The investigation of shallow natural gas occurrences within existing ground-water wells in Golden Valley County, North Dakota, was conducted over a seven day period from July 14 to 22, 2009. Over 150 well sites were screened prior to the field component of this investigation. Of these, 75 well sites, consisting of historic and existing observation and stock wells, were selected to be visited in the field in order to (1) determine the actual existence of the well, (2) to verify its location, and (3) perform flue-ionization detector field screening for possible shallow natural gas occurrences. 29 well sites (27 observation wells and 2 stock wells) were verified to have a ground-water observation well at their prescribed point and were subsequently field screened. 28 wells were not visited at their prescribed locations in the field and were presumed abandoned or destroyed. 17 wells were not visited due to access and/or time constraints.

Each of the wells were field screened for the presence of combustible gases using a portable FID calibrated for methane (0.0 ppm low-limit and 10,000 ppm upper-limit) 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 field screening a water level reading within the well was collected using an electric well tape. Of the 29 existing wells field screened, 16 wells internal positive FID responses, ranging from 0.6 ppm to 4,291 ppm as methane (Figure 1). Of the wells showed no response (i.e., a 0.0 ppm instrument reading during field screening at both the TOC and GWI). Two wells (140-150-6BBB2 & 141-152-9ADD3) were found to have detectable concentrations of methane emanating from the TOC. It has been observed in the field that is more likely to detect methane at the GWI, or at higher up in the aquifer column within a given well. It has been less typical to detect methane at the TOC, except for the western part of the county. Domestic, irrigation, or municipal water supply wells were not considered 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 volumes of other hydrocarbons may be present in conjunction with FID response. A confirmatory gas analysis is required to detect and quantify the absolute presence and concentration of methane and other hydrocarbons that may be present in conjunction with FID. Additional analytical methods and procedures are useful for the selection of candidate observation wells depth and or area to conduct additional sampling and analysis and potentially focus future field investigative efforts.

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Figure 1. Graph depicting the relative relationship and absolute maximum values of flame-ionization detector (FID) instrument response in parts per million (ppm) as methane, at the top of casing (TOC) and/or the ground-water/air interface (GWI).

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).
- Historical observation well location. No existing well at well site location visited.
- Existing observation well, no FID response at TOC and/or the 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.
- Existing observation well site not visited during this investigation.
- Other Features:

Map 1. Location map of South Valley County, North Dakota. The investigation of shallow natural gas occurrences within existing ground-water wells in Golden Valley County, North Dakota was conducted over a seven day period from July 14 to 22, 2009. Over 150 well sites were screened prior to the field component of this investigation. Of these, 75 well sites, consisting of historic and existing observation and stock wells, were selected to be visited in the field in order to (1) determine the actual existence of the well, (2) to verify its location, and (3) perform flue-ionization detector field screening for possible shallow natural gas occurrences. 29 well sites (27 observation wells and 2 stock wells) were verified to have a ground-water observation well at their prescribed point and were subsequently field screened. 28 wells were not visited at their prescribed locations in the field and were presumed abandoned or destroyed. 17 wells were not visited due to access and/or time constraints.