

Field Screening for Shallow Gas in Selected Wells in Burleigh County, North Dakota

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Field screening for shallow natural gas occurrences within existing ground-water observation wells in Burleigh County, North Dakota was conducted on September 11, 2007. A total of 18 observation well sites, consisting of historic and existing ground-water observation wells, drilled in the county for the purposes of ground-water monitoring of unconsolidated and shallow bedrock aquifers, were field screened during this investigation.

The 18 observation wells selected for a second round of field screening each had previous shallow gas occurrences collected during previous field screening in July, 2007. 65 observation well sites that were previously field screened and returned a 0.0 ppm value (i.e. no detect) were not visited during this investigation. Each of the selected wells were field screened for the presence of combustible gases using a portable FID calibrated to methane (101 ppm low-span or 10,000 ppm high-span) in air. The FID was used solely for field screening on all wells. Instrument response was collected at the top of well casing (TOC) and just above the groundwater/air interface (GWI), after the collection of a water level reading within the well using an electric well tape.

Of the existing wells field screened, 16 of the previously field screened wells returned positive FID responses, ranging from 0.1 to 792.6 ppm as methane (Figure 1); 3 of the wells showed no response (i.e., a 0.0 ppm as methane instrument reading) during the second round of field screening at both the TOC and GWI. Two wells were found to have a detectable concentration of methane at the TOC: Well 138-79-19-BCC1 had an FID response of 3.5 ppm. Well 138-77-34-ABB had an FID response of 0.7 ppm. It continues to be observed that during field screening it is more likely to detect methane at the GWI, or slightly higher up in the air column, within a given well. It has been less typical to detect methane emanating from the TOC.

The occurrence of FID responses are distributed in the southwestern portion of the county, similar to the distribution of occurrences during the July 11, 2007 event. This is due, in part, to the spatial distribution of monitoring points in the county. The apparent reduction in concentrations of detected FID responses may be due in part to seasonality or pumping effects induced by local irrigation wells.

FID field screening is not a stand-alone analytical tool. It must be used in conjunction with additional analytical methods and procedures. A positive FID instrument response indicates that the presence of methane is highly likely at the well since the instrument is selectively sensitive to methane and is calibrated specifically to a predetermined concentration of methane in air. However, excessive moisture and low oxygen levels or high values of carbon dioxide can influence FID response. A confirmatory gas analysis is required to determine and quantify the absolute presence and concentration of methane and other hydrocarbons that may be present in conjunction with FID field screening results.

The reconnaissance level field screening results presented here are intended to aid in the selection of future candidate observation well locations and or areas to conduct additional sampling and analysis and potentially focus future field investigative efforts.

