North Dakota Geological Survey
Geological Investigations No. 50

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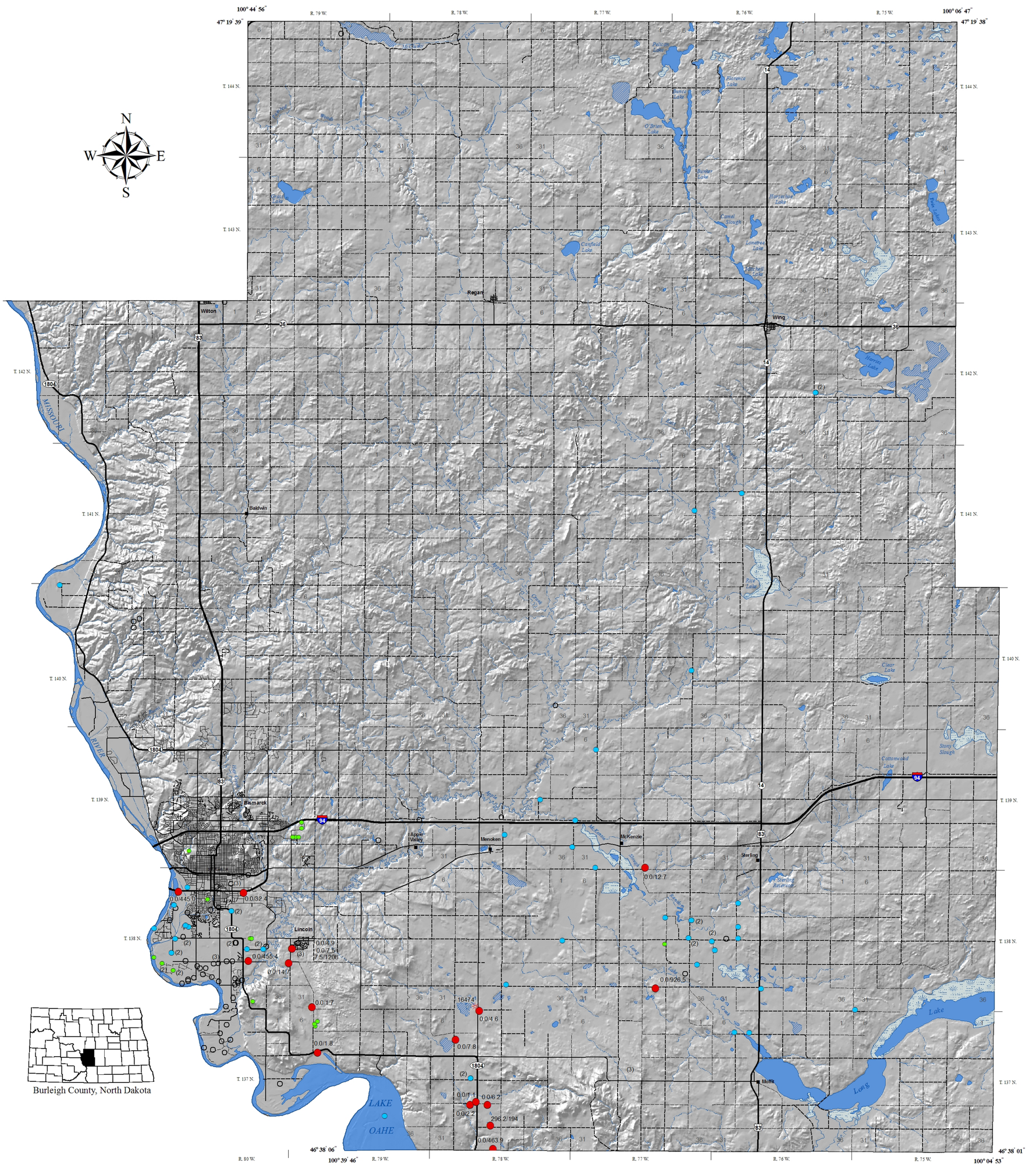
Field Screening for Shallow Gas in Burleigh County, North Dakota



Fred J. Anderson

2007

The investigation of shallow natural gas occurrences within existing ground-water observation wells in Burleigh County, North Dakota was conducted over a six, non-consecutive day period on July 6, 9 -12, and 15, 2007. A total of 143 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 reviewed prior to the field component of this investigation.

124 of these observation well sites were selected to be visited in the field to (1) determine the actual existence of the well, (2) to verify its location, and (3) perform flame-ionization detector field screening for possible shallow natural gas occurrences. 60 observation well sites were not found during the investigation, suggesting that these wells have either been abandoned or destroyed. 64 observation well site locations were verified to have a ground-water observation well at their prescribed point and were subsequently field screened.

Each of the wells were field screened for the presence of combustible gasses 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).

Of the existing wells field screened, 18 returned positive FID responses, ranging from 1.1 to 1,208 ppm as methane; 46 of the wells showed no response (i.e., a 0.0 ppm as methane instrument reading) during field screening at both the TOC and GWI. Two wells were found to have detectable concentrations of methane at the TOC: Well 138-79-19-BCC1 had an FID response of 7.5 ppm. Well 137-78-28DCC3 had an FID response of 296.2 ppm. It has generally been observed that it is more likely to detect methane at or above the GWI in a given well. It has been less typical to actually detect methane emanating from the TOC.

The occurrence of FID responses are distributed in the southwestern portion of the county. This is due, in part, to the spatial distribution of monitoring points in the county. Stock wells and individual private, irrigation, or municipal water supply wells were not considered as a part of this investigation.

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.

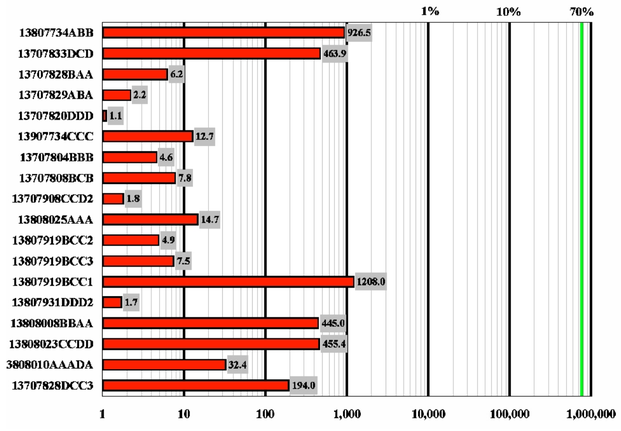


Figure 1. Graph depicting the relative relationship and maximum values of FID instrument responses from selected wells in Burleigh County. FID results for each well are presented in order of sampling occurrence from top to bottom. Values shown are those reported from the ground-water/air interface (as CH_4 in ppm). The typical concentration of CH_4 in commercial natural gas is highlighted by the vertical green line at 70%.

Explanation

Geologic Symbols

7.5/1208 (TOC/GWI)	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.
	Historical observation well location.
(3)	Indicates number of wells drilled at same coordinates.
16474	Shallow gas well. ND Oil & Gas Division well file number in superscript.

Other Features

	Water	+	Section Corners
	Water - Intermittent	94	Interstate Highway
	Marsh	83	Federal Highway
	River/Stream - Perennial	14	State Highway
	Stream - Intermittent		Paved Road
			Unpaved Road

Cartographic Compilation: Elroy L. Kadrmas