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# SAM Oil LLC
# Proposed SAM 1-9
## White River Valley, Nye County Nevada
## Estimated Ultimate Recovery 400K of oil per well
## 10 million bbls EUR, or more, for the prospect

**Prospect Summary:**
The proposed SAM 1-9 well is up dip from the Northwest "White River Valley #6" well that was drilled in 1981 and recovered 39 API gravity oil from Tertiary volcanic rocks (Poole and Claypool, 1984) in DST #1 between 2190 feet and 2225 feet (see Figures 6). The White River Valley #6 (WRV#6) well is about 1900 feet east southeast of the proposed "SAM 1-9" drill site. Wire line logs indicate that the zone tested with DST #1 in the WRV#6 well was tight; however, there are numerous loss of circulation zones between 1702 and 2200 feet in the WRV#6 well indicative of excellent permeability. Oil on the pits prompted the operator to run the DST in the volcanic section even though sample shows were lacking. A subsequent analysis of the drill cuttings indicate that there were sample shows from 1702 to 2200 feet, but were either ignored because of sample quality and or significance, or missed by the mudloggers (See Appendix 1). The primary target for the WRV#6 well were sands in the Mississippian Chainman that had good oil shows in a well that Northwest had drilled in 1976 (WRV#1).

**Proposed SAM 1-9 Well**

- Proposed TD: 2,200 feet
- Analog: Trap Spring field located about 28 miles west northwest of proposed drill site. Average cumulative production per well at trap springs is 400,000 bbls of oil (see Fig 7) Discovered in 1976, produces oil from Oligocene Volcanic rocks with fracture porosity Trap Spring total field production: 15 million barrels of oil (2018)
- Estimated top of pay (Oligocene Volcanic Rocks): 1500 feet (GL).
- Conservative EUR from prospect between 10 and 15 million barrels of oil

**Geology:**
Well control and seismic data clearly indicate that that bedding in the area dips to the east and the SAM 1-6 well is up dip from the WRV#6 well (see Figures 1 and 5) which recovered oil in Tertiary volcanic rocks. The top of the Chainman shale, which has obvious lithology and elog characteristics, was encountered at 7900 feet in the White River Valley #1 well. In the White River Valley #6 well the Chainman is at 5920 feet, nearly 2000 feet high to the WRV#1 well which 1.25 miles is east of the WRV#6 well. Devonian Guilmette limestone and dolomite in outcrop about 2 miles west southwest of the proposed drill site dip between 20 and 30 degrees to

the northeast. Faulting observed in this outcrop strikes northeast and forms the surface structure observed in outcrop. This structure is believed to be buried at depth under the SAM 1-9 drill site. A geomorphic anomaly is clearly evident in areal images (eg: google earth) and inferred to reflect a surface expression of the buried faulted bounded anticline (see Figure 3).

The structure targeted by the SAM 1-9 well is a fault bounded anticline. This structure is observed in an outcrop of Devonian Guilmette located about 1.8 miles southwest of the proposed well. Northeast trending normal faults create a structural high in the middle of the outcrop with faults dipping north on the north side of the highest point on this outcrop and faults dipping south on the south side of the outcrop. Residual gravity lows to the north and south of the structure support this interpretation. The cap rock is composed of clay rich sediments very similar to the Trap Spring field in Railroad Valley.

**Source Rock:**

The primary source rock is the Chainman shale which is 1,760 feet thick in the WRV#1 well. The Chainman shale in the WRV#1 well is entirely in the oil window. Gravity data indicates that the hydrocarbon kitchen (east of the proposed SAM 1-9 well) encompasses nearly 31 square miles. The bottom hole temperature in the WRV#1 well is 186F (at 10,483ft) and the calculated temperature gradient, with this non-equilibrated temperature, at the WRV#1 well is about 1.3F/100 feet. Therefore, the top of the oil window (onset of oil generation) is at about 6900 feet, significantly shallower than the top of the Chainman shale in the WRV#1 well. The average vitrinite reflectance (Ro) of the Chainman in offset wells is about .73 indicating about 20% oil expulsion. The TAI (Thermal Alteration Index) indicates that the Chainman has expelled nearly 50% of its potential oil. These are slightly conflicting results; however, assuming that the Chainman shale is capable of generating 200 barrels of oil per acre foot, and using a conservative 500 feet for the thickness of the shale within the Hydrocarbon Kitchen, 50% expulsion, the Chainman shale in this part of White River Valley has expelled about 1 billion barrels of oil. By comparison, Ramsey Barrett (1987) calculated that mature (oil generating) Chainman shale in Railroad Valley encompasses 50 square miles and has a potential of 228 barrels of oil per acre foot.

**Estimated oil recovery:**

The analog production for this prospect is the Trap Spring oil field which has produced slightly more than 15 million barrels of oil from volcanic rocks since its discovery in 1976. The trap spring field currently produces oil from 24 wells with an average field wide monthly production of about 10,000 barrels of oil per month. Historically there have been about 37 wells that have produced oil at Trap Spring. The arithmetic average cumulative production for each well is about 400,000 barrels of oil. Some wells have produced over 1 million barrels of oil.

The areal extent of the prospect encompasses approximately 2500 acres (see Figure 9). Assuming a hypothetical oil column of only 80 feet, fracture porosity of 12%, 70% oil saturation, and a 20% recovery factor the Estimated Ultimate Recovery (EUR) for the prospect is over 25 million barrels of oil. A more conservative estimate would cover about 1000 acres and have an EUR of 10 million barrels of oil.

