

# Additional Information

Received: 12/21/2021

COG Operating LLC  
Hasta La Vista 8 Fee SWD #1  
C-108 – Additional Attachment  
December 6, 2021

**Statement Regarding Injection Interval and Confining Layers**

The injection interval for the Hasta La Vista 8 Fee SWD 1 proposed well is within the Devonian and Silurian formations. This unit is made up of the Wristen Group and Fusselman Formation. The overall thickness of this interval is between 1,400 to 2,000 feet consisting of limestone and dolostone with significant primary and secondary porosity and permeability. Below the injection interval is the Montoya Formation, which is between 300 and 500 feet thick. Figure 1 shows the isopach map of the Wristen Group and Fusselman Formation along with known faults and proposed well location. Figure 2 shows the isopach map of the Montoya Formation.

Basement faults in the area are sourced from the Tectonic Map of Texas (Ewing, 1990). The Precambrian Basement Map (Frenzel et al, 1988) is the source of the Precambrian faults which is inferred from subsurface data. The proposed Hasta La Vista 8 Fee SWD 1 well is located 4.6 miles to the west of the nearest Precambrian fault and 0.8 miles to the east of the nearest Basement fault.

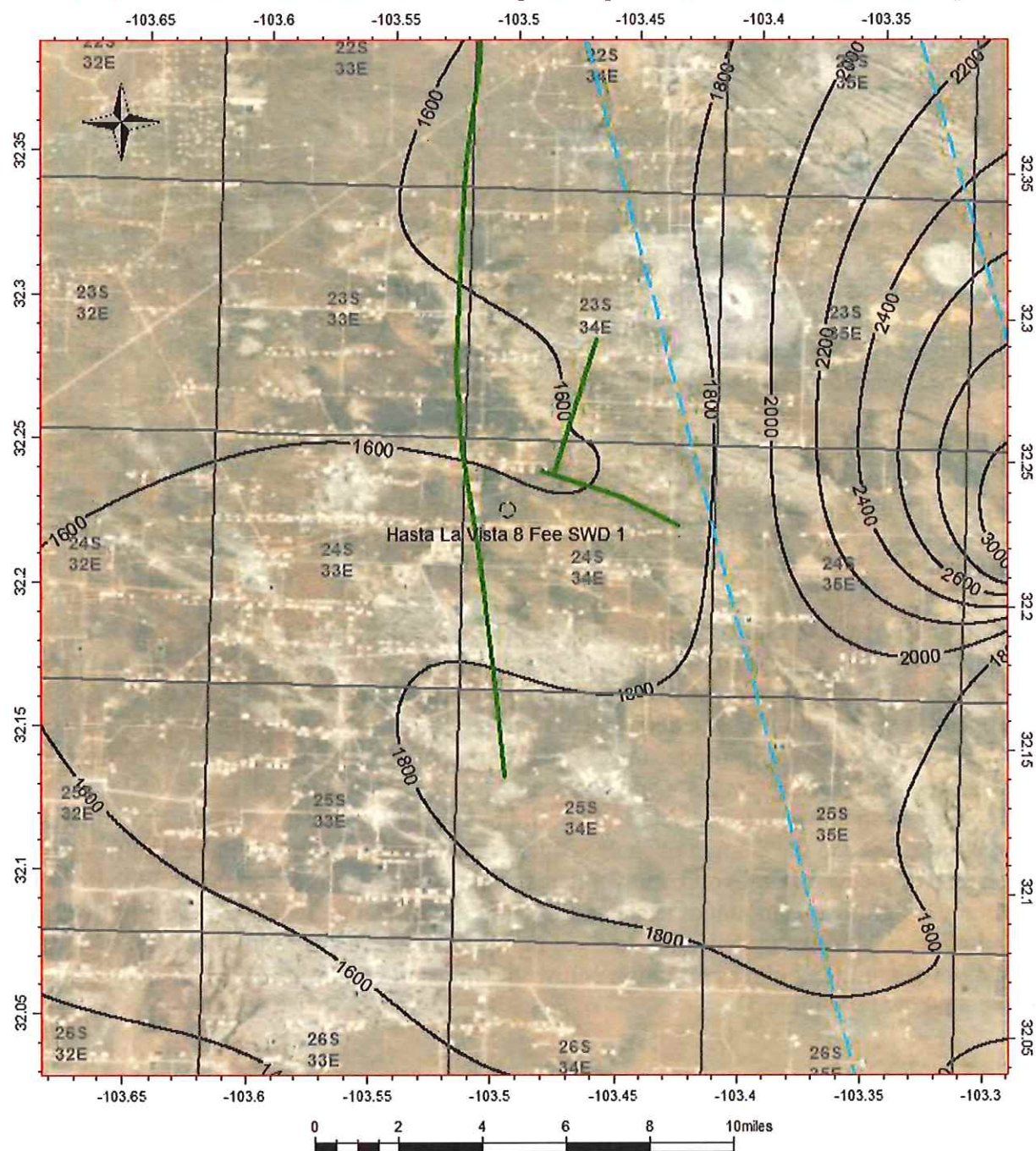
Overlying the Wristen Group is the Woodford Shale. The Woodford Shale in this area is between 200 to 300 feet thick, consisting of mostly shale and mudstone that act as a confining layer above the injection interval. Figure 3 shows the isopach map of the Woodford Formation, known faults and proposed well location. The underlying confining layer below the injection interval for the Hasta La Vista 8 Fee SWD 1 proposed well is the Simpson Group. The Simpson Group in this area is between 600 to 800 feet thick and consists of a series of shales, carbonates, and some sand. The Simpson Group interval acts as a confining layer below the injection interval due to the large thickness and the amount of shale sequences within this interval. Figure 4 shows the isopach map of the Simpson Group, known faults and proposed well location. The Woodford Shale and the significant amount of shale within the Simpson Group will likely prevent fluids from migrating outside of the injection interval in this well. There is an additional 400 to 600 feet of thickness of the Ellenburger Formation below the Simpson Group and above Precambrian Basement (shown in Figure 5).

