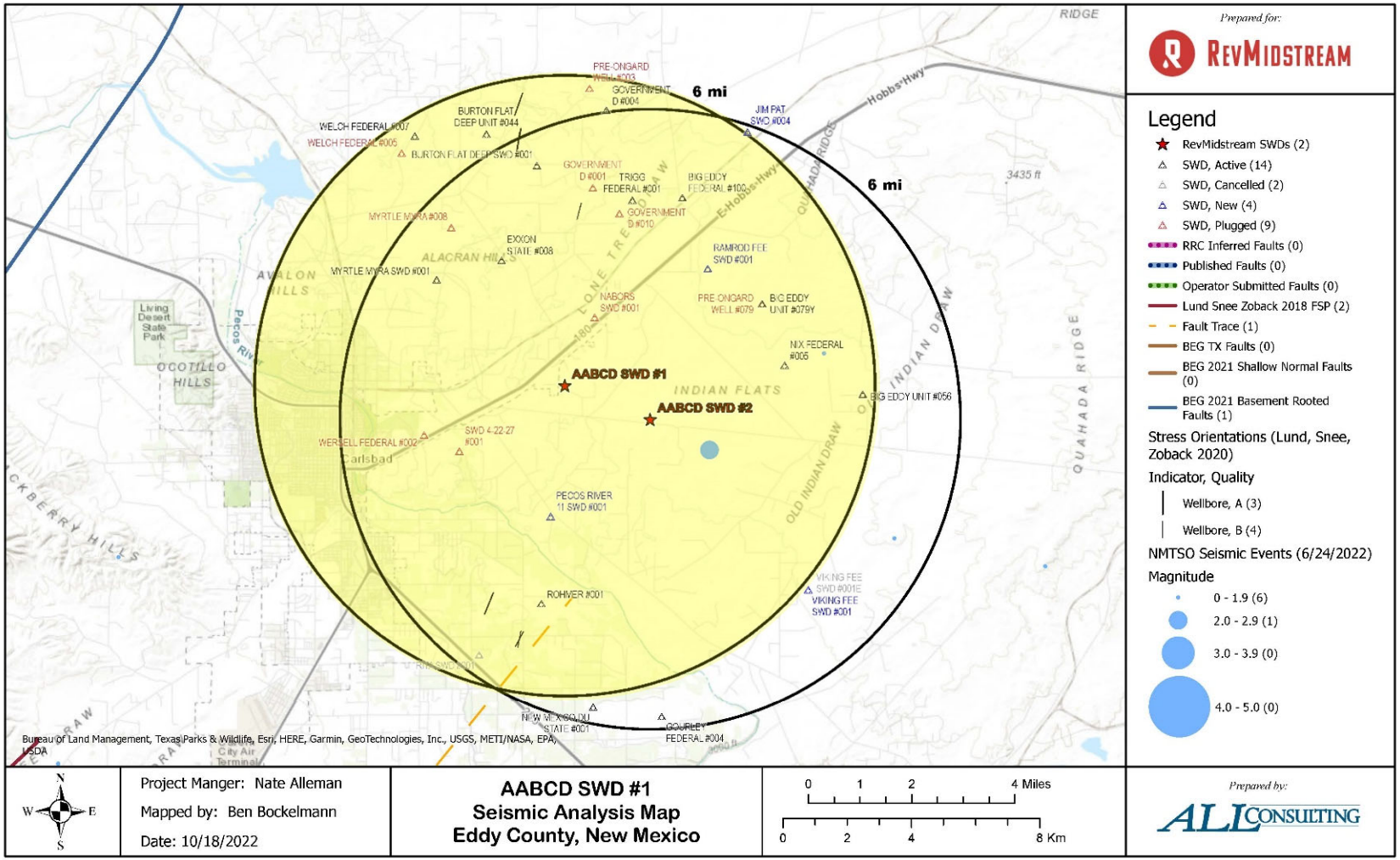
- **Modeled SWDs:** 20 Class II Injection Wells are located within the 6-mile radius area(s) of review (AOR) and were included in this model.
- **Modeled Injection Rates:**
  - Subject SWDs: the AABCD SWD #1 and AABCD SWD #2 were modeled at 45,000 barrels of water per day (BWPD).
  - Active & Pending SWDs: Modeled at various rates based on maximum requested injection rate within each injection application where available. When maximum requested injection rate was not available, the single highest reported monthly injection volume in the wells history was used for modeling rate.
- **Modeled Injection Timeframe:** Each SWD was modeled at the constant rate listed above from 2022 – 2047.