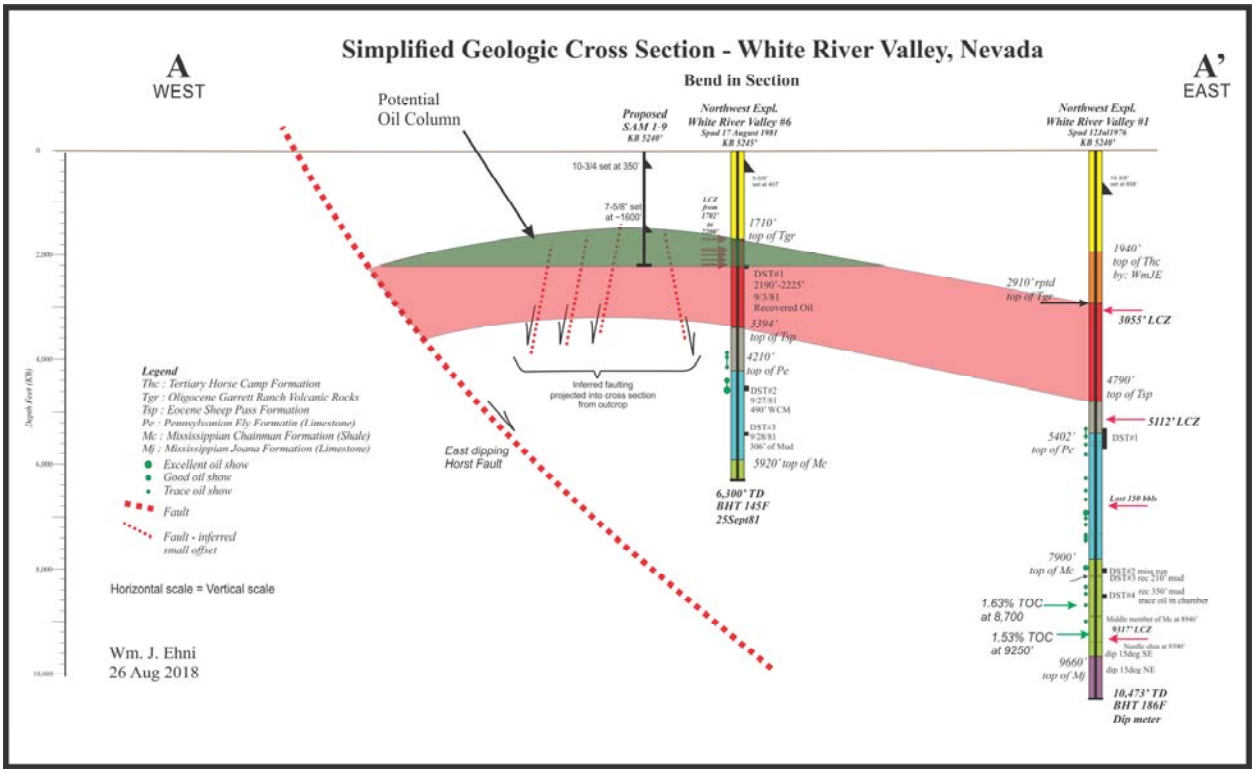


Figure 1A: Simplified geologic cross section A-A' The proposed SAM 1-9 well is up dip from the WRV#6 well that tested 39 gravity oil from volcanic rocks between 2190 and 2225 feet (DST#1). Based on well control integrated with seismic data, the SAM 1-9 well should be about 300 feet high to the WRV#6 well. Assuming that DST#1 in the WRV#6 well was at the bottom of the oil column, the "potential oil column" could be nearly 800 feet thick. It is interesting to note that the WRV#1 well also encountered permeability (LCZ at 3055 feet) near the top of the volcanic section.

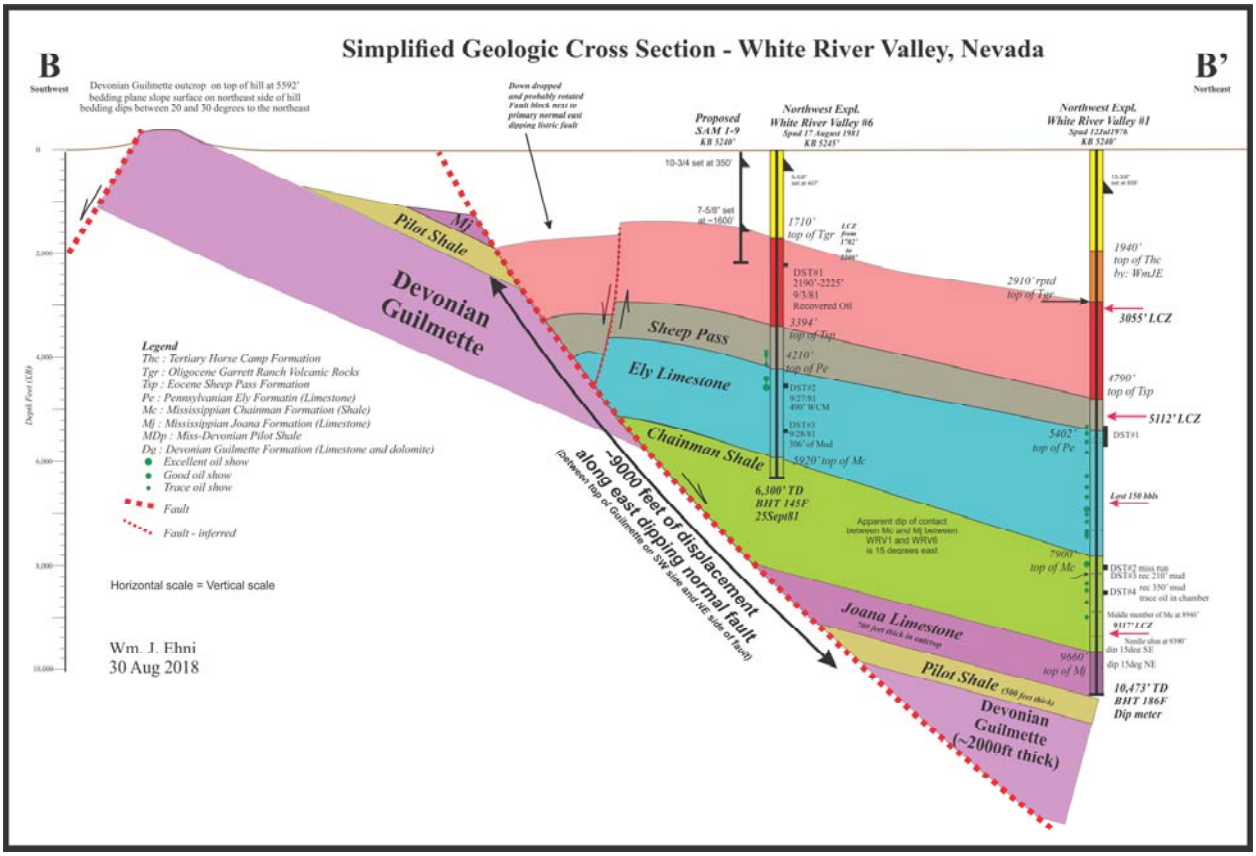


Figure 1B: Simplified geologic cross section B-B'. The outcrop to the southwest of the prospect is part of an intragraben horst with Devonian Guilmette dipping to the northeast. The northeast facing slope of this outcrop is a bedding plane surface where the Pilot shale has been eroded off of the surface exposing the top of the Devonian Guilmette. This northeast dip extends all of the way to the White River Valley #1 well where the source rock (Chainman shale) is well within the oil window. The east dipping range front fault is a "sealing" fault just as seen in the Trap Spring and Eagle Springs oil fields in Railroad Valley.