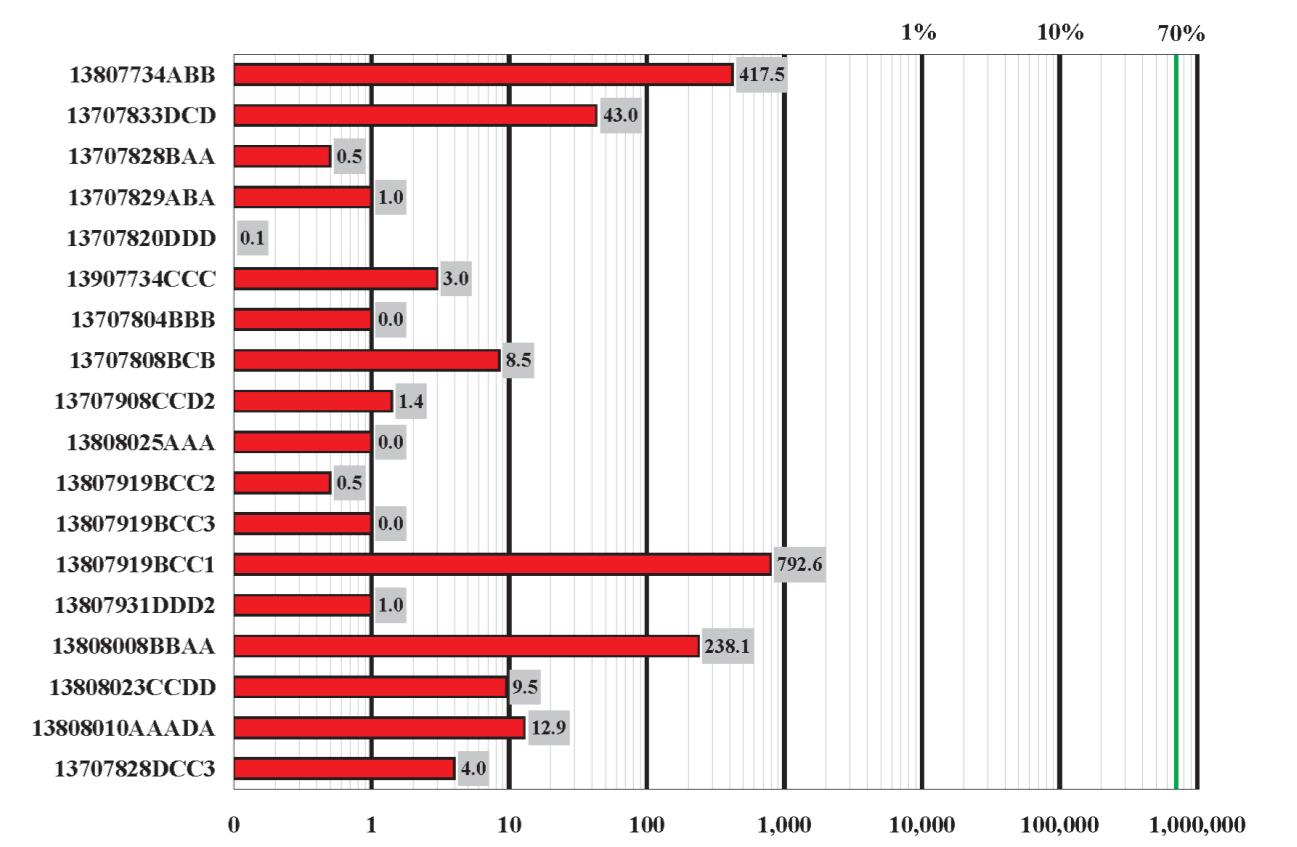


Figure 1. Graph depicting the relative relationship and maximum values of FID instrument responses from selected wells in Burleigh County. FID results for each well are presented in order of sampling occurrence from top to bottom. Values shown are those reported from the ground-water/air interface (as CH₄ in ppm). The typical concentration of CH₄ in commercial natural gas is highlighted by the vertical green line at 70%. The typical concentration of CH₄ in commercial natural gas is highlighted by the vertical green line at 70%.

