

**UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE**

160 East 7th Street
CHESTER, PA 19013

SUBJECT: ENG- Geophysical Investigations

DATE: 19 May 1994

To: Donald W. Lake
State Conservation Engineer
USDA-Soil Conservation Service
100 S. Clinton Street, Room 771
P.O. Box 7248
Syracuse, New York 13261-7248

Purpose:

To provide training on the uses of electromagnetic induction (EM) techniques and the operation of the EM31 meter. To use ground-penetrating radar (GPR) techniques to assess the Andover Dam sites in Allegany County and bottom sediments beneath a portion of the Irondequoit stream channel in Linear Park, Monroe County.

Participants:

Joseph Albert, Sr. Public Health Sanitarian, Depth of Health,
Rochester, NY
Geoffrey Benway, Project Engineer, MRB Group, Rochester, NY
Richard Crowe, Asst. State Engineer, SCS, Syracuse, NY
Jim Doolittle, Soil Specialist, SCS, Chester, PA
Tony Esser, Water Quality Coordinator, SCS, Syracuse, NY
Matt Havens, Soil Scientist, SCS, Walton, NY
Gary Lamont, Resource Conservationist, SCS, Walton, NY
Jazelle Jusino, Biological Science Tech., SCS, Walton, NY
Lee Sepelak, Conservation Engineering Tech., SCS, Binghamton, NY
Fred Sinclair, District Manager, Allegany SWCD, Belmont, NY
Michael Simon, Assoc. Engineer, MRB Group, Rochester, NY
Paula Smith, District Manager, Monroe County SWCD, Rochester, NY
Dave Sullivan, Geologist, SCS, Syracuse, NY
Michael Townsend, Water Quality Specialist, SCS, NY

Activities:

A slide presentation on the uses of EM techniques was given at the Binghamton Field Office on the morning of 4 May. During the afternoon of 4 May, an animal waste holding facility in Broome County was surveyed as part of the EM field demonstration and training exercise. Dave Sullivan and I travelled to Allegany County in the late afternoon of 4 May. The Andover Dam site was surveyed on the morning of 5 May. During the afternoon of 5 May, Dave Sullivan and I travelled to Monroe County and viewed the proposed survey site in Penfield. On the morning of 6 May a GPR survey was conducted at the streambank erosion and stabilization project at Linear Park in Penfield. I returned to Chester, Pennsylvania, on the afternoon of 6 May.

Equipment:

The electromagnetic induction meter used was the EM31 manufactured by GEONICS Limited.¹ Measurements of conductivity are expressed as milliSiemens per meter (mS/m). Two-dimensional plots of the EM data from the waste holding facility in Broome County were prepared using SURFER software developed by Golden Software, Inc.¹

The radar unit used in this study was the Subsurface Interface Radar (SIR) System-8 manufactured by Geophysical Survey Systems, Inc. The system was powered by a 12-volt marine battery. The model 3110 (120 mHz) antenna with a model 705DA transceiver were used in this study.

Discussion:Broome County - Animal Waste-Holding Facility

An irregularly-shaped, 500 by 300 foot grid was established along the east and south sides of a waste-holding pond and farm structures. The grid interval was 50 feet. Survey flags were inserted in the ground at each of the 37 grid intersections. At each grid intersection, measurements were obtained with the EM31 meter in both the horizontal and vertical dipole orientations. Each participant was given the opportunity to operate the EM31 meter and to conduct an EM survey. Interpretations of the EM data were discussed in the field.

The study site was in an area of Unadilla silt loam, 0 to 5 percent slopes. Unadilla is member of the coarse-silty, mixed, mesic Typic Dystrochrepts family. This well drained soil form in outwash deposits.

Figures 1 and 2 are two-dimensional plots of apparent conductivity measurements of the study area. In each plot, the interval is 1 mS/m. These plots represent computer simulations of data obtained with the EM31 in the horizontal and vertical dipole modes, respectively. The EM31 meter scans depths of 0 to 2.75 meters in the horizontal and 0 to 6.0 meters in the vertical dipole mode.

In Figures 1 and 2, values of apparent conductivity are noticeably higher near the waste facility and farm structures and in a small depression (located about 100 feet north of the southeast corner of the study area). Runoff from the farm structures appears to have been channeled along a roadway into the small depression. Higher values of conductivity were attributed to elevated levels of nitrates and chlorides from animal wastes.

Allegheny County - Andover Dam Site

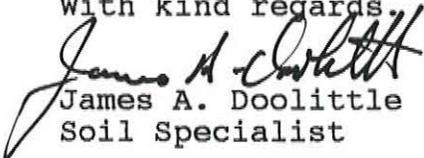
Survey flags were placed at five foot intervals along the upstream edge of the existing dam structure. Three additional range lines were established across the water. These range lines were upstream and parallel with the dam structure. These ranges were established at distances of 5, 10 and 15 feet away from the structure.

have the opportunity to become more familiar with and to more fully assess the potentials of using this technique to support SCS programs in the New York.

3. The ground-penetrating radar survey at the Andover Dam site helped to characterize the site. Generally, numerous subsurface anomalies occur within 7.5 feet of the existing up-stream edge of the structure. Ground truth verification is needed to confirm the nature of the discerned anomalies.

It is my pleasure to work in New York, with Dave Sullivan and members of your fine SCS staff.

With kind regards,


James A. Doolittle
Soil Specialist

cc:

D. Sullivan, Geologist, SCS, Syracuse, NY

J. Culver, National Leader, SSQAS, NSSC, SCS, Lincoln, NE

S. Holzhey, Assistant Director, NSSC, SCS, Lincoln, NE

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