Regards,



Carrie M. Martin  
Staff Geologist  
ConocoPhillips  
[carrie.m.martin@conocophillips.com](mailto:carrie.m.martin@conocophillips.com)  
432-221-0479

# Fusselman/Wristen Group Isopach and Faults Map



Area	Permian	Surface name	Silurian / Devonian Isopach
Geographic datum	GCS_North_American_1927	Contour inc	200
Projection	NAD27 / Texas Central (US ft)	Scale	1:200000

LEGEND	
—	NM TOWNSHIPS
—	Precambrian Faults
—	Basement Faults
○	Proposed well surface location

Figure 1: Silurian / Devonian (Fusselman Formation / Wristen Group) Isopach and Faults Map

# Upper Ordovician (Montoya) Isopach and Faults Map

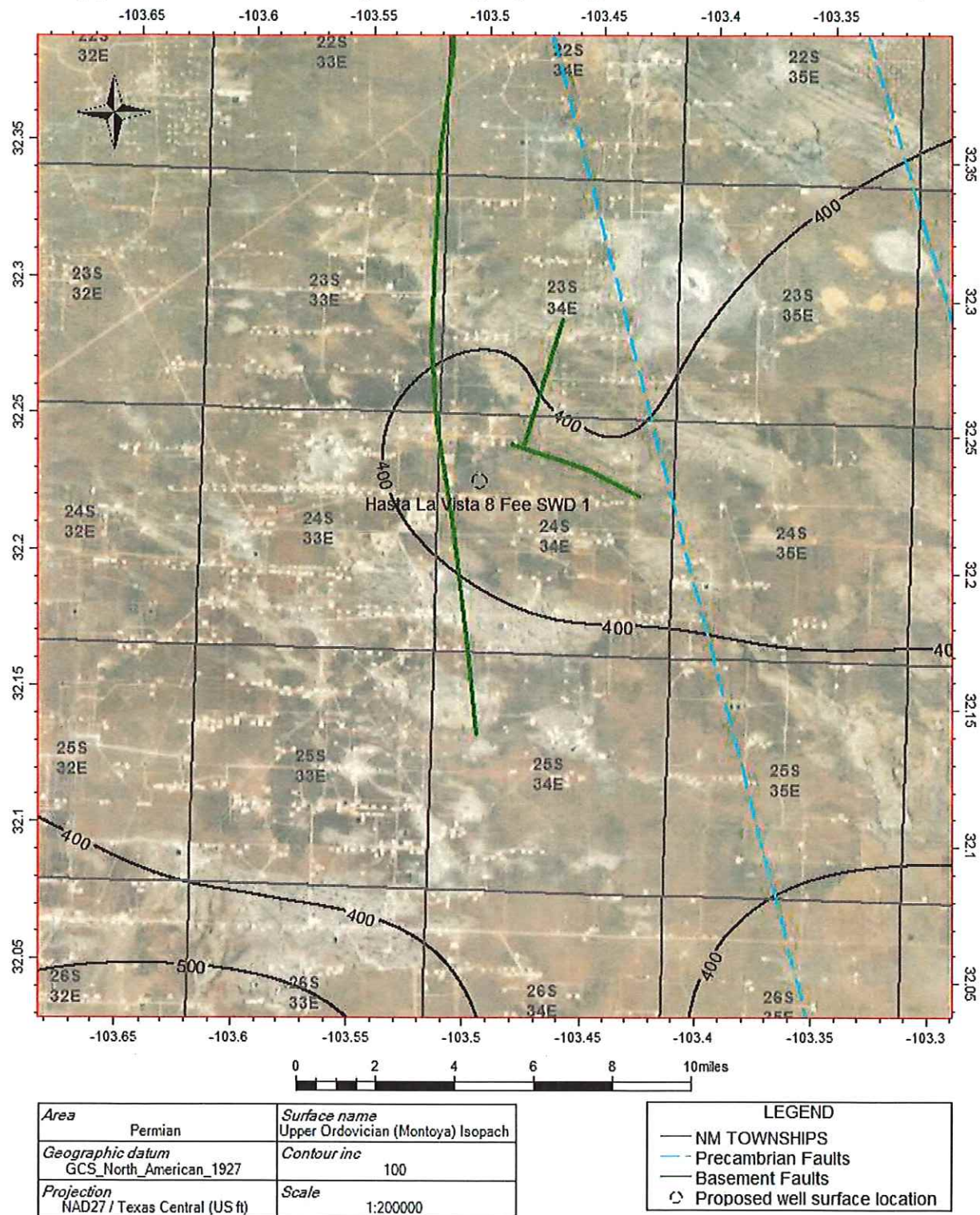


Figure 2: Upper Ordovician (Montoya) Isopach and Faults Map

# Late Devonian (Woodford) Isopach and Faults Map

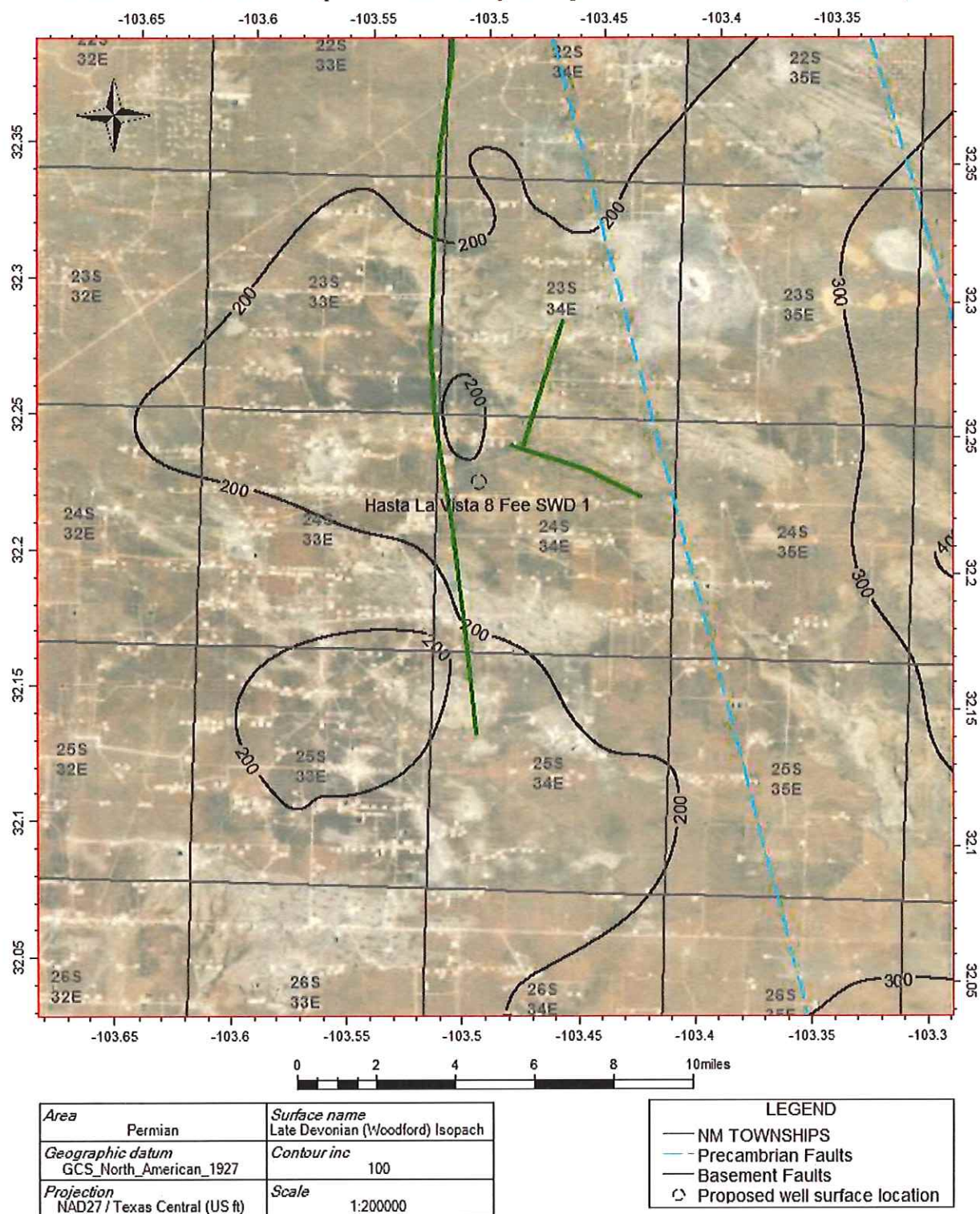


Figure 3: Late Devonian (Woodford) Isopach and Faults Map

Middle Ordovician (Simpson) Isopach and Faults Map

