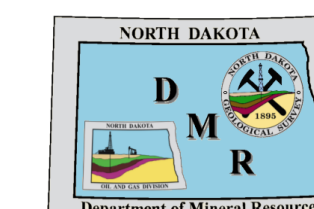


Shallow Gas Field Screening in the Bottineau 100K Sheet, North Dakota



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The investigation of shallow natural gas occurrences within existing ground-water observation wells in the Bottineau Quadrangle was conducted on September 14 and 15, and November 6, 2006. A total of 115 observation well sites, consisting of historic and existing ground-water observation wells, drilled in Bottineau and Rolette counties, for the purposes of ground-water monitoring of unconsolidated and shallow bedrock aquifers, were reviewed prior to the field component of this investigation.

71 of these observation well sites were selected to be visited in the field within the Bottineau 100K Sheet to (1) determine the existence of the well, (2) verify its location, and (3) perform field screening for natural gas occurrences. 50 observation well sites were not found during the investigation, suggesting that these wells have either been abandoned or destroyed. 20 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 flame-ionization detector (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 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, only one returned a positive FID response, of 3.2 ppm as methane.

Stock wells and individual private 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 (i.e. humidity) 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.

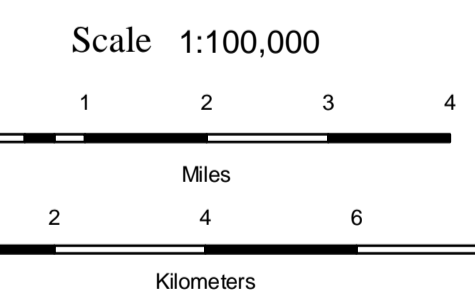
Explanation

Geologic Symbols

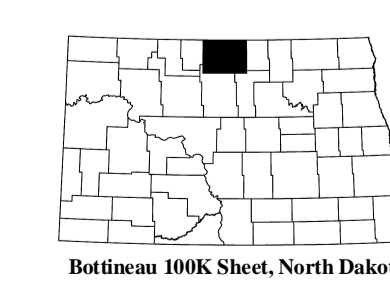
- Existing observation well with a positive numerical FID instrument response in parts per million (ppm) as methane, at the top of casing (TOC) and/or the ground-water/air interface (GWI).
- Existing observation well, no FID response at TOC and/or the GWI.
- Historical observation well location. No existing well at well site location visited. Well presumed abandoned or destroyed.
- Nested wells; locations not separable at this scale.
- (2) Indicates number of wells drilled at same coordinates.

Other Features

- Water
- Water - Intermittent
- Marsh
- River/Stream - Perennial
- Stream - Intermittent
- County Boundary
- Section Corners
- Federal Highway
- State Highway
- Paved Road
- Unpaved Road



Mercator Projection 1983 North American Datum
Standard parallel 48° 30' Central meridian 100° 30'
USGS NED Shaded Relief - Vertical Exaggeration 5x



117° 30'
1980 Magnetic North
Declination at Center of Sheet

Mohall	Bottineau	Rock Lake
Minot	Valva	Leeds
Garrison	Drake	New Rockford

Adjoining 100K Maps

