



United States
Department of
Agriculture

Soil
Conservation
Service

Northeast WTC
160 E. 7th Street
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Subject: **SOI - Report of Ground-Penetrating Radar (GPR)
Assistance, King and Queen County, Virginia,
30 March - 2 April 1986** Date: **April 22, 1986**

To: **Niles McIoda 430
State Soil Scientist
Soil Conservation Service
Richmond, VA**

PURPOSE

To provide GPR assistance to the initial field review of King and Queen County.

PRINCIPAL PARTICIPANTS

James Baker, Soil Survey Coordinator, VPI, Blacksburg, VA
James Doollittle, Soil Specialist (GPR), SCS, Chester, PA
Diane Hoppe, Party Leader, SCS, Tappahannock, VA
Mark Crouch, Soil Specialist, SCS, Richmond, VA
David Jones, Soil Specialist, SCS, Richmond, VA
Dean Rector, Soil Specialist, SCS, Richmond, VA

EQUIPMENT

The equipment used was the SIR System-8 with the ADTEK SR-8004H graphic recorder. The 120, 300, and 500 MHz antennas were used at various times and under differing soil conditions. However, the 120 MHz antenna with the model 705DA transceiver provided the best balance of resolution and probing depth and was preferred.

The ADTEK DT-6000 tape recorder was not used during this assistance.

DISCUSSION

The GPR provided clear and interpretable graphic profiles of the investigated soils and substantiated the dichotomy of the landscape and the separation of map units as presented by Diane Hoppe, Soil Survey Party Leader. Soil profiled with the GPR included: Bojac (coarse-loamy, mixed, thermic Typic Hapludults), Caroline (clayey, mixed, thermic Typic Paleudults), Craven (clayey, mixed, thermic Aquic Hapludults), Dogue (clayey, mixed, thermic Aquic Hapludults), Emporia (fine-loamy, siliceous, thermic Typic Hapludults), Kenansville (loamy, siliceous, thermic Arenic Hapludults), Roanoke (clayey, mixed, thermic Typic Ochraqults), Runford (coarse-loamy, siliceous, thermic Typic Hapludults), Suffolk (fine-loamy, siliceous, thermic Typic Hapludults), and Tetotum (fine-loamy, mixed, thermic Aquic Hapludults).



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Generally, the radar was very effective in determining the depth to and the lateral extent of the argillic horizon in the selected soils. However, the argillic horizon could not be observed in areas where it was within depths of 14 to 16 inches of the soil surface. This deficiency resulted from the large amplitude of the surface pulse, superpositioning of the reflection of the surface pulse on the reflection of the shallow argillic horizon, and mutual signal interference and cancellation.

Within the study area, a noticeable decrease in clay content occurs in many soils with increasing depth. The GPR appears to have effectively and consistently recorded decreases in clay content with depth and the occurrence of coarse textured strata within the substratum of many soils. Within the study area, the GPR can be used to differentiate areas of Hapludults from Paludults.

Images of the water table were not apparent on the graphic profiles. Generally, water tables are readily apparent only in coarse textured soils which have abrupt capillary fringes. Within the study area, images of the water table occurring within coarse textured strata of the substratum were masked or canceled by images from adjoining, closely spaced interfaces.

In all moderately-coarse and moderately-fine textured soils, the GPR provided graphic images from the full soil profile (2 meters). In areas of fine textured soils (e.g., Craven and Roanoke), the probing depth was restricted by the high clay content of the argillic horizon to depth of one meter.

During this initial visit, the ability of the GPR to discern variations in soil types and properties was examined. The radar performed well. As most radar transects crossed map unit boundaries, no attempt was made to determine the composition of soils within each unit. However, if desired, the GPR could become an effective quality control tool in this and other similar Atlantic Coastal Plain counties of Virginia.

My sincerest thanks to members of your staff for a most informative and enjoyable review. All graphic profiles have been returned to Dean Rector under a separate cover letter.

James A. Doolittle
Soil Specialist (GPR)

cc:
O. Rice

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