Injection Data

All SWDs within 6 miles of AABCD #1 & #2 SWDs

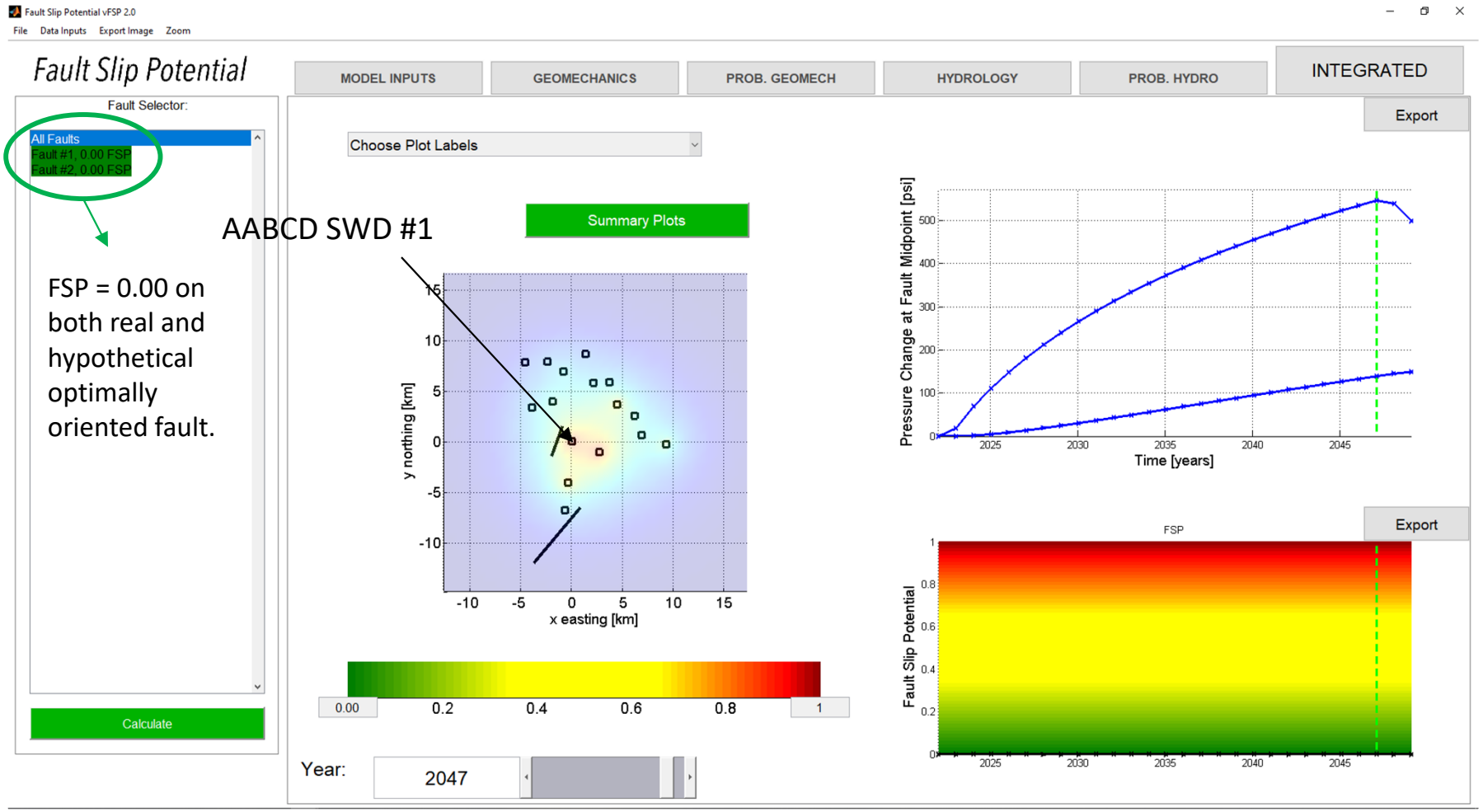
SWD Name (API)	SWD Status	Injection Rate (BWPD)	Modeled Time Period
AABCD #1	Pending	45,000	2022 - 2047
AABCD #2	Pending	45,000	2022 - 2047
MYRTLE MYRA SWD #001 (15-21515)	Active	5,508	2022 - 2047
EXXON STATE #008 (15-22055)	Active	11,000	2022 - 2047
BIG EDDY UNIT #079Y (15-23385)	Active	767	2022 - 2047
NEW MEXICO DU STATE #001 (15-24531)	Active	4,111	2022 - 2047
BIG EDDY FEDERAL #100 (15-24824)	Active	1,785	2022 - 2047
TRIGG FEDERAL #001 (15-25006)	Active	139	2022 - 2047
ROHMER #001 (15-25722)	Active	3,551	2022 - 2047
WELCH FEDERAL #007 (15-26710)	Active	744	2022 - 2047
NIX FEDERAL #005 (15-29196)	Active	325	2022 - 2047
BURTON FLAT DEEP UNIT #044 (15-32274)	Active	6,277	2022 - 2047
BURTON FLAT DEEP SWD #001 (15-40987)	Active	12,082	2022 - 2047
VIKING FEE SWD #001E (15-45309)	Pending	30,000	2022 - 2047
PECOS RIVER 11 SWD #001 (15-46767)	Pending	35,000	2022 - 2047
GOVERNMENT D #004 (15-24921)	Active	824	2022 - 2047
BIG EDDY UNIT #056 (15-22222)	Active	32,637	2022 - 2047
GOURLEY FEDERAL #004 (15-22661)	Active	35	2022 - 2047
RAMROD FEE SWD #001 (15-49301)	Pending	30,000	2022 - 2047
JIM PAT SWD #004 (15-48075)	Pending	40,000	2022 - 2047

