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United States
Department of
Agriculture

Soil
Conservation
Service

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Subject: GPR Survey of Mudboils in Tully
Valley, Onondaga County, New York

Date: 12 August 1993

To: Dave Sullivan
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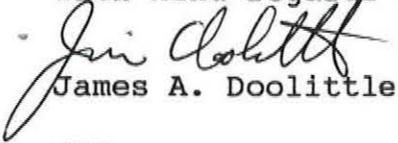
I am unclear as to the purpose of the GPR investigation. The radar profiles disclose ample near-surface information, but the depths of observation are too restricted to disclose the sources of the mudboils. Within the investigation site, soil and geologic materials provide an inhospitable environment for deep (15 to 100 feet) profiling with ground-penetrating radar (GPR). Test reports reveal excessive amounts of fines (> 97 percent fines) in strata located within 14 feet of the surface. Rates of signal attenuation would be extremely high in these layers and would limit the observation depth of GPR to lesser depths. In addition, contamination of the soil close to active mud-boils by brackish water would restrict radar observations to the surface.

Ground-penetrating radar has profiled the soil to various depths and charted the depths to a clay-enriched layer. Generally, I assume that GPR profiled the relatively coarser, surficial till and sandy alluvial sediments. I assume that a clay-enriched layer forms the prominent, continuous, undulating subsurface interface on each profile. On most profiles, this interface is relatively shallow (< 25 to 50 nanoseconds) and limits radar penetration. It would have been valuable to have verified the depth to this interface at the time of the radar survey. Wet or depressional areas seem to conform to areas where this interface is covered by thicker deposits of relatively coarser-textured materials.

Radar profiles were collected with both 300 and 80 mHz antennas. It is generally accepted that the lower frequency and longer pulse duration of the 80 mHz antenna should provide greater observation depths but poorer resolution of most subsurface features. The 80 mHz antenna provided little information from this site. This antenna did not significantly extend the depth of observation and the resolution of subsurface interfaces was extremely poor. The 300 mHz antenna provided excellent profiles of near-surface soil and geologic features. The value of these depth-restricted radar profiles lies in whether or not they provide additional information as to the location and source of the mudboils.

Generally, in areas of fine-textured soil materials the use of GPR is inappropriate and other geophysical tools should be considered (electromagnetic induction, resistivity). I would welcome the opportunity to discuss GPR with Dorothy Tepper of the USGS. If it has not already been done, I encourage discussion of this site and the applications of various geophysical techniques with Peter Haeni, USGS, Water Resources Division, Hartford, Connecticut.

With kind regards .


James A. Doolittle

cc:

James Culver, National Leader, SSQAS, NSSC, SCS, Lincoln, NE

AUG 16 1993