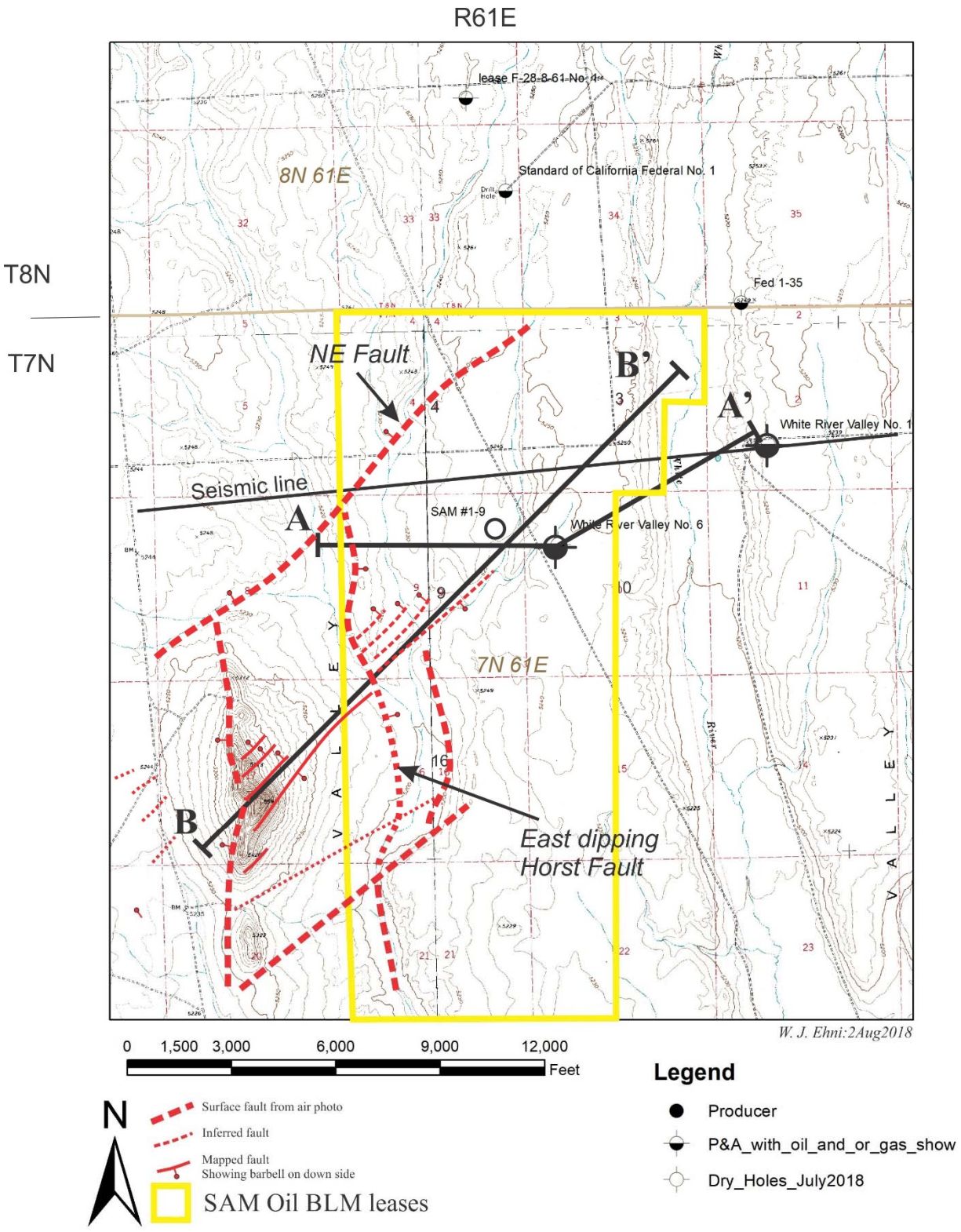


Figure 2: SAM Oil LLC leasehold encompassing about 4080 acres, and showing air photo fault interpretation, location of cross section A-A', B-B' and seismic line #4 (see Figure 5)