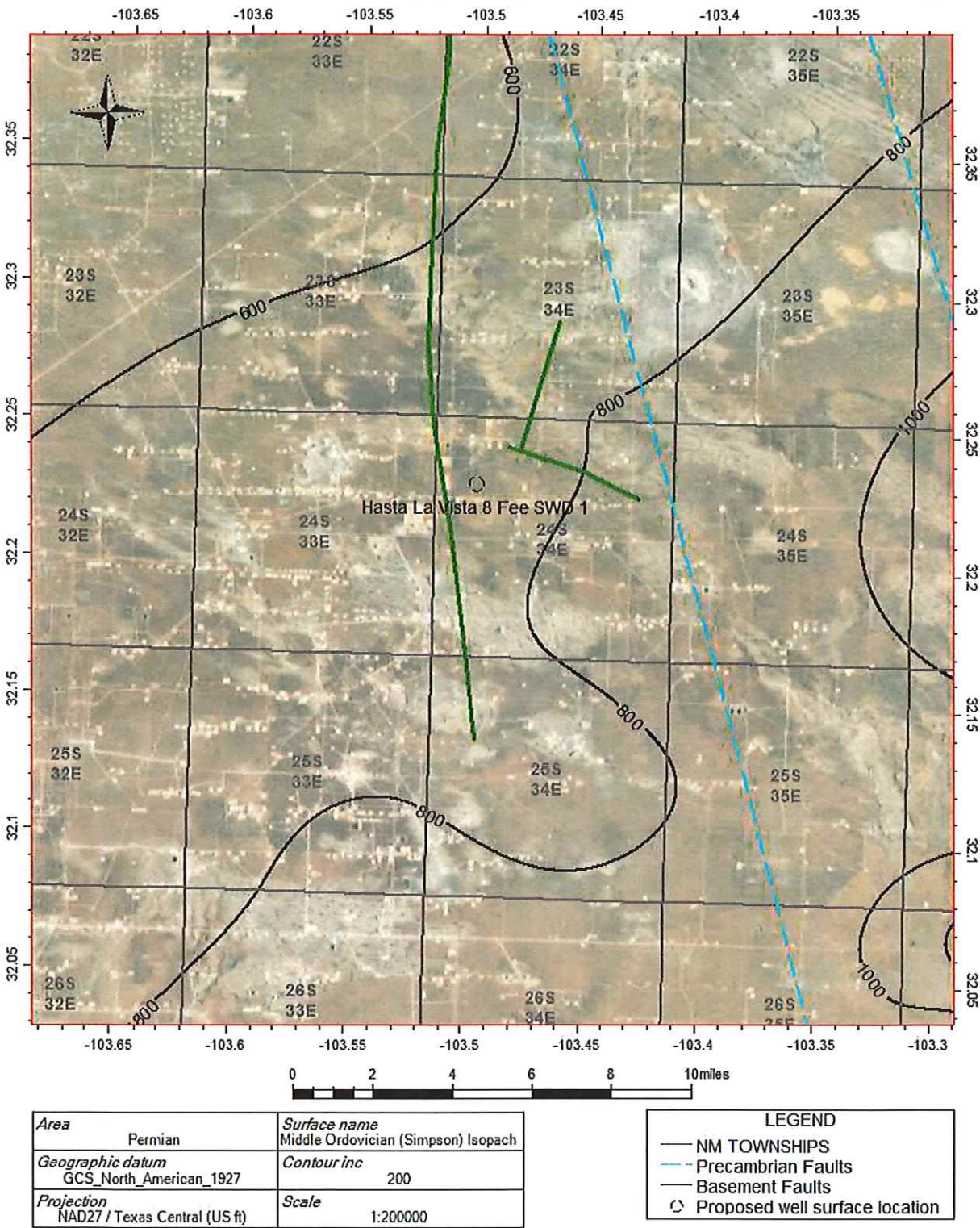


Figure 4: Middle Ordovician (Simpson Group) Isopach and Faults Map

# Lower Ordovician (Ellenburger) Isopach and Faults Map

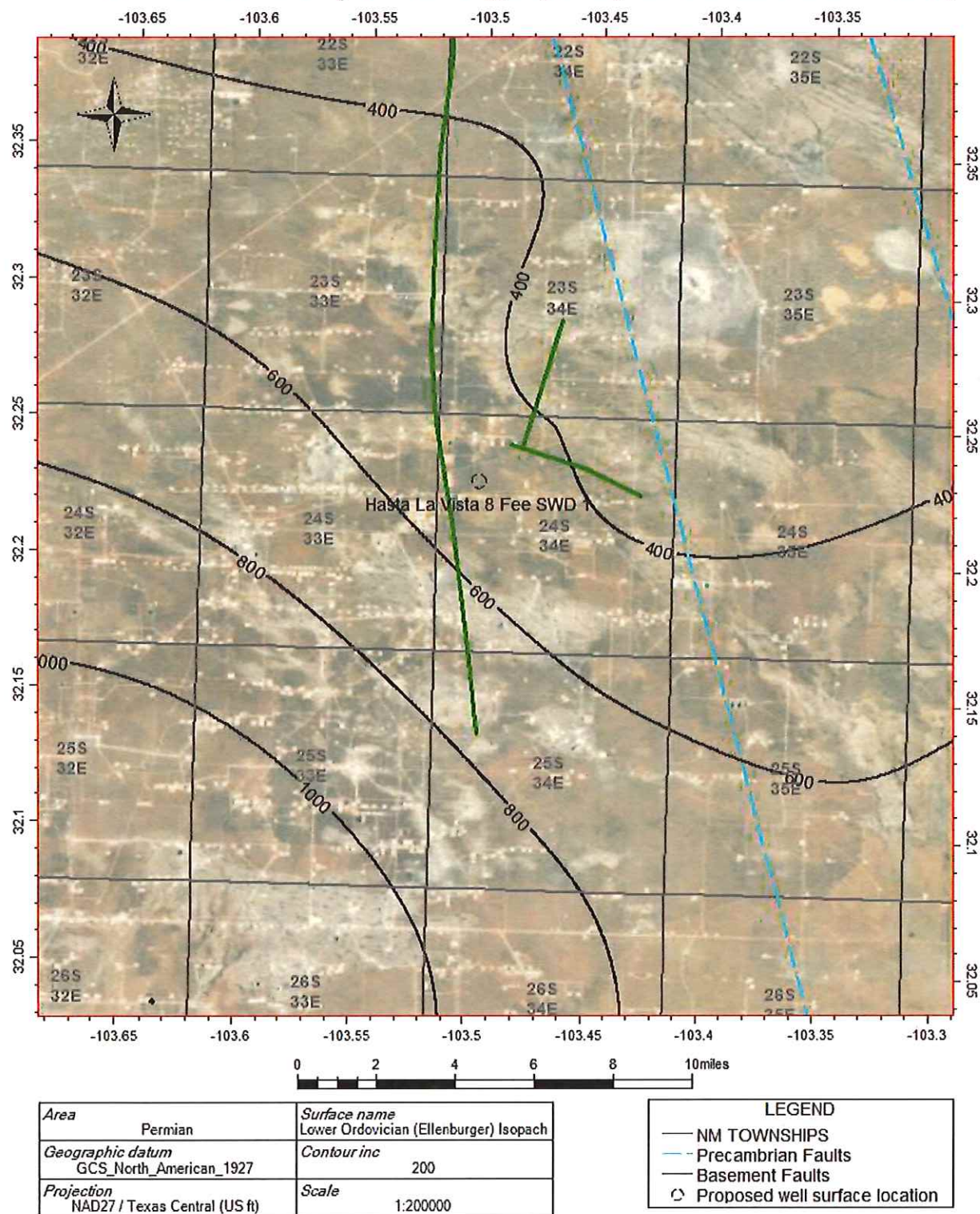


Figure 5: Lower Ordovician (Ellenburger) Isopach and Faults Map

### Statement Regarding Historical Review of Earthquakes in the Area

Historical review of earthquakes was conducted within a 50 km area around the Hasta La Vista 8 Fee SWD 1 proposed well. Seismic events were sourced from USGS earthquake catalog from January 1, 1970 to December 2, 2021 with a magnitude greater than 1.0. Table 1 shows all the seismic events within the 50 km area. There are a total 58 seismic events within this time-period ranging in magnitude from 1.0 to 4.6. Figure 6 shows the seismic event locations as red circles. The nearest earthquake to the Hasta La Vista 8 Fee SWD 1 proposed well is 4.12 miles to the west.

