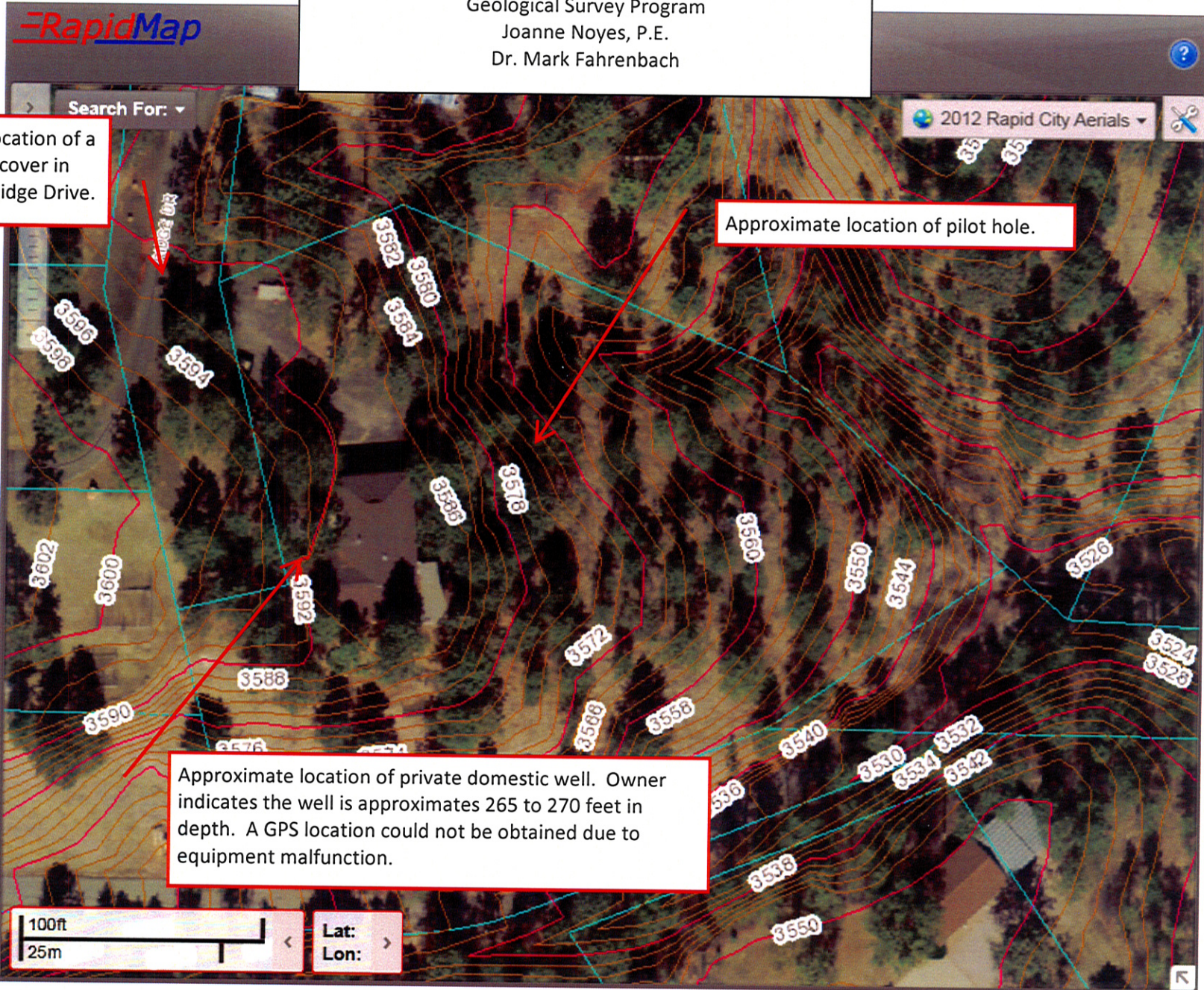


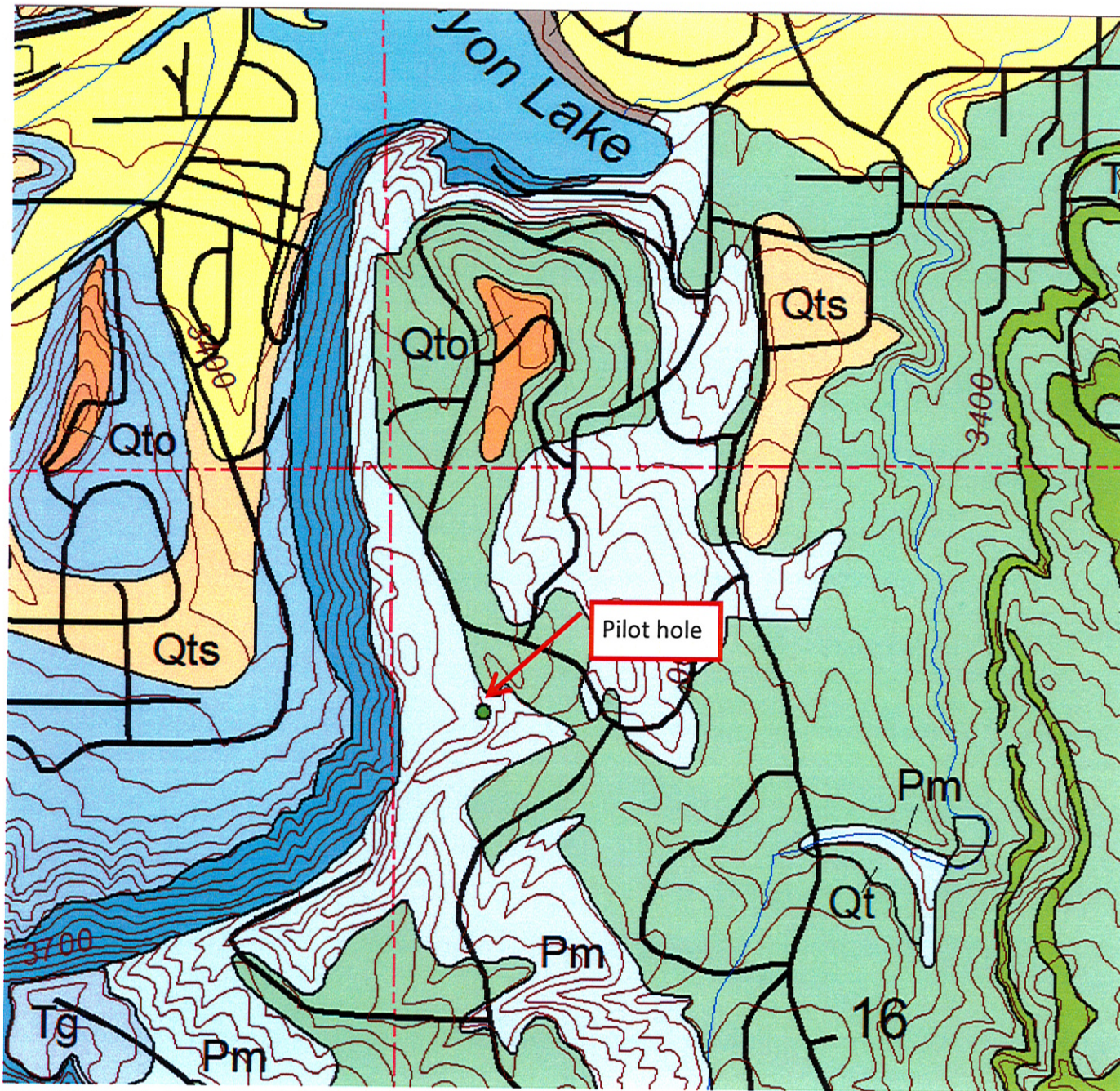
3618 Ridge Drive
Tom Udager property owner
Site visit November 18, 2013
Geological Survey Program
Joanne Noyes, P.E.
Dr. Mark Fahrenbach

Approximate location of a sanitary sewer cover in the middle of Ridge Drive.

Approximate location of pilot hole.

Approximate location of private domestic well. Owner indicates the well is approximately 265 to 270 feet in depth. A GPS location could not be obtained due to equipment malfunction.





Rapid City West Geologic Quadrangle. Point is location of pilot hole. A Trimble GPS unit was used to obtain GPS coordinates. The pilot hole is shown to be located on the Minnekahta Limestone. Property owner indicated a geotechnical boring was drilled in the immediate vicinity of the pilot hole. A copy of the boring was not provided.



Pilot hole by Nelson Excavating. Left photo is of the west wall; white/gray is Minnekahta Limestone; red shale or silty material is the Spearfish Formation. The Spearfish Formation is a thin layer that is approximately 12 inches on the west side of the pilot hole and less than six inches on the north, east and south side of the hole. Photo below is of the north wall; broken limestones visible near the surface with all the knobby material in the wall also limestone. Based on our observations of the pilot hole walls and the outcrops around the property at similar elevations as the pilot hole, it is our opinion that the limestone is in place bedrock that is highly fractured with the overlying Spearfish Formation infiltrating downward into the fractures and cracks.





Photo of the location of a Minnekahta Limestone outcrop to the north of the pilot hole. Inset shows the detail of the outcrop.





Location of excavator equipment near pilot hole.

Photos of Minnekahta Limestone outcrops taken southeast (photo to the right) and south (photo above) of the pilot hole.