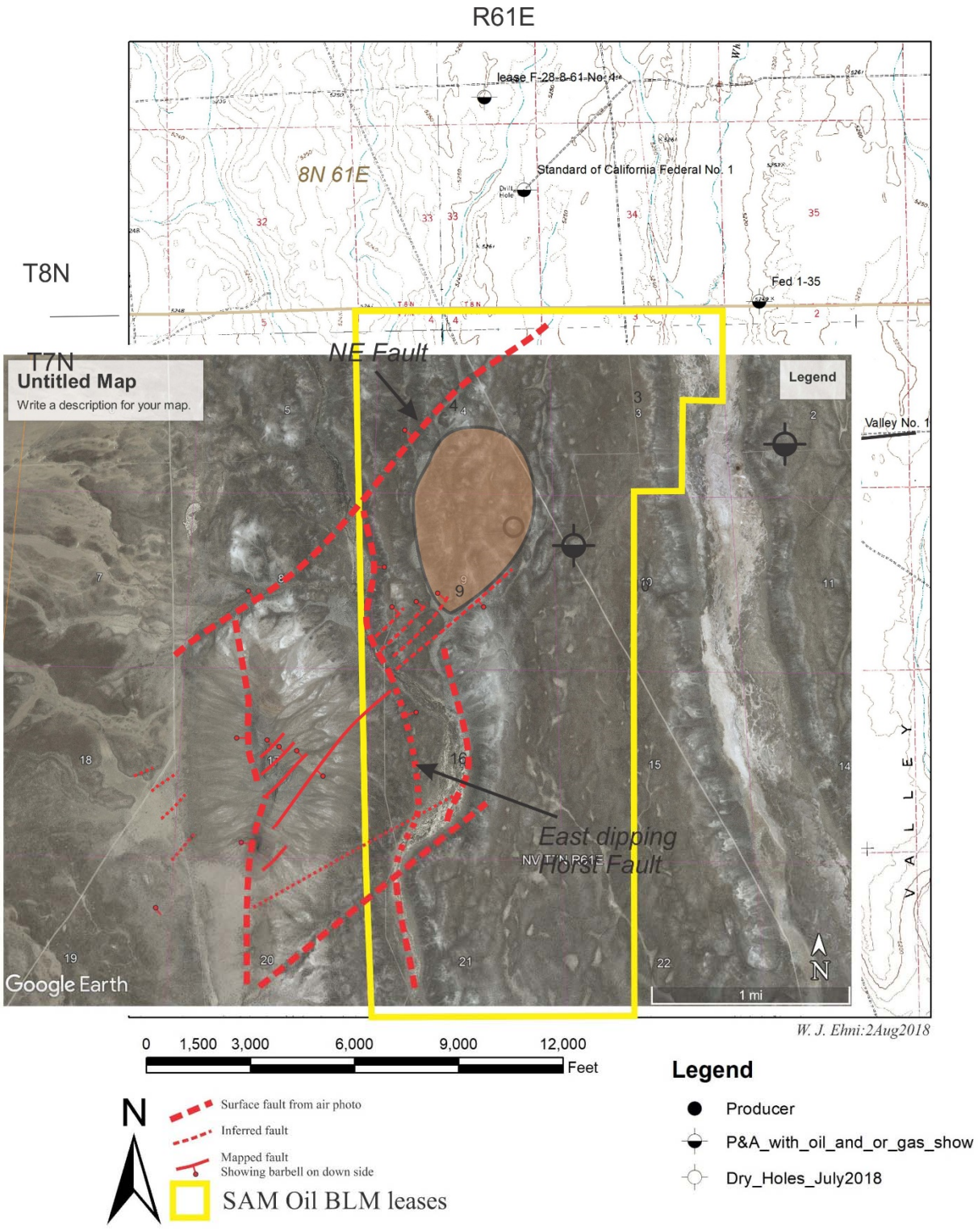


Figure 3: Google Earth image showing fault interpretation and geomorphic anomaly (shaded orange) and SAM Oil LLC 4080 acre lease block

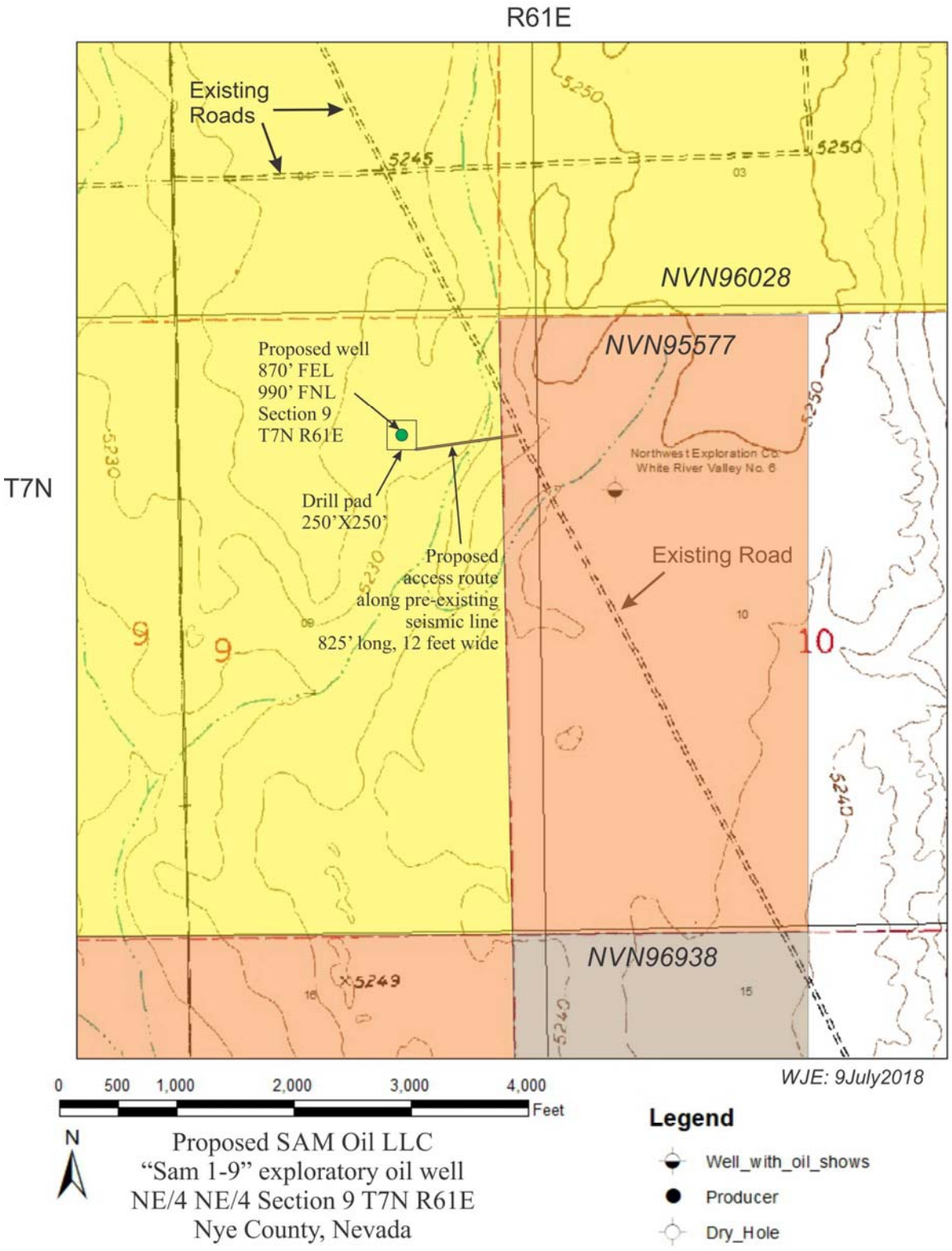


Figure 4: Proposed drill site located west northwest of the Northwest "White River Valley #6 well.

