HM-1-13 Drilling Plan

The U.S. Geological Survey proposes to acquire a core in order to determine the lithology, stratigraphic sequence and resource (hydrocarbon) potential of the Niobrara Formation and Benton Shale. This work is in support of ongoing research as part of the USGS National Oil and Gas Resources Project. A truck mounted rotary drill rig will be used to bore a 1500-2000 foot deep hole to extract a 1400-1500 foot thick, 2.5 inch diameter core sample. The proposed drill site is approximately 2.5 miles northwest of the town of Wolcott, Colorado. The operation is scheduled for July 2013, and will continue for 15 days, or until drilling is completed. Drilling is not anticipated to exceed 20 days. Project activities will continue through the weekend if necessary. The surface area necessary to conduct operations is anticipated to be no more than 200 feet by 200 feet in size. Access to the proposed drill site will be from existing Mill Creek Road, shown in Figure 1. The proposed site is shown in Figure 2, the site map. No new roads need to be constructed to the drill site because there are existing roads in place. There should be minimal new surface disturbance because of existing surface disturbance in the area. Operations will be halted during rain, which would also minimize impact to the surface. The drill rig will be set up just off of the existing dirt road.

Figure 1. Vicinity Map

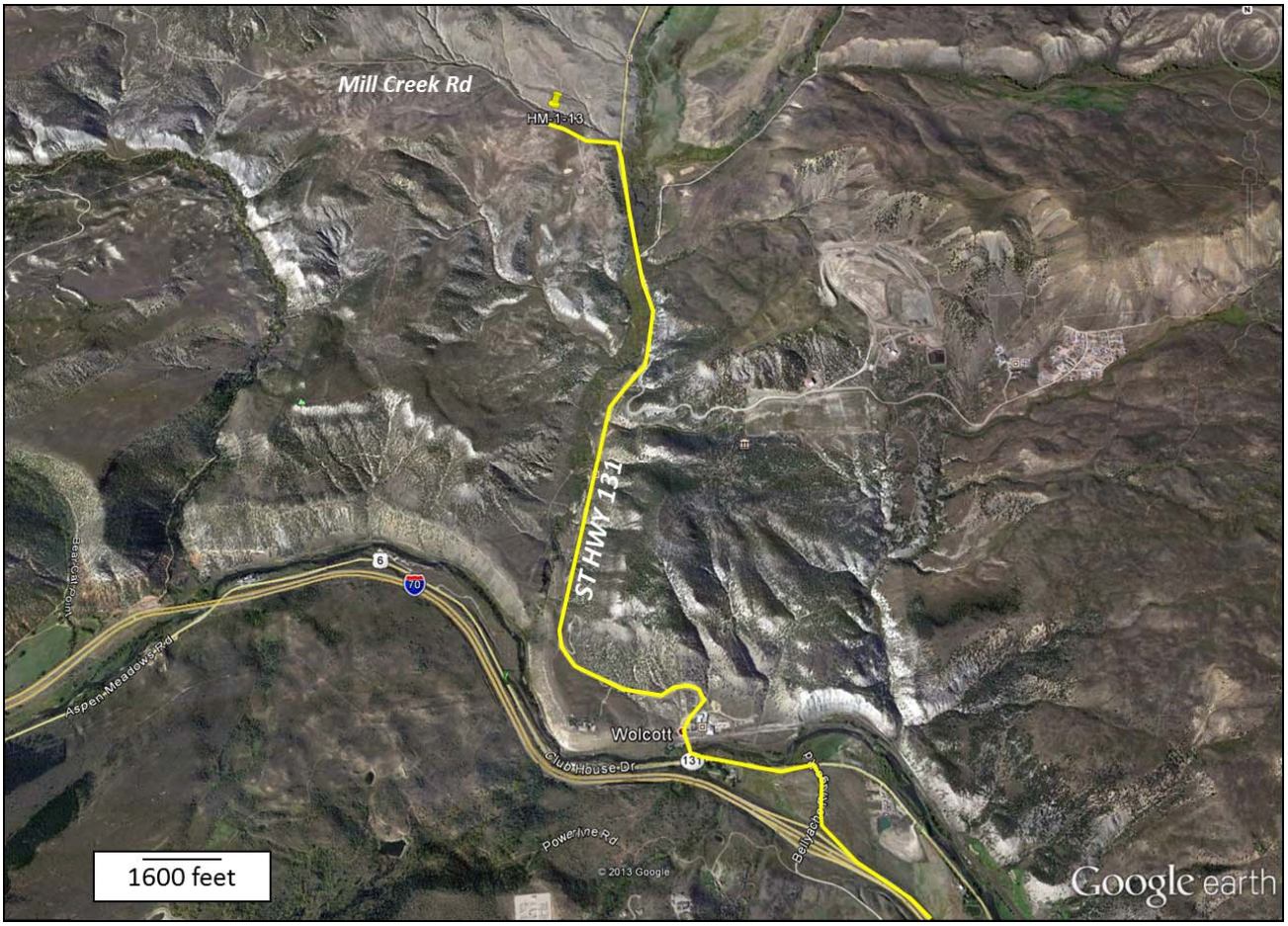

Figure 2. Site Map

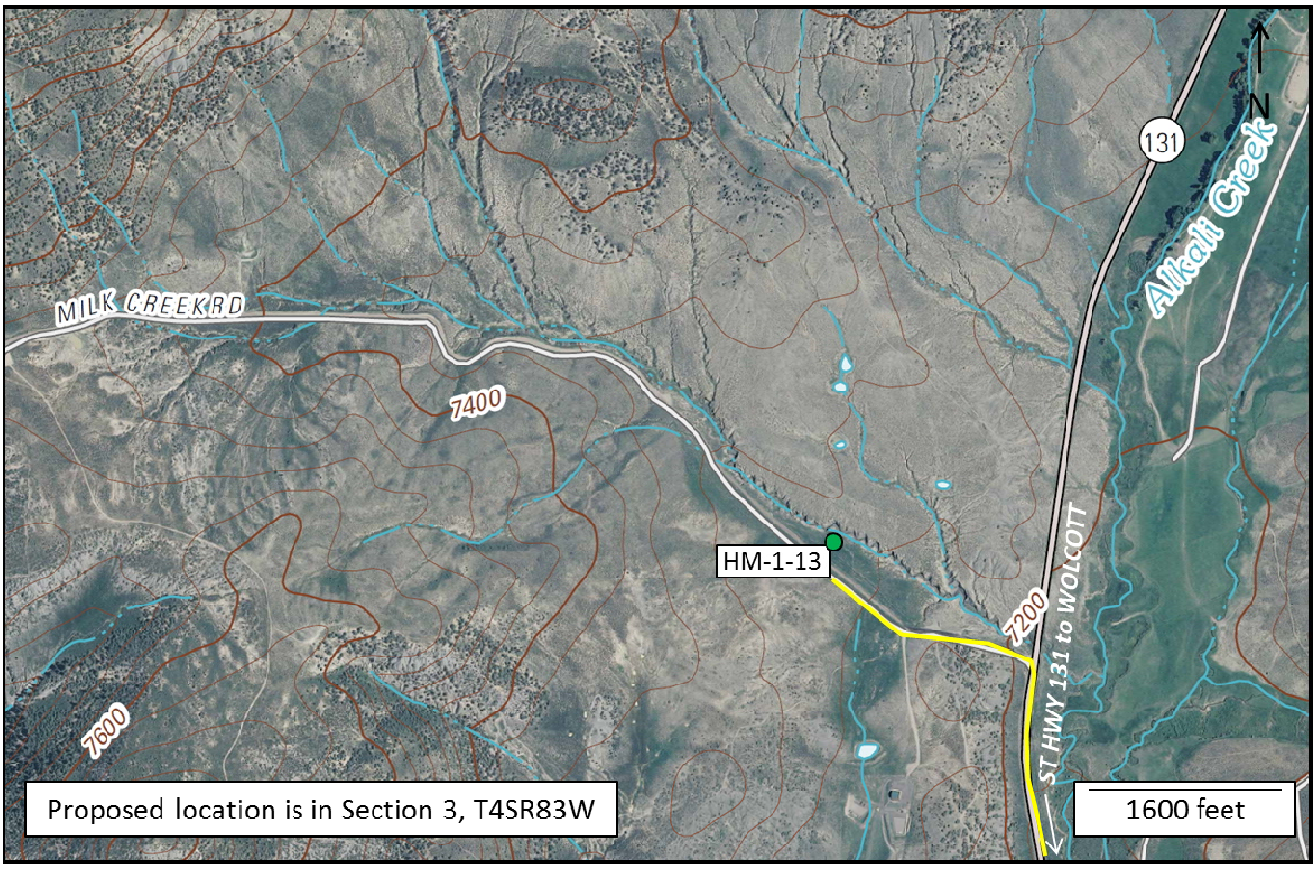

Figure 3, "proposed Wolcott coring site layout", shows a plan view of the proposed drilling operation. A porta-john will be located in the northern part of the site.

A USGS drill crew will be in charge of the coring operation. Compressors on the drilling rig will be used to air drill a 6-inch diameter rotary hole to 40 feet. Surface casing (6-inch PVC) will be set at a depth of 40 feet. Dust is collected at the drill point with a "diverter head", so this is essentially a dust free drilling operation. Coring will begin immediately below the surface casing. The