Regards,



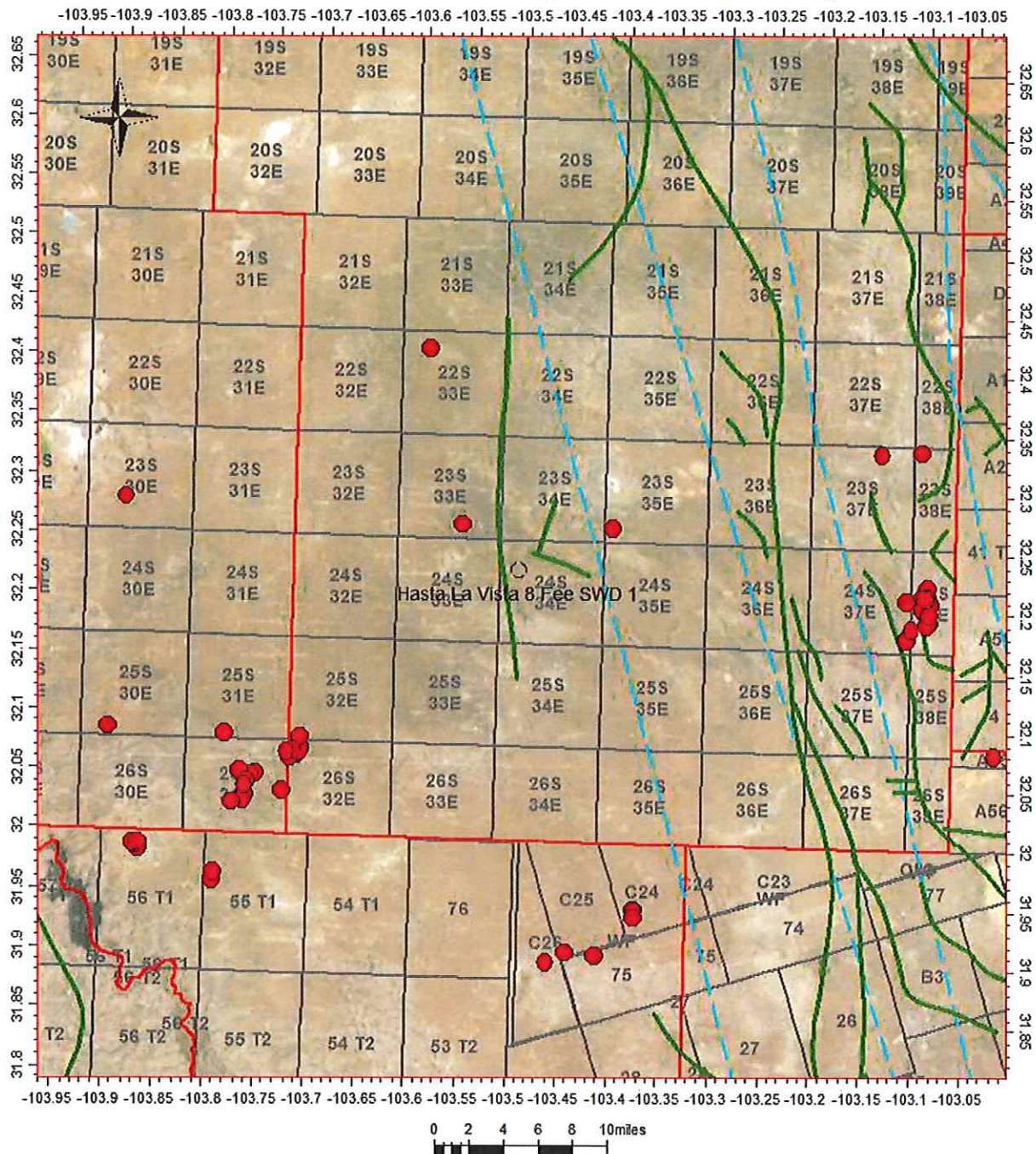
Carrie M. Martin  
Staff Geologist  
ConocoPhillips  
[carrie.m.martin@conocophillips.com](mailto:carrie.m.martin@conocophillips.com)  
432-221-0479

Table 1: Seismicity within 50 km of proposed SWD well (USGS source: Jan. 1970 – Dec. 2021)

Date	Origin Time GMT	Latitude	Longitude	Depth (km)	Magnitude
2021-12-01	8:56:17	31.9846	-103.8697	7.73	3
2021-11-13	4:53:34	32.4132	-103.5923	5.00	3.2
2021-10-25	5:08:04	32.2083	-103.0893	2.45	2
2021-10-19	18:49:23	31.9882	-103.8719	7.83	2.3
2021-10-19	11:45:27	31.9892	-103.8751	7.52	2
2021-10-14	22:05:11	31.9901	-103.8697	7.52	3.3
2021-10-13	21:02:19	32.2220	-103.0925	2.23	2.2
2021-09-22	0:25:44	32.0694	-103.7176	7.62	1.7
2021-09-21	8:15:44	32.0726	-103.7116	8.24	2.3
2021-09-21	4:19:43	32.0680	-103.7159	8.91	3.2
2021-09-20	23:31:46	32.2128	-103.0989	3.55	1.9
2021-09-20	17:46:29	32.2037	-103.0968	4.43	2.7
2021-09-14	21:52:41	32.1927	-103.0903	6.04	1.8
2021-09-10	11:51:14	32.0870	-103.9025	8.34	2.3
2021-09-10	11:20:39	32.1780	-103.1139	8.00	1.9
2021-09-10	2:44:26	32.1780	-103.1118	5.99	1.9
2021-09-09	22:04:39	32.1909	-103.0925	5.70	2.5
2021-09-09	21:47:19	31.9451	-103.3775	7.91	1.7
2021-09-09	14:47:54	31.9432	-103.3764	8.21	2.7