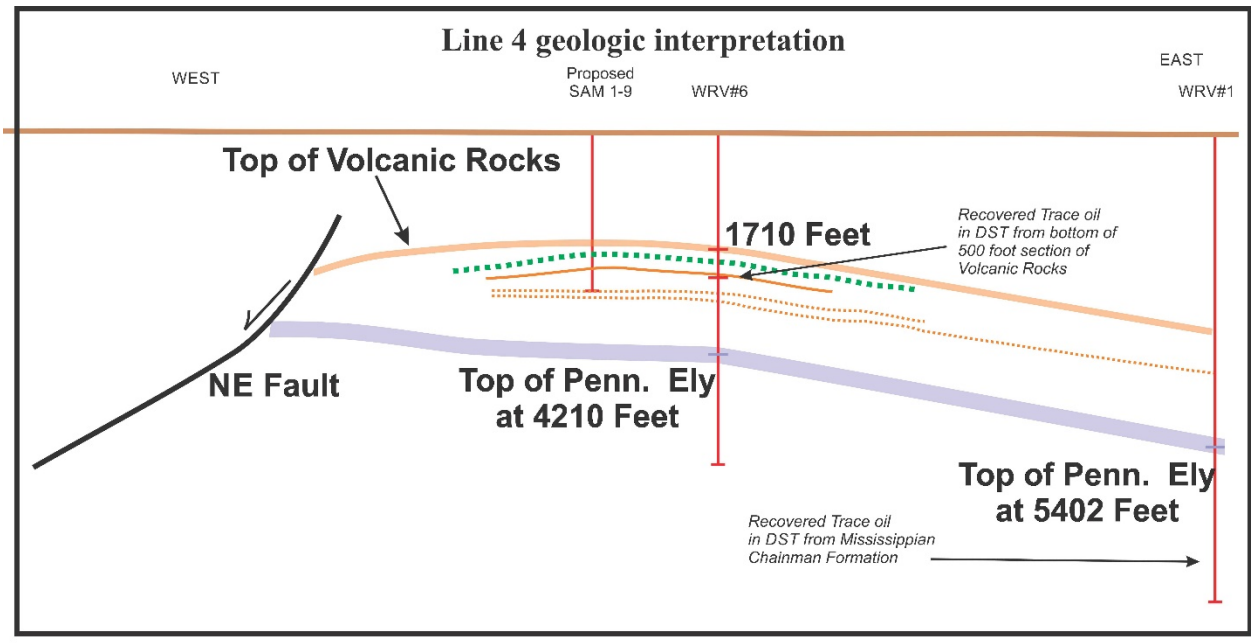


Figure 5: Seismic line 4 is north of the proposed SAM 1-9 drill site, but clearly shows east dipping bedding and the anticline imaged in the volcanic rocks.

Table 15. Summary of crude-oil samples analyzed from the Great Basin region. See Figures 2 and 3 for locations.

