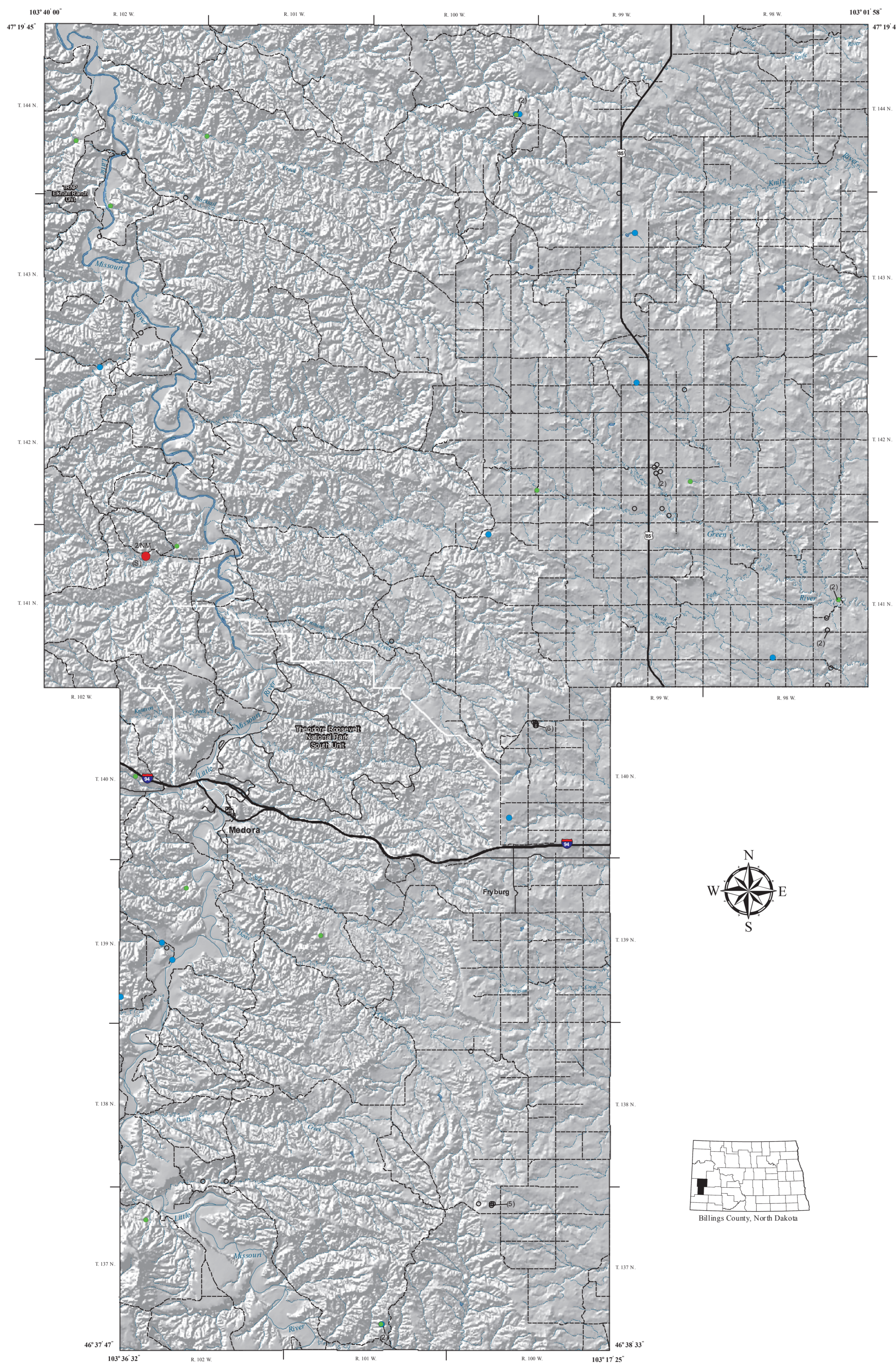


Field Screening for Shallow Gas in Billings County, North Dakota

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The investigation of shallow natural gas occurrences within existing ground-water wells in Billings County, North Dakota, was conducted over a four non-consecutive day period from July 7, to July 15, 2009. A total of 121 wells sites, consisting of historic and existing ground-water wells, drilled in the county for the purpose of ground-water monitoring of unconsolidated and shallow bedrock aquifers and stock water supply, were reviewed prior to the field component of this investigation. 65 of these 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. During the investigation, 37 well sites were not found, suggesting that these wells either have been abandoned or destroyed. 13 ground-water well site locations (4 observation wells and 9 stock wells) were verified to have a testable well at their prescribed point and were subsequently field screened.

Each of the wells were field screened for the presence of combustible gases using a portable FID calibrated to methane (100 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 field screening readings, a depth to water level reading within the well was taken using an electric well tape. Of the existing wells field screened, one well (141-102-10ABD) returned a low-level positive FID response, of 2.0 ppm as methane. This well is an artesian well completed in the Fox Hills Aquifer. The remaining 12 wells showed no response (i.e., a 0.0 ppm as methane instrument reading during field screening at both the TOC and GWI). It has been observed that it is more likely to detect methane at the GWI or higher up in the air column within a given well. It has been less typical to actually detect methane emanating from the TOC. Domestic, irrigation, and 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 than may be present in conjunction with FID screening results. The reconnaissance level screening results presented here are intended to aid in the selection of future candidate well locations and or areas to conduct additional sampling and analysis and potentially focus future field investigative efforts.

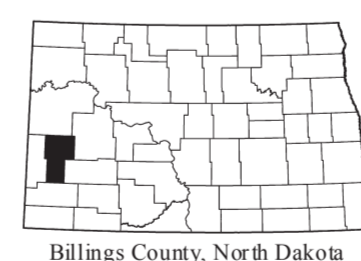
Explanation

Geologic Symbols

- Existing well with a positive numerical FID instrument response in parts per million (ppm) as methane, at the top of casing (TOC) and/or the groundwater/air interface (GWI). NM indicates not measured. (S) indicates stock well.
- 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.
- Wells sites not visited during this investigation.
- Nested wells; locations not separable at this scale.
- (2) Indicates number of wells drilled at same coordinates.

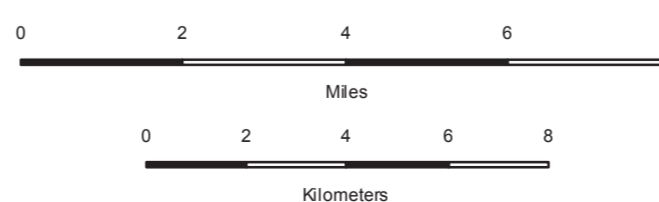
Other Features

- Water
- River/Stream - Perennial
- - - Stream - Intermittent
- National Park Boundary
- I-58 Interstate Highway
- 85 US Highway
- Paved Road
- - - Unpaved Road



Billings County, North Dakota

Scale 1:150,000



Mercator Projection 1983 North American Datum
Standard parallel 46° 37' 30" Central meridian 103° 22' 30"
USGS NED Shaded Relief - Vertical Exaggeration 9x