operation will require air, with injection of water to eliminate dust and to lubricate the bit. The water will come from Wolcott or Edwards, the site yet to be determined. Potential water sources include pumped from the river, an irrigation ditch, or taken from a municipal stand pipe. Water obtained will be trucked to the site along the dirt access road located next to the drill truck.

The water used in the drilling will be injected at a rate of 2-3 gallon/minute unless formation water is encountered (estimate is less than 10,000 gallons of drilling water). Formation water is not anticipated because of the low permeability of the lithology of the Niobrara Formation and Benton Shale. No chemical additives will be used during drilling.

Following coring, the well bore will be logged using geophysical techniques either by the USGS or a contracted company. This will require the logger to set up temporarily over the drill site but will result in

no surface or subsurface disturbance unless it is deemed necessary to ream the hole prior to logging using a 5 inch rotary bit to make sure the hole is competent. If needed, this would return a small amount of additional cuttings and water to the surface. The hole will be filled with water to obtain resistivity measurements.

The drill site will be completely fenced with a standard 5-foot orange mesh plastic fence that is highly visible. Yellow caution tape and signage will also be employed. The drill site will be staffed from sunrise to sundown, through the weekend, if needed, minimizing the hazards to the public.

The drill hole will be closed immediately following logging. A high-solid, bentonite slurry will be pumped from the bottom of the hole to 20 feet below the land surface. The remaining 20 feet will be filled with cement. Any holes or depressions left by drilling equipment, for example, by hydraulic rams, will be smoothed out by rakes. All trash will be disposed in the rented dumpster and sewage will be contained in the rented porta-john.

Figure 3. Proposed Wolcott (HM-1-13) coring site layout and schematic