| Item | Field/Well | | Depth in ft | Rock Unit/Lithology | Age | Location sec., T., R. | API gravity | Sulfur % | $\delta^{34}S$ o/oo | $C_{15+}$ % of oil | Hydrocarbons % of $C_{15+}$ | SAT/AROM | $\delta^{13}C_{SAT}$ o/oo | $\delta^{13}C_{AROM}$ o/oo | pr/ph | CPI |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | RAILROAD VALLEY | | | | | | | | | | |
| | Currant Field | | | | | | | | | | | | | | | |
| 1. | Northwest Exploration Co. Currant No. 1 | DST-3 | 6856-7080 | Sheep Pass Formation | Tertiary | 26, 10N, 57E | 15 | 4.7 | - 13.8 | 97 | 67 | 0.4 | -29.4 | -28.0 | 0.6 | - 1 |
| 2. | Northwest Exploration Co. Currant No. 1 | | 6856-7080 | do. | do. | do. | 14 | 4.4 | + 13.8 | 75 | 76 | 1.1 | -29.4 | -29.2 | 0.8 | - 1 |
| | Eagle Springs Field | | | | | | | | | | | | | | | |
| 3. | Shell Oil Co., Eagle Springs Unit No. 1-35, No. 62-35[a,b] | | 6252-6500<br>6450-6730 | welded tuff | do. | 35, 9N, 57E | 26 | 1.4 | + 7.8 | 85 | 60 | 2.4 | -30.2 | -29.1 | 0.9 | 1 |
| 4. | Texoto Oil Co. Gose No. 74-35 | | 6465-6750 | Sheep Pass Formation | do. | do. | 23 | 2.3 | + 6.3 | 94 | 50 | 2.4 | -29.6 | -28.8 | 0.5 | 1 |
| 5. | Draycutt Corp. No. 5[c] | | 6714-6852 | do. | do. | 36,9N,57E | 28 | 1.5 | + 7.0 | 93 | 81 | 2.5 | -30.3 | -29.3 | 0.8 | 1 |
| 6. | Draycutt Corp. No. 45-36[a] | | 6064-6230 | do. | do. | do. | 23 | 1.4 | — | 95 | 53 | 2.2 | -29.7 | -29.0 | 0.8 | 1 |
| | Trap Spring Field | | | | | | | | | | | | | | | |
| 7. | CHADCO Inc., Britton No. 13-21 | | 3976-4140 | welded tuff | do. | 13, 9N, 57E | 30 | 0.6 | + 1.4 | 97 | 63 | 2.3 | -30.6 | -30.4 | 1.5 | 1 |
| 8. | Northwest Exploration Co. Trap Spring No. 19 | | 3374-4100 | do. | do. | 23, 9N, 56E | 29 | 0.5 | + 1.6 | 85 | 69 | 2.6 | -30.7 | -30.4 | 1.5 | 1 |
| 9. | CHADCO Inc. Zusspan No. 24-1 | | 4910-4944 | do. | do. | 24, 9N, 56E | 21 | 0.6 | + 2.5 | 90 | 67 | 3.3 | -30.5 | -30.4 | 1.5 | 1 |
| 10. | Northwest Exploration Co. Trap Spring No. 1 | | 4220-4653 | do. | do. | 27, 9N, 56E | 19 | 0.6 | + 2.5 | 98 | 60 | 2.4 | -30.7 | -30.6 | 1.5 | 1 |
| 11. | Northwest Exploration Co. Trap Spring No. 3 | | 3269-4083 | do. | do. | 34, 9N, 56E | 24 | 0.5 | + 2.3 | 90 | 92 | 1.9 | -30.6 | -30.5 | 1.5 | 1 |
| | Bacon Flat Field | | | | | | | | | | | | | | | |
| 12. | Northwest Exploration Co. Bacon Flat No. 1 | | 5316-5333 | dolomite | Devonian | 17, 7N, 57E | 29 | 0.6 | + 3.7 | 88 | 89 | 7.2 | -30.3 | -30.1 | 1.7 | 1 |
| | Grant Canyon Field | | | | | | | | | | | | | | | |
| 13. | Northwest Exploration Co. Grant Canyon No. 1 | | 4374-4426 | do. | do. | 21, 7N, 57E | 27 | 0.5 | + 2.8 | 97 | 78 | 4.1 | -30.1 | -30.0 | 1.4 | 1 |
| | | | | | | PINE VALLEY | | | | | | | | | | |
| | Blackburn Field | | | | | | | | | | | | | | | |
| 14. | Amoco Production Co. Blackburn No. 3 | upper zone | 7072-7090 | dolomite | Devonian(?) | 8, 27N, 52E | 28 | 0.4 | + 17 | 73 | 89 | 4.4 | -30.6 | 29.9 | 1.8 | 1 |
| 15. | Amoco Production Co. Blackburn No. 3 | lower zone | 7120-7140 | do. | do. | do. | 27 | 0.6 | + 16 | 88 | 87 | 3.9 | -30.6 | -29.6 | 1.8 | 1 |
| 16. | Amoco Production Co. Blackburn No. 10 | upper zone | 5660-5870 | tuff | Tertiary | do. | 30 | 0.7 | + 20 | 85 | 47 | 3.6 | -31.1 | -30.0 | 1.6 | 1 |
| 17. | Amoco Production Co. Blackburn No. 10 | lower zone | 6718-6744 | sandstone | Mississippian(?) | do. | 30 | 0.5 | + 18 | 17 | 84 | 3.7 | -30.3 | -29.8 | 1.6 | 1 |
| | Pine Valley area | | | | | | | | | | | | | | | |
| 18. | Mineral Hill water tank seep near McCoy Spring[d] | | surface | | Quaternary | 29–30, 27N, 52E[d] | — | — | — | 74 | 67 | 3.5 | -30.1 | -29.5 | 1.4 | 1 |
| | | | | | | WHITE RIVER VALLEY | | | | | | | | | | |
| 19 | Northwest Exploration Co. White River Valley No. 6 | DST-1 | 2190-2225 | tuff conglomerate | Tertiary | 10, 7N, 61E | 39 | 0.17 | + 14 | 94 | 67 | 11 | -31.4 | -29.8 | 1.4 | 1 |
| | | | | | | HUNTINGTON VALLEY | | | | | | | | | | |
| 20. | Wexpro Co. Jiggs No. 10-1 | upper zone (DST) | 9399-9440 | Elko Formation | Tertiary | 10, 29N, 55E | 43 | < 0.1 | + 15 | 99 | 94 | 12 | -29.8 | -28.1 | 1.3 | 1 |
| 21. | Wexpro Co. Jiggs No. 10-1 | lower zone (perforated pipe) | 10,060-10,080<br>10,140-10,160 | siltstone and shaly limestone | Miss. Penn. | do. | 50 | < 0.1 | — | 33 | 91 | 27 | -27.7 | -27.2 | 6 | — |
| | | | | | | NORTHEASTERN NEVADA | | | | | | | | | | |
| 22. | Shell Oil Co. Mary's River Federal No. 1 | | 3515-3545 | tuffaceous sandstone and siltstone | Tertiary | 30, 38N, 61E | 38 | 0.15 | - 0.4 | 95 | 89 | 15 | -27.6 | -26.0 | 0.8 | 1 |
| 23. | Sun Exploration & Production Co. So. Pacific No. 3-13 | | 8390-8430 | shale unit in Humboldt Formation | do. | 13, 39N, 65E | 32 | < 0.1 | + 10.2 | 86 | 90 | 6.9 | -30.6 | -28.6 | 1.8 | 1 |
| | | | | | | NORTHERN GREAT SALT LAKE | | | | | | | | | | |
| | Rozel Point Field | | | | | | | | | | | | | | | |
| 24. | Charles E. King Rozel-State No. 1 | | 152 | basalt | Pliocene | 8, 8N, 7W | 9 | 12.1 | - 6.9 | 70 | 64 | 0.14 | -25.4 | -25.9 | 0.08 | 1 |

Figure 6: Table 15 from Poole and Claypool (RMAG 1984) with analysis of oil from the White River Valley #6 well indicating an API Gravity of 39 and Pr/Ph ratio of 1.4, suggestive that the oil is sourced by the Mississippian Chainman shale.

