

SKR-598-25-AV-02
05-045-15186
Sample Data Analysis and Interpretation
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Chevron Corporation requested that Environmental Standards analyze and interpret laboratory analytical data acquired from four production gas and four bradenhead gas samples collected from four Skinner Ridge wells producing from the Williams Fork formation. In addition, to the data for those wells, Chevron provided production gas data from two additional Williams Fork wells, bradenhead gas data from one of those and two production gas samples from offset wells producing from the Wasatch Formation for comparison. The focus of the study was to determine whether the bradenhead gases of the following wells could be distinguished as having influence from the Wasatch formation gases.

Observations pertinent to SKR-598-25-AV-02 bradenhead gas are below:

- The produced gases samples were characteristic of the primarily thermogenic sourced gases identified by the USGS as typical in the Piceance Basin. The δ -13C1 (methane) values were in the expected range as well. The dryness as defined by C[1]/C[1-5] was in the upper end of the range, which is associated with increasing thermal maturity of the reservoir(s). The gases generally can be categorized as methane rich, a feature identified by the USGS as being produced by devolatilization of humic coal and is generally seen in coal beds of the Cameo-Fairfield zone of the Williams Fork producing interval.
- All samples plotted well within the range for thermogenic gases. The subject bradenhead gases as a group were significantly drier than the production gases ($p < 0.05$). The bradenhead gases (amber) for the Block 25 wells (SKR 598-25-AV-02, SKR 598-25-BV-11 and SKR 598-25-BV-22), while still clearly dominated by thermogenic gases are shifted to a minor degree in the direction of microbial gas.
- Two Wasatch production gases, (SKR-598-25-CV-09 and SKR 598-25-01) have slightly heavier δ 13CC1 and the δ 2HC1 stable isotope ratios than the Williams Fork production gases and the bradenhead gases.
- The ethane and propane present in the Block 25 bradenhead samples (SKR 598-25-AV-02, SKR 598-25-BV-11 and SKR 598-25-BV-22) are distinguishable as being lighter isotopically than the production samples, and featuring isotopic reversal for propane versus ethane; indicating a separate gas source for these bradenhead gases, likely having undergone isotopic rollover typical of near post-mature gases.
- The VREiso data indicated intercepts around 1.4 for all production gases in both formations. The Block 25 Williams Fork bradenhead gases averaged 0.85
- The subject bradenhead samples exhibit very low or undetectable concentrations of carbon dioxide (CO2) (<0.005-0.10 mol %). The production samples for all wells contained CO2 values in the expected range (<4mol%), with an average for the Williams Fork production gases of 1.82mol% and an average for the Wasatch production gases of 0.91 mol%.
- (Carbon dioxide is more soluble in water and more reactive than the C1-C6 alkane hydrocarbons, therefore it is possible CO2 has been removed from the bradenhead gas through contact with water and dissolution and/or chemical reactions in the surface casing annuli of the wells, or during migration into the annuli.

Summary of observations pertaining to SKR-598-25-AV-02 bradenhead gas:

SKR 598-25-AV-02 contained predominantly thermogenic hydrocarbons and minor components of biogenic methane, as indicated by differences in the stable carbon and hydrogen isotope signatures as well as the gas wetness data. No evidence was observed to indicate input from the Wasatch formation was contributing to the Block 25 bradenhead gases