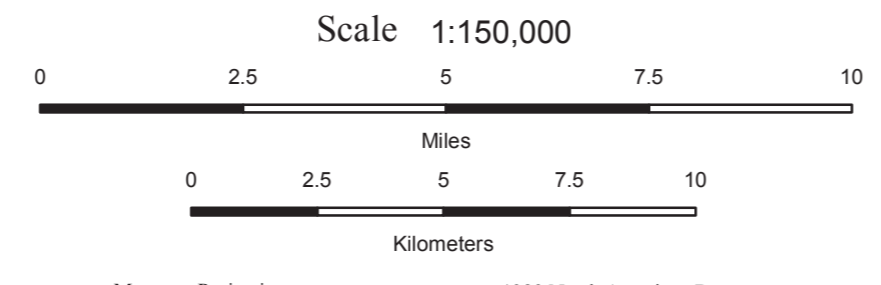
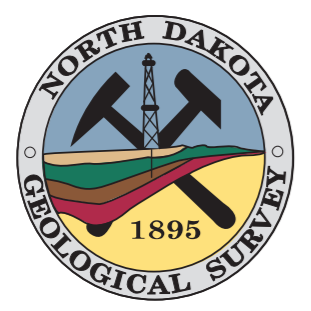
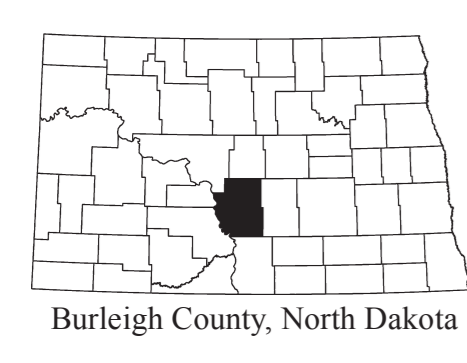
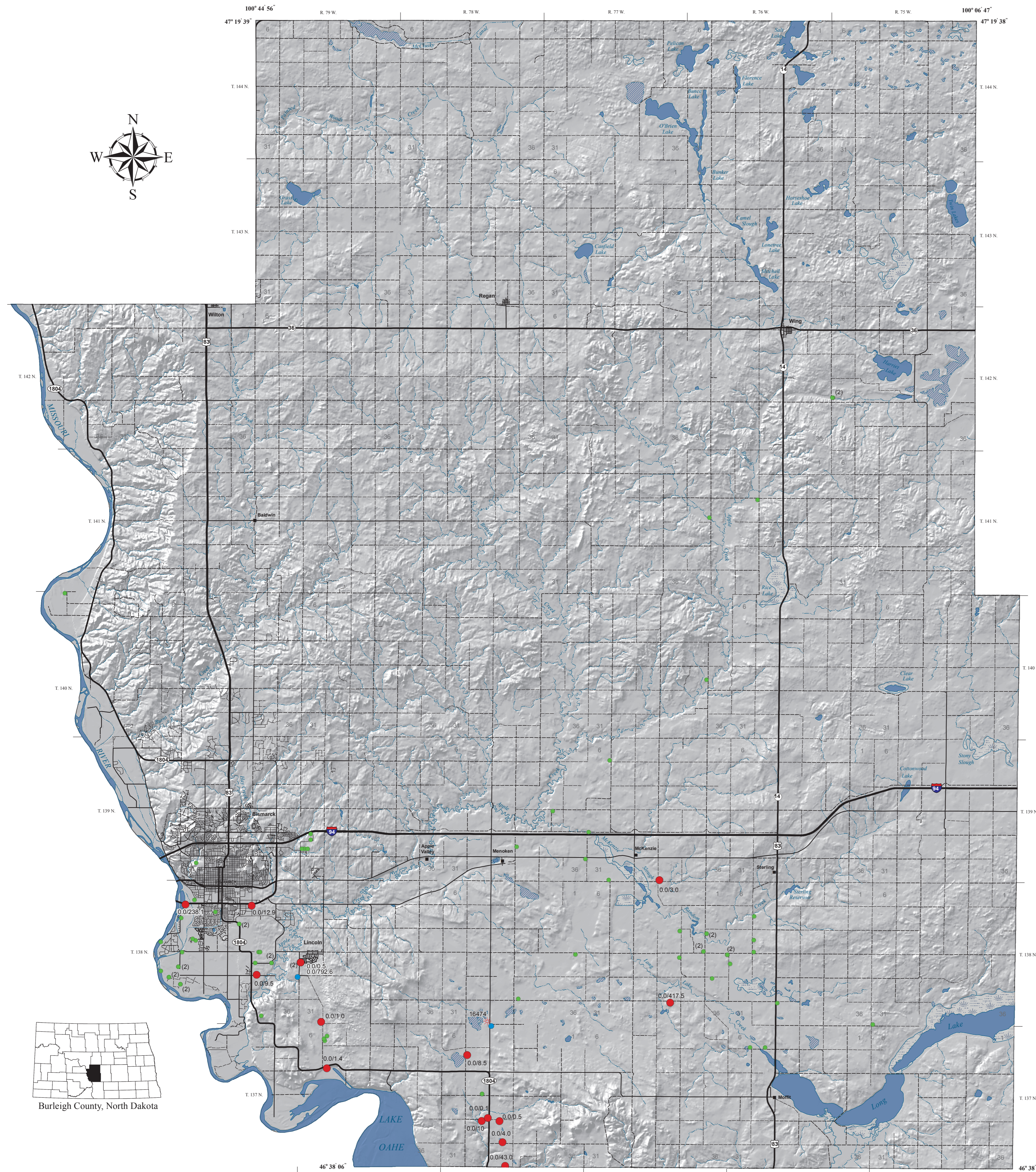
Explanation

Geologic Symbols

- Existing observation well with a positive numerical FID instrument response in parts per million (ppm) as methane, at the top of casing (TOC) and/or the ground-water/air interface (GWI).
- Existing observation well, no FID response at TOC and/or the GWI.
- Well sites not visited.
- (2) Indicates number of wells drilled at same coordinates.
- *16474 Shallow gas well. ND Oil & Gas Division well file number in superscript.

Other Features

- Water
- Water - Intermittent
- Marsh
- River/Stream - Perennial
- Stream - Intermittent
- + Section Corners
- 84 Interstate Highway
- 83 Federal Highway
- 14 State Highway
- Paved Road
- Unpaved Road



Mercator Projection 1983 North American Datum
Standard parallel 46° 37' 30"
Central meridian 100° 30' 00"
USGS NED Shaded Relief - Vertical Exaggeration 9x