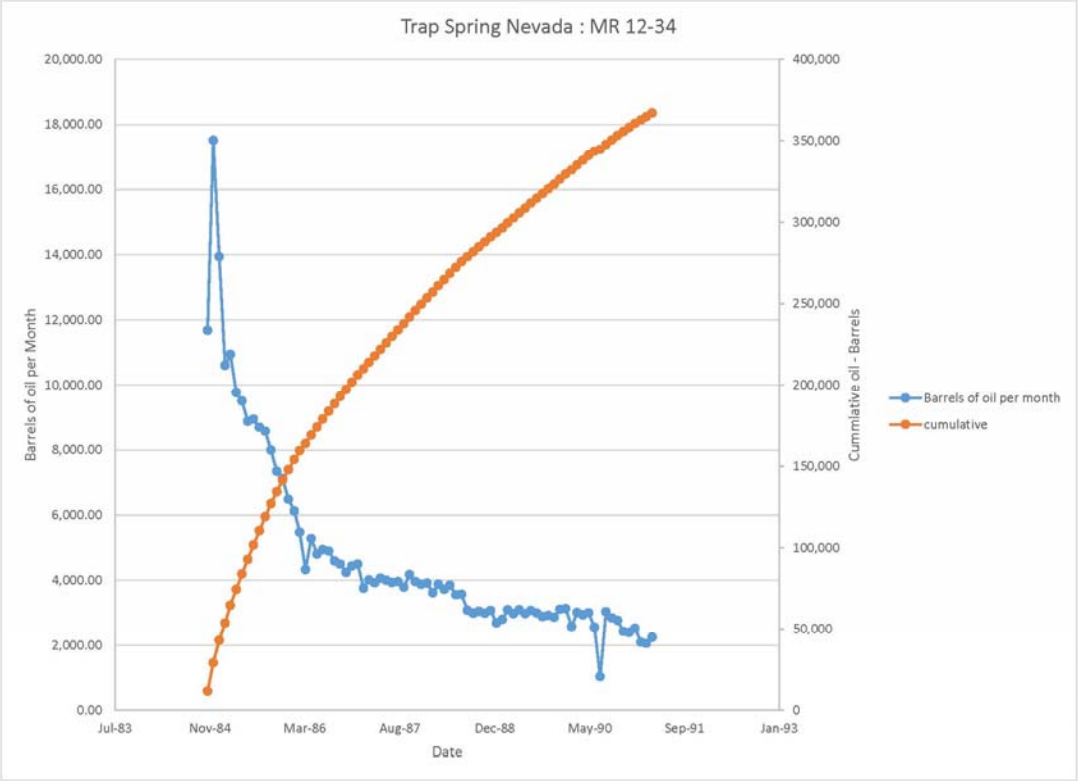


Figure 7: Production history for an average well in the Trap Spring field (analog for this White River Valley prospect). The Trap Spring field was discovered in 1976 and has produced more that 15 million barrels of oil. It currently produces about 10,000 barrels of oil per month from about 24 wells. Some wells have produced over 1 million barrels of oil, and naturally some wells have produced less than 300,000 barrels of oil. Statistically, there have been about 37 wells that have contributed to the 15 million barrels of oil produced over the nearly 42 years of production. Average cumulative production for each well is about 400,000 barrels of oil.

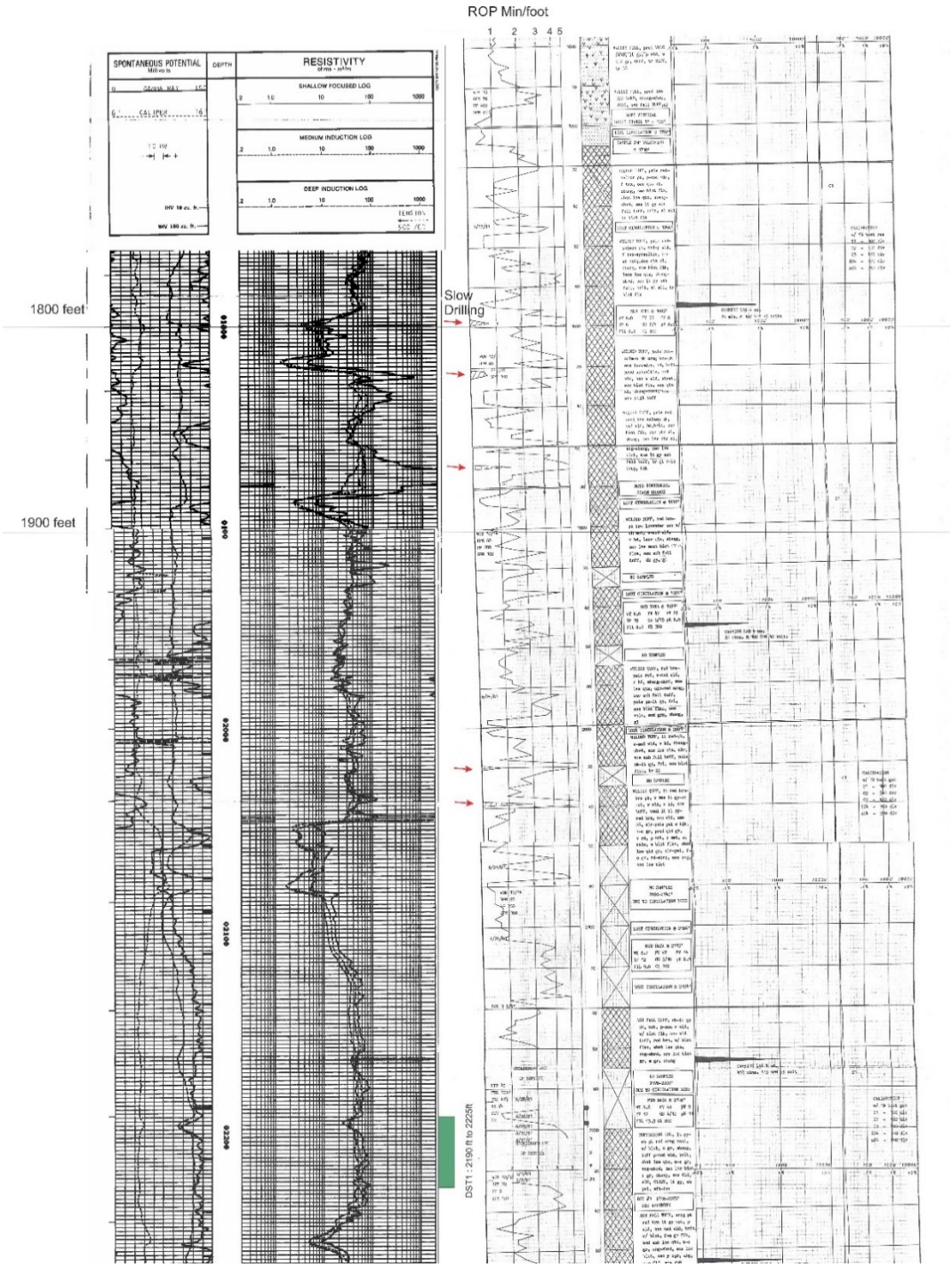


Figure 8: Dual Induction and Mud logs from the White River Valley #6 well, between 1800 feet and about 2050 feet. There are several zones with very slow drilling indicative of densely welded volcanic tuff. Typical production zones in the welded tuffs in the Trap Spring field have a high (100 ohm-meter) resistivity and very slow drilling as seen between 1800 feet and 2050 feet in the White River #6. DST #1 was run in a zone with relatively low permeability as indicated by a very small difference in the resistivity of short and long tools. Note that the solid line on far left track is GR and is highest between 1800 feet and 2050, also indicative of a densely welded tuff capable of supporting fracture permeability as found in the Trap Spring field.