AABCD #1 FSP Area Map

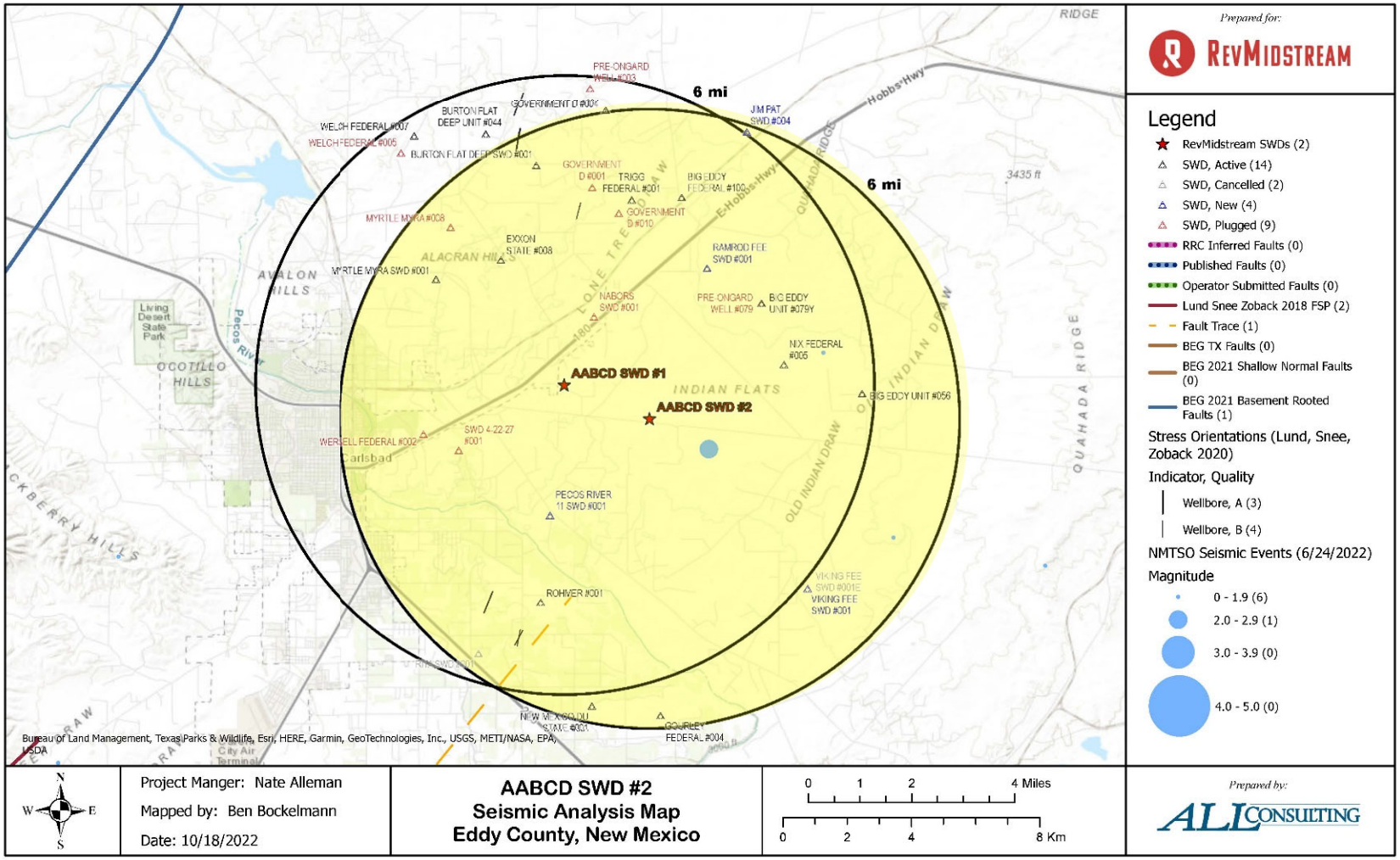


FSP After 25 Years

AABCD SWD #1

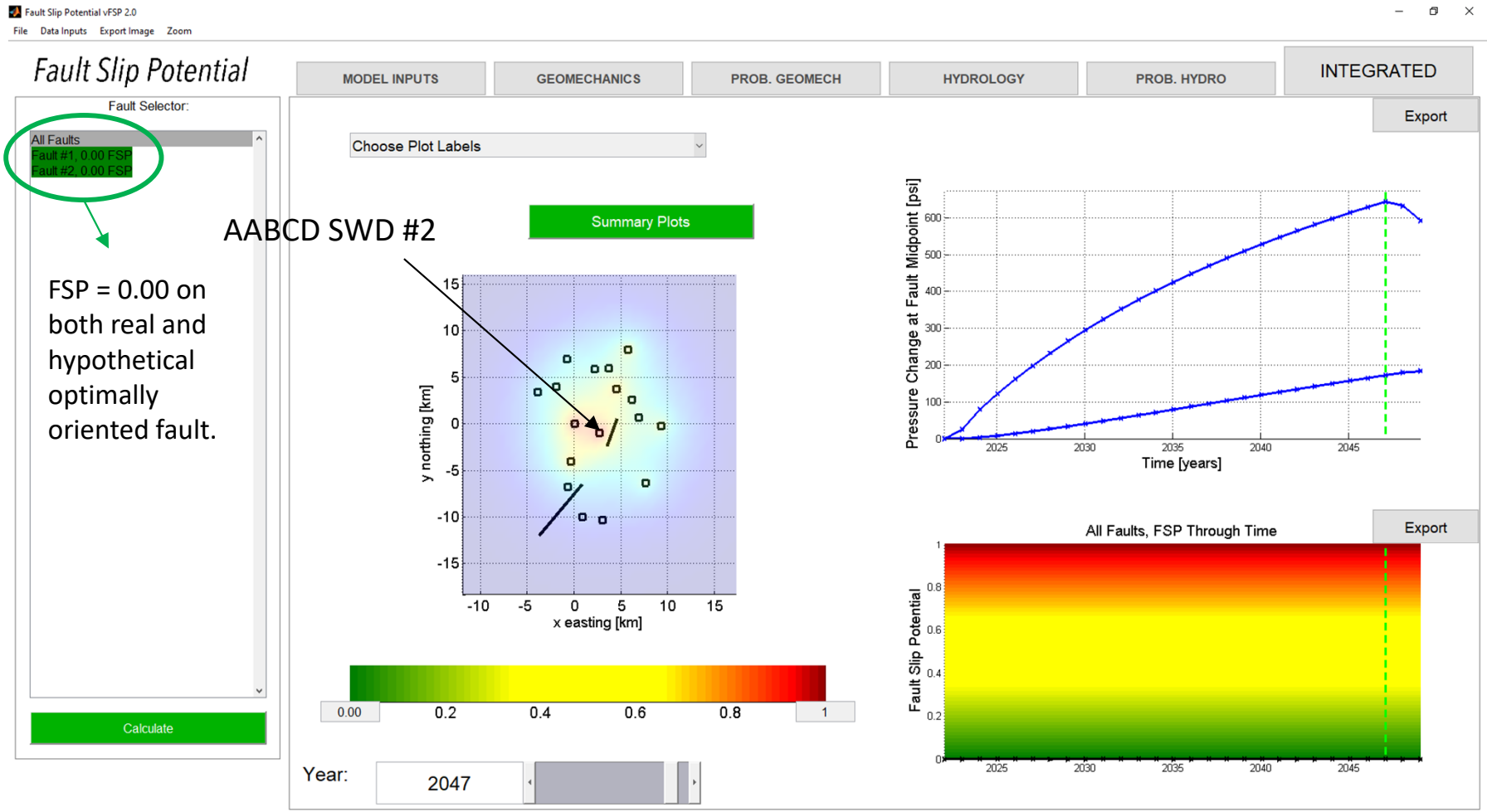


AABCD #2 FSP Area Map



FSP After 25 Years

AABCD SWD #2



FSP = 0.00 on both real and hypothetical optimally oriented fault.

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Conclusions

- One known fault exists in the 6-mile radius area of review. One hypothetical optimally oriented fault added to each model run per NMOCD request.
- FSP modeling through 25 years, with injection rates that are likely overestimated, show no risk of potential fault slip in the area on hypothetical optimally oriented fault.