2021-09-09	10:51:06	31.9382	-103.3770	10.12	1.6
2021-09-07	8:29:09	32.2028	-103.0957	1.61	2.2
2021-09-05	11:59:29	32.1872	-103.1075	6.24	2
2021-09-03	8:47:54	32.2037	-103.0968	5.26	2
2021-09-01	17:52:40	32.2137	-103.0914	3.18	2.4
2021-09-01	8:54:10	32.2000	-103.0903	1.64	2
2021-09-01	7:19:23	32.2128	-103.0946	5.01	2.5
2021-08-31	10:17:19	32.2101	-103.1129	7.09	2.1
2021-08-17	22:24:07	32.0722	-103.7170	7.42	2
2021-08-15	14:56:22	32.0740	-103.7116	7.83	3.2
2021-08-04	6:53:57	32.0754	-103.7132	7.52	1.9
2021-08-04	3:06:21	32.0731	-103.7116	7.73	2.3
2021-07-31	11:29:49	32.0648	-103.7224	8.39	2.5
2021-07-28	23:50:22	32.0703	-103.7132	8.70	2.7
2021-07-28	19:20:39	32.0830	-103.7124	7.29	2.2
2021-07-19	11:23:25	32.0712	-103.7192	7.83	4
2021-07-15	8:13:04	32.0510	-103.7559	7.42	1.6
2021-07-01	19:49:12	31.9594	-103.7962	6.75	2.3
2021-07-01	2:51:28	32.0840	-103.7879	8.09	1.6
2021-06-25	10:04:25	32.0699	-103.7257	7.42	2
2021-06-16	16:10:53	31.9051	-103.4137	9.50	1.6
2021-06-08	6:34:48	31.9668	-103.7957	7.52	2.1
2021-05-10	4:36:40	32.0372	-103.7294	8.70	1.8
2021-04-28	14:56:38	32.0317	-103.7672	7.93	1.9
2021-04-04	13:02:13	31.9074	-103.4434	6.05	1.9
2021-03-19	14:18:19	32.0326	-103.7656	8.60	2.7
2021-03-19	8:02:15	32.0503	-103.7616	8.68	2.2
2021-03-19	2:43:27	32.0284	-103.7683	8.34	3.4
2020-11-08	21:19:55	31.8986	-103.4622	5.98	2.7
2020-07-14	4:44:04	32.0528	-103.7722	11.84	2.5
2020-04-23	4:34:53	32.0439	-103.7650	9.81	2.6
2019-12-30	3:01:14	32.0402	-103.7668	5.00	2.5
2019-11-28	12:52:42	32.0263	-103.7789	9.65	2.7
2019-10-21	11:58:57	32.2659	-103.4070	5.00	2.7
2017-05-03	17:47:21	32.0819	-103.0226	5.00	2.6
2012-03-18	10:57:22	32.2810	-103.8920	5.00	3.1
2001-06-02	1:55:54	32.3340	-103.1410	5.00	3.3
1992-01-02	11:45:36	32.3360	-103.1010	5.00	4.6
1984-12-04	20:36:36	32.2660	-103.5560	5.00	2.9

# Historical Seismicity and Faults Map



Area	Permian	Points
Geographic datum	GCS North American 1927	Historical Seismicity
Projection	NAD27 / Texas Central (US ft)	Scale
		1:488281

LEGEND
— NM TOWNSHIPS
— TX BLOCKS
— COUNTIES
— Precambrian Faults
— Basement Faults
○ Proposed well surface location

Figure 5: Historical Seismicity (Jan. 1, 1970 to Dec. 2, 2021) and Faults Map