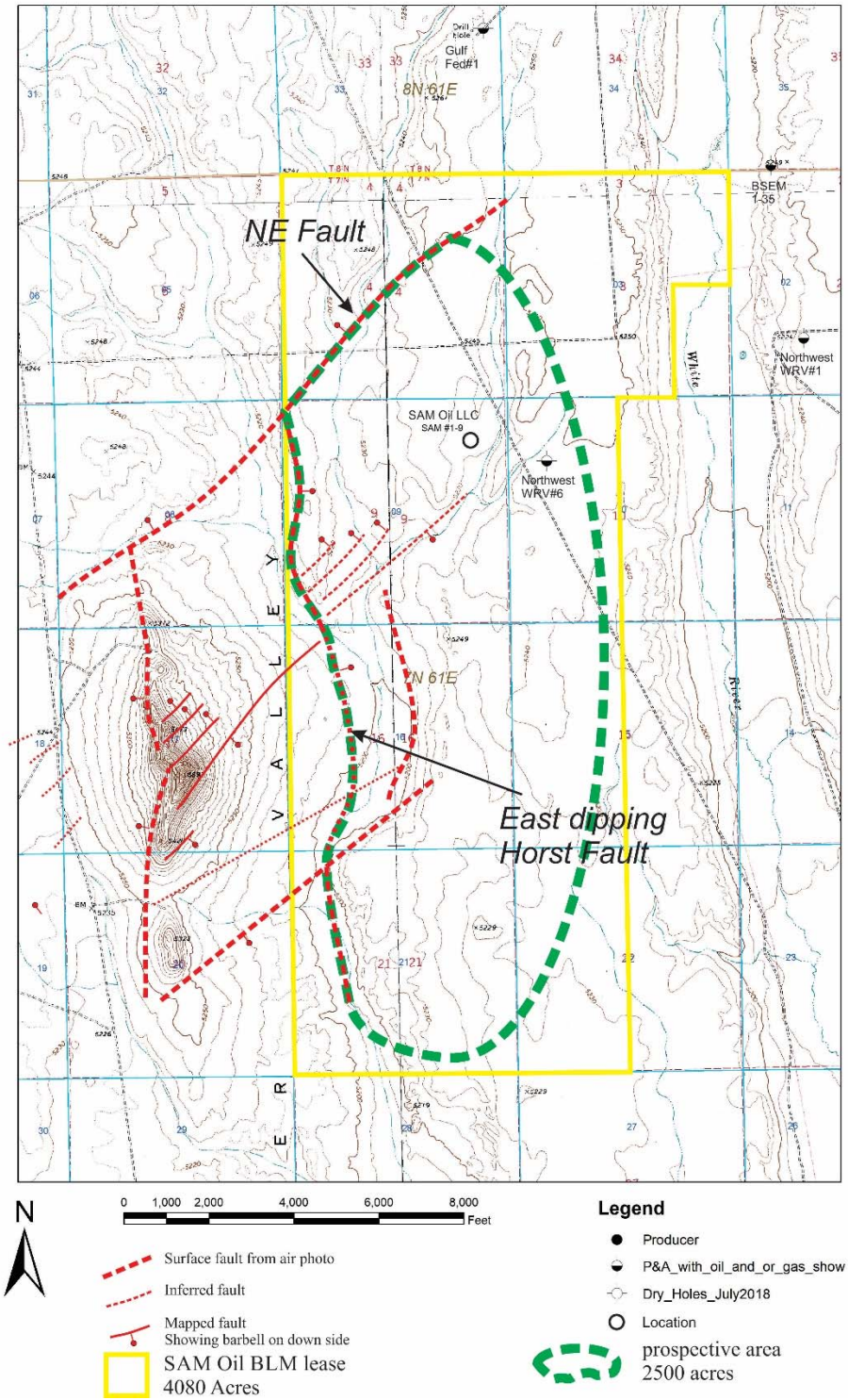


Figure 9: The areal extent of the prospective area encompasses approximately 2500 acres.

Appendix 1: White River Valley #1 sample shows

Drill cuttings stored at the Nevada Bureau and Mines sample library were inspected and oil shows were noted in several intervals. Solvent (acetone) was used on samples from five different intervals that appeared to have oil stain. In each instance individual drill chips (or LCM) that appeared to have oil stain were sampled for evaluating oil shows under a black light. Obtaining an oil cut from samples that are nearly 37 years old is challenging and not always productive; however, the results indicate that there were subtle oil shows staring as shallow as 1790 feet. Light oil shows are sometimes problematic to recognize while drilling, especially in zones with loss of circulation.

1750 to 1760 feet
Trace LCM; Possible oil stain on welded tuff. No cut

1770 to 1780 feet
Sample is 99% LCM; mostly cedar fiber, some looks oil stained but would not cut.

1790 to 1800 feet
75% LCM; oil stained sub micro crystalline pumaceous tuff (almost looks like siltstone), very slow diffuse yellow white cut, producing a very weak residual light yellow ring.

2140 to 2150 feet
4 drill chips of pink welded tuff, one chip has brown oil stain in matrix, very slow diffuse yellow white cut, producing a very weak residual light yellow ring.

2225 to 2230 feet
Note that this is only a 5 foot sample.
30% black oil with a very slow diffuse yellow white cut, producing a very weak residual light yellow ring.
50% LCM in sample
Rock type appears to be a gray welded tuff, but sample quality is very poor.
This appears to be just an LCM sample that was collected by the mud loggers, dried under a heat lamp and bagged. This sample was collected after running DST #1 and it appears that the well had produced a fair amount of oil after the DST was run.