- Known fault within the area of review is not optimally oriented for slip and shows no risk of potential fault slip.
- This area presents little to no risk for injection induced seismicity.

References

U.S. Geological Survey. "Faults." https://earthquake.usgs.gov/hazards/qfaults/ (Accessed December 17, 2021)

NMOCD Well Search. OCD Permitting - Wells. (n.d.). Retrieved June 30, 2022, from https://wwwapps.emnrd.nm.gov/OCD/OCDPermitting/Data/Wells.aspx

Lund Snee, Jens-Erik, 2020, State of Stress in North America: Seismicity, Tectonics, and Unconventional Energy Development [Ph.D. thesis]: Stanford University, 254p.

Reynolds, Todd. 2019. “FSP Analysis (Fault Slip Potential) Exhibits.” New Mexico Oil Conservation Division Case No. 20313, Case No. 20314, and Case No. 20472.

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State of New Mexico
Energy, Minerals and Natural Resources
Oil Conservation Division
1220 S. St Francis Dr.
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CONDITIONS

Action 153048

CONDITIONS

Operator: REV Midstream SWD #1, LLC P.O. Box 12878 Oklahoma City, OK 73157	OGRID: 330316
	Action Number: 153048
	Action Type: [IM-SD] Admin Order Support Doc (ENV) (IM-BAO)

CONDITIONS

Created By	Condition	Condition Date
drose	Document uploaded to record. Does not constitute approval of app, or indicate that material has been reviewed. Technical staff will reach out should there be additional questions.